FOREWORD

Thank you for purchasing our robot products. This manual contains the information necessary for the correct use of the Manipulator. Please carefully read this manual and other related manuals before installing the robot system. Keep this manual handy for easy access at all times.

WARRANTY

The robot and its optional parts are shipped to our customers only after being subjected to the strictest quality controls, tests, and inspections to certify its compliance with our high performance standards.

Product malfunctions resulting from normal handling or operation will be repaired free of charge during the normal warranty period. (Please ask your Regional Sales Office for warranty period information.)

However, customers will be charged for repairs in the following cases (even if they occur during the warranty period):

1. Damage or malfunction caused by improper use which is not described in the manual, or careless use.
2. Malfunctions caused by customers’ unauthorized disassembly.
3. Damage due to improper adjustments or unauthorized repair attempts.
4. Damage caused by natural disasters such as earthquake, flood, etc.

Warnings, Cautions, Usage:

1. If the robot or associated equipment is used outside of the usage conditions and product specifications described in the manuals, this warranty is void.
2. If you do not follow the WARNINGS and CAUTIONS in this manual, we cannot be responsible for any malfunction or accident, even if the result is injury or death.
3. We cannot foresee all possible dangers and consequences. Therefore, this manual cannot warn the user of all possible hazards.
TRADEMARKS

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TRADEMARK NOTATION IN THIS MANUAL

Microsoft® Windows® XP Operating system
Microsoft® Windows® Vista Operating system
Microsoft® Windows® 7 Operating system

NOTICE

No part of this manual may be copied or reproduced without authorization.
The contents of this manual are subject to change without notice.
Please notify us if you should find any errors in this manual or if you have any comments regarding its contents.

INQUIRIES

Contact the following service center for robot repairs, inspections or adjustments.
If service center information is not indicated below, please contact the supplier office for your region.
Please prepare the following items before you contact us.
- Your controller model and its serial number
- Your manipulator model and its serial number
- Software and its version in your robot system
- A description of the problem

SERVICE CENTER
MANUFACTURER

Seiko Epson Corporation
Toyoshina Plant
Robotics Solutions Operations Division
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FAX : +81-(0)263-72-1495

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Japan

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TEL : +81-(0)3-5321-4161
SAFETY PRECAUTIONS

Installation of robots and robotic equipment should only be performed by qualified personnel in accordance with national and local codes. Please carefully read this manual and other related manuals when using this software. Keep this manual in a handy location for easy access at all times.

### WARNING

- This symbol indicates that a danger of possible serious injury or death exists if the associated instructions are not followed properly.

### CAUTION

- This symbol indicates that a danger of possible harm to people or physical damage to equipment and facilities exists if the associated instructions are not followed properly.
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<td>EPSON RC+ 6.0.0 List of New Commands</td>
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### Summary of SPEL+ Commands

The following is a summary of SPEL+ commands.

#### System Management Commands

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<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset</td>
<td>Resets the controller.</td>
</tr>
<tr>
<td>SysConfig</td>
<td>Displays controller setup.</td>
</tr>
<tr>
<td>SysErr</td>
<td>Returns the latest error status or warning status.</td>
</tr>
<tr>
<td>Date</td>
<td>Sets the system date.</td>
</tr>
<tr>
<td>Time</td>
<td>Sets system time.</td>
</tr>
<tr>
<td>Date$</td>
<td>Returns the system date as a string.</td>
</tr>
<tr>
<td>Time$</td>
<td>Returns system time as a string.</td>
</tr>
<tr>
<td>Hour</td>
<td>Displays / returns controller operation time.</td>
</tr>
<tr>
<td>Stat</td>
<td>Returns controller status bits.</td>
</tr>
<tr>
<td>CtrlInfo</td>
<td>Returns controller information.</td>
</tr>
<tr>
<td>RobotInfo</td>
<td>Returns robot information.</td>
</tr>
<tr>
<td>RobotInfo$</td>
<td>Returns robot text information.</td>
</tr>
<tr>
<td>TaskInfo</td>
<td>Returns task information.</td>
</tr>
<tr>
<td>TaskInfo$</td>
<td>Returns task text information.</td>
</tr>
<tr>
<td>DispDev</td>
<td>Sets the current display device.</td>
</tr>
<tr>
<td>EStopOn</td>
<td>Return the Emergency Stop status.</td>
</tr>
<tr>
<td>CtrlDev</td>
<td>Returns the current control device number.</td>
</tr>
<tr>
<td>Cls</td>
<td>Clears the EPSON RC+ 6.0 Run, Operator, or Command window text area.</td>
</tr>
<tr>
<td></td>
<td>Clears the TP print panel.</td>
</tr>
<tr>
<td>Toff</td>
<td>Turns off execution line display on the LCD.</td>
</tr>
<tr>
<td>Ton</td>
<td>Specifies a task which shows a execution line on the LCD.</td>
</tr>
<tr>
<td>SafetyOn</td>
<td>Return the Safety Door open status.</td>
</tr>
<tr>
<td>Eval</td>
<td>Executes a Command window statement from a program and returns the error status.</td>
</tr>
<tr>
<td>ShutDown</td>
<td>Shuts down EPSON RC+ and optionally shuts down or restarts Windows.</td>
</tr>
<tr>
<td>SetLCD</td>
<td>Sets or displays how the controller's LCD panel displays data.</td>
</tr>
<tr>
<td>TeachOn</td>
<td>Returns the Teach mode status.</td>
</tr>
<tr>
<td>WindowsStatus</td>
<td>Returns the Windows startup status.</td>
</tr>
</tbody>
</table>

#### Robot Control Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AtHome</td>
<td>Returns if the current robot orientation is Home position or not.</td>
</tr>
<tr>
<td>Calib</td>
<td>Replaces the current arm posture pulse values with the current CalPls values.</td>
</tr>
<tr>
<td>CalPls</td>
<td>Specifies and displays the position and orientation pulse values for calibration.</td>
</tr>
<tr>
<td>Hofs</td>
<td>Returns the offset pulses used for software zero point correction.</td>
</tr>
</tbody>
</table>
## Summary of SPEL+ Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCal</td>
<td>Executes machine calibration for robots with incremental encoders.</td>
</tr>
<tr>
<td>MCalComplete</td>
<td>Returns status of MCal.</td>
</tr>
<tr>
<td>MCordr</td>
<td>Specifies and displays the moving joint order for machine calibration Mcal. Required only for robots with incremental encoders.</td>
</tr>
<tr>
<td>Power</td>
<td>Sets / returns servo power mode.</td>
</tr>
<tr>
<td>Motor</td>
<td>Sets / returns motor status.</td>
</tr>
<tr>
<td>MHour Function</td>
<td>Returns the accumulated MOTOR ON time of the robot motors.</td>
</tr>
<tr>
<td>SFree</td>
<td>Removes servo power from the specified servo axis.</td>
</tr>
<tr>
<td>SLock</td>
<td>Restores servo power to the specified servo axis.</td>
</tr>
<tr>
<td>SyncRobots</td>
<td>Start the reserved robot motion.</td>
</tr>
<tr>
<td>Jump</td>
<td>Jumps to a point using point to point motion.</td>
</tr>
<tr>
<td>Jump3</td>
<td>Jumps to a point using 3D gate motion.</td>
</tr>
<tr>
<td>Jump3CP</td>
<td>Jumps to a point using 3D motion in continuous path.</td>
</tr>
<tr>
<td>Arch</td>
<td>Sets / returns arch parameters for Jump motion.</td>
</tr>
<tr>
<td>LimZ</td>
<td>Sets the upper Z limit for the Jump command.</td>
</tr>
<tr>
<td>Sense</td>
<td>Returns status of Sense operation.</td>
</tr>
<tr>
<td>JS</td>
<td>Returns the status of the most recent Jump command for the current robot.</td>
</tr>
<tr>
<td>JT</td>
<td>Returns the status of the most recent Jump command for the current robot.</td>
</tr>
<tr>
<td>Go</td>
<td>Moves the robot to a point using point to point motion.</td>
</tr>
<tr>
<td>Pass</td>
<td>Executes simultaneous four joint Point to Point motion, passing near but not through the specified points.</td>
</tr>
<tr>
<td>Pulse</td>
<td>Moves the robot to a position defined in pulses.</td>
</tr>
<tr>
<td>BGo</td>
<td>Executes Point to Point relative motion, in the selected local coordinate system.</td>
</tr>
<tr>
<td>BMove</td>
<td>Executes linear interpolation relative motion, in the selected local coordinate system.</td>
</tr>
<tr>
<td>TGo</td>
<td>Executes Point to Point relative motion, in the current tool coordinate system.</td>
</tr>
<tr>
<td>TMove</td>
<td>Executes linear interpolation relative motion, in the selected tool coordinate system.</td>
</tr>
<tr>
<td>Till</td>
<td>Specifies motion stop when input occurs.</td>
</tr>
<tr>
<td>TillOn</td>
<td>Returns the current Till status.</td>
</tr>
<tr>
<td>!…!</td>
<td>Process statements during motion.</td>
</tr>
<tr>
<td>Speed</td>
<td>Sets / returns speed for point to point motion commands.</td>
</tr>
<tr>
<td>Accel</td>
<td>Sets / returns acceleration and deceleration for point to point motion.</td>
</tr>
<tr>
<td>Inertia</td>
<td>Specifies or displays the inertia settings of the robot arm.</td>
</tr>
<tr>
<td>Weight</td>
<td>Specifies or displays the weight settings of the robot arm.</td>
</tr>
<tr>
<td>Arc</td>
<td>Moves the arm using circular interpolation.</td>
</tr>
<tr>
<td>Arc3</td>
<td>Moves the arm in 3D using circular interpolation.</td>
</tr>
<tr>
<td>Move</td>
<td>Moves the robot using linear interpolation.</td>
</tr>
<tr>
<td>Curve</td>
<td>Defines the data and points required to move the arm along a curved path. Many data points can be defined in the path to improve precision of the path.</td>
</tr>
<tr>
<td>CV Move</td>
<td>Performs the continuous spline path motion defined by the Curve instruction.</td>
</tr>
<tr>
<td>SpeedS</td>
<td>Sets / returns speed for linear motion commands.</td>
</tr>
<tr>
<td>AccelS</td>
<td>Sets / returns acceleration and deceleration for linear motion.</td>
</tr>
<tr>
<td>SpeedR</td>
<td>Sets / returns speed for tool rotation.</td>
</tr>
</tbody>
</table>
AccelR          Sets / returns acceleration and deceleration for tool rotation.
AccelMax       Returns maximum acceleration value limit available for Accel.
Brake          Turns brake on or off for specified joint of the current robot.
Home           Moves robot to user defined home position.
HomeClr        Clears the home position definition.
HomeDef        Returns status of home position definition.
HomeSet        Sets user defined home position.
Hordr          Sets motion order for Home command.
InPos          Checks if robot is in position (not moving).
CurPos         Returns current position while moving.
TCPSpeed       Returns calculated current tool center point velocity.
Pallet          Defines a pallet or returns a pallet point.
Fine           Sets positioning error limits.
QP              Sets / returns Quick Pause status.
QPDecelR       Sets the deceleration speed of quick pause for the change of tool orientation during the CP motion.
QPDecelS       Sets the deceleration speed of quick pause in the CP motion.
CP              Sets CP (Continuous Path) motion mode.
Box             Specifies and displays the approach check area.
BoxClr          Clears the definition of approach check area.
BoxDef          Returns whether Box has been defined or not.
Plane           Specifies and displays the approach check plane.
PlaneClr        Clears (undefines) a Plane definition.
PlaneDef        Returns the setting of the approach check plane.
InsideBox       Displays a prompt in a dialog box, waits for the operator to input text or choose a button, and returns the contents of the box.
InsidePlane     Returns the check status of the approach check plane.
GetRobotInsideBox Returns a robot which is in the approach check area.
GetRobotInsidePlane Returns a robot which is in the approach check plane.
Find            Specifies or displays the condition to store coordinates during motion.
FindPos         Returns a robot point stored by Fine during a motion command.
PosFound        Returns status of Find operation.
WaitPos         Waits for robot to decelerate and stop at position before executing the next statement while path motion is active.
Robot           Selects the current robot.
RobotModel$    Returns the robot model name.
RobotName$     Returns the robot name.
RobotSerial$   Returns the robot serial number.
RobotType      Returns the robot type.
TargetOK        Returns a status indicating whether or not the PTP (Point to Point) motion from the current position to a target position is possible.
JRange          Sets / returns joint limits for one joint.
Range           Sets limits for all joints.
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<td>XYLim</td>
<td>Sets or displays the permissible XY motion range limits for the robot.</td>
</tr>
<tr>
<td>XYLimClr</td>
<td>Clears the XYLim definition.</td>
</tr>
<tr>
<td>XYLimDef</td>
<td>Returns whether XYLim has been defined or not.</td>
</tr>
<tr>
<td>XY</td>
<td>Returns a point from individual coordinates that can be used in a point expression.</td>
</tr>
<tr>
<td>Dist</td>
<td>Returns the distance between two robot points.</td>
</tr>
<tr>
<td>PTPBoost</td>
<td>Specifies or displays the acceleration, deceleration and speed algorithmic boost parameter for small distance PTP (point to point) motion.</td>
</tr>
<tr>
<td>PTPBoostOK</td>
<td>Returns whether or not the PTP (Point to Point) motion from a current position to a target position is a small travel distance.</td>
</tr>
<tr>
<td>PTPTime</td>
<td>Returns the estimated time for a point to point motion command without executing it.</td>
</tr>
<tr>
<td>CX</td>
<td>Sets / returns the X axis coordinate of a point.</td>
</tr>
<tr>
<td>CY</td>
<td>Sets / returns the Y axis coordinate of a point.</td>
</tr>
<tr>
<td>CZ</td>
<td>Sets / returns the Z axis coordinate of a point.</td>
</tr>
<tr>
<td>CU</td>
<td>Sets / returns the U axis coordinate of a point.</td>
</tr>
<tr>
<td>CV</td>
<td>Sets / returns the V axis coordinate of a point.</td>
</tr>
<tr>
<td>CW</td>
<td>Sets / returns the W axis coordinate of a point.</td>
</tr>
<tr>
<td>CR</td>
<td>Sets / returns the R axis coordinate of a point.</td>
</tr>
<tr>
<td>CS</td>
<td>Sets / returns the S axis coordinate of a point.</td>
</tr>
<tr>
<td>CT</td>
<td>Sets / returns the T axis coordinate of a point.</td>
</tr>
<tr>
<td>PIs</td>
<td>Returns the pulse value of one joint.</td>
</tr>
<tr>
<td>Agl</td>
<td>Returns joint angle at current position.</td>
</tr>
<tr>
<td>PAgl</td>
<td>Return a joint value from a specified point.</td>
</tr>
<tr>
<td>JA</td>
<td>Returns a robot point specified in joint angles.</td>
</tr>
<tr>
<td>AglToPls</td>
<td>Converts robot angles to pulses.</td>
</tr>
<tr>
<td>DegToRad</td>
<td>Converts degrees to radians.</td>
</tr>
<tr>
<td>RadToDeg</td>
<td>Converts radians to degrees.</td>
</tr>
<tr>
<td>Joint</td>
<td>Displays the current position for the robot in joint coordinates.</td>
</tr>
<tr>
<td>JTran</td>
<td>Perform a relative move of one joint.</td>
</tr>
<tr>
<td>PTran</td>
<td>Perform a relative move of one joint in pulses.</td>
</tr>
<tr>
<td>RealPls</td>
<td>Returns the pulse value of the specified joint.</td>
</tr>
<tr>
<td>RealPose</td>
<td>Returns the current position of the specified robot.</td>
</tr>
<tr>
<td>PPIs</td>
<td>Return the pulse position of a specified joint value from a specified point.</td>
</tr>
<tr>
<td>LJM Function</td>
<td>Returns the point data with the orientation flags converted to enable least joint motion when moving to a specified point based on the reference point.</td>
</tr>
<tr>
<td>AutoLJM</td>
<td>Sets the Auto LJM</td>
</tr>
<tr>
<td>AutoLJM Function</td>
<td>Returns the state of the Auto LJM</td>
</tr>
<tr>
<td>AvoidSingularity</td>
<td>Sets the Singularity avoiding function</td>
</tr>
<tr>
<td>AvoidSingularity Function</td>
<td>Returns the state of the Singularity avoiding function</td>
</tr>
<tr>
<td>SingularityAngle</td>
<td>Sets the singularity neighborhood angle for the singularity avoiding function</td>
</tr>
<tr>
<td>SingularityAngle Function</td>
<td>Returns the singularity neighborhood angle for the singularity avoiding function</td>
</tr>
<tr>
<td>SingularityDist</td>
<td>Sets the singularity neighborhood distance necessary for the singularity avoiding function</td>
</tr>
<tr>
<td>SingularityDist Function</td>
<td>Returns the singularity neighborhood distance necessary for the singularity avoiding function</td>
</tr>
</tbody>
</table>
Summary of SPEL+ Commands

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<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SingularitySpeed</td>
<td>Sets the singularity neighborhood speed for the singularity avoiding function</td>
</tr>
<tr>
<td>SingularitySpeed Function</td>
<td>Returns the singularity neighborhood speed for the singularity avoiding function</td>
</tr>
<tr>
<td>AbortMotion</td>
<td>Aborts a motion command and puts the running task in error status.</td>
</tr>
<tr>
<td>Align Function</td>
<td>Returns point data converted to align robot orientation with the nearest coordinate axis in local coordinate system.</td>
</tr>
<tr>
<td>AlignECP Function</td>
<td>Returns point data converted to align robot orientation with a nearest coordinate axis in ECP coordinate system.</td>
</tr>
<tr>
<td>SoftCP</td>
<td>Settings / displays SoftCP motion mode.</td>
</tr>
<tr>
<td>SoftCP Function</td>
<td>Returns the status of SoftCP motion mode.</td>
</tr>
<tr>
<td>Here</td>
<td>Teach a robot point at the current position.</td>
</tr>
<tr>
<td>Where</td>
<td>Displays current robot position data.</td>
</tr>
</tbody>
</table>

Torque Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>Returns the torque control mode setting and current mode.</td>
</tr>
<tr>
<td>TCSpeed</td>
<td>Specifies the speed limit in the torque control.</td>
</tr>
<tr>
<td>TCLim</td>
<td>Specifies the torque limit of each joint for the torque control mode.</td>
</tr>
<tr>
<td>RealTorque</td>
<td>Returns the current torque instruction value of the specified joint.</td>
</tr>
<tr>
<td>ATCLR</td>
<td>Clears and initializes the average torque for one or more joints.</td>
</tr>
<tr>
<td>ATRQ</td>
<td>Displays the average torque for the specified joint.</td>
</tr>
<tr>
<td>PTCLR</td>
<td>Clears and initializes the peak torque for one or more joints.</td>
</tr>
<tr>
<td>PTRQ</td>
<td>Displays the peak torque for the specified joint.</td>
</tr>
<tr>
<td>OLAccel</td>
<td>Sets up the automatic adjustment of acceleration/deceleration that is adjusted</td>
</tr>
<tr>
<td>OLRate</td>
<td>Displays overload rating for one or all joints for the current robot.</td>
</tr>
<tr>
<td>LimitTorque</td>
<td>Sets / returns the upper torque value in High power mode.</td>
</tr>
<tr>
<td>LimitTorque Function</td>
<td>Returns the LimitTorque setting value.</td>
</tr>
</tbody>
</table>

Input / Output Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On</td>
<td>Turns an output on.</td>
</tr>
<tr>
<td>Off</td>
<td>Turns an output off.</td>
</tr>
<tr>
<td>Oport</td>
<td>Reads status of one output bit.</td>
</tr>
<tr>
<td>Sw</td>
<td>Returns status of input.</td>
</tr>
<tr>
<td>In</td>
<td>Reads 8 bits of inputs.</td>
</tr>
<tr>
<td>InW</td>
<td>Returns the status of the specified input word port.</td>
</tr>
<tr>
<td>InBCD</td>
<td>Reads 8 bits of inputs in BCD format.</td>
</tr>
<tr>
<td>InReal</td>
<td>Reads an input data of 2 words (32 bits) as a floating-point data (IEEE754 compliant) of 32 bits.</td>
</tr>
<tr>
<td>Out</td>
<td>Sets / returns 8 bits of outputs.</td>
</tr>
<tr>
<td>OutW</td>
<td>Simultaneously sets 16 output bits.</td>
</tr>
<tr>
<td>OpBCD</td>
<td>Simultaneously sets 8 output bits using BCD format.</td>
</tr>
<tr>
<td>OutReal</td>
<td>Output the output data of real value as the floating-point data (IEEE754 compliant) of 32 bits to the output port 2 words (32 bits).</td>
</tr>
</tbody>
</table>
### Summary of SPEL+ Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MemOn</td>
<td>Turns a memory bit on.</td>
</tr>
<tr>
<td>MemOff</td>
<td>Turns a memory bit off.</td>
</tr>
<tr>
<td>MemSw</td>
<td>Returns status of memory bit.</td>
</tr>
<tr>
<td>MemIn</td>
<td>Reads 8 bits of memory I/O.</td>
</tr>
<tr>
<td>MemOut</td>
<td>Sets / returns 8 memory bits.</td>
</tr>
<tr>
<td>MemInW</td>
<td>Returns the status of the specified I/O word port. Each word port contains 16 memory I/O bits.</td>
</tr>
<tr>
<td>MemOutW</td>
<td>Simultaneously sets 16 memory I/O bits.</td>
</tr>
<tr>
<td>Wait</td>
<td>Wait for condition or time.</td>
</tr>
<tr>
<td>TMOut</td>
<td>Sets default time out for Wait statement.</td>
</tr>
<tr>
<td>Tw</td>
<td>Returns the status of the Wait condition and Wait timer interval.</td>
</tr>
<tr>
<td>Input</td>
<td>Receives input data from the display device and stored in a variable(s).</td>
</tr>
<tr>
<td>Print</td>
<td>Display characters on current display window.</td>
</tr>
<tr>
<td>Line Input</td>
<td>Input a string from the current display window.</td>
</tr>
<tr>
<td>Input #</td>
<td>Allows string or numeric data to be received from a file, communications port, or database and stored in one or more variables.</td>
</tr>
<tr>
<td>Print #</td>
<td>Outputs data to the specified file, communications port, database, or device.</td>
</tr>
<tr>
<td>Line Input #</td>
<td>Reads data of one line from a file, communication port, database, or the device.</td>
</tr>
<tr>
<td>Lof</td>
<td>Checks whether the specified RS-232 or TCP/IP port has any lines of data in its buffer.</td>
</tr>
<tr>
<td>SetIn</td>
<td>For Virtual IO, sets specified input port (8 bits) to the specified value.</td>
</tr>
<tr>
<td>SetInW</td>
<td>For Virtual IO, sets specified input word (16 bits) to the specified value.</td>
</tr>
<tr>
<td>SetSw</td>
<td>For Virtual IO, sets specified input bit to the specified value.</td>
</tr>
<tr>
<td>IOLabel$</td>
<td>Returns the I/O label for a specified input or output bit, byte, or word.</td>
</tr>
<tr>
<td>IONumber</td>
<td>Returns the I/O number of the specified I/O label.</td>
</tr>
<tr>
<td>OpenCom</td>
<td>Open an RS-232 communication port.</td>
</tr>
<tr>
<td>OpenCom Function</td>
<td>Acquires the task number that executes OpenCom.</td>
</tr>
<tr>
<td>CloseCom</td>
<td>Close the RS-232C port that has been opened with OpenCom.</td>
</tr>
<tr>
<td>SetCom</td>
<td>Sets or displays parameters for RS-232C port.</td>
</tr>
<tr>
<td>ChkCom</td>
<td>Returns number of characters in the reception buffer of a communication port.</td>
</tr>
<tr>
<td>OpenNet</td>
<td>Open a TCP/IP network port.</td>
</tr>
<tr>
<td>OpenNet Function</td>
<td>Acquires the task number that executes OpenNet.</td>
</tr>
<tr>
<td>CloseNet</td>
<td>Close the TCP/IP port previously opened with OpenNet.</td>
</tr>
<tr>
<td>SetNet</td>
<td>Sets parameters for a TCP/IP port.</td>
</tr>
<tr>
<td>ChkNet</td>
<td>Returns number of characters in the reception buffer of a network port.</td>
</tr>
<tr>
<td>WaitNet</td>
<td>Wait for TCP/IP port connection to be established.</td>
</tr>
<tr>
<td>Read</td>
<td>Reads characters from a file or communications port.</td>
</tr>
<tr>
<td>ReadBin</td>
<td>Reads binary data from a file or communications port.</td>
</tr>
<tr>
<td>Write</td>
<td>Writes characters to a file or communication port without end of line terminator.</td>
</tr>
<tr>
<td>WriteBin</td>
<td>Writes binary data to a file or communications port.</td>
</tr>
</tbody>
</table>
**Summary of SPEL+ Commands**

**InputBox**
Displays a prompt in a dialog box, waits for the operator to input text or choose a button, and returns the contents of the box.

**MsgBox**
Displays a message in a dialog box and waits for the operator to choose a button.

**RunDialog**
Runs an EPSON RC+ 6.0 dialog from a SPEL+ program.

**LatchEnable**
Enable / Disable the latch function for the robot position by the R-l/O input.

**LatchState Function**
Returns the latch state of robot position using the R-l/O.

**LatchPos Function**
Returns the robot position latched using the R-l/O input signal.

**SetLatch**
Sets the latch function of the robot position using the R-l/O input.

---

**Point Management Commands**

**ClearPoints**
Clears all point data in memory.

**LoadPoints**
Loads point data from a file in memory.

**SavePoints**
Saves point data to a file in memory.

**ImportPoints**
Imports a point file into the current project for the specified robot.

**ExportPoints**
Exports a point file to the specified path in the PC.

**P#**
Defines a specified point.

**PDef**
Returns the definition status of a specified point.

**PDel**
Deletes specified position data.

**PLabel**
Defines a label for a specified point.

**PLabel$**
Returns the point label associated with a point number.

**PNumber**
Returns the point number associated with a point label.

**PList**
Displays point data in memory for the current robot.

**PLocal**
Sets the local attribute for a point.

---

**Coordinate Change Commands**

**Arm**
Sets / returns current arm.

**ArmSet**
Defines an arm.

**ArmDef**
Returns status of arm definition.

**ArmClr**
Clears an arm definition.

**Tool**
Sets / returns the current tool number.

**TLSet**
Defines or displays a tool coordinate system.

**TLDdef**
Returns status of tool definition.

**TLClr**
Clears a tool definition.

**ECP**
Sets / returns the current ECP number.

**ECPSet**
Defines or displays an external control point.

**ECPDef**
Returns status of ECP definition.

**ECPClr**
Clears an ECP definition.

**Base**
Defines and displays the base coordinate system.

**Local**
Define a local coordinate system.

**LocalDef**
Returns status of local definition.

**LocalClr**
Clears (undefines) a local coordinate system.

**Elbow**
Sets / returns elbow orientation of a point.

**Hand**
Sets / returns hand orientation of a point.

**Wrist**
Sets / returns wrist orientation of a point.

**J4Flag**
Sets / returns the J4Flag setting of a point.

**J6Flag**
Sets / returns the J6Flag orientation of a point.

**J1Flag**
Sets / returns the J1Flag setting of a point.

**J2Flag**
Sets / returns the J2Flag orientation of a point.

**J1Angle**
Returns the J1Angle attribute of a point.
Summary of SPEL+ Commands

VxCalib
- Creates the calibration data.

VxCalDelete
- Deletes the calibration data.

VxCalInfo
- Returns the calibration completion status / calibration data.

VxCalLoad
- Loads the calibration data from the file.

VxCalSave
- Saves the calibration data to the file.

VxTrans
- Converts pixel coordinates to the robot coordinates and returns the converted point data.

Program Control Commands

Function
- Declare a function.

For...Next
- Executes one or more statements for a specific count.

GoSub
- Execute a subroutine.

Return
- Returns from a subroutine.

GoTo
- Branch unconditionally to a line number or label.

Call
- Call a user function.

If..Then..Else..EndIf
- Conditional statement execution

Else
- Used with the If instruction to allow statements to be executed when the condition used with the If instruction is False. Else is an option for the If/Then instruction.

Select ...
- Sends one of several groups of statements, depending on the value of an expression.

Do...Loop
- Do...Loop construct.

Declare
- Declares an external function in a dynamic link library (DLL).

Trap
- Specify a trap handler.

OnErr
- Defines an error handler.

Era
- Returns robot joint number for last error.

Erf$
- Returns the function name for last error.

Erl
- Returns line number of error.

Err
- Returns error number.

Ert
- Returns task number of error.

ErrMsg$
- Returns error message.

Signal
- Sends a signal to tasks executing WaitSig.

SyncLock
- Synchronizes tasks using a mutual exclusion lock.

SynUnlock
- Unlocks a sync ID that was previously locked with SyncLock.

WaitSig
- Waits for a signal from another task.

ErrorOn
- Returns the error status of the controller.

Error
- Generates a user error.

EResume
- Resumes execution after an error-handling routine is finished.

PauseOn
- Returns the pause status.

Exit
- Exits a loop construct or function.

Program Execution Commands

Xqt
- Execute a task.

Pause
- Pause all tasks that have pause enabled.

Cont
- Resumes the controller after a Pause statement has been executed and continues the execution of all tasks.

Halt
- Suspend a task.

Quit
- Quits a task.

Resume
- Resume a task in the halt state.

MyTask
- Returns current task.

TaskDone
- Returns the completion status of a task.
TaskState
Returns the current state of a task.

TaskWait
Waits to for a task to terminate.

Restart
Restarts the current main program group.

Recover
Executes safeguard position recovery and returns status.

RecoverPos
Returns the position where a robot was in when safeguard was open.

StartMain
Executes the main function from a background task.

Pseudo Statements

#define Defines a macro.
#ifdef ... #endif Conditional compile.
#ifndef ... #endif Conditional compile.
#include Include a file.
#undef Undefines an identifier previously defined with #define.

File Management Commands

Dir Displays the contents of the specified directory.
ChDir Changes and displays the current directory.
ChDisk Sets the object disk for file operations.
MkDir Creates a subdirectory on a controller disk drive.
RmDir Removes an empty subdirectory from a controller disk drive.
RenDir Rename a directory.

FileDateTime$ Returns the date and time of a file.
FileExists Checks if a file exists.
FileLen Returns the length of a file.
FolderExists Checks if a folder exists.

Type Displays the contents of the specified file.
Del Deletes one or more files.
Copy Copies a file to another location.
Rename Renames a file.

AOpen Opens file in the appending mode.
BOpen Opens file in binary mode.
ROpen Opens a file for reading.
Uopen Opens a file for read / write access.
WOpen Opens a file for writing.
Input # Allows string or numeric data to be received from a file, communications port, or database and stored in one or more variables.
Print # Outputs data to the specified file, communications port, database, or device.
Line Input # Reads data of one line from a file, communication port, database, or the device.
Read Reads characters from a file or communications port.
ReadBin Reads binary data from a file or communications port.
Write Writes characters to a file or communication port without end of line terminator.
WriteBin Writes binary data to a file or communications port.
Seek Changes position of file pointer for a specified file.
Close Closes a file.

Eof Returns end of file status.
ChDrive Changes the current disk drive for file operations.
## Summary of SPEL+ Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CurDir$</td>
<td>Returns a string representing the current directory.</td>
</tr>
<tr>
<td>CurDrive$</td>
<td>Returns a string representing the current drive.</td>
</tr>
<tr>
<td>CurDisk$</td>
<td>Returns a string representing the current disk.</td>
</tr>
<tr>
<td>Flush</td>
<td>Writes a file's buffer into the file.</td>
</tr>
</tbody>
</table>

## Fieldbus Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FbusIO_GetBusStatus</td>
<td>Returns the status of the specified Fieldbus.</td>
</tr>
<tr>
<td>FbusIO_GetDeviceStatus</td>
<td>Returns the status of the specified Fieldbus device.</td>
</tr>
<tr>
<td>FbusIO_SendMsg</td>
<td>Sends an explicit message to a Fieldbus device and returns the reply.</td>
</tr>
</tbody>
</table>

## Numeric Value Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ctr</td>
<td>Return the value of a counter.</td>
</tr>
<tr>
<td>CTReset</td>
<td>Resets a counter.</td>
</tr>
<tr>
<td>Tmr</td>
<td>Returns the value of a timer.</td>
</tr>
<tr>
<td>TmReset</td>
<td>Resets a timer to 0.</td>
</tr>
<tr>
<td>Sin</td>
<td>Returns the sine of an angle.</td>
</tr>
<tr>
<td>Cos</td>
<td>Returns cosine of an angle.</td>
</tr>
<tr>
<td>Tan</td>
<td>Returns the tangent of an angle.</td>
</tr>
<tr>
<td>Acos</td>
<td>Returns arccosine.</td>
</tr>
<tr>
<td>Asin</td>
<td>Returns arcsine.</td>
</tr>
<tr>
<td>Atan</td>
<td>Returns arctangent.</td>
</tr>
<tr>
<td>Atan2</td>
<td>Returns arctangent based on X, Y position.</td>
</tr>
<tr>
<td>Sqr</td>
<td>Returns the square root of a number.</td>
</tr>
<tr>
<td>Abs</td>
<td>Returns the absolute value of a number.</td>
</tr>
<tr>
<td>Sgn</td>
<td>Returns the sign of a number.</td>
</tr>
<tr>
<td>Int</td>
<td>Converts a real number to an integer.</td>
</tr>
<tr>
<td>BClr</td>
<td>Clear one bit in a number and return the new value</td>
</tr>
<tr>
<td>BSet</td>
<td>Sets a bit in a number and returns the new value</td>
</tr>
<tr>
<td>BTSt</td>
<td>Returns the status of 1 bit in a number.</td>
</tr>
<tr>
<td>Fix</td>
<td>Returns the integer portion of a real number.</td>
</tr>
<tr>
<td>Hex</td>
<td>Returns a string representing a specified number in hexadecimal format.</td>
</tr>
<tr>
<td>Randomize</td>
<td>Initializes the random-number generator.</td>
</tr>
<tr>
<td>Redim</td>
<td>Redimension an array at run-time.</td>
</tr>
<tr>
<td>Rnd</td>
<td>Return a random number.</td>
</tr>
<tr>
<td>UBound</td>
<td>Returns the largest available subscript for the indicated dimension of an array.</td>
</tr>
</tbody>
</table>

## String Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asc</td>
<td>Returns the ASCII value of a character.</td>
</tr>
<tr>
<td>Chr$</td>
<td>Returns the character of a numeric ASCII value.</td>
</tr>
<tr>
<td>Left$</td>
<td>Returns a substring from the left side of a string.</td>
</tr>
<tr>
<td>Mid$</td>
<td>Returns a substring.</td>
</tr>
<tr>
<td>Right$</td>
<td>Returns a substring from the right side of a string.</td>
</tr>
<tr>
<td>Len</td>
<td>Returns the length of a string.</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>LSet$</td>
<td>Returns a string padded with trailing spaces.</td>
</tr>
<tr>
<td>RSet$</td>
<td>Returns a string padded with leading spaces.</td>
</tr>
<tr>
<td>Space$</td>
<td>Returns a string containing space characters.</td>
</tr>
<tr>
<td>Str$</td>
<td>Converts a number to a string.</td>
</tr>
<tr>
<td>Val</td>
<td>Converts a numeric string to a number.</td>
</tr>
<tr>
<td>LCase$</td>
<td>Converts a string to lower case.</td>
</tr>
<tr>
<td>UCase$</td>
<td>Converts a string to upper case.</td>
</tr>
<tr>
<td>LTrim$</td>
<td>Removes spaces from beginning of string.</td>
</tr>
<tr>
<td>RTrim$</td>
<td>Removes spaces from end of string.</td>
</tr>
<tr>
<td>Trim$</td>
<td>Removes spaces from beginning and end of string.</td>
</tr>
<tr>
<td>ParseStr</td>
<td>Parse a string and return array of tokens.</td>
</tr>
<tr>
<td>FmtStr$</td>
<td>Format a number or string.</td>
</tr>
<tr>
<td>InStr</td>
<td>Returns position of one string within another.</td>
</tr>
<tr>
<td>Tab$</td>
<td>Returns a string containing the specified number of tabs characters.</td>
</tr>
</tbody>
</table>

**Logical Operators**

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>And</td>
<td>Performs logical and bitwise AND operation.</td>
</tr>
<tr>
<td>Or</td>
<td>Or operator.</td>
</tr>
<tr>
<td>LShift</td>
<td>Shifts bits to the left.</td>
</tr>
<tr>
<td>Mod</td>
<td>Modulus operator.</td>
</tr>
<tr>
<td>Not</td>
<td>Not operator.</td>
</tr>
<tr>
<td>RShift</td>
<td>Shifts bits to the right.</td>
</tr>
<tr>
<td>Xor</td>
<td>Exclusive Or operator.</td>
</tr>
<tr>
<td>Mask</td>
<td>Performs bitwise AND operation in Wait statements.</td>
</tr>
</tbody>
</table>

**Variable commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boolean</td>
<td>Declares Boolean variables.</td>
</tr>
<tr>
<td>Byte</td>
<td>Declares byte variables.</td>
</tr>
<tr>
<td>Double</td>
<td>Declares double variables.</td>
</tr>
<tr>
<td>Global</td>
<td>Declares global variables.</td>
</tr>
<tr>
<td>Integer</td>
<td>Declares integer variables.</td>
</tr>
<tr>
<td>Long</td>
<td>Declares long integer variables.</td>
</tr>
<tr>
<td>Real</td>
<td>Declares real variables.</td>
</tr>
<tr>
<td>String</td>
<td>Declares string variables.</td>
</tr>
</tbody>
</table>

**Security Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GetCurrentUser$</td>
<td>Returns the current EPSON RC+ user.</td>
</tr>
<tr>
<td>Login</td>
<td>Log into EPSON RC+ 6.0 as another user.</td>
</tr>
</tbody>
</table>

**Conveyor Tracking Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cnv_AbortTrack</td>
<td>Aborts tracking motion to a conveyor queue point.</td>
</tr>
<tr>
<td>Cnv_Accel Function</td>
<td>Returns acceleration and deceleration for the conveyor</td>
</tr>
<tr>
<td>Cnv_Accel</td>
<td>Sets acceleration and deceleration for the conveyor</td>
</tr>
<tr>
<td>Cnv_Downstream</td>
<td>Returns the downstream limit for the specified conveyor.</td>
</tr>
<tr>
<td>Cnv_Fine Function</td>
<td>Returns the current Cnv_Fine setting.</td>
</tr>
<tr>
<td>Cnv_Fine</td>
<td>Sets the value of Cnv_Fine for one conveyor.</td>
</tr>
<tr>
<td>Cnv_Mode</td>
<td>Sets the mode of the specified conveyor.</td>
</tr>
<tr>
<td>Cnv_Mode Function</td>
<td>Returns the mode of the specified conveyor.</td>
</tr>
<tr>
<td>Cnv_Name$ Function</td>
<td>Returns the name of the specified conveyor.</td>
</tr>
</tbody>
</table>
### Summary of SPEL+ Commands

- **Cnv_Number Function**: Returns the number of a conveyor specified by name.
- **Cnv_OffsetAngle**: Sets the offset value for the conveyor queue data.
- **Cnv_OffsetAngle Function**: Returns the offset value of the conveyor queue data.
- **Cnv_Point Function**: Returns a robot point in the specified conveyor's coordinate system derived from sensor coordinates.
- **Cnv_PosErr Function**: Returns deviation in current tracking position compared to tracking target.
- **Cnv_Pulse Function**: Returns the current position of a conveyor in pulses.
- **Cnv_QueAdd**: Adds a robot point to a conveyor queue.
- **Cnv_QueGet Function**: Returns a point from the specified conveyor's queue.
- **Cnv_QueLen Function**: Returns the number of items in the specified conveyor's queue.
- **Cnv_QueList**: Displays a list of items in the specified conveyor's queue.
- **Cnv_QueMove**: Moves data from upstream conveyor queue to downstream conveyor queue.
- **Cnv_QueReject**: Sets and displays the queue reject distance for a conveyor.
- **Cnv_QueReject Function**: Returns the current part reject distance for a conveyor.
- **Cnv_QueRemove**: Removes items from a conveyor queue.
- **Cnv_QueUserData**: Sets and displays user data associated with a queue entry.
- **Cnv_QueUserData Function**: Returns the user data value associated with an item in a conveyor queue.
- **Cnv_RobotConveyor Function**: Returns the conveyor being tracked by a robot.
- **Cnv_Speed Function**: Returns the current speed of a conveyor.
- **Cnv_Trigger**: Latches current conveyor position for the next Cnv_QueAdd statement.
- **Cnv_Upstream**: Returns the upstream limit for the specified conveyor.

### Force Sensing Commands

- **Force_Calibrate**: Sets zero offsets for all axes for the current force sensor.
- **Force_ClearTrigger**: Clears all trigger conditions for the current force sensor.
- **Force_GetForces**: Returns the forces and torques for all force sensor axes in an array.
- **Force_GetForce Function**: Returns the force for a specified axis.
- **Force_Sensor**: Sets the current force sensor for the current task.
- **Force_Sensor Function**: Returns the current force sensor for the current task.
- **Force_SetTrigger**: Sets the force trigger for the Till command.

### DB Commands

- **CloseDB**: Close the database that has been opened with the OpenDB command and releases the file number.
- **OpenDB**: Opens a database or Excel workbook.
- **SelectDB**: Searches the data in the table in an opened database.

### PG Commands

- **PG_FastStop**: Stop the PG axes immediately.
- **PG_LSpeed**: Sets the pulse speed of the time when the PG axis starts accelerating and fishishes decelerating.
- **PG_Scan**: Starts the continuous spinning motion of the PG robot axes.
- **PG_SlowStop**: Stops slowly the PG axis spinning continuously.
This section describes each SPEL+ command as follows:

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Syntax describes the format used for each command. For some commands, there is more than one syntax shown, along with a number that is referenced in the command description. Parameters are shown in italics.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameters</td>
<td>Describes each of the parameters for this command.</td>
</tr>
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</tr>
<tr>
<td>Description</td>
<td>Gives details about how the command works.</td>
</tr>
<tr>
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</tr>
<tr>
<td>See Also</td>
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</tr>
<tr>
<td>Example</td>
<td>Gives one or more examples of using this command.</td>
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</table>
SYMBOLS

This manual uses the following symbols to show what context the command can be used in:

- > May be used from the command window.
- S May be used as a statement in a SPEL* program.
- F May be used as a Function in a SPEL* program.
Processes input/output statements in parallel with motion.

Syntax

\[
\text{motion cmd} \quad !\text{statements} !
\]

Parameters

- **motion cmd**: Any valid motion command included in the following list: Arc, Arc3, Go, Jump, Jump3, Jump3CP, Move, BGo, BMove, TGo, TMove.
- **statements**: Any valid parallel processing I/O statement(s) which can be executed during motion. (See table below)

Description

Parallel processing commands are attached to motion commands to allow I/O statements to execute simultaneously with the beginning of motion travel. This means that I/O can execute while the arm is moving rather than always waiting for arm travel to stop and then executing I/O. There is even a facility to define when within the motion that the I/O should begin execution. (See the Dn parameter described in the table below.)

The table below shows all valid parallel processing statements. Each of these statements may be used as single statements or grouped together to allow multiple I/O statements to execute during one motion statement.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Dn</td>
<td>Used to specify %travel before the next parallel statement is executed. n is a percentage between 0 and 100 which represents the position within the motion where the parallel processing statements should begin. Statements which follow the Dn parameter will begin execution after n% of the motion travel has been completed. When used with the Jump, Jump3, and Jump3CP commands, %travel does not include the depart and approach motion. To execute statements after the depart motion has completed, include D0 (zero) at the beginning of the statement. Dn may appear a maximum of 16 times in a parallel processing statement.</td>
</tr>
<tr>
<td>On / Off n</td>
<td>Turn Output bit number n on or off.</td>
</tr>
<tr>
<td>MemOn / MemOff n</td>
<td>Turns memory I/O bit number n on or off.</td>
</tr>
<tr>
<td>Out p, d</td>
<td>Outputs data d to output port p.</td>
</tr>
<tr>
<td>OpBCD p, q</td>
<td>Outputs data d to output port p.</td>
</tr>
<tr>
<td>OutW p, d</td>
<td>Outputs data d to memory I/O port p.</td>
</tr>
<tr>
<td>MemOut p, d MemOutW p, d</td>
<td>Outputs data d to memory I/O port p.</td>
</tr>
<tr>
<td>Signal s</td>
<td>Generates synchronizing signal.</td>
</tr>
<tr>
<td>Wait t</td>
<td>Delays for t seconds prior to execution of the next parallel processing statement.</td>
</tr>
<tr>
<td>WaitSig s</td>
<td>Waits for signal s before processing next statement.</td>
</tr>
<tr>
<td>Wait Sw(n) = j</td>
<td>Delays execution of next parallel processing statement until the input bit n is equal to the condition defined by j. (On or Off)</td>
</tr>
<tr>
<td>Wait MemSw(n) = j</td>
<td>Delays execution of the next parallel processing statement until the memory I/O bit n is equal to the condition defined by j. (On or Off)</td>
</tr>
<tr>
<td>other conditions</td>
<td>Wait other than the above two patterns is available. Refer to Wait Statement for details.</td>
</tr>
<tr>
<td>Print</td>
<td>Prints data to the display device.</td>
</tr>
<tr>
<td>Print #</td>
<td>Prints data to the specified communications port.</td>
</tr>
<tr>
<td>External functions</td>
<td>Executes the external functions declared with Declare statement.</td>
</tr>
</tbody>
</table>
Notes

When Motion is Completed before All I/O Commands are Complete
If, after completing the motion for a specific motion command, all parallel processing statement execution has not been completed, subsequent program execution is delayed until all parallel processing statements execution has been completed. This situation is most likely to occur with short moves with many I/O commands to execute in parallel.

When the Till statement is used to stop the arm before completing the intended motion
If Till is used to stop the arm at an intermediate travel position, the system considers that the motion is completed. The next statement execution is delayed until the execution of all parallel processing statements has been completed.

When the AbortMotion statement or Trap is used to stop the arm before completing the motion
After the arm stops at an intermediate travel position, D statement cannot be executed.

Specifying n near 100% can cause path motion to decelerate
If a large value of n is used during CP motion, the robot may decelerate to finish the current motion. This is because the position specified would normally be during deceleration if CP was not being used. To avoid deceleration, consider placing the processing statement after the motion command. For example, in the example below, the On 1 statement is moved after the jump to P1 to after the jump.

```plaintext
CP On
Jump P1 !D96; On 1!
Go P2

CP On
Jump P1
On 1
Go P2
```

The Jump statement and Parallel Processing
It should be noted that execution of parallel processing statements which are used with the Jump statement begins after the rising motion has completed and ends at the start of falling motion.

The Here statement and Parallel Processing
You cannot use both of the Here statement and parallel processing in one motion command like this:

```plaintext
Go Here :Z(0) ! D10; MemOn 1 !
```

Be sure to change the program like this:

```plaintext
P999 = Here
Go P999 Here :Z(0) ! D10; MemOn 1 !
```

See Also
Arc, Arc3, Go, Jump, Jump3, Jump3CP, Move, BGo, BMove, TGo, TMove

!...! Parallel Processing Example
The following examples show various ways to use the parallel processing feature with Motion Commands:

Parallel processing with the Jump command causes output bit 1 to turn on at the end of the Z joint rising travel and when the 1st, 2nd, and 4th axes begin to move. Then output bit 1 is turned off again after 50% of the Jump motion travel has completed.

```plaintext
Function test
   Jump P1 !D0; On 1; D50; Off 1!
Fend
```

Parallel processing with the Move command causes output bit 5 to turn on when the joints have completed 10% of their move to the point P1. Then 0.5 seconds later turn output bit 5 off.

```plaintext
Function test2
   Move P1 !D10; On 5; Wait 0.5; Off 5!
Fend
```
#define

Defines identifier to be replaced by specified replacement string.

**Syntax**

```
#define identifier [(parameter, [parameter ])] string
```

**Parameters**

- **identifier**
  Keyword defined by user which is an abbreviation for the `string` parameter. Rules for identifiers are as follows:
  - The first character must be alphabetic while the characters which follow may be alphanumeric or an underscore (\_).
  - Spaces or tab characters are not allowed as part of the `identifier`.

- **parameter**
  Normally used to specify a variable (or multiple variables) which may be used by the replacement string. This provides for a dynamic define mechanism which can be used like a macro. A maximum of up to 8 parameters may be used with the `#define` command. However, each parameter must be separated by a comma and the parameter list must be enclosed within parenthesis.

- **string**
  This is the replacement string which replaces the identifier when the program is compiled. Rules regarding replacement strings are as follows:
  - Spaces or tabs are allowed in replacement strings.
  - Identifiers used with other `#define` statements cannot be used as replacement strings.
  - If the comment symbol (\`) is included, the characters following the comment symbol will be treated as a comment and will not be included in the replacement string.
  - The replacement string may be omitted. In this case the specified identifier is replaced by "nothing" or the null string. This actually deletes the identifier from the program.

**Description**

The `#define` instruction causes a replacement to occur within a program for the specified identifier. Each time the specified identifier is found the identifier is replaced with the replacement string prior to compilation. However, the source code will remain with the identifier rather than the replacement string. This allows code to become easier to read in many cases by using meaningful identifier names rather than long difficult to read strings of code.

The defined identifier can be used for conditional compiling by combining with the `#ifdef` or `#ifndef` commands.

If a parameter is specified, the new identifier can be used like a macro.

**Notes**

*Using `#define` for variable declaration or label substitutions will cause an error:*

It should be noted that usage of the `#define` instruction for variable declaration will cause an error.

**See Also**

`#ifdef`, `#ifndef`
#define Example

' Uncomment next line for Debug mode.
' #define DEBUG

Input #1, A$
ifdef DEBUG
    Print "A$ = ", A$
endif
Print "The End"

#define SHOWVAL(x) Print "var = ", x

Integer a

a = 25

SHOWVAL(a)
#ifdef...#else...#endif

Provides conditional compiling capabilities.

Syntax

```
#ifdef identifier
...put selected source code for conditional compile here.
[#else
...put selected source code for false condition here.]
#endif
```

Parameters

```
identifier
```

Keyword defined by the user which when defined allows the source code defined between #ifdef and #else or #endif to be compiled. Thus the identifier acts as the condition for the conditional compile.

Description

```
#ifdef...#else...#endif allows for the conditional compiling of selected source code. The condition as to whether or not the compile will occur is determined based on the identifier. #ifdef first checks if the specified identifier is currently defined by #define. The #else statement is optional.

If defined, and the #else statement is not used, the statements between #ifdef and #endif are compiled. Otherwise, if #else is used, then the statements between #ifdef and #else are compiled.

If not defined, and the #else statement is not used, the statements between #ifdef and #endif are skipped without being compiled. Otherwise, if #else is used, then the statements between #else and #endif are compiled.
```

See Also

```
#define, ifndef
```

#ifdef Example

A section of code from a sample program using #ifdef is shown below. In the example below, the printing of the value of the variable A$ will be executed depending on the presence or absence of the definition of the #define DEBUG pseudo instruction. If the #define DEBUG pseudo instruction was used earlier in this source, the Print A$ line will be compiled and later executed when the program is run. However, the printing of the string "The End" will occur regardless of the #define DEBUG pseudo instruction.

```
' Uncomment next line for Debug mode.
' #define DEBUG

Input #1, A$
#endif DEBUG
   Print "A$ = ", A$
#endif
Print "The End"
```
#ifndef...#endif

Provides conditional compiling capabilities.

Syntax

```c
#ifndef identifier
...Put selected source code for conditional compile here.
#else
...put selected source code for true condition here.
#endif
```

Parameters

- `identifier` : Keyword defined by the user which when Not defined allows the source code defined between `#ifndef` and `#else` or `#endif` to be compiled. Thus the identifier acts as the condition for the conditional compile.

Description

This instruction is called the "if not defined" instruction. `#ifndef...#else...#endif` allow for the conditional compiling of selected source code. The `#else` statement is optional.

- If defined, and the `#else` statement is not used, the statements between `#ifndef` and `#endif` are not compiled. Otherwise, if `#else` is used, then the statements between `#else` and `#endif` are compiled.

- If not defined, and the `#else` statement is not used, the statements between `#ifndef` and `#endif` are compiled. Otherwise, if `#else` is used, then the statements between `#else` and `#endif` are not compiled.

Notes

Difference between `#ifdef` and `#ifndef`

The fundamental difference between `#ifdef` and `#ifndef` is that the `#ifdef` instruction compiles the specified source code if the identifier is defined. The `#ifndef` instruction compiles the specified source code if the identifier is not defined.

See Also

- `#define`, `#ifdef`

#include Example

A section of code from a sample program using `#ifndef` is shown below. In the example below, the printing of the value of the variable A$ will be executed depending on the presence or absence of the definition of the `#define NODELAY` pseudo instruction. If the `#define NODELAY` pseudo instruction was used earlier in this source, the Wait 1 line will Not be compiled along with the rest of the source for this program when it is compiled. (i.e. submitted for running.) If the `#define NODELAY` pseudo instruction was not used (i.e. NODELAY is not defined) earlier in this source, the Wait 1 line will be compiled and later executed when the program is run. The printing of the string "The End" will occur regardless of the `#define NODELAY` pseudo instruction.

```c
' Comment out next line to force delays.
#define NODELAY 1

Input #1, A$
#ifndef NODELAY
Wait 1
#endif
Print "The End"
```
#include

Includes the specified file into the file where the #include statement is used.

**Syntax**

```c
#include "fileName.INC"
```

**Parameters**

- `fileName`  
  fileName must be the name of an include file in the current project. All include files have the INC extension. The filename specifies the file which will be included in the current file.

**Description**

#include inserts the contents of the specified include file with the current file where the #include statement is used.

Include files are used to contain #define statements and global variable declarations.

The #include statement must be used outside of any function definitions.

An include file may contain a secondary include file. For example, FILE2 may be included within FILE1, and FILE3 may be included within FILE2. This is called nesting.

**See Also**

#define, ifdef, ifndef

**#include Example**

**Include File (Defs.inc)**

```c
#define DEBUG 1
#define MAX_PART_COUNT 20
```

**Program File (main.prg)**

```c
#include "defs.inc"

Function main
    Integer i

    Integer Parts(MAX_PART_COUNT)

Fend
```
#undef

Undefines an identifier previously defined with #define.

Syntax

```
#define identifier
```

Parameters

identifier Keyword used in a previous #define statement.

See Also

#define, #ifdef, #ifndef
AbortMotion

Aborts a motion command and puts the running task in error status. This command is for the experienced user and you need to understand the command specification before use.

Syntax

AbortMotion {robotNumber | All}

Parameters

robotNumber  Robot number that you want to stop the motion for.
All  Aborts motion for all robots.

Description

Depending on the robot status when AbortMotion is executed, the result is different as follows. In each case, hook an error and handle the error processing with OnErr to continue the processing. Error 2999 can use the constant ERROR_DOINGMOTION. Error 2998 can use the constant ERROR_NOMOTION.

Write a program not to execute AbortMotion more than twice before executing the continuous execution (Cont).

When the robot is executing the motion command
The robot promptly pauses the arm motion immediately and cancels the remaining motions. Error 2999 (ERROR_DOINGMOTION) occurs in the task which was running the motion command for the robot. For the following motion commands, the robot directly moves to the next position from the point where it was paused.

When the robot has been paused immediately
When AbortMotion is executed, the remaining motion is canceled. Error 2999 (ERROR_DOINGMOTION) occurs in the task which was running the motion command for the robot when specifying the Cont statement. For the following motion commands, the robot directly moves to the next position from the point where it was paused.

When the robot is in WaitRecover status (Safeguard Open)
When AbortMotion is executed, the remaining motion is canceled. The following motions can be selected with the Recover command flags.

When executing “Recover robotNumber, WithMove”, the robot motors turn on and the recovery motion is executed.
When Cont is executed, error 2999 (ERROR_DOINGMOTION) occurs in the task which was running the motion command for the robot. For the following motion commands, the robot directly moves to the next position from the point where it was paused.

When executing “Recover robotNumber, WithoutMove”, the robot motors turn on. When Cont is executed, error 2999 (ERROR_DOINGMOTION) occurs in the task which was running the motion command for the robot. For the following motion commands, the robot directly moves to the next position from the point where it was paused, without the recovery motion.
When the robot is executing commands other than motion commands
Error 2998 (ERROR_NOMOTION) occurs in the task which was previously running the motion command for the robot. When the task is waiting with Wait or Input commands, the task is aborted promptly and error 2998 occurs.
When executing a motion command with CP On and a program has no more motion commands, error 2998 occurs even if the robot is running.

When the robot is not running from a program (task)
An error occurs.

See Also
OnErr, Recover, Till

AbortMotion Example
When memory I/O #0 turns on, AbortMotion is executed and the robot goes back to the home position.

Function main
  Motor On
  Xqt sub, NoEmgAbort
  OnErr GoTo errhandle

  Go P0
  Wait Sw(1)
  Go P1

  Quit sub
  Exit Function

errstart:
  Home
  Quit sub
  Exit Function

errhandle:
  Print Err
  If Err = ERROR_DOINGMOTION Then
    Print "Robot is moving"
    EResume errstart
  ElseIf Err = ERROR_NOMOTION Then
    Print "Robot is not moving"
    EResume errstart
  EndIf

  Print "Error Stop"
  Quit All
Fend

Function sub
  MemOff 0
  Wait MemSw(0)
  AbortMotion 1
  MemOff 0
Fend
Abs Function

Returns the absolute value of a number.

Syntax

\[ \text{Abs}(\text{number}) \]

Parameter

\( \text{number} \quad \text{Any valid numeric expression.} \)

Return Values

The absolute value of a number.

Description

The absolute value of a number is its unsigned magnitude. For example, \( \text{Abs}(-1) \) and \( \text{Abs}(1) \) both return 1.

See Also

Atan, Atan2, Cos, Int, Mod, Not, Sgn, Sin, Sqr, Str$, Tan, Val

Abs Function Example

The following examples are done from the command window using the Print instruction.

\[
> \text{print abs}(1) \\
1 \\
> \text{print abs}(-1) \\
1 \\
> \text{print abs}(-3.54) \\
3.54 \\
> 
\]
Accel Statement

Sets (or displays) the acceleration and deceleration rates for the point to point motion instructions Go, Jump and Pulse.

Syntax

(1) Accel \textit{accel}, \textit{decel} [, \textit{departAccel}, \textit{departDecel}, \textit{approAccel}, \textit{approDecel} ]

(2) Accel

Parameters

- \textit{accel} Integer expression 1 or more representing a percentage of maximum acceleration rate.
- \textit{decel} Integer expression 1 or more representing a percentage of the maximum deceleration rate.
- \textit{departAccel} Depart acceleration for Jump. Valid Entries are 1 or more. Optional. Available only with Jump command.
- \textit{departDecel} Depart deceleration for Jump. Valid Entries are 1 or more. Optional. Available only with Jump command.
- \textit{approAccel} Approach acceleration for Jump. Valid Entries are 1 or more. Optional. Available only with Jump command.
- \textit{approDecel} Approach deceleration for Jump. Valid Entries are 1 or more. Optional. Available only with Jump command.

Return Values

When parameters are omitted, the current Accel parameters are displayed.

Description

\textbf{Accel} specifies the acceleration and deceleration for all Point to Point type motions. This includes motion caused by the Go, Jump and Pulse robot motion instructions.

Each acceleration and deceleration parameter defined by the \textbf{Accel} instruction may be an integer value 1 or more. This number represents a percentage of the maximum acceleration (or deceleration) allowed. Usually, the maximum value is 100. However, some robots allow setting larger than 100. Use AccelMax function to get the maximum value available for Accel.

The Accel instruction can be used to set new acceleration and deceleration values or simply to print the current values. When the Accel instruction is used to set new accel and decel values, the first 2 parameters (\textit{accel} and \textit{decel}) in the \textbf{Accel} instruction are required.

The optional \textit{departAccel}, \textit{departDecel}, \textit{approAccel}, and \textit{approDecel} parameters are effective for the Jump instruction only and specify acceleration and deceleration values for the depart motion at the beginning of Jump and the approach motion at the end of Jump.

The \textbf{Accel} value initializes to the default values (low acceleration) when any one of the following conditions occurs:

Controller Startup
Motor On
SFree, SLock, Brake
Reset, Reset Error
Stop button or QuitAll stops tasks
Notes

Executing the Accel command in Low Power Mode (Power Low)

If Accel is executed when the robot is in low power mode (Power Low), the new values are stored, but the current values are limited to low values.

The current acceleration values are in effect when Power is set to High, and Teach mode is OFF.

Accel vs. AccelS

It is important to note that the Accel instruction does not set the acceleration and deceleration rates for straight line and arc motion. The AccelS instruction is used to set the acceleration and deceleration rates for the straight line and arc type moves.

Accel setting larger than 100

Usually, the maximum value is 100. However, some robots allow setting larger than 100.
In general use, Accel setting 100 is the optimum setting that maintains the balance of acceleration and vibration when positioning. However, you may require an operation with high acceleration to shorten the cycle time by decreasing the vibration at positioning. In this case, set the Accel to larger than 100. Except in some operation conditions, the cycle time may not change by setting Accel to larger than 100.

See Also

AccelR, AccelS, Go, Jump, Jump3, Power, Pulse, Speed, TGo

Accel Statement Example

The following example shows a simple motion program where the acceleration (Accel) and speed (Speed) is set using predefined variables.

```plaintext
Function acctest
  Integer slow, accslow, decslow, fast, accfast, decfast
  slow = 20     'set slow speed variable
  fast = 100    'set high speed variable
  accslow = 20  'set slow acceleration variable
  decslow = 20  'set slow deceleration variable
  accfast = 100 'set fast acceleration variable
  decfast = 100 'set fast deceleration variable
  Accel accslow, decslow
  Speed slow
  Jump pick
  On gripper
  Accel accfast, decfast
  Speed fast
  Jump place
  .
  .
Fend
```

<Example 2>
Set the Z joint downward deceleration to be slow to allow a gentle placement of the part when using the Jump instruction. This means we must set the Zdnd parameter low when setting the Accel values.

```
>Accel 100,100,100,100,100,35
```

```
>Accel
  100  100
  100  100
  100  35
>```
Accel Function

Returns specified acceleration value.

Syntax

\texttt{Accel(paramNumber)}

Parameter

\textit{paramNumber} 

- Integer expression which can have the following values:
  1: acceleration specification value
  2: deceleration specification value
  3: depart acceleration specification value for Jump
  4: depart deceleration specification value for Jump
  5: approach acceleration specification value for Jump
  6: approach deceleration specification value for Jump

Return Values

- Integer 1% or more

See Also

- Accel Statement

Accel Function Example

This example uses the \texttt{Accel} function in a program:

\begin{verbatim}
Integer currAccel, currDecel

' Get current accel and decel
currAccel = Accel(1)
currDecel = Accel(2)
Accel 50, 50
SRVJump pick
' Restore previous settings
Accel currAccel, currDecel
\end{verbatim}
AccelMax Function

Returns maximum acceleration value limit available for Accel.

Syntax

AccelMax(maxValueNumber)

Parameter

maxValueNumber  Integer expression which can have the following values:

1: acceleration maximum value
2: deceleration maximum value
3: depart acceleration maximum value for Jump
4: depart deceleration maximum value for Jump
5: approach acceleration maximum value for Jump
6: approach deceleration maximum value for Jump

Return Values

Integer 1% or more

See Also

Accel

AccelMax Function Example

This example uses the AccelMax function in a program:

' Get maximum accel and decel
Print AccelMax(1), AccelMax(2)
AccelR Statement

Sets or displays the acceleration and deceleration values for tool rotation control of CP motion.

Syntax
(1) AccelR  accel, [decel]
(2) AccelR

Parameters
accel  Real expression in degrees / second² (0.1 to 5000).
decel Real expression in degrees / second² (0.1 to 5000).

Return Values
When parameters are omitted, the current AccelR settings are displayed.

Description
AccelR is effective when the ROT modifier is used in the Move, Arc, Arc3, BMove, TMove, and Jump3CP motion commands.

The AccelR value initializes to the default values when any one of the following conditions occurs:

Controller Startup
Motor On
SFree, SLock, Brake
Reset, Reset Error
Stop button or QuitAll stops tasks

See Also
Arc, Arc3, BMove, Jump3CP, Power, SpeedR, TMove

AccelR Statement Example

AccelR 360, 200
AccelR Function

Returns specified tool rotation acceleration value.

Syntax

AccelR(paramNumber)

Parameter

paramNumber

Integer expression which can have the following values:

1: acceleration specification value
2: deceleration specification value

Return Values

Real value in degrees / second²

See Also

AccelR Statement

AccelR Function Example

Real currAccelR, currDecelR

' Get current accel and decel
currAccelR = AccelR(1)
currDecelR = AccelR(2)
AccelS Statement

Sets the acceleration and deceleration rates for the Straight Line and Continuous Path robot motion instructions such as Move, Arc, Arc3, Jump3, etc.

Syntax
(1) AccelS  accel, [decel ], [departAccel], [departDecel], [approAccel], [approDecel]
(2) AccelS

Parameters
accel Real expression represented in mm/sec^2 units to define acceleration and deceleration values for straight line and continuous path motion. If decel is omitted, then accel is used to specify both the acceleration and deceleration rates.
decel Optional. Real expression represented in mm/sec^2 units to define the deceleration value.
departAccel Optional. Real expression for depart acceleration value for Jump3, Jump3CP.
departDecel Optional. Real expression for depart deceleration value for Jump3, Jump3CP.
approAccel Optional. Real expression for approach acceleration value for Jump3, Jump3CP.
approDecel Optional. Real expression for approach deceleration value for Jump3, Jump3CP.

Valid entries range of the parameters

<table>
<thead>
<tr>
<th>accel / decel</th>
<th>departAccel / departDecel</th>
<th>approAccel / approDecel</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 to 25000</td>
<td>0.1 to 25000</td>
<td></td>
</tr>
</tbody>
</table>

(mm/sec^2)

Return Values
Displays Accel and Decel values when used without parameters

Description
AccelS specifies the acceleration and deceleration for all interpolated type motions including linear and curved interpolations. This includes motion caused by the Move and Arc motion instructions.

The AccelS value initializes to the default values when any one of the following conditions occurs:

Controller Startup
Motor On
SFree, SLock, Brake
Reset, Reset Error
Stop button or QuitAll stops tasks
Notes

Executing the AccelS command in Low Power Mode (Power Low):

If AccelS is executed when the robot is in low power mode (Power Low), the new values are stored, but the current values are limited to low values.

The current acceleration values are in effect when Power is set to High, and Teach mode is OFF.

Accel vs. AccelS:

It is important to note that the AccelS instruction does not set the acceleration and deceleration rates for point to point type motion. (i.e. motions initiated by the Go, Jump, and Pulse instructions.) The Accel instruction is used to set the acceleration and deceleration rates for Point to Point type motion.

See Also

Accel, Arc, Arc3, Jump3, Jump3CP, Power, Move, TMove, SpeedS

AccelS Example

The following example shows a simple motion program where the straight line/continuous path acceleration (AccelS) and straight line/continuous path speed (SpeedS) are set using predefined variables.

```spel
Function acctest
    Integer slow, accslow, fast, accfast

    slow = 20        'set slow speed variable
    fast = 100       'set high speed variable
    accslow = 200    'set slow acceleration variable
    accfast = 5000   'set fast acceleration variable
    AccelS accslow
    SpeedS slow
    Move P1
    On 1
    AccelS accfast
    SpeedS fast
    Jump P2
    .
    .
    .
Fend
```
AccelS Function

Returns acceleration or deceleration for CP motion commands.

Syntax

\[ \text{AccelS}(\text{paramNumber}) \]

Parameters

\text{paramNumber} \quad \text{Integer expression which can have the following values:}

1: acceleration value
2: deceleration value
3: depart acceleration value for Jump3, Jump3CP
4: depart deceleration value for Jump3, Jump3CP
5: approach acceleration value for Jump3, Jump3CP
6: approach deceleration value for Jump3, Jump3CP

Return Values

Real value from 0 - 5000 mm/sec/sec

See Also

AccelS Statement, Arc3, SpeedS, Jump3, Jump3CP

AccelS Function Example

\[
\text{Real } \text{savAccelS} \\
\text{savAccelS} = \text{AccelS}(1)
\]
Acos Function

Returns the arccosine of a numeric expression.

Syntax

\[
\text{Acos(number)}
\]

Parameters

\text{number} \quad \text{Numeric expression representing the cosine of an angle.}

Return Values

Real value, in radians, representing the arccosine of the parameter \text{number}.

Description

\text{Acos} returns the arccosine of the numeric expression. Values range is from -1 to 1. The value returned by \text{Acos} will range from 0 to PI radians. If \text{number} is < -1 or > 1, an error occurs.

To convert from radians to degrees, use the \text{RadToDeg} function.

See Also

Abs, Asin, Atan, Atan2, Cos, DegToRad, RadToDeg, Sgn, Sin, Tan, Val

Acos Function Example

```
Function acostest
  Double x

  x = Cos(DegToRad(30))
  Print "Acos of ", x, " is ", Acos(x)
Fend
```
Agl Function

Returns the joint angle for the selected rotational joint, or position for the selected linear joint.

Syntax

\[ \text{Agl}(\text{jointNumber}) \]

Parameters

\( \text{jointNumber} \) Integer expression representing the joint number. Values are from 1 to the number of joints on the robot. The additional S axis is 8 and T axis is 9.

Return Values

The joint angle for selected rotational joint or position for selected linear joints.

Description

The \text{Agl} function is used to get the joint angle for the selected rotational joint or position for the selected linear joint.

If the selected joint is rotational, \text{Agl} returns the current angle, as measured from the selected joint's 0 position, in degrees. The returned value is a real number.

If the selected joint is a linear joint, \text{Agl} returns the current position, as measured from the selected joint's 0 position, in mm. The returned value is a real number.

If an auxiliary arm is selected with the \text{Arm} statement, \text{Agl} returns the angle (or position) from the standard arm's 0 pulse position to the selected arm.

See Also

\text{PAgl}, \text{Pls}, \text{PPls}

Agl Function Example

The following examples are done from the command window using the \text{Print} instruction.

\[ > \text{print agl}(1), \text{agl}(2) \]
\[ 17.234 \quad 85.355 \]
AglToPls Function

Converts robot angles to pulses.

Syntax

\[ \text{AglToPls}(j1, j2, j3, j4 \ [, j5, j6 \ [, j7 \ [, j8, j9 \ ]])} \]

Parameters

- \( j1 - j6 \): Real expressions representing joint angles.
- \( j7 \): Real expression representing the joint #7 angle. For the Joint type 7-axis robot.
- \( j8 \): Real expression representing the additional S axis angle.
- \( j9 \): Real expression representing the additional T axis angle.

Return Values

A robot point whose location is determined by joint angles converted to pulses.

Description

Use AglToPls to create a point from joint angles.

Note

Assignment to point can cause part of the joint position to be lost.

In certain cases, when the result of AglToPls is assigned to a point data variable, the arm moves to a joint position that is different from the joint position specified by AglToPls.

For example:

\[ \text{P1 = AglToPls}(0, 0, 0, 90, 0, 0) \]
\[ \text{Go P1 ' moves to AglToPls}(0, 0, 0, 0, 0, 90) \text{ joint position} \]

Similarly, when the AglToPls function is used as a parameter in a CP motion command, the arm may move to a different joint position from the joint position specified by AglToPls.

\[ \text{Move AglToPls}(0, 0, 0, 90, 0, 0) \ ' \text{ moves to AglToPls}(0, 0, 0, 0, 0, 90) \text{ joint position} \]

When using the AglToPls function as a parameter in a PTP motion command, this problem does not occur.

See Also

Agl, JA, Pls

AglToPls Function Example

\[ \text{Go AglToPls}(0, 0, 0, 90, 0, 0) \]
Align Function

Returns the point data converted to align the robot orientation (U, V, W) at the specified point in the tool coordinate system with the nearest axis of the specified local coordinate system.

Syntax

(1) Align (Point, [localNumber])

Parameters

Point
The point data.

localNumber
The local coordinate system number to be a reference for the alignment of orientation.
If omitted, the base coordinate system is used.

Description

While operating the 6-axis robot, the robot orientation may have to be aligned with an axis of the specified local coordinate system without changing the tool coordinate system position (origin) defined with the point data.

Align Function converts the orientation data (U,V,W) of the specified point data and aligns with the nearest axis of the specified local coordinate system.

For robots except the 6-axis robot, it returns a specified point.

See Also

AlignECP Function, LJM Function

Align Function Example

Move Align(P0) ROT
P1 = Align(P0, 1)
Move P1 ROT
AlignECP Function

Returns the point data converted to align the robot orientation (U, V, W) at the specified point in the tool coordinate system with the nearest axis of the specified ECP coordinate system.

Syntax

(2) AlignECP (Point, ECPNumber)

Parameters

Point
The point data.

ECPNumber
The ECP coordinate system number to be a reference for the alignment of orientation.

Description

While operating the 6-axis robot, the robot orientation may have to be aligned with an axis of the specified local coordinate system without changing the tool coordinate system position (origin) defined with the point data.

AlignECP Function converts the orientation data (U,V,W) of the specified point data and aligns with the nearest axis of the specified local coordinate system.

For robots except the 6-axis robot, it returns a specified point.

See Also

Align Function, LJM Function

AlignECP Function Example

```
Move AlignECP(P0) ROT
P1 = AlignECP(P0, 1)
Move P1 ROT
```
And Operator

Operator used to perform a logical or bitwise And of 2 expressions.

Syntax

\[ \text{result} = \text{expr1 And expr2} \]

Parameters

- `expr1`, `expr2`  
  For logical And, any valid expression which returns a Boolean result. For bitwise And, an integer expression.
- `result`  
  For logical And, result is a Boolean value. For bitwise And, result is an integer.

Description

A logical **And** is used to combine the results of 2 or more expressions into 1 single Boolean result. The following table indicates the possible combinations.

<table>
<thead>
<tr>
<th>expr1</th>
<th>expr2</th>
<th>result</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>True</td>
<td>False</td>
<td>False</td>
</tr>
<tr>
<td>False</td>
<td>True</td>
<td>False</td>
</tr>
<tr>
<td>False</td>
<td>False</td>
<td>False</td>
</tr>
</tbody>
</table>

A bitwise **And** performs a bitwise comparison of identically positioned bits in two numeric expressions and sets the corresponding bit in `result` according to the following table:

<table>
<thead>
<tr>
<th>If bit in expr1 is</th>
<th>And bit in expr2 is</th>
<th>The result is</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

See Also

- LShift, Mask, Not, Or, RShift, Xor

And Operator Example

```plaintext
Function LogicalAnd(x As Integer, y As Integer)
  If x = 1 And y = 2 Then
    Print "The values are correct"
  EndIf
EndFunction

Function BitWiseAnd()
  If (Stat(0) And &H800000) = &H800000 Then
    Print "The enable switch is open"
  EndIf
EndFunction

>print 15 and 7
7
>```
AOpen Statement

Opens file in the appending mode.

Syntax

\[
\text{AOpen} \ fileName \ As \ #fileNumber \\
\]

Close #fileNumber

Parameters

- **fileName**: String expression that specifies valid path and file name. If specifying only a file name, the file must be in the current directory. See ChDisk for the details.
- **fileNumber**: Integer expression representing values from 30 - 63.

Description

Opens the specified file and identifies it by the specified file number. This statement is used for appending data to the specified file. If the specified file is not found, create a new file. The specified fileNumber identifies the file while it is open and cannot be used to refer to a different file until the current file is closed. fileNumber is used by other file operations such as Print#, Write, Flush, and Close.

Use the Close statement to close the file and release the file number.

It is recommended that you use the FreeFile function to obtain the file number so that more than one task are not using the same number.

Note

Do not use a network path, otherwise an error occurs.

File write buffering

File writing is buffered. The buffered data can be written with Flush statement. Also, when closing a file with Close statement, the buffered data can be written.

See Also

Close, Print#, BOpen, ROpen, OOpen, WOpen, FreeFile, Flush

AOpen Statement Example

```
Integer fileNum, i

FileNum = FreeFile
WOpen "TEST.TXT" As #fileNum
For i = 0 To 100
    Print #fileNum, i
Next I
Close #fileNum
....
....
FileNum = FreeFile
AOpen "TEST.TXT" As #FileNum
For i = 101 To 200
    Print #FileNum, i
Next i
Close #FileNum
```
Arc, Arc3 Statements

Arc moves the arm to the specified point using circular interpolation in the XY plane. Arc3 moves the arm to the specified point using circular interpolation in 3 dimensions. These two commands are available for SCARA robots (including RS series) and 6-axis robots.

Syntax

(1) Arc  
midPoint, endPoint [ROT] [CP] [ searchExpr ] [!...!] [SYNC]

(2) Arc3  
midPoint, endPoint [ROT] [ECP] [CP] [ searchExpr ] [!...!] [SYNC]

Parameters

midPoint  Point expression. The middle point (taught previously by the user) which the arm travels through on its way from the current point to endPoint.

endPoint  Point expression. The end point (taught previously by the user) which the arm travels to during the arc type motion. This is the final position at the end of the circular move.

ROT  Optional. Decides the speed/acceleration/deceleration in favor of tool rotation.

ECP  Optional. External control point motion. This parameter is valid when the ECP option is enabled.

CP  Optional. Specifies continuous path motion.

searchExpr  Optional. A Till or Find expression.

Till  
Till Sw(expr) = {On | Off}

Find  
Find Sw(expr) = {On | Off}

!...!  Parallel processing statements may be used with the Arc statement. These are optional. (Please see the Parallel Processing description for more information.)

SYNC  Reserves a motion command. The robot will not move until SyncRobots is executed.

Description

Arc and Arc3 are used to move the arm in a circular type motion from the current position to endPoint by way of midPoint. The system automatically calculates a curve based on the 3 points (current position, endPoint, and midPoint) and then moves along that curve until the point defined by endPoint is reached. The coordinates of midPoint and endPoint must be taught previously before executing the instruction. The coordinates cannot be specified in the statement itself.

Arc and Arc3 use the SpeedS speed value and AccelS acceleration and deceleration values. Refer to Using Arc3 with CP below on the relation between the speed/acceleration and the acceleration/deceleration. If, however, the ROT modifier parameter is used, Arc and Arc3 use the SpeedR speed value and AccelR acceleration and deceleration values. In this case SpeedS speed value and AccelS acceleration and deceleration value have no effect.

Usually, when the move distance is 0 and only the tool orientation is changed, an error will occur. However, by using the ROT parameter and giving priority to the acceleration and the deceleration of the tool rotation, it is possible to move without an error. When there is not an orientational change with the ROT modifier parameter and movement distance is not 0, an error will occur.

Also, when the tool rotation is large as compared to move distance, and when the rotation speed exceeds the specified speed of the manipulator, an error will occur. In this case, please reduce the speed or append the ROT modifier parameter to give priority to the rotational speed/ acceleration/ deceleration.

When ECP is used (Arc3 only), the trajectory of the external control point corresponding to the ECP number specified by ECP instruction moves circular with respect to the tool coordinate system. In this case, the trajectory of tool center point does not follow a circular line.
Setting Speed and Acceleration for Arc Motion

SpeedS and AccelS are used to set speed and acceleration for the Arc and Arc3 instructions. SpeedS and AccelS allow the user to specify a velocity in mm/sec and acceleration in mm/sec^2.

Notes

Arc Instruction works in Horizontal Plane Only

The Arc path is a true arc in the Horizontal plane. The path is interpolated using the values for endPoint as its basis for Z and U. Use Arc3 for 3 dimensional arcs.

Range Verification for Arc Instruction

The Arc and Arc3 statements cannot compute a range verification of the trajectory prior to the arc motion. Therefore, even for target positions that are within an allowable range, en route the robot may attempt to traverse a path which has an invalid range, stopping with a severe shock which may damage the arm. To prevent this from occurring, be sure to perform range verifications by running the program at low speeds prior to running at faster speeds.

Suggested Motion to Setup for the Arc Move

Because the arc motion begins from the current position, it may be necessary to use the Go, Jump or other related motion command to bring the robot to the desired position prior to executing Arc or Arc3.

Using Arc, Arc3 with CP

The CP parameter causes the arm to move to the end point without decelerating or stopping at the point defined by endPoint. This is done to allow the user to string a series of motion instructions together to cause the arm to move along a continuous path while maintaining a specified speed throughout all the motion. The Arc and Arc3 instructions without CP always cause the arm to decelerate to a stop prior to reaching the end point.

Potential Errors

Changing Hand Attributes

Pay close attention to the HAND attributes of the points used with the Arc instruction. If the hand orientation changes (from Right Handed to Left Handed or vice-versa) during the circular interpolation move, an error will occur. This means the arm attribute (/L Lefty, or /R Righty) values must be the same for the current position, midPoint and endPoint points.

Attempt to Move Arm Outside Work Envelope

If the specified circular motion attempts to move the arm outside the work envelope of the arm, an error will occur.
See Also

!Parallel Processing!, AccelS, Move, SpeedS

Arc Example

The diagram below shows arc motion which originated at the point P100 and then moves through P101 and ends up at P102. The following function would generate such an arc:

```
Function ArcTest
  Go P100
  Arc P101, P102
  Fend
```

Tip

When first trying to use the Arc instruction, it is suggested to try a simple arc with points directly in front of the robot in about the middle of the work envelope. Try to visualize the arc that would be generated and make sure that you are not teaching points in such a way that the robot arm would try to move outside the normal work envelope.
Arch Statement

Defines or displays the Arch parameters for use with the Jump, Jump3, Jump3CP instructions.

Syntax

(1) Arch archNumber, departDist, approDist
(2) Arch archNumber
(3) Arch

Parameters

archNumber Integer expression representing the Arch number to define. Valid Arch numbers are (0-6) making a total of 7 entries into the Arch table. (see default Arch Table below)
departDist The vertical distance moved (Z) at the beginning of the Jump move before beginning horizontal motion. (specified in millimeters)
approDist The vertical distance required (as measured from the Z position of the point the arm is moving to) to move in a completely vertical fashion with all horizontal movement complete. (specified in millimeters)

Return Values

Displays Arch Table when used without parameters.
The Arch table of the specified Arch number will be displayed when only the Arch number is specified.

Description

The primary purpose of the Arch instruction is to define values in the Arch Table which is required for use with the Jump motion instruction. The Arch motion is carried out per the parameters corresponding to the arch number selected in the Jump C modifier. (To completely understand the Arch instruction, the user must first understand the Jump instruction.)

The Arch definitions allow the user to "round corners" in the Z direction when using the Jump C instruction. While the Jump instruction specifies the point to move to (including the final Z joint position), the Arch table entries specify how much distance to move up before beginning horizontal motion (riseDist) and how much distance up from the final Z joint position to complete all horizontal motion (fallDist). (See diagram below)
There are a total of 8 entries in the **Arch** Definition Table with 7 of them (0-6) being user definable. The 8th entry (**Arch 7**) is the default Arch which actually specifies no arch at all which is referred to as Gate Motion. (See Gate Motion diagram below) The Jump instruction used with the default **Arch** entry (Entry 8) causes the arm to do the following:

1) Begin the move with only Z-joint motion until it reaches the Z-Coordinate value specified by the LimZ command. (The upper Z value)
2) Next move horizontally to the target point position until the final X, Y and U positions are reached.
3) The Jump instruction is then completed by moving the arm down with only Z-joint motion until the target Z-joint position is reached.

### Gate Motion

*Jump with Arch 7*

![Gate Motion Diagram](image)

#### Arch Table Default Values:

<table>
<thead>
<tr>
<th>Arch Number</th>
<th>Depart Distance</th>
<th>Approach Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>1</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>4</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>6</td>
<td>90</td>
<td>90</td>
</tr>
</tbody>
</table>

### Notes

**Jump Motion trajectory changes depending on motion and speed**

Jump motion trajectory is comprised of vertical motion and horizontal motion. It is not a continuous path trajectory. The actual Jump trajectory of arch motion is not determined by **Arch** parameters alone. It also depends on motion and speed.

Always use care when optimizing Jump trajectory in your applications. Execute Jump with the desired motion and speed to verify the actual trajectory.

When speed is lower, the trajectory will be lower. If Jump is executed with high speed to verify an arch motion trajectory, the end effector may crash into an obstacle with lower speed.

In a Jump trajectory, the depart distance increases and the approach distance decreases when the motion speed is set high. When the fall distance of the trajectory is shorter than the expected, lower the speed and/or the deceleration, or change the fall distance to be larger.

Even if Jump commands with the same distance and speed are executed, the trajectory is affected by motion of the robot arms. As a general example, for a SCARA robot the vertical upward distance increases and the vertical downward distance decreases when the movement of the first arm is large. When the vertical fall distance decreases and the trajectory is shorter than the expected, lower the speed and/or the deceleration, or change the fall distance to be larger.
Another Cause of Gate Motion

When the specified value of the Rising Distance or Falling Distance is larger than the actual Z-joint
distance which the robot must move to reach the target position, Gate Motion will occur. (i.e. no type
Arch motion will occur.)

Arch values are Maintained

The Arch Table values are permanently saved and are not changed until either the user changes them.

See Also

Jump, Jump3, JumpCP

Arch Example

The following are examples of Arch settings done from the command window.

```plaintext
> arch 0, 15, 15
> arch 1, 25, 50
> jump p1 c1
> arch
> arch0 = 15.000   15.000
> arch1 = 25.000   50.000
> arch2 = 50.000   50.000
> arch3 = 60.000   60.000
> arch4 = 70.000   70.000
> arch5 = 80.000   80.000
> arch6 = 90.000   90.000
> 
```
Arch Function

Returns arch settings.

Syntax

Arch(archNumber, paramNumber)

Parameters

archNumber Integer expression representing arch setting to retrieve parameter from (0 to 6).

paramNumber 1: depart distance
             2: approach distance

Return Value

Real number containing distance.

See Also

Arch statement

Arch Function Example

Real archValues(6, 1)
Integer i

' Save current arch values
For i = 0 to 6
    archValues(i, 0) = Arch(i, 1)
    archValues(i, 1) = Arch(i, 2)
Next i
Arm Statement

Selects or displays the arm number to use.

Syntax

(1) Arm armNumber
(2) Arm

Parameters

armNumber  Optional integer expression. Valid range is from 0 - 15. The user may select up to 16 different arms. Arm 0 is the standard (default) robot arm. Arm 1 - 15 are auxiliary arms defined by using the ArmSet instruction. When omitted, the current arm number is displayed.

Return Values

When the Arm instruction is executed without parameters, the system displays the current arm number.

Description

Allows the user to specify which arm to use for robot instructions. Arm allows each auxiliary arm to use common position data. If no auxiliary arms are installed, the standard arm (arm number 0) operates. Since at time of delivery the arm number is specified as 0, it is not necessary to use the Arm instruction to select an arm. However, if auxiliary arms are used they must first defined with the ArmSet instruction.

The auxiliary arm configuration capability is provided to allow users to configure the proper robot parameters for their robots when the actual robot configuration is a little different than the standard robot. For example, if the user mounted a 2nd orientation joint to the 2nd robot link, the user will probably want to define the proper robot linkages for the new auxiliary arm which is formed. This will allow the auxiliary arm to function properly under the following conditions:

- Specifying that a single data point be moved through by 2 or more arms.
- Using Pallet
- Using Continuous Path motion
- Using relative position specifications
- Using Local coordinates

For SCARA robots (including RS series) with rotating joints used with a Cartesian coordinate system, joint angle calculations are based on the parameters defined by the ArmSet parameters. Therefore, this command is critical if any auxiliary arm or hand definition is required.

Notes

Arm 0

Arm 0 cannot be defined or changed by the user through the ArmSet instruction. It is reserved since it is used to define the standard robot configuration. When the user sets Arm to 0 this means to use the standard robot arm parameters.

Arm Number Not Defined

Selecting auxiliary arm numbers that have not been defined by the ArmSet command will result in an error.
Arm Statement

See Also
ArmClr, ArmSet, ECPSet, TLSet

Arm Statement Example
The following examples are potential auxiliary arm definitions using the ArmSet and Arm instructions. ArmSet defines the auxiliary arm and Arm defines which Arm to use as the current arm. (Arm 0 is the default robot arm and cannot be adjusted by the user.)

From the command window:

> ArmSet 1, 300, -12, -30, 300, 0
> ArmSet
  arm0 250 0 0 300 0
  arm1 300 -12 -30 300 0

> Arm 0
> Jump P1  'Jump to P1 using the Standard Arm Config
> Arm 1
> Jump P1  'Jump to P1 using auxiliary arm 1
Arm Function

Returns the current arm number for the current robot.

Syntax

    Arm

Return Values

    Integer containing the current arm number.

See Also

    Arm Statement

Arm Function Example

    Print "The current arm number is: ", Arm
ArmClr Statement

Clears (undefines) an arm definition.

Syntax

```
ArmClr armNumber
```

Parameters

```
armNumber
```

Integer expression representing which of 15 arms to clear (undefine). (Arm 0 is the default arm and cannot be cleared.)

See Also

Arm, ArmSet, ECPSet, Local, LocalClr, Tool, TLSet

ArmClr Example

```
ArmClr 1
```
ArmDef Function

Returns arm definition status.

Syntax

ArmDef (armNumber)

Parameters

armNumber Integer expression representing which arm to return status for.

Return Values

True if the specified arm has been defined, otherwise False.

See Also

Arm, ArmClr, ArmSet, ECPSet, Local, LocalClr, Tool, TLClr, TLSet

ArmDef Example

Function DisplayArmDef(armNum As Integer)

  Integer i

  If ArmDef(armNum) = False Then
    Print "Arm ", ArmNum, "is not defined"
  Else
    Print "Arm ", armNum, " Definition:";
    For i = 1 to 5
      Print ArmSet(armNum, i)
    Next i
  EndIf
EndFunction
ArmSet Statement

Specifies and displays auxiliary arms.

Syntax
(1) ArmSet armNumber, link2Dist, joint2Offset, zOffset, [link1Dist], [orientAngOffset]
(2) ArmSet armNumber
(3) ArmSet

Parameters
armNumber Integer expression: Valid range from 1-15. The user may define up to 15 different auxiliary arms.

SCARA Robots (including RS series)

<table>
<thead>
<tr>
<th>paramName</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Horizontal distance from joint #2 to orientation center (mm)</td>
</tr>
<tr>
<td>2</td>
<td>Joint #2 angle offset (degree)</td>
</tr>
<tr>
<td>3</td>
<td>Height offset (mm)</td>
</tr>
<tr>
<td>4</td>
<td>Horizontal distance from joint #1 to joint #2 (mm)</td>
</tr>
<tr>
<td>5</td>
<td>Orientation joint angle offset in degrees.</td>
</tr>
</tbody>
</table>

Return Values
When the ArmSet instruction is initiated without parameters, the system displays all the auxiliary arm numbers and parameters. The specified arm numbers and parameters will be displayed when only the arm number is specified.

Description
Allows the user to specify auxiliary arm parameters to be used in addition to the standard arm configuration. This is most useful when an auxiliary arm or hand is installed to the robot. When using an auxiliary arm, the arm is selected by the Arm instruction.

The link1Dist and orientAngOffset parameters are optional. If they are omitted, the default values are the standard arm values.

The auxiliary arm configuration capability is provided to allow users to configure the proper robot parameters for their robots when the actual robot configuration is a little different than the standard robot. For example, if the user mounted a 2nd orientation joint to the 2nd robot link, the user will probably want to define the proper robot linkages for the new auxiliary arm which is formed. This will allow the auxiliary arm to function properly under the following conditions:

- Specifying that a single data point be moved through by 2 or more arms.
- Using Pallet
- Using Continuous Path motion
- Using relative position specifications
- Using Local coordinates
For SCARA robots (including RS series) with rotating joints used with a Cartesian coordinate system, joint angle calculations are based on the parameters defined by the ArmSet parameters. Therefore, this command is critical if any auxiliary arm or hand definition is required.

Notes

Arm 0

Arm 0 cannot be defined or changed by the user. It is reserved since it is used to define the standard robot configuration. When the user sets Arm to 0 this means to use the standard robot arm parameters.

See Also

Arm, ArmClr

ArmSet Statement Example

The following examples are potential auxiliary arm definitions using the ArmSet and Arm instructions. ArmSet defines the auxiliary arm and Arm defines which Arm to use as the current arm. (Arm 0 is the default robot arm and cannot be adjusted by the user.)

From the command window:

> ArmSet 1, 300, -12, -30, 300, 0
> ArmSet
  Arm 0: 125.000, 0.000, 0.000, 225.000, 0.000
  Arm 1: 300.000, -12.000, -30.000, 300.000, 0.000
> Arm 0
> Jump P1  'Jump to P1 using the Standard Arm Config
> Arm 1
> Jump P1  'Jump to P1 using auxiliary arm 1
ArmSet Function

Returns one ArmSet parameter.

Syntax

\[
\text{ArmSet}(\text{armNumber}, \text{paramNumber})
\]

Parameters

- \text{armNumber}: Integer expression representing the arm number to retrieve values for.
- \text{paramNumber}: Integer expression representing the parameter to retrieve (0 to 5), as described below.

SCARA Robots (including RS series)

<table>
<thead>
<tr>
<th>paramNumber</th>
<th>Value Returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Horizontal distance from joint #2 to orientation center (mm)</td>
</tr>
<tr>
<td>2</td>
<td>Joint #2 angle offset (degree)</td>
</tr>
<tr>
<td>3</td>
<td>Height offset (mm)</td>
</tr>
<tr>
<td>4</td>
<td>Horizontal distance from joint #1 to joint #2 (mm)</td>
</tr>
<tr>
<td>5</td>
<td>Orientation joint angle offset in degrees.</td>
</tr>
</tbody>
</table>

Return Values

Real number containing the value of the specified parameter, as described above.

See Also

ArmClr, ArmSet Statement

ArmSet Function Example

\[
\text{Real } x \\
\ x = \text{ArmSet}(1, 1)
\]
Asc Function

Returns the ASCII value of the first character in a character string.

Syntax

`Asc(string)`

Parameters

`string` Any valid string expression of at least 1 character in length.

Return Values

Returns an integer representing the ASCII value of the 1st character in the string sent to the `ASC` function.

Description

The `Asc` function is used to convert a character to its ASCII numeric representation. The character string sent to the `ASC` function may be a constant or a variable.

Notes

Only the First Character ASCII Value is Returned

Although the `Asc` instruction allows character strings larger than 1 character in length, only the 1st character is actually used by the `Asc` instruction. `Asc` returns the ASCII value of the 1st character only.

See Also

`Chr$, InStr, Left$, Len, Mid$, Right$, Space$, Str$, Val`

Asc Function Example

This example uses the `Asc` instruction in a program and from the command window as follows:

```
Function asctest
    Integer a, b, c
    a = Asc("a")
    b = Asc("b")
    c = Asc("c")
    Print "The ASCII value of a is ", a
    Print "The ASCII value of b is ", b
    Print "The ASCII value of c is ", c
End
```

From the command window:

```
>print asc("a")
97
>print asc("b")
98
>""
Asin Function

Returns the arcsine of a numeric expression.

Syntax

Asin(number)

Parameters

number Numeric expression representing the sine of an angle.

Return Values

Real value, in radians, representing the arc sine of the parameter number.

Description

Asin returns the arcsine of the numeric expression. Values range is from -1 to 1. The value returned by Asin will range from -PI / 2 to PI / 2 radians. If number is < -1 or > 1, an error occurs.

To convert from radians to degrees, use the RadToDeg function.

See Also

Abs, Acos, Atan, Atan2, Cos, DegToRad, RadToDeg, Sgn, Sin, Tan, Val

Asin Function Example

Function asintest
    Double x

    x = Sin(DegToRad(45))
    Print "Asin of ", x, " is ", Asin(x)
Fend
AtHome Function

Returns if the current robot is in its Home position or not.

Syntax
AtHome

Return Values
True if the current robot is in its Home position, otherwise False.

Description
The AtHome function returns if the current robot is in its Home position or not. To register the Home position, use HomeSet command or Robot Manager. To move to the Home position, use the Home command.

See Also
Home, HomeClr, HomeDef, HomeSet, Hordr, MCalComplete
Atan Function

Returns the arctangent of a numeric expression.

Syntax

\[
\text{Atan}(number)
\]

Parameters

\( number \) \quad \text{Numeric expression representing the tangent of an angular value.}

Return Values

Real value, in radians, representing the arctangent of the parameter \( number \).

Description

\text{Atan} \text{ returns the arctangent of the numeric expression. The numeric expression (} number \text{) may be any numeric value. The value returned by \text{Atan} \text{ will range from -PI to PI radians.}

To convert from radians to degrees, use the RadToDeg function.

See Also

Abs, Acos, Asin, Atan2, Cos, DegToRad, RadToDeg, Sgn, Sin, Tan, Val

Atan Function Example

\[
\begin{align*}
\text{Function atantest} \\
\text{Real } x, y \\
x = 0 \\
y = 1 \\
\text{Print } "\text{Atan of } x, " \text{ is } , \text{Atan}(x) \\
\text{Print } "\text{Atan of } y, " \text{ is } , \text{Atan}(y) \\
\text{Fend}
\end{align*}
\]
Atan2 Function

Returns the angle of the imaginary line connecting points (0,0) and (X, Y) in radians.

Syntax
Atan2(X, Y)

Parameters
X Numeric expression representing the X coordinate.
Y Numeric expression representing the Y coordinate.

Return Values
Numeric value in radians (-PI to +PI).

Description
Atan2(X, Y) returns the angle of the line which connects points (0, 0) and (X, Y). This trigonometric function returns an arctangent angle in all four quadrants.

See Also
Abs, Acos, Asin, Atan, Cos, DegToRad, RadToDeg, Sgn, Sin, Tan, Val

Atan2 Function Example

Function at2test
Real x, y
Print "Please enter a number for the X Coordinate:";
Input x
Print "Please enter a number for the Y Coordinate:";
Input y
Print "Atan2 of ", x, ", ", y, ", " is ", Atan2(x, y)
Fend
ATCLR Statement

Clears and initializes the average torque for one or more joints.

**Syntax**

```
ATCLR [j1], [j2], [j3], [j4], [j5], [j6], [j7], [j8], [j9]
```

**Parameters**

- **j1 – j9**: Optional. Integer expression representing the joint number. If no parameters are supplied, then the average torque values are cleared for all joints. The additional S axis is 8 and T axis is 9.

**Description**

ATCLR clears the average torque values for the specified joints.

You must execute ATCLR before executing ATRQ.

**See Also**

ATRQ, PTRQ

**ATCLR Statement Example**

```
> atclr
> go p1
> atrq 1
 0.028
> atrq
 0.028  0.008
 0.029  0.009
 0.000  0.000
> 
```
ATRQ Statement

Displays the average torque for the specified joint.

Syntax

ATRQ [jointNumber]

Parameters

jointNumber Optional. Integer expression representing the joint number.
The additional S axis is 8 and T axis is 9.

Return Values

Displays current average torque values for all joints.

Description

ATRQ displays the average RMS (root-mean-square) torque of the specified joint. The loading state of the motor can be obtained by this instruction. The result is a real value from 0 to 1 with 1 being maximum average torque.

You must execute ATCLR before this command is executed.

This instruction is time restricted. You must execute ATRQ within 60 seconds after ATCLR is executed. When this time is exceeded, error 4030 occurs.

See Also

ATCLR, ATRQ Function, PTRQ

ATRQ Statement Example

```plaintext
> atclr
> go pl
> atrq 1
  0.028
> atrq
  0.028  0.008
  0.029  0.009
  0.000  0.000
>
```
ATRQ Function

ATRQ Function

Returns the average torque for the specified joint.

Syntax

ATRQ (jointNumber)

Parameters

jointNumber

Integer expression representing the joint number.

The additional S axis is 8 and T axis is 9.

Return Values

Real value from 0 to 1.

Description

The ATRQ function returns the average RMS (root-mean-square) torque of the specified joint. The loading state of the motor can be obtained by this instruction. The result is a real value from 0 to 1 with 1 being maximum average torque.

You must execute ATCLR before this function is executed.

This instruction is time restricted. You must execute ATRQ within 60 seconds after ATCLR is executed. When this time is exceeded, error 4030 occurs.

See Also

ATRQ Statement, PTCLR, PTRQ Statement

ATRQ Function Example

This example uses the ATRQ function in a program:

```plaintext
Function CheckAvgTorque
    Integer i
    Go P1
    ATCLR
    Go P2
    Print "Average torques:"
    For i = 1 To 4
        Print "Joint ", i, ", " = ", ATRQ(i)
    Next i
    Fend
```
AutoLJM Statement

Sets the Auto LJM function.

**Syntax**

AutoLJM { On | Off }

**Parameter**

On | Off
---
On: Enables the Auto LJM.
Off: Disables the Auto LJM.

**Description**

AutoLJM is available for the following commands.
Arc, Arc3, Go, Jump3, Jump3CP, Move

When AutoLJM is On, the manipulator operates with a least joint motion, just like using the LJM function, whether the LJM function is applied to the position data to be passed to each command or not. For example, to get the same effect as Go LJM(P1), you can write a program as follows.

```
AutoLJM On
Go P1
AutoLJM Off
```

Since AutoLJM can enable LJM within a particular section of a program, it is not necessary to edit each motion command.

When AutoLJM is Off, the LJM function is only enabled when it is applied to the position data to be passed to each motion command.

In any of the following cases, AutoLJM has the setting specified in the controller settings (factory default: Off).

- Controller startup
- Reset
- All task stop
- Motor On
- Switching the Auto / Programming operation mode

**Notes**

**Double application of AutoLJM and LJM function**

If LJM function is applied to the point data to be passed to the motion command while AutoLJM is On, LJM will be doubly applied at the command execution.

For Move LJM(P1, Here) and Move LJM(P1), enabling AutoLJM will not affect the motion. However, if AutoLJM is enabled for Move LJM(LJM(P1, P0), motion completion positions of Move LJM(LJM(P1, P0), Here), which enabled AutoLJM, and the one of Move LJM(P1, P0), which did not enable AutoLJM, may be different.

It is recommended to write a program not to duplicate AutoLJM and LJM functions.

**AutoLJM Usage Precaution**

You can set the AutoLJM function to be enabled at the controller startup by setting the controller preferences. However, if Auto LJM is enabled at all times by controller preferences or commands, this function automatically adjusts the posture of the manipulator to reduce the motion distance, even when you intended to move the joint widely. Therefore, it is recommended to create a program to apply the LJM function only when necessary by using LJM function or AutoLJM command.
AutoLJM Statement

See Also
AutoLJM Function, LJM Function

AutoLJM example

AutoLJM On
Go P1
Go P2
AutoLJM Off
AutoLJM Function

Returns the state of the AutoLJM.

Syntax
AutoLJM

Return Values
0  = Auto LJM OFF
1  = Auto LJM ON

See Also
AutoLJM

AutoLJM Function Example

If AutoLJM = Off Then
    Print "AutoLJM is off"
EndIf
AvoidSingularity Statement

Sets the singularity avoiding function.

Syntax

AvoidSingularity { mode }

Parameter

<table>
<thead>
<tr>
<th>mode</th>
<th>Integer expression representing a singularity avoiding mode to use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>Value</td>
</tr>
<tr>
<td>SING_NONE</td>
<td>0</td>
</tr>
<tr>
<td>SING_THRU</td>
<td>1</td>
</tr>
<tr>
<td>SING_THRUROT</td>
<td>2</td>
</tr>
<tr>
<td>SING_VSD</td>
<td>3</td>
</tr>
<tr>
<td>SING_AUTO</td>
<td>4</td>
</tr>
</tbody>
</table>

Description

AvoidSingularity is available for following commands.
Move, Arc, Arc3, Jump3, Jump3CP

A singularity avoiding function is to prevent acceleration errors when the vertical 6-axis robot approaches to the singularity in CP motion by passing a different trajectory and returning to the original trajectory after passing the singularity. This function is only applicable for the wrist singularity. Since the singularity avoiding function is usually set to “1: Enabled” at the controller startup, it is not necessary to change the setting. If you do not want a singularity avoidance to ensure compatibility with software which does not support the singularity avoiding function, or to avoid a trajectory gap, disable the function.

A variable speed CP motion function automatically controls speed while keeping the trajectory when the vertical 6-axis robot approaches to the singularity in order to avoid the acceleration error and overspeed error, and returns to the normal speed command after leaving the singularity. To pass the singularity while keeping the trajectory, Joint #4 and #6 may move largely.

If the AvoidSingularity parameter is changed, this function remains enabled until the next controller startup.

At the controller startup, AvoidSingularity has the setting specified in the controller setting (factory default: 1). Also, parameters for SingularityAngle, SingularitySpeed, and SingularityDist are reset to the default values when AvoidSingularity setting is changed.

Notes

Condition setting of singularity neighborhood
To determine whether the manipulator approaches to the singularity neighborhood, angle of Joint #5 and angular velocity of Joint #4 are used. By default, Joint #5 angle is set to ±10 degrees, and Joint #4 angle is set to ±10 % with respect to the maximum joint velocity. To change these settings, use SingularityAngle and SingularitySpeed commands.

See Also
AvoidSingularity Function, SingularityAngle, SingularitySpeed, SingularityDist

AvoidSingularity Example

AvoidSingularity 0  ‘Disables the singularity avoidance and operate the manipulator
Move P1
Move P2
AvoidSingularity 1
AvoidSingularity Function

AvoidSingularity Function

Returns the state of AvoidSingularity.

Syntax

AvoidSingularity

Return values

0  = Singularity avoiding function disabled
1  = Singularity avoiding function enabled
2  = Singularity avoiding function enabled for CP motion commands with an ROT modifier
3  = Variable speed CP motion function enabled
4  = Automatic selection of the singularity avoiding function or the variable speed CP motion function.

See also

AvoidSingularity

AvoidSingularity Function Example

If AvoidSingularity = Off Then
    Print "AvoidSingularity is off"
EndIf
**Base Statement**

Defines and displays the base coordinate system.

### Syntax

1. `Base pCoordinateData`
2. `Base pOrigin, pXaxis, pYaxis, [ { X | Y } ]`

### Parameters

- **pCoordinateData**: Point data representing the coordinate data of the origin and direction.
- **pOrigin**: Integer expression representing the origin point using robot coordinate system.
- **pXaxis**: Integer expression representing a point along the X axis using robot coordinate system if X alignment is specified.
- **pYaxis**: Integer expression representing a point along the Y axis using robot coordinate system if Y alignment is specified.
- **X | Y**: Optional. If X alignment is specified, then `pXaxis` is on the X axis of the new coordinate system and only the Z coordinate of `pYaxis` is used. If Y alignment is specified, then `pYaxis` is on the Y axis of the new coordinate system and only the Z coordinate of `pXaxis` is used. If omitted, X alignment is assumed.

### Description

Defines the robot base coordinate system by specifying base coordinate system origin and rotation angle in relation to the robot absolute coordinate system.

To reset the Base coordinate system to default, execute the following statement. This will make the base coordinate system the same as the robot absolute coordinate system.

```
Base XY(0, 0, 0, 0)
```

### Notes

**Changing the base coordinate system affects all local definitions**

When base coordinates are changed, all local coordinate systems must be re-defined.

### See Also

Local

### Base Statement Example

Define base coordinate system origin at 100 mm on X axis and 100 mm on Y axis

```
> Base XY(100, 100, 0, 0)
```
BClr Function

Clear one bit in a number and return the new value

Syntax

BClr (number, bitNum)

Parameters

- number: Specifies the numeric value to clear the bit by an expression or numeric value.
- bitNum: Specifies the bit (integer from 0 to 31) to be cleared by an expression or numeric value.

Return Values

Returns the new value of the specified numeric value (integer).

See Also

BSet, BTst

BClr Example

    flags = BClr(flags, 1)
Executes Point to Point relative motion, in the selected local coordinate system.

Syntax

\[
\text{BGo} \text{ destination} \ [\text{CP}] \ [\text{searchExpr}] \ [!...!] \ [\text{SYNC}]
\]

Parameters

- **destination**: The target destination of the motion using a point expression.
- **CP**: Optional. Specifies continuous path motion.
- **searchExpr**: Optional. A Till or Find expression.
  - Till: \(\text{Sw} (expr) = \{\text{On} | \text{Off}\}\)
  - Find: \(\text{Sw} (expr) = \{\text{On} | \text{Off}\}\)
- **!...!**: Optional. Parallel Processing statements can be added to execute I/O and other commands during motion.
- **SYNC**: Reserves a motion command. The robot will not move until SyncRobots is executed.

Description

Executes point to point relative motion, in the selected local coordinate system that is specified in the destination point expression.

If a local coordinate system is not specified, relative motion will occur in local 0 (base coordinate system).

Arm orientation attributes specified in the destination point expression are ignored. The manipulator keeps the current arm orientation attributes. However, for a 6-Axis manipulator, the arm orientation attributes are automatically changed in such a way that joint travel distance is as small as possible.

The Till modifier is used to complete BGo by decelerating and stopping the robot at an intermediate travel position if the current Till condition is satisfied.

The Find modifier is used to store a point in FindPos when the Find condition becomes true during motion.

When Till is used and the Till condition is satisfied, the manipulator halts immediately and the motion command is finished. If the Till condition is not satisfied, the manipulator moves to the destination point.

When Find is used and the Find condition is satisfied, the current position is stored. Please refer to Find for details.

When parallel processing is used, other processing can be executed in parallel with the motion command.

The CP parameter causes acceleration of the next motion command to start when the deceleration starts for the current motion command. In this case the robot will not stop at the destination coordinate and will continue to move to the next point.

See Also

Accel, BMove, Find, !...! Parallel Processing, Point Assignment, Speed, Till, TGo, TMove, Tool
BGo Example

> BGo XY(100, 0, 0, 0) 'Move 100mm in X direction
'(in the local coordinate system)

Function BGoTest

    Speed 50
    Accel 50, 50
    Power High

    P1 = XY(300, 300, -20, 0)
P2 = XY(300, 300, -20, 0) /L
Local 1, XY(0, 0, 0, 45)

    GoP1
Print Here
    BGo XY(0, 50, 0, 0)
Print Here

    Go P2
Print Here
    BGo XY(0, 50, 0, 0)
Print Here

    BGo XY(0, 50, 0, 0) /1
Print Here

Fend

[Output]
X:  300.000 Y:  300.000 Z:  -20.000 U:  0.000 V:  0.000 W:  0.000 /R /0
X:  300.000 Y:  350.000 Z:  -20.000 U:  0.000 V:  0.000 W:  0.000 /R /0
X:  300.000 Y:  300.000 Z:  -20.000 U:  0.000 V:  0.000 W:  0.000 /L /0
X:  300.000 Y:  350.000 Z:  -20.000 U:  0.000 V:  0.000 W:  0.000 /L /0
X:  264.645 Y:  385.355 Z:  -20.000 U:  0.000 V:  0.000 W:  0.000 /L /0
BMove Statement

Executes linear interpolation relative motion, in the selected local coordinate system

Syntax

BMove destination [ROT] [CP] [searchExpr] [ !! ] [SYNC]

Parameters

destination
The target destination of the motion using a point expression.

ROT
Optional. :Decides the speed/acceleration/deceleration in favor of tool rotation.

CP
Optional. Specifies continuous path motion.

searchExpr
Optional. A Till or Find expression.

Till | Find
Till Sw(expr) = {On | Off}
Find Sw(expr) = {On | Off}

!!
Optional. Parallel Processing statements can be added to execute I/O and other commands during motion.

SYNC
Reserves a motion command. The robot will not move until SyncRobots is executed.

Description

Executes linear interpolated relative motion, in the selected local coordinate system that is specified in the destination point expression.

If a local coordinate system is not specified, relative motion will occur in local 0 (base coordinate system).

Arm orientation attributes specified in the destination point expression are ignored. The manipulator keeps the current arm orientation attributes. However, for a 6-Axis manipulator, the arm orientation attributes are automatically changed in such a way that joint travel distance is as small as possible.

BMove uses the SpeedS speed value and AccelS acceleration and deceleration values. Refer to Using BMove with CP below on the relation between the speed/acceleration and the acceleration/deceleration. If, however, the ROT modifier parameter is used, BMove uses the SpeedR speed value and AccelR acceleration and deceleration values. In this case SpeedS speed value and AccelS acceleration and deceleration value have no effect.

Usually, when the move distance is 0 and only the tool orientation is changed, an error will occur. However, by using the ROT parameter and giving priority to the acceleration and the deceleration of the tool rotation, it is possible to move without an error. When there is not an orientational change with the ROT modifier parameter and movement distance is not 0, an error will occur.

Also, when the tool rotation is large as compared to move distance, and when the rotation speed exceeds the specified speed of the manipulator, an error will occur. In this case, please reduce the speed or append the ROT modifier parameter to give priority to the rotational speed/acceleration/deceleration.

The Till modifier is used to complete BMove by decelerating and stopping the robot at an intermediate travel position if the current Till condition is satisfied.

The Find modifier is used to store a point in FindPos when the Find condition becomes true during motion.
When Till is used and the Till condition is satisfied, the manipulator halts immediately and the motion command is finished. If the Till condition is not satisfied, the manipulator moves to the destination point.

When Find is used and the Find condition is satisfied, the current position is stored. Please refer to Find for details.

When parallel processing is used, other processing can be executed in parallel with the motion command.

Notes

Using BMove with CP

The CP parameter causes the arm to move to destination without decelerating or stopping at the point defined by destination. This is done to allow the user to string a series of motion instructions together to cause the arm to move along a continuous path while maintaining a specified speed throughout all the motion. The BMove instruction without CP always causes the arm to decelerate to a stop prior to reaching the point destination.

See Also

AccelS, BGo, Find, !....! Parallel Processing, Point Assignment, SpeedS, TGo, Till, TMove, Tool

BMove Example

> BMove XY(100, 0, 0, 0)  'Move 100mm in the X direction (in the local coordinate system)

Function BMoveTest

    Speed 50
    Accel 50, 50
    SpeedS 100
    AccelS 1000, 1000
    Power High

    P1 = XY(300, 300, -20, 0)
    P2 = XY(300, 300, -20, 0) /L
    Local 1, XY(0, 0, 0, 45)

    Go P1
    Print Here
    BMove XY(0, 50, 0, 0)
    Print Here

    Go P2
    Print Here
    BMove XY(0, 50, 0, 0)
    Print Here

    BMove XY(0, 50, 0, 0) /1
    Print Here

Fend

[Output]
X:  300.000  Y:  300.000  Z:  -20.000  U:  0.000  V:  0.000  W:  0.000  /R /0
X:  300.000  Y:  350.000  Z:  -20.000  U:  0.000  V:  0.000  W:  0.000  /R /0
X:  300.000  Y:  350.000  Z:  -20.000  U:  0.000  V:  0.000  W:  0.000  /L /0
X:  300.000  Y:  350.000  Z:  -20.000  U:  0.000  V:  0.000  W:  0.000  /L /0
X:  264.645  Y:  385.355  Z:  -20.000  U:  0.000  V:  0.000  W:  0.000  /L /0
Boolean Statement

Declares variables of type Boolean. (1 byte whole number).

Syntax

Boolean varName [(subscripts)], [ varName [(subscripts)]]...

Parameters

varName

Variable name which the user wants to declare as type Boolean.

subscripts

Optional. Dimensions of an array variable; up to 3 dimensions may be declared. The subscripts syntax is as follows (ubound1, [ubound2], [ubound3]) ubound1, ubound2, ubound3 each specify the maximum upper bound for the associated dimension.

The elements in each dimension of an array variable are numbered from 0 and the available number of array elements is the upper bound value + 1. When specifying the upper bound value, make sure the number of total elements is within the range shown below:

<table>
<thead>
<tr>
<th>Type</th>
<th>Maximum Total Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local variable</td>
<td>2000</td>
</tr>
<tr>
<td>Global Preserve variable</td>
<td>4000</td>
</tr>
<tr>
<td>Global variable and module variable</td>
<td>100000</td>
</tr>
</tbody>
</table>

Description

Boolean is used to declare variables as type Boolean. Variables of type Boolean can contain one of two values, False and True. Local variables should be declared at the top of a function. Global and module variables must be declared outside of functions.

See Also

Byte, Double, Global, Integer, Long, Real, String

Boolean Statement Example

Boolean partOK
Boolean A(10)  'Single dimension array of boolean
Boolean B(10, 10)  'Two dimension array of boolean
Boolean C(5, 5, 5)  'Three dimension array of boolean

partOK = CheckPart()
If Not partOK Then
   Print "Part check failed"
EndIf
BOpen Statement

Opens file in binary mode.

Syntax

```
BOpen fileName As #fileNumber
.
Close #fileNumber
```

Parameters

<table>
<thead>
<tr>
<th>parameter</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>fileName</td>
<td>String expression that specifies valid path and file name. If specifying only a file name, the file must be in the current directory. See ChDisk for the details.</td>
</tr>
<tr>
<td>fileNumber</td>
<td>Integer expression representing values from 30 - 63.</td>
</tr>
</tbody>
</table>

Description

Opens the specified file and identifies it by the specified file number. This statement is used for accessing the specified file in binary mode. If the specified file is not found, it will create a new file. If the file exists, it will read and write the data from the beginning. Use the ReadBin and WriteBin commands to read and write data in binary mode.

Note

Do not use a network path, otherwise an error occurs.

The specified fileNumber identifies the file while it is open and cannot be used to refer to a different file until the current file is closed. fileNumber is used by other file operations such as ReadBin, WriteBin, Seek, Eof, Flush, and Close.

The read/write position (pointer) of the file can be changed using the Seek command. When switching between read and write access, use Seek to reposition the file pointer.

Use the Close statement to close the file and release the file number.

It is recommended that you use the FreeFile function to obtain the file number so that more than one task are not using the same number.

See Also

Close, AOpen, FreeFile, ReadBin, ROpen, UOpen, WOpen, WriteBin

BOpen Example

```
Integer fileNum, i

fileNum = FreeFile
BOpen "TEST.DAT" As #fileNum
For i = 0 To 100
   WriteBin #fileNum, i
Next i

Flush #fileNum
Seek #fileNum, 10
ReadBin #fileNum, i
Print "data = ", i
Close #fileNum
```
Box Statement

Specifies and displays the approach check area.

Syntax

(1) Box AreaNum, [robotNumber], minX, maxX, minY, maxY, minZ, maxZ
(2) Box AreaNum, [robotNumber]
(3) Box

Parameters

AreaNum        Integer expression representing the area number from 1 to 15.

robotNumber    Optional. Integer expression that specifies which robot you want to configure. If omitted, the current robot number is used.

minX           The minimum X coordinate position which can be set to the approach check area.

maxX           The maximum X coordinate position which can be set to the approach check area.

minY           The minimum Y coordinate position which can be set to the approach check area.

maxY           The maximum Y coordinate position which can be set to the approach check area.

minZ           The minimum Z coordinate position which can be set to the approach check area.

maxZ           The maximum Z coordinate position which can be set to the approach check area.

Return Values

When Syntax (2) is used, the area setting of the specified area is displayed.
When Syntax (3) is used, the area settings for all area numbers of the current robot are displayed.

Description

Box is used to set the approach check area. The approach check area is for checking approaches of the robot end effector in the approach check area. The position of the end effector is calculated by the current tool. The approach check area is set on the base coordinate system of the robot and is between the specified maximum and minimum X, Y, and Z.

When the approach check area is used, the system detects approaches in any motor power status during the controller is ON.

You can also use GetRobotInsideBox function or InsideBox function to get the result of the approach check. GetRobotInsideBox function can be used for wait condition of Wait command. You can provide the check result to the I/O by setting the remote output setting.
When several robots use one area, you should define the area from each robot coordinate system.

Configure the Box 1 from Robot 1 position
Box 1, 1, 100, 200, 0, 100, 0, 100
Lower limit of axes X, Y, Z is (100,0,0) and upper limit is (200,100,100)

Configure the Box 1 from Robot 2
Box 1, 2, -200, -100, 0, 100, 0, 100
Lower limit of axes X, Y, Z is (−200,0,0) and upper limit is (−100,100,100)

Notes

Turning Off Approach Check Area by coordinate axis
You can turn off the approach check area of each coordinate axis. To turn off only the Z axis, define the minZ and maxZ to be 0. For example Box 1, 200, 300, 0, 500, 0, 0.
In this case, it checks if the robot end effector is in the XY dimensional area.

Default values of Approach Check Area
The default values for the Box statement are "0, 0, 0, 0, 0, 0". (Approach Check Area Checking is turned off.)

Tool Selection
The approach check is executed for the current tool. When you change the tool, the approach check may display the tool approach from inside to outside of the area or the other way although the robot is not operating.

Additional axis
For the robot which has the additional ST axis (including the running axis), the approach check plane to set doesn’t depend on the position of additional axis, but is based on the robot base coordinate system.

Tip
Set Box statement from Robot Manager
EPSON RC+ 6.0 has a point and click dialog box for defining the approach check area. The simplest method to set the Box values is by using the Box page on the Robot Manager.

See Also
BoxClr, BoxDef, GetRobotInsideBox, InsideBox, Plane

Box Statement Example
These are examples to set the approach check area using Box statement.

> Box 1, -200, 300, 0, 500, -100, 0

> Box
Box 1: -200.000, 300.000, 0.000, 500.000, -100.000, 0.000
Box Function

Returns the specified approach check area.

Syntax

Box(AreaNum, [robotNumber], limit)

Parameters

AreaNum Integer expression representing the area number from 1 to 15.

robotNumber Optional. Integer expression that specifies which robot you want to configure. If omitted, the current robot number is used.

limit Integer expression that specifies which limit to return.

1: Lower limit
2: Upper limit

Return Values

When you select 1 for limit, the point contains the lower limit of the X, Y, Z coordinates. When you select 2 for limit, the point contains the upper limit of the X, Y, Z coordinates.

See Also

Box, BoxClr, BoxDef, GetRobotInsideBox, InsideBox

Box Function Example

P1 = Box(1,1)
P2 = Box(1,2)
BoxClr Statement

Clears the definition of approach check area.

Syntax

BoxClr AreaNum [,robotNumber]

Parameters

- **AreaNum**: Integer expression representing the area number from 1 to 15.
- **robotNumber**: Optional. Integer expression that specifies which robot you want to configure. If omitted, the current robot number is used.

See Also

- Box, BoxDef, GetRobotInsideBox, InsideBox

BoxClr Function Example

This example uses BoxClr function in a program.

```plaintext
Function ClearBox

    If BoxDef(1) = True Then
        BoxClr 1
    EndIf

EndFunction
```
BoxDef Function

Returns whether Box has been defined or not.

Syntax

\[\text{BoxDef} (\text{AreaNum}) [, \text{robotNumber}]\]

Parameters

- **AreaNum**: Integer expression representing an area number from 1 to 15.
- **robotNumber**: Integer expression representing a robot number you want to configure. If omitted, the current robot will be specified.

Return Values

True if approach check area is defined for the specified area number, otherwise False.

See Also

Box, BoxClr, GetRobotInsideBox, InsideBox

BoxDef Function Example

This example uses BoxDef function in a program.

```plaintext
Function ClearBox

    If BoxDef(1) = True Then
        BoxClr 1
    EndIf
EndFunction
```
Brake Statement

Turns brake on or off for specified joint of the current robot.

Syntax

Brake status, jointNumber

Parameters

status

The keyword On is used to turn the brake on. The keyword Off is used to turn the brake off.

jointNumber

The joint number from 1 to 6.

Description

The Brake command is used to turn brakes on or off for one joint of the 6-axis robot. It can only be executed as a command command. This command is intended for use by maintenance personnel only. When the Brake statement is executed, the robot control parameter is initialized. See Motor On for the details.

WARNING

Use extreme caution when turning off a brake. Ensure that the joint is properly supported, otherwise the joint can fall and cause damage to the robot and personnel.

Before releasing the brake, be ready to use the emergency stop switch so that you can immediately press it. When the controller is in emergency stop status, the motor brakes are locked. Be aware that the robot arm may fall by its own weight when the brake is turned off with Brake command.

See Also

Motor, Power, Reset, SFree, SLock

Brake Example

> brake on, 1
> brake off, 1
Brake Function

Returns brake status for specified joint.

Syntax

Brake (jointNumber)

Parameters

jointNumber Integer expression representing the joint number. Value are from 1 to the number of joints on the robot.

Return Values

0 = Brake off, 1 = Brake on.

See Also

Brake Statement

Brake Example

If Brake(1) = Off Then
    Print “Joint 1 brake is off”
EndIf
BSet Function

Sets a bit in a number and returns the new value.

Syntax

\[ \text{BSet}(number, \text{bitNum}) \]

Parameters

- \( number \) Specifies the value to set the bit with an expression or numeric value.
- \( bitNum \) Specifies the bit (integer from 0 to 31) to be set by an expression or numeric value.

Return Values

Returns the bit set value of the specified numeric value (integer).

See Also

- BCir, BTst

BSet Example

\[ \text{flags} = \text{BSet}(\text{flags}, 1) \]
BTst Function

Returns the status of 1 bit in a number.

Syntax

\[
\text{BTst} (\text{number}, \text{bitNum})
\]

Parameters

- \text{number} Specifies the number for the bit test with an expression or numeric value.
- \text{bitNum} Specifies the bit (integer from 0 to 31) to be tested.

Return Values

Returns the bit test results (integer 1 or 0) of the specified numeric value.

See Also

BClr, Bset

BTst Example

\[
\text{If BTst(flags, 1) Then}
\quad \text{Print "Bit 1 is set"}
\quad \text{EndIf}
\]
**Byte Statement**

Declares variables of type Byte. (2 byte whole number).

**Syntax**

```
Byte varName ([subscripts]) [ , varName ([subscripts])...]
```

**Parameters**

- **varName**
  - Variable name which the user wants to declare as type Byte.
- **subscripts**
  - Optional. Dimensions of an array variable; up to 3 dimensions may be declared.
  - The subscripts syntax is as follows
    - `(ubound1, [ubound2], [ubound3])`
  - ubound1, ubound2, ubound3 each specify the maximum upper bound for the associated dimension.
  - The elements in each dimension of an array are numbered from 0 and the available number of array elements is the upper bound value + 1.
  - When specifying the upper bound value, make sure the number of total elements is within the range shown below:
    - Local variable: 2000
    - Global Preserve variable: 4000
    - Global variable and module variable: 100000

**Description**

- **Byte** is used to declare variables as type Byte. Variables of type Byte can contain whole numbers ranging in value from -128 to +127. Local variables should be declared at the top of a function. Global and module variables must be declared outside of functions.

**See Also**

Boolean, Double, Global, Integer, Long, Real, String

**Byte Example**

The following example declares a variable of type Byte and then assigns a value to it. A bitwise And is then done to see if the high bit of the value in the variable test_ok is On (1) or Off (0). The result is printed to the display screen. (Of course in this example the high bit of the variable test_ok will always be set since we assigned the variable the value of 15.)

```plaintext
Function Test
  Byte A(10) 'Single dimension array of byte
  Byte B(10, 10) 'Two dimension array of byte
  Byte C(5, 5, 5) 'Three dimension array of byte
  Byte test_ok
  test_ok = 15
  Print "Initial Value of test_ok = ", test_ok
  test_ok = (test_ok And 8)
  If test_ok <> 8 Then
    Print "test_ok high bit is ON"
  Else
    Print "test_ok high bit is OFF"
  EndIf
End
```

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Calib Statement

Replaces the current arm posture pulse values with the current CalPls values.

Syntax

```
Calib joint1, [joint2], [joint3], [joint4], [joint5], [joint6], [joint7], [joint8], [joint9]
```

Parameters

```
joint
```
Integer number from 1-9 that specifies the joint number to calibrate. While normally only one joint may need calibration at a time, up to all nine joints may be calibrated with the Calib command at the same time.

Additional S axis is 8 and T axis is 9.

Description

Automatically calculates and specifies the offset (Hofs) value. This offset is necessary for matching the origin for each robot joint motor to the corresponding robot mechanical origin.

The `Calib` command should be used when the motor pulse value has changed. The most common occurrence for use is after changing a motor. Normally, the calibration position pulse values would match the CalPls pulse values. However, after maintenance operations such as changing the motors, these two sets of values will no longer match, and therefore calibration becomes necessary.

Calibration may be accomplished by moving the arm to a desired calibration position, and then executing the `Calib` command. By executing `Calib`, the calibration position pulse value is changed to the CalPls value, (the correct pulse value for the calibration position).

In order to perform a proper calibration, Hofs values must be determined. To have Hofs values automatically calculated, move the arm to the desired calibration position, and execute `Calib`. The controller automatically calculates Hofs values based on the calibration pulse values and on the CalPls pulse values.

Notes

Use caution when using the Calib command

`Calib` is intended to be used for maintenance purposes only. Execute `Calib` only when necessary. Executing `Calib` causes the Hofs value to be replaced. Because unintended Hofs value changes can cause unpredictable robot motion, use caution in executing `Calib` only when necessary.

Potential Errors

No Joint Number Specified Error

If the joint number is not specified with the `Calib` command, an error will occur.

See Also

CalPls, Hofs

Calib Example

Example from the monitor window.

```
> CalPls  'Display current CalPls values
 65523 43320  
-1550 21351
> Pulse   'Display current Pulse values
 65526 49358
 1542 21299
> Calib 2 'Execute calibration for joint 2 only
> Pulse   'Display (changed) Pulse values
 65526 43320
-1542 21299
> 
```
Call Statement

Calls a user function.

Syntax
Call funcName [argList]

Parameters
- **funcName**: The name of a Function which is being called.
- **argList**: Optional. List of arguments that were specified in the Function declaration.
  For the argument, use the following syntax:
  
  `[ByRef] varName [( )], or numerical expression`

- **ByRef**: Optional. Specify ByRef when you refer to the variable to be seen by the calling function. In this case, the argument change in a function can be reflected to the variable of the calling side. You can change the values received as a reference.

Description
The Call instruction causes the transfer of program control to a function (defined in Function...Fend). This means that the Call instruction causes program execution to leave the current function and transfer to the function specified by Call. Program execution then continues in that function until an Exit Function or Fend instruction is reached. Control is then passed back to the original calling function at the next statement after the Call instruction.

You may omit the Call keyword and argument parentheses. For example, here is a call statement used with or without the Call keyword:

- Call MyFunc(1, 2)
- MyFunc 1, 2

You can call an external function in a dynamic link library (DLL). For details, refer to Declare Statement.

To execute a subroutine within a function, use GoSub...Return.

You can specify a variable as an argument. Specifying the ByRef parameter, you can reflect the change of argument in the function to the variable of the calling side.

When specifying the ByRef parameter, you need to specify ByRef as well for the argument list of the function definition (Function statement) and DLL function definition (Declare statement).

ByRef is necessary when giving an array variable as an argument.

See Also
Function, GoSub

Call Statement Example

<File1: MAIN.PRG>

Function main
Call InitRobot
Fend

<File2: INIT.PRG>

Function InitRobot
If Motor = Off Then
Motor On
EndIf
Power High
Speed 50
Accel 75, 75
Fend
CalPls Statement

Specifies and displays the position and orientation pulse values for calibration.

Syntax

1) CalPls
   j1Pulses, j2Pulses, j3Pulses, j4Pulses, [j5Pulses, j6Pulses], [j7Pulses], [j8Pulses, j9Pulses]

2) CalPls

Parameters

j1Pulses  First joint pulse value. This is a long integer expression.
j2Pulses  Second joint pulse value. This is a long integer expression.
j3Pulses  Third joint pulse value. This is a long integer expression.
j4Pulses  Fourth joint pulse value. This is a long integer expression.
j5Pulses  Optional. Fifth joint pulse value. This is a long integer expression.
j6Pulses  Optional. Sixth joint pulse value. This is a long integer expression.
j7Pulses  Optional. Seventh joint pulse value. This is a long integer expression.
j8Pulses  Optional. Eighth joint pulse value. This is a long integer expression.
j9Pulses  Optional. Ninth joint pulse value. This is a long integer expression.

Return Values

When parameters are omitted, displays the current CalPls values.

Description

Specifies and maintains the correct position pulse value(s) for calibration.

CalPls is intended to be used for maintenance, such as after changing motors or when motor zero position needs to be matched to the corresponding arm mechanical zero position. This matching of motor zero position to corresponding arm mechanical zero position is called calibration.

Normally, the calibration position Pulse values match the CalPls pulse values. However, after performing maintenance operations such as changing motors, these two sets of values no longer match, and therefore calibration becomes necessary.

Calibration may be accomplished by moving the arm to a certain calibration position and then executing Calib. By executing Calib, the calibration position pulse value is changed to the CalPls value (the correct pulse value for the calibration position.)

Hofs values must be determined to execute calibration. To have Hofs values automatically calculated, move the arm to the desired calibration position, and execute Calib. The controller automatically calculates Hofs values based on calibration position pulse values and on the CalPls values.

Notes

CalPls Values Cannot be Changed by cycling power

CalPls values are not initialized by turning main power to the controller off and then on again. The only method to modify the CalPls values is to execute the Calib command.

See Also

Calib, Hofs
CalPls Function

Returns calibration pulse value specified by the CalPls Statement.

Syntax

CalPls(joint)

Parameters

joint  Integer expression representing a robot joint number or 0 to return CalPls status.

The additional S axis is 8 and T axis is 9.

Return Values

Integer value containing number of calibration pulses. When joint is 0, returns 1 or 0 depending on if CalPls has been executed.

See Also

CalPls

CalPls function Example

This example uses the CalPls function in a program:

Function DisplayCalPlsValues
    Integer i
    Print "CalPls Values:",
    For i = 1 To 4
        Print "Joint ", i, " CalPls = ", CalPls(i)
    Next i
End
ChDir Statement

Changes and displays the current directory.

Syntax

(1) ChDir *pathName*
(2) ChDir

Parameter

*pathName* String expression representing the name of the new default path.
See ChDisk for the details.

Description

(1) Changes to the specified directory by specifying the parameter.
(2) When the parameter is omitted, the current directory is displayed. This is used to display the current directory when it is not known.

ChDir is available only with the PC disk.

When the power is ON, the root directory will be the current directory if no project is open, and if a project is open, the project directory will be the current directory.

If you change the drive with ChDrive, the root directory will be the current directory.

See Also

ChDrive, Dir, ChDisk, CurDir$

ChDir Example

The following examples are done from the command window.

> ChDir \       'Change current directory to the root directory
> ChDir ..      'Change current directory to parent dir
> Cd \TEST\H55  'Change current directory to \H55 in \TEST
> Cd A:\TEST\H55 'Display current directory
ChDisk Statement

Sets the object disk for file operations.

Syntax

ChDisk \textit{PC}|\textit{USB}|\textit{RAM}

Parameters

\begin{itemize}
  \item \textit{PC} \hspace{1cm} Folders (such as Hard disk) on the Windows Part
  \item \textit{USB} \hspace{1cm} USB memory on the Real Part
  \item \textit{RAM} \hspace{1cm} Memory on the Real Part
\end{itemize}

Description

Specifies which disk to use for file operations. Default is PC disk.

The RC620 controller supports the following disks as the object of file operations.

\begin{center}
\begin{tabular}{|l|p{11cm}|}
  \hline
  \textbf{PC} & Folders on the Windows Part  \\
  & The initial setting is PC and normally you don’t have to change \\
  & the setting from PC.  \\
  & Accesses to the files on the project folders.  \\
  \hline
  \textbf{USB} & USB memory connected to the controller memory port  \\
  & This is useful to exchange files when you don’t use the Windows Part \\
  & (RC+).  \\
  \hline
  \textbf{RAM} & Temporary files on the memory  \\
  & These files are not saves when you turn off the controller.  \\
  & This is useful to save the data temporary.  \\
  \hline
\end{tabular}
\end{center}

Some of the SPEL\textsuperscript{*} commands change the object of the file operations according to the ChDisk setting. Also, the ChDisk setting is available only with the PC disk for some commands.

\begin{center}
\begin{tabular}{|l|l|l|}
  \hline
  \textbf{ChDisk} & \textbf{Curve} & Object is always the project folders.  \\
  \textbf{ChDrive} & \textbf{CVMove} & File name can be specified.  \\
  \textbf{ChDir} & \textbf{LoadPoints} & If path is specified, an error occurs.  \\
  \textbf{don’t affect...} & \textbf{SavePoints} &  \\
  & \textbf{ImportPoints file name} &  \\
  \hline
  \textbf{ChDisk don’t affect...} & \textbf{Access, Excel file name of OpenDB} & Object is always the Windows folders.  \\
  & \textbf{ImportPoints source path} & If only file name is specified, it can be \\
  & \textbf{VLoadModel} & affected by the current drive and folder.  \\
  & \textbf{VSacelImage} & You can also specify a full path.  \\
  & \textbf{VSaveModel} &  \\
  \hline
  \textbf{Executable when ChDisk is PC} & \textbf{ChDir} & If you execute without setting ChDisk to PC,  \\
  & \textbf{Dir} & an error occurs.  \\
  & \textbf{FolderExists} & If only file name and directory name are \\
  & \textbf{MkDir} & specified, it can be affected by the current  \\
  & \textbf{RenDir} & drive and folder.  \\
  & \textbf{RmDir} & You can also specify a full path.  \\
  & & USB and RAM have no idea of directory.  \\
  \hline
\end{tabular}
\end{center}
### ChDisk Statement

<table>
<thead>
<tr>
<th>Executable when ChDisk is USB or RAM</th>
<th>Copy</th>
<th>Del</th>
<th>FileDataTime</th>
<th>FileExist</th>
<th>FileLen</th>
<th>AOpen, BOpen, ROpen, UOpen, WOpen</th>
<th>Rename</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>When ChDisk is PC:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>If only file name and directory name are specified, it can be affected by the current drive and folder. You can also specify a full path.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>When ChDisk is USB or RAM:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Only file name can be specified and if a path is specified, an error occurs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special</td>
<td>Declare</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>See Declare for the details. Any specified file name can be accepted. It cannot be affected by the current drive and folder</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How to decide a full path when ChDisk is PC is as follows:

<table>
<thead>
<tr>
<th>Only file name</th>
<th>&quot;abc.txt&quot;</th>
<th>Curret drive + Current directory + Specified file name &quot;C:\EpsonRC60\Projects\ProjectName\abc.txt&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full path without a drive</td>
<td>&quot;abc.txt&quot;</td>
<td>Current drive + Specified full path &quot;C:\abc.txt&quot;</td>
</tr>
<tr>
<td>Full path with a drive</td>
<td>&quot;d:\abc.txt&quot;</td>
<td>Specified full path &quot;d:\abc.txt&quot;</td>
</tr>
<tr>
<td>Drive is a network folder</td>
<td>&quot;k:\abc.txt&quot;</td>
<td>If the &quot;k&quot; drive is network folder, an error occurs. This will be supported by the following version.</td>
</tr>
<tr>
<td>Network path</td>
<td>&quot;\Epson\data\abc.txt&quot;</td>
<td>If a network path is specified, an error occurs. This will not be supported in the future version.</td>
</tr>
</tbody>
</table>

You can have one ChDisk setting per controller. If you want to set more than one disk as a system, take a exceptional control to switch the ChDisk setting.

**See Also**

ChDir, ChDrive, Dir, CurDisk$

**ChDisk Example**

Examples from the Command window.

> ChDisk PC
ChDrive Statement

Changes the current disk drive for file operations.

Syntax

ChDrive drive

Parameters

drive String expression or literal containing a valid drive letter.

Description

ChDrive is available only with the PC disk.

When the power is turned on, the "C" drive will be the current drive if a project is closed. If a project is open, the drive of the opened project will be the current drive.

See ChDisk for the details.

See Also

ChDir, ChDisk, CurDrive$

ChDrive Statement Example

The following examples are done from the command window.

> ChDrive d
ChkCom Function

Returns number of characters in the reception buffer of a communication port

Syntax

`ChkCom ( portNumber As Integer )`

Parameters

- `portNumber` Integer value that specifies the RS-232C port number
  - Real Part 1 ~ 8
  - Windows Part 1001 ~ 1002

Return Values

Number of characters received (integer).

- If the port cannot receive characters, the following negative values are returned to report the current port status:
  - -2 Port is used by another task
  - -3 Port is not open

See Also

CloseCom, OpenCom, Read, Write

ChkCom Example

```plaintext
Integer numChars

numChars = ChkCom(1)
```
ChkNet Function

Returns number of characters in the reception buffer of a network port

Syntax

```
ChkNet ( portNumber As Integer )
```

Parameters

```
portNumber  TCP/IP port number (201 ~ 216)
```

Return Values

Number of characters received (integer).

If the port cannot receive characters, the following negative values are returned to report the current port status:

-1 Port is open but communication has not been established
-2 Port is used by another task
-3 Port is not open

See Also

CloseNet, OpenNet, Read, Write

ChkNet Example

```
Integer numChars
numChars = ChkNet(201)
```
**Chr$ Function**

Returns the character specified by a numeric ASCII value.

**Syntax**

\[ \text{Chr$}(\text{number}) \]

**Parameters**

- **number**: An integer expression between 1 and 255.

**Return Values**

Returns a character that corresponds with the specified ASCII code specified by the value of \text{number}.

**Description**

\text{Chr$} \text{ returns a character string (1 character) having the ASCII value of the parameter } \text{number}. \text{ When the \text{number} specified is outside of the range 1-255 an error will occur.}

**See Also**

- Asc, Instr, Left$, Len, Mid$, Right$, Space$, Str$, Val

**Chr$ Function Example**

The following example declares a variable of type String and then assigns the string "ABC" to it. The \text{Chr$} \text{ instruction is used to convert the numeric ASCII values into the characters "A", "B" and "C". The } \&H \text{ means the number following is represented in hexadecimal form. (} \&H41 \text{ means Hex 41)}

```plaintext
Function Test
    String temp$
    temp$ = Chr$(&H41) + Chr$(&H42) + Chr$(&H43)
    Print "The value of temp = ", temp$
End
```


ClearPoints Statement

Erases the robot position data memory.

Syntax
ClearPoints

Description
ClearPoints initializes the robot position data area. Use this instruction to erase point definitions which reside in memory before teaching new points.

See Also
Plist, LoadPoints, SavePoints

ClearPoints Statement Example
The example below shows simple examples of using the ClearPoints command (from the command window). Notice that no teach points are shown when initiating the Plist command once the ClearPoints command is given.

```plaintext
>P1=100,200,-20,0/R
>P2=0,300,0,20/L
>plist
P1=100,200,-20,0/R
P2=0,300,0,20/L
>clearpoints
>plist
>```
Close Statement

Closes a file that has been opened with AOpen, BOpen, ROpen, UOpen, or WOpen.

Syntax

Close #fileNumber

Parameters

fileNumber  Integer expression whose value is from 30 - 63.

Description

Closes the file referenced by file handle fileNumber and releases it.

See Also

AOpen, BOpen, Flush, FreeFile, Input #, Print #, ROpen, UOpen, WOpen

Close Example

This example opens a file, writes some data to it, then later opens the same file and reads the data into an array variable.

```
Integer fileNumber, i, j

fileNumber = FreeFile
WOpen "TEST.DAT" As #fileNum
For i = 0 To 100
    Print #fileNum, i
Next i
Close #fileNum

FileNum = FreeFile
ROpen "TEST.DAT" As #fileNum
For i = 0 to 100
    Input #fileNum, j
    Print j
Next i
Close #fileNum
```
CloseCom Statement

Close the RS-232C port that has been opened with OpenCom.

Syntax

`CloseCom #portNumber | All`

Parameters

- `portNumber`: RS-232C port number to close.
  - Real Part: 1 ~ 8
  - Windows Part: 1001 ~ 1002

If All is specified, the task will close all the open RS-232C port.

See Also

ChkCom, OpenCom

CloseCom Statement Example

```
CloseCom #1
```
CloseDB Statement

Close the database that has been opened with the OpenDB command and releases the file number.

Syntax

```
CloseDB  #fileNumber
```

Parameters

`fileNumber` Database number specified with OpenDB from 501 ~ 508

Description

CloseDB closes the database and Excel book, and releases the database number.

See Also

OpenDB, SelectDB, Input #, Print #

CloseDB Example

Refer to OpenDB use example
CloseNet Statement

Close the TCP/IP port previously opened with OpenNet.

Syntax

CloseNet  #portNumber | All

Parameters

portNumber  TCP/IP port number to close (201 ~ 216)

If All is specified, the task will close all the open TCP/IP port.

See Also

ChkNet, OpenNet

CloseNet Statement Example

CloseNet  #201
Cls Statement

Clears the EPSON RC+ 6.0 Run, Operator, or Command window text area. Clears also the TP print panel.

Syntax

(1) Cls #deviceID

(2) Cls

Parameters

deviceID

- 21 RC+
- 24 TP

When deviceID is omitted, the display device is cleared.

Description

Cls clears the current EPSON RC+ Run or Operator window text area, depending on where the program was started from.

If Cls is executed from a program that was started from the Command window, the command window text area is cleared.

When deviceID is omitted, the display of the current display device is cleared.

Cls Example

If this example is run from the Run window or Operator window, the text area of the window will be cleared when Cls executes.

```
Function main
  Integer i
  Do
    For i = 1 To 10
      Print i
    Next i
  Cls
  Loop
End
```
Cnv_AbortTrack Statement

Aborts tracking motion to a conveyor queue point.

Syntax

```
Cnv_AbortTrack [ stopZheight ]
```

Parameters

*stopZheight* Optional. Real expression that specifies the Z position the robot should move to after aborting the track.

Description

When a motion command to a conveyor queue point is in progress, *Cnv_AbortTrack* can be executed to abort it.

If *stopZHeight* is specified, the robot will move up to this value only if the Z axis position at the time of abort is below *stopZHeight* and will then be decelerated to a stop.

If *stopZHeight* is omitted, the robot is decelerated to a stop without the depart motion in the Z direction.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

- *Cnv_RobotConveyor Statement*

Cnv_AbortTrack Statement Example

```
' Task to monitor robot whose part being tracked has gone downstream
Function WatchDownstream
    Robot 1
    Do
        If g_TrackInCycle And Cnv_QueLen(1, CNV_QUELEN_DOWNSTREAM) > 0 Then
            ' Abort tracking for current robot and move robot Z axis to 0
            g_AbortTrackInCycle = TRUE
            Cnv_AbortTrack 0
            g_AbortTrackInCycle = FALSE
        EndIf
        Wait .01
    Loop
    Fend
```
Cnv_Accel Statement

Sets acceleration and deceleration of the tracking motion in the Conveyor Tracking.

Syntax

```
Cnv_Accel (conveyorNumber), accel/decel
```

Parameters

- `conveyorNumber`: Integer expression representing the conveyor number (1 ~ 16)
- `accel/decel`: Acceleration and deceleration of tracking motion

Description

Sets acceleration and deceleration of the tracking motion in Conveyor Tracking. Acceleration and deceleration cannot be set separately. Change the parameters when acceleration setting erro occurs, or when it is required to reduce work picking time. The default value is 2000[mm/sec²].

Note

This command will only work if the Conveyor Tracking option is active.

See Also

- Cnv_Accel Function

Cnv_Accel Statement Example

```
Cnv_Accel 1,2000
```
Cnv_Accel Function

Returns acceleration and deceleration of tracking motion in Conveyor Tracking.

Syntax

Cnv_Accel (conveyorNumber)

Parameters

conveyorNumber  Integer expression representing the conveyor number (1 ~ 16)

Return Value

Real value in millimeters.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

Cnv_Accel

Cnv_AccelFunction Example

    Print Cnv_Accel (1)
Cnv_Downstream Function

Returns the downstream limit for the specified conveyor.

Syntax

\texttt{Cnv\_Downstream (conveyorNumber )}

Parameters

- \textit{conveyorNumber} Integer expression representing the conveyor number (1 \sim 16)

Return Values

Real value in millimeters.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

- Cnv_Upstream

Cnv_Downstream Statement Example

\begin{verbatim}
Print "Downstream limit: ", Cnv_Downstream(1)
\end{verbatim}
Cnv_Fine Statement

Sets the value of Cnv_Fine for one conveyor.

Syntax

\[
\text{Cnv\_Fine \ conveyorNumber \[, \ fineValue\]} \nonumber
\]

Parameters

- \text{conveyorNumber} \quad \text{Integer expression representing the conveyor number.}
- \text{fineValue} \quad \text{Optional. Real expression that specifies the distance at which tracking is completed in millimeters. A value of 0 means that Cnv\_Fine is not used. If omitted, the current Cnv\_Fine setting is displayed.}

Description

After confirming the tracking operation is complete, specify the distance from the part that is acceptable for the next command. When specifying 0, the Cnv\_Fine setting will not be used and the next command will be accepted when the motion command is complete.

The default value of 0 mm is automatically set when the following conditions occur:
- Conveyor is created.
- Controller is started.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

Cnv\_Fine Function

Cnv\_Fine Statement Example

\[
\text{Cnv\_Fine \ 1, \ 5} \nonumber
\]
Cnv_Fine Function

Returns the current Cnv_Fine setting.

Syntax

Cnv_Fine(conveyorNumber)

Parameters

conveyorNumber  Integer expression representing the conveyor number (1 ~ 16).

Return Values

Real value of Cnv_Fine in millimeters.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

Cnv_Fine Statement

Cnv_Fine Function Example

Real f

    f = Cnv_Fine(1)
Cnv_LPulse Function

Returns the pulse value latched by the conveyor trigger.

**Syntax**

\[
\text{Cnv_LPulse (conveyorNumber)}
\]

**Parameters**

- **conveyorNumber** Integer expression that specifies the conveyor number (1 ~ 16)

**Description**

Returns the latest conveyor pulses latched by the hardware trigger wires or Cnv_Trigger.

**Return Values**

Long value that contains the latched pulses of the specified conveyor.

**Note**

This command will only work if the Conveyor Tracking option is active.

**See Also**

Cnv_Trigger, Cnv_Pulse

**Cnv_LPulse function Example**

```
Print "Latched conveyor position: ", Cnv_LPulse(1)
```
Sets the tracking mode for the conveyor tracking.

**Syntax**

\[
\text{Cnv\_Mode}\ (\text{conveyorNumber}, \text{modeNumber})
\]

**Parameter**

- **conveyorNumber**: Integer expression that specifies the conveyor number (1 ~ 16)
- **modeNumber**: 0: Picking quantity-priority mode
  1: Picking accuracy-priority mode

**Description**

Sets the tracking mode for the conveyor tracking. Cnv\_Mode is only available for the linear conveyors. Set the tracking mode before starting the conveyor tracking. If the mode is not selected, or if the conveyor speed is 350 mm/sec or more, the picking quantity-priority mode will be set.

Picking quantity-priority mode: Although this mode is inferior in picking accuracy to the picking accuracy-priority mode, it takes less time to catch up with the moving work pieces. Therefore, this mode is suitable for the conveyor systems in which space between the work pieces is narrow or the fast-speed conveyor systems.

Picking accuracy-priority mode: Although this mode takes longer time to catch up with the work pieces compared to the picking quantity-priority mode, this improves the picking accuracy. Therefore, this mode is suitable for the conveyor systems for small work pieces.

**Note**

This command will only work if the Conveyor Tracking option is active.

**See Also**

- Cnv\_Mode Function

**Cnv\_Mode Example**

\[
\text{Cnv\_Mode\ 1, 1}
\]
Cnv_Mode Function

Returns the tracking mode of the conveyor tracking.

Syntax

\texttt{Cnv\_Mode (conveyorNumber)}

Parameter

\texttt{conveyorNumber}  \hspace{1em} \text{Integer expression that specifies the conveyor number (1 ~ 16)}

Return Values

- Integer expression 0 or 1.
- 0: Picking quantity-priority mode
- 1: Picking accuracy-priority mode

Note

This command will only work if the Conveyor Tracking option is active.

See Also

Cnv_Mode

Cnv_Mode Function Example

\begin{verbatim}
Print Cnv_Mode (1)
\end{verbatim}
Cnv_Name$ Function

Returns the name of the specified conveyor.

Syntax

\[ \text{Cnv\_Name$ (conveyorNumber)} \]

Parameters

- `conveyorNumber` Integer value from 1 ~ 16 representing the conveyor number.

Return Values

- A string containing the conveyor name.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

- Cnv_Number

Cnv_Name$ Function Example

```
Print "Conveyor 1 Name: ", Cnv_Name$(1)
```
Cnv_Number Function

Returns the number of a conveyor specified by name.

Syntax

Cnv_Number (conveyorName)

Parameters

conveyorName   String expression representing the conveyor name.

Return Values

Integer conveyor number.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

Cnv_Name$.

Cnv_Number Function Example

    Integer cnvNum

    cnvNum = Cnv_Number("Main Conveyor")
Cnv_OffsetAngle

Sets the offset value for the conveyor queue data.

Syntax

Cnv_OffsetAngle conveyorNumber [, offsetAngle]

Parameters

conveyorNumber  Integer value from 1 ~ 16 representing the conveyor number.
offsetAngle  Real value representing the offset value for the conveyor queue data (unit: degree). Optional. If omitted, the current offset is displayed.

Description

Sets the offset value for the conveyor queue data.
Cnv_OffsetAngle is available for the circular conveyor.
Conveyor Tracking may have tracking delay according to the conveyor speed. If the tracking delay is occurred, the robot handles the parts in the wrong position moved by the tracking delay.
Cnv_OffsetAngle gives the offset value to the queue in order to move the robot back to the correct position.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

Cnv_OffsetAngle Function

Cnv_OffsetAngle Example

Cnv_OffsetAngle 1, 5
Cnv_OffsetAngle Function

Returns the offset value of the conveyor queue data.

Syntax

\[
\text{Cnv\_OffsetAngle}(\text{conveyorNumber})
\]

Parameters

\begin{itemize}
  \item \text{conveyorNumber} \quad \text{Integer value from 1 \sim 16 representing the conveyor number.}
\end{itemize}

Return Values

Integer value (unit: degree).

Note

This command will only work if the Conveyor Tracking option is active.

See Also

Cnv_OffsetAngle

Cnv_OffsetAngle Function Example

\[
\text{Real offsetAngle}
\]
\[
\text{offsetAngle} = \text{Cnv\_OffsetAngle}(1)
\]
Cnv_Point Function

Returns a robot point in the specified conveyor's coordinate system derived from sensor coordinates.

Syntax

\[
\text{Cnv\_Point (conveyorNumber, sensorX, sensorY [, sensorU])}
\]

Parameters

- \text{conveyorNumber}: Integer expression representing the conveyor number.
- \text{sensorX}: Real expression for the sensor X coordinate.
- \text{sensorY}: Real expression for the sensor Y coordinate.
- \text{sensorU}: Optional. Real expression for the sensor U coordinate.

Return Values

Robot point in conveyor coordinate system.

Description

The \text{Cnv\_Point} function must be used to create points that can be added to a conveyor queue. For vision conveyors, \text{sensorX} and \text{sensorY} are the vision coordinates from the camera. For sensor conveyors, \text{sensorX} and \text{sensorY} can be 0, since this is the origin of the conveyor's coordinate system.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

- Cnv_Speed

Cnv_Point Function Example

```plaintext
Boolean found
Integer i, numFound
Real x, y, u

Cnv_Trigger 1
VRun FindParts
VGet FindParts.Part.NumberFound, numFound
For i = 1 To numFound
  VGet FindParts.Part.CameraXYU(i), found, x, y, u
  Cnv_QueAdd 1, Cnv_Point(1, x, y)
Next i
```

Cnv_PosErr Function

Returns deviation in current tracking position compared to tracking target.

Syntax

Cnv_PosErr (conveyorNumber)

Parameters

conveyorNumber  Integer expression representing the conveyor number.

Return Values

Real value in millimeters.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

Cnv_MakePoint

Cnv_PosErr Function Example

Print "Conveyor 1 position error: ", Cnv_PosErr(1)
Cnv_Pulse Function

Returns the current position of a conveyor in pulses.

Syntax

\texttt{Cnv\_Pulse (conveyorNumber)}

Parameters

\texttt{conveyorNumber} \hspace{1em} Integer expression representing the conveyor number.

Return Values

Long value of current pulses for specified conveyor.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

Cnv\_Trigger, Cnv\_LPulse

Cnv\_Pulse Function Example

\begin{verbatim}
Print "Current conveyor position: ", Cnv\_Pulse(1)
\end{verbatim}
**Cnv_QueAdd Statement**

Adds a robot point to a conveyor queue.

**Syntax**

```plaintext
Cnv_QueAdd conveyorNumber, pointData [, userData ]
```

**Parameters**

- `conveyorNumber`: Integer expression that specifies the number of the conveyor to use.
- `pointData`: The robot point to add to the conveyor queue.
- `userData`: Optional. Real expression used to store user data along with the point.

**Description**

`pointData` is added to the end of the specified conveyor's queue. It is registered together with the currently latched conveyor pulse position.

If the distance between `pointData` and the previous point in the queue is at or below that specified by `Cnv_QueReject`, the point data will not be added to the queue, and no error will occur.

The maximum queue data value is 1000.

**Note**

This command will only work if the Conveyor Tracking option is active.

**See Also**

- `Cnv_RobotConveyor Statement`

**Cnv_QueAdd Statement Example**

```plaintext
Boolean found
Integer i, numFound
Real x, y, u

Cnv_Trigger 1
VRun FindParts
VGet FindParts.Part.NumberFound, numFound
For i = 1 To numFound
  VGet FindParts.Part.CameraXYU(i), found, x, y, u
  Cnv_QueAdd 1, Cnv_Point(1, x, y)
Next i
```
Cnv_QueGet Function

Returns a point from the specified conveyor's queue.

Syntax

\[ \text{Cnv\_QueGet(} \text{conveyorNumber [, index ])} \]

Parameters

- **conveyorNumber**: Integer expression representing the conveyor number.
- **index**: Optional. Integer expression representing the index of the queue data to retrieve.

Return Values

A robot point in the specified conveyor's coordinate system.

Description

Use **Cnv_QueGet** to retrieve points from the conveyor queue. When **queNumber** is omitted, the first point in the queue is returned. Otherwise, the point from the specified **queNumber** is returned.

**Cnv_QueGet** does not delete the point from the queue. Instead, you must use **Cnv_QueRemove** to delete it.

To track a part as the conveyor moves, you must use **Cnv_QueGet** in a motion command statement. For example:

\[ \text{Jump Cnv\_QueGet(1) ' this tracks the part} \]

You cannot assign the result from **Cnv_QueGet** to a point and then track it by moving to the point.

\[ \text{P1 = Cnv\_QueGet(1)} \]
\[ \text{Jump P1 ' this does not track the part} \]

When you assign the result from **Cnv_QueGet** to a point, the coordinate values correspond to the position of the part when the point assignment was executed.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

**Cnv_QueLen, Cnv_QueRemove**

Cnv_QueGet Function Example

\[ \text{' Jump to the first part in the queue and track it} \]
\[ \text{Jump Cnv\_QueGet(1)} \]
\[ \text{On gripper} \]
\[ \text{Wait .1} \]
\[ \text{Jump place} \]
\[ \text{Off gripper} \]
\[ \text{Wait .1} \]
\[ \text{Cnv\_QueRemove 1} \]
Cnv_QueLen Function

Returns the number of items in the specified conveyor's queue.

Syntax

```
Cnv_QueLen(conveyorNumber [, paramNumber ] )
```

Parameters

- **conveyorNumber**: Integer expression representing the conveyor number.
- **paramNumber**: Optional. Integer expression that specifies which data to return the length for.

<table>
<thead>
<tr>
<th>Symbolic constant</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNV_QUELEN_ALL</td>
<td>0</td>
<td>Returns total number of items in queue.</td>
</tr>
<tr>
<td>CNV_QUELEN_UPSTREAM</td>
<td>1</td>
<td>Returns number of items upstream.</td>
</tr>
<tr>
<td>CNV_QUELEN_PICKUPAREA</td>
<td>2</td>
<td>Returns number of items in pickup area.</td>
</tr>
<tr>
<td>CNV_QUELEN_DOWNSTREAM</td>
<td>3</td>
<td>Return number of items downstream.</td>
</tr>
</tbody>
</table>

Return Values

Integer number of items.

Description

Cnv_QueLen is used to find out how many items are available in the queue. Typically, who will want to know how many items are in the pick up area.

You can also use Cnv_QueLen as an argument to the Wait statement.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

Cnv_QueGet

Cnv_QueLen Function Example

```
Do
  Do While Cnv_QueLen(1, CNV_QUELEN_DOWNSTREAM) > 0
    Cnv_QueRemove 1, 0
  Loop
  If Cnv_QueLen(1, CNV_QUELEN_PICKUPAREA) > 0 Then
    Jump Cnv_QueGet(1, 0) C0
    On gripper
    Wait .1
    Cnv_QueRemove 1, 0
    Jump place
    Off gripper
    Jump idlePos
  EndIf
Loop
```
Cnv_QueList Statement

Displays a list of items in the specified conveyor's queue.

Syntax

Cnv_QueList conveyorNumber, [ numOfItems ]

Parameters

conveyorNumber  Integer expression representing the conveyor number.

numOfItems  Optional. Integer expression to specify how many items to display. If omitted, all items are displayed.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

Cnv_QueGet

Cnv_QueList Statement Example

Cnv_QueList 1
Cnv_QueMove Statement

Moves data from upstream conveyor queue to downstream conveyor queue.

Syntax

```
Cnv_QueMove conveyorNumber, [ index ], [ userData ]
```

Parameters

- `conveyorNumber` Integer value from 1 ~ 16 representing the conveyor number.
- `index` Optional. Integer expression that specifies the index of the queue to move. (The first item in the queue is index #0.)
- `userData` Optional. Real expression used to store user data along with the item.

Description

Cnv_QueMove is used to move one or more items from a conveyor queue to its associated downstream conveyor queue. If `index` is specified, the first item (index #0) of the queue is moved.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

Cnv_QueGet

Cnv_QueMove Statement Example

```
Cnv_QueMove 1
```
Cnv_QueReject Statement

Sets and displays the queue reject distance for a conveyor.

Syntax

\[
\text{Cnv\_QueReject \ conveyorNumber [, rejectDistance ]}
\]

Parameters

- **conveyorNumber**: Integer expression representing the conveyor number.
- **rejectDistance**: Optional. Real expression specifying the minimum distance between parts allowed in the queue in millimeters. If omitted, the current rejectDistance is displayed.

Description

Use **Cnv_QueReject** to specify the minimum distance between parts to prevent double registration in the queue. As parts are scanned by the vision system, they will be found more than once, but they should only be registered once. **Cnv_QueReject** helps the system filter out double registration.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

- Cnv_QueReject Function

Cnv_QueReject Statement Example

\[
\text{Cnv\_QueReject \ 1, 20}
\]
Cnv_QueReject Function

Returns the current part reject distance for a conveyor.

Syntax

```
Cnv_QueReject (conveyorNumber)
```

Parameters

- `conveyorNumber` Integer expression representing the conveyor number.

Return Values

Real value in millimeters.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

- Cnv_QueReject Statement

Cnv_QueReject Function Example

```
Real rejectDist

RejectDist = Cnv_QueReject(1)
```
Cnv_QueRemove Statement

Removes items from a conveyor queue.

Syntax

\[ \text{Cnv\_QueRemove} \ \text{conveyorNumber} \ [, \ \text{index} \ | \ \text{All}] \]

Parameters

- \text{conveyorNumber} Integer expression representing the conveyor number.
- \text{index} Optional. Integer expression specifying the index of the first item to remove or specify All to remove all.

Description

Use Cnv_QueRemove to remove one or more items from a conveyor queue. Typically, you remove items from the queue after you are finished with the data.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

- Cnv_QueAdd Statement

Cnv_QueRemove Statement Example

```
Jump Cnv_QueGet(1)
On gripper
Wait .1
Jump place
Off gripper
Wait .1

' Remove the data from the conveyor
Cnv_QueRemove 1
Jump Cnv_QueGet(1)
On gripper
Wait .1
Jump place
Off gripper
Wait .1

' Remove the data from the conveyor
Cnv_QueRemove 1
```
Cnv_QueUserData Statement

Sets and displays user data associated with a queue entry.

Syntax

```
Cnv_QueUserData conveyorNumber, [ index ], [ userData ]
```

Parameters

- `conveyorNumber`  Integer expression representing the conveyor number.
- `index` Optional. Integer expression specifying the index of the item number in the queue.
- `userData` Optional. Real expression specifying user data.

Description

Cnv_QueUserData is used to store your own data with each item in a conveyor queue. User data is optional. It is not necessary for normal operation.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

Cnv_QueUserData Function

Cnv_QueUserData Statement Example

```
Cnv_QueUserData 1, 1, angle
```
Cnv_QueUserData Function

Returns the user data value associated with an item in a conveyor queue.

Syntax

\[ \text{Cnv\_QueUserData}(\text{conveyorNumber}[, \text{index}]) \]

Parameters

- \text{conveyorNumber} Integer expression representing the conveyor number.
- \text{index} Optional. Integer expression specifying the index of the item number in the queue.

Return Values

Real value.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

Cnv_QueUserData Statement

Cnv_QueUserData Function Example

\[ \text{ Add to queue } \]
Cnv_QueAdd 1, Cnv_Point(1, x, y), angle

\[ \text{ Remove from queue } \]
angle = Cnv_QueUserData(1)  \text{ ' default to queue index of 0 } \]
Jump Cnv_QueGet(1) :U(angle)
Cnv_QueRemove 1
Cnv_RobotConveyor Function

Returns the conveyor being tracked by a robot.

Syntax
Cnv_RobotConveyor [ (robotNumber) ]

Parameters
robotNumber Integer expression representing the robot number.

Return Values
Integer conveyor number. 0 = no conveyor being tracked.

Description
When using multiple robots, you can use Cnv_RobotConveyor to see which conveyor a robot is currently tracking.

Note
This command will only work if the Conveyor Tracking option is active.

See Also
Cnv_MakePoint Statement

Cnv_RobotConveyor Function Example

Integer cnvNum

cnvNum = Cnv_RobotConveyor(1)
Cnv_Speed Function

Returns the current speed of a conveyor.

Syntax

\[ \text{Cnv\_Speed}(\text{conveyorNumber}) \]

Parameters

- \text{conveyorNumber} \quad \text{Integer expression representing the conveyor number.}

Return Values

For straight conveyors, a real value in millimeters per second. For circular conveyors, a real value in degrees per sec.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

- Cnv_Pulse

Cnv_Speed Statement Example

\[ \text{Print } \text{"Conveyor speed: ", Cnv\_Speed(1)} \]
**Cnv_Trigger Statement**

Latches current conveyor position for the next Cnv_QueAdd statement.

**Syntax**

```
Cnv_Trigger conveyorNumber
```

**Parameters**

- `conveyorNumber` Integer expression representing the conveyor number.

**Description**

*Cnv_Trigger* is a software trigger command that must be used if there is no hardware trigger wired to the PG board for the conveyor encoder.

**Note**

This command will only work if the Conveyor Tracking option is active.

**See Also**

- Cnv_QueAdd

**Cnv_Trigger Statement Example**

```
Boolean found
Integer i, numFound
Real x, y, u

Cnv_Trigger 1
VRun FindParts
VGet FindParts.Part.NumberFound, numFound
For i = 1 To numFound
    VGet FindParts.Part.CameraXYU(i), found, x, y, u
    Cnv_QueAdd 1, Cnv_Point(1, x, y)
Next i
```
Cnv_Upstream Function

Returns the upstream limit for the specified conveyor.

Syntax

\[
\text{Cnv\_Upstream} \ (\text{conveyorNumber})
\]

Parameters

\text{conveyorNumber} \quad \text{Integer expression representing the conveyor number.}

Return Values

Real value in millimeters.

Note

This command will only work if the Conveyor Tracking option is active.

See Also

Cnv_Downstream

Cnv_Upstream Function Example

Print "Upstream limit: ", Cnv_Upstream(1)
Cont Statement

Resumes the controller after a Pause statement has been executed and continues the execution of all tasks.
This command is for the experienced user and you need to understand the command specification before the use.

Syntax
Cont

Description
To execute the Cont statement from a program, you need to set the [Enable advanced task commands] checkbox in Setup | System Configuration | Controller | Preferences page. However, even if this preference is enabled, you cannot execute the Cont statement from a task executed by Trap SGClose.

The Cont command resumes the controller tasks paused by the Pause statement or safeguard open and continues all tasks execution. It has the same function as the <Continue> button on the Run Window, Operator Window, and the Continue Remote input.

If you execute the Cont command during WaitRecover status (waiting for the recover after safeguard open), it will turn on all the robot motors and execute the recover motion. Then, the program will be resumed.
If you just want to turn on motors and execute recover motion, use the Recover command.

When executing Cont command from a program, you must understand the command specification and confirm that the system has the proper conditions for the Cont command. Improper use such as continuous execution of a command within a loop may deteriorate the system safety.

See Also
Pause, Recover

Cont Example

Function main
   Xqt 2, monitor, NoPause
   Do
      Jump P1
      Jump P2
   Loop
   Fend

Function monitor
   Do
      If Sw(pswitch) = On then
         Pause
         Wait Sw(pswitch) = Off and Sw(cswitch) = On
         Cont
      End If
   Loop
   Fend
Copy Statement

Copies a file to another location.

Syntax

Copy source, destination

Parameters

source Pathname and filename of the source location of the file to copy.
See ChDisk for the details.

destination Pathname and filename of the destination to copy the specified source file to.
See ChDisk for the details.

Description

Copies the specified source filename to the specified destination filename.

The same pathname and filename may not be specified for both source and destination files.
An error occurs if the destination already exists.

Note

Do not use a network path, otherwise an error occurs.

Wildcard characters (*. ?) are not allowed in specified filenames.

When used in the Command window, quotes and comma may be omitted.

See Also

ChDir, Dir, MkDir

Copy Command Example

The following example is done from the Command window.

> copy TEST.DAT TEST2.DAT

> Copy TEST.DAT c: 'NG
!! Error: 7203 Access is denied.
> Copy TEST.DAT c:\ 'OK
>
Cos Function

Returns the cosine of a numeric expression.

Syntax

`Cos(number)`

Parameters

- `number`: Numeric expression in Radians.

Return Values

Numeric value in radians representing the cosine of the numeric expression `number`.

Description

`Cos` returns the cosine of the numeric expression. The numeric expression (`number`) must be in radian units. The value returned by the `Cos` function will range from -1 to 1.

To convert from degrees to radians, use the `DegToRad` function.

See Also

Abs, Atan, Atan2, Int, Mod, Not, Sgn, Sin, Sqr, Str$, Tan, Val

Cos Function Example

The following example shows a simple program which uses `Cos`.

```plaintext
Function costest
    Real x
    Print "Please enter a value in radians"
    Input x
    Print "COS of ", x, " is ", Cos(x)
Fend
```

The following examples use `Cos` from the Command window.

Display the cosine of 0.55:

```plaintext
>print cos(0.55)
0.852524522059506
>
Display cosine of 30 degrees:

>print cos(DegToRad(30))
0.866025403784439
>
```
Sets CP (Continuous Path) motion mode.

Syntax

CP { On | Off }

Parameters

On | Off  The keyword On is used to enable path motion. The keyword Off is used to disable CP mode.

Description

CP (Continuous Path) motion mode can be used for the Arc, Arc3, Go, Jump, Jump3, Jump3CP, and Move robot motion instructions.

When CP mode is On, each motion command executes the next statement as deceleration starts. Continuous path motion will continue regardless of whether the CP parameter is specified in each motion command or not.

When CP is Off, this function is active only when the CP parameter is specified in each motion command.

When CP is On, path motion will continue without full deceleration between two CP motions (Arc, Arc3, Jump3, Jump3CP, Move), or two PTP motions (Go, Jump).

In contrast, full deceleration will occur between a CP motion and a PTP motion.

CP will be set to Off in the following cases

- Controller Startup
- Motor On
- SFree, SLock, Brake
- Reset, Reset Error
- Stop button or QuitAll stops tasks

See Also

CP Function, Arc, Move, Go

CP Statement Example

CP On
Move P1
Move P2
CP Off
CP Function

Returns status of path motion.

Syntax
CP

Return Values
0 = Path motion off, 1 = Path motion on.

See Also
CP Statement

CP Function Example

If CP = Off Then
    Print "CP is off"
EndIf
Ctr Function

Returns the counter value of the specified Hardware Input counter.

Syntax

\[
\text{Ctr(bitNumber)}
\]

Parameters

\text{bitNumber} \quad \text{Number of the Hardware Input bit set as a counter. Only 16 counters can be active at the same time.}

Return Values

The current count of the specified Hardware Input Counter. (Integer expression from 0-65535)

Description

\text{Ctr} works with the \text{CTReset} statement to allow Hardware inputs to be used as counters.

Each time a hardware input specified as a counter is switched from the Off to On state that input causes the counter to increment by 1.

The \text{Ctr} function can be used at any time to get the current counter value for any counter input. Any of the Hardware Inputs can be used as counters. However, only 16 counters can be active at the same time.

Counter Pulse Input Timing Chart

\[\begin{array}{c|c|c}
\text{High (ON)} & 4 \text{ msec or longer} & 4 \text{ msec or longer} \\
\text{Low (OFF)} & & \\
\end{array}\]

See Also

\text{CTReset}

Ctr Function Example

The following example shows a sample of code which could be used to get a hardware input counter value.

\[
\begin{align*}
\text{CTReset 3} & \quad \text{'Reset counter for input 3 to 0} \\
\text{On 0} & \quad \text{'Turn an output switch on} \\
\text{Wait Ctr (3) >= 5} & \quad \text{Wait 5 input cycles are counted for Input 3} \\
\text{Off 0} & \quad \text{'When 5 input cycles are counted for Input 3 turn switch off (output 0 off)'}
\end{align*}
\]
CTReset Statement

Resets the counter value of the specified input counter and enables the input to be a counter input.

Syntax

\[ \text{CTReset}(\text{bitNumber}) \]

Parameters

- \text{bitNumber} Number of the input bit set as a counter. This must be an integer expression representing a valid input bit. Only 16 counters can be active at the same time.

Description

CTReset works with the CTR function to allow inputs to be used as counters. CTReset sets the specified input bit as a counter and then starts the counter. If the specified input is already used as a counter, it is reset and started again.

Notes

Turning Off Power and Its Effect on Counters

Turning off main power releases all counters.

Using the Ctr Function

Use the Ctr Function to retrieve current Hardware Input counter values.

See Also

Ctr

CTReset Example

The following example shows a sample of code which could be used to get a hardware input counter value.

\begin{verbatim}
CTReset 3  'Reset Counter 3 to 0
On 0      'Turn an output switch on
Wait Ctr(3) >= 5
Off 0     'When 5 input cycles are counted for Input 3 turn 'switch off (output 0 off)
\end{verbatim}
CtrlDev Function

Returns the current control device number.

Syntax

CtrlDev

Return Values

21  Self
22  Remote I/O

See Also
CtrlInfo Function

CtrlDev Function Example

Print "The current control device is: ", CtrlDev
### CtrlInfo Function

Returns controller information.

**Syntax**

```plaintext
CtrlInfo (index)
```

**Parameters**

- `index`: Integer expression that represents the index of the information to retrieve.

**Description**

The following table shows the information that is available from the `CtrlInfo` function:

<table>
<thead>
<tr>
<th>Index</th>
<th>Bit</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>N/A</td>
<td></td>
<td>Obtained for compatibility. Use index 9 to get the firmware version of the controller.</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>Controller status:</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>&amp;H1</td>
<td>Ready state</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>&amp;H2</td>
<td>Start state</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>&amp;H4</td>
<td>Pause state</td>
</tr>
<tr>
<td></td>
<td>3-7</td>
<td></td>
<td>Undefined</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>Enable switch is on</td>
</tr>
<tr>
<td>1-31</td>
<td></td>
<td></td>
<td>Undefined</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>Teach mode circuit problem detected</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>&amp;H1</td>
<td>Safeguard circuit problem detected</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>&amp;H4</td>
<td>Estop circuit problem detected</td>
</tr>
<tr>
<td>3-31</td>
<td></td>
<td></td>
<td>Undefined</td>
</tr>
<tr>
<td>4</td>
<td>N/A</td>
<td></td>
<td>0 – Normal mode</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 – Dry run mode</td>
</tr>
<tr>
<td>5</td>
<td>N/A</td>
<td></td>
<td>Control device:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>21 – RC+</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>22 – Remote</td>
</tr>
<tr>
<td>6</td>
<td>N/A</td>
<td></td>
<td>Number of defined robots</td>
</tr>
<tr>
<td>7</td>
<td>N/A</td>
<td></td>
<td>Operation mode:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0 – Program mode</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 – Auto mode</td>
</tr>
<tr>
<td>8</td>
<td>N/A</td>
<td></td>
<td>Undefined</td>
</tr>
<tr>
<td>9</td>
<td>N/A</td>
<td></td>
<td>Firmware version of the Controller</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Example) Version 1.6.2.4 is 1060204</td>
</tr>
<tr>
<td>10</td>
<td>N/A</td>
<td></td>
<td>SMART status of hard disk</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0 : SMART status is normal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 : SMART status is not normal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If SMART status is not normal, the hard disk can be broken. You need to backup the data promptly and replace the hard disk with a new one.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>When using the RAID option, you cannot use the SMART status; it always returns that it is normal.</td>
</tr>
</tbody>
</table>
CtrlInfo Function

Return Values
Long value of the desired data

See Also
RobotInfo, TaskInfo

CtrlInfo Function Example
Print "The controller version: ", CtrlInfo(6)
CurDir$ Function

Returns a string representing the current directory.

Syntax

CurDir$

Return Values

A string that includes the current drive and path.

See Also

ChDir, CurDrive$, CurDisk$

CurDir$ Function Example

Print "The current directory is: ", CurDir$
CurDisk$ Function

Returns a string representing the current disk.

Syntax

CurDisk$

Return Values

A string that contains the current disk letter.

See Also

ChDisk, CurDir$, CurDrive$

CurDisk$ function Example

    Print "The current disk is: ", CurDisk$
**CurDrive$ Function**

Returns a string representing the current drive.

**Syntax**

```
CurDrive$
```

**Return Values**

A string that contains the current drive letter.

**See Also**

ChDrive, CurDir$, CurDisk$

**CurDrive$ Function Example**

```plaintext
Print "The current drive is: ", CurDrive$
```
CurPos Function

Returns the current target position of the specified robot.

Syntax
CurPos

Return Values
A robot point representing the current target position of the specified robot.

See Also
InPos, FindPos, RealPos

CurPos Function Example

Function main
   Xqt showPosition
   Do
      Jump P0
      Jump P1
   Loop
   Fend

Function showPosition
   Do
      P99 = CurPos
      Print CX(P99), CY(P99)
   Loop
   Fend
defines the data and points required to move the arm along a curved path. Many data points can be defined in the path to improve precision of the path.

Syntax
Curve fileName, closure, mode, numAxes, pointList

Parameters
fileName A string expression for the name of the file in which the point data is stored. The specified fileName will have the extension .crv appended to the end so no extension is to be specified by the user. When the Curve instruction is executed, file will be created.

You cannot specify a file path and fileName doesn't have any effect from ChDisk. See ChDisk for the details.

closure Specifies whether or not the defined Curve is Closed or left Open at the end of the curved motion. This parameter must be set to one of two possible values, as shown below.

C - Closed Curve
O - Open Curve

When specifying the open curve, the Curve instruction creates the data to stop the arm at the last point of the specified point series. When specifying the closed curve, the Curve instruction creates the data required to continue motion through the final specified point and then stopping motion after returning the arm to the starting point of the specified point series for the Curve instruction.

mode Specifies whether or not the arm is automatically interpolated in the tangential direction of the U-Axis. It can also specify the ECP number in the upper four bits.

<table>
<thead>
<tr>
<th>Mode Setting</th>
<th>Tangential Correction</th>
<th>ECP Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexadecimal</td>
<td>Decimal</td>
<td></td>
</tr>
<tr>
<td>&amp;H00</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&amp;H10</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>&amp;H20</td>
<td>32</td>
<td>2</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>&amp;HA0</td>
<td>160</td>
<td>10</td>
</tr>
<tr>
<td>&amp;HB0</td>
<td>176</td>
<td>11</td>
</tr>
<tr>
<td>&amp;HC0</td>
<td>192</td>
<td>12</td>
</tr>
<tr>
<td>&amp;HD0</td>
<td>208</td>
<td>13</td>
</tr>
<tr>
<td>&amp;HE0</td>
<td>224</td>
<td>14</td>
</tr>
<tr>
<td>&amp;HF0</td>
<td>240</td>
<td>15</td>
</tr>
<tr>
<td>&amp;H02</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>&amp;H12</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>&amp;H22</td>
<td>34</td>
<td>2</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>&amp;HA2</td>
<td>162</td>
<td>10</td>
</tr>
<tr>
<td>&amp;HB2</td>
<td>178</td>
<td>11</td>
</tr>
<tr>
<td>&amp;HC2</td>
<td>194</td>
<td>12</td>
</tr>
<tr>
<td>&amp;HD2</td>
<td>210</td>
<td>13</td>
</tr>
<tr>
<td>&amp;HE2</td>
<td>226</td>
<td>14</td>
</tr>
<tr>
<td>&amp;HF2</td>
<td>242</td>
<td>15</td>
</tr>
</tbody>
</table>
When specifying tangential correction, **Curve** uses only the U-Axis coordinate of the starting point of the point series. Tangential correction continuously maintains tool alignment tangent to the curve in the XY plane. It is specified when installing tools such as cutters that require continuous tangential alignment. When specifying a closed curve (using the `closure` parameter) with Automatic Interpolation in the tangential direction of the U-Axis, the U-Axis rotates 360 degrees from the start point. Therefore, before executing the CVMove instruction, set the U-Axis movement range using the Range instruction so the 360 degree rotation of the U-Axis does not cause an error.

When using ECP, specify the ECP number in the upper four bits.

When generating a curve considering the additional axis position included in the point data, specify the nineth bit as 1. For example, when using no orientation offset or ECP and generating a curve considering the additional axis position, specify &H100.

When generating a curve for the additional axis, join the continuous point data of S axis and T axis separately from the robot coordinate system.

However if the additional axis is consisted of the PG axis, it doesn’t generate a curve with the continuous point but creates the data to move to the final point.

**numAxes** Integer number 2, 3, 4, or 6 which specifies the number of axes controlled during the curve motion as follows:

2 - Generate a curve in the XY plane with no Z Axis movement or U Axis rotation.
3 - Generate a curve in the XYZ space with no U axis rotation.
4 - Generate a curve in the XYZ space with U-Axis rotation.
6 - Generate a curve in the XYZ space with U, V, and W axes rotation (6-Axis robots only).

The axes not selected to be controlled during the **Curve** motion maintain their previous encoder pulse positions and do not move during **Curve** motion.

**pointList** `{ point expression | P(start:finish) [, output command ] ...` This parameter is actually a series of Point Numbers and optional output statements either separated by commas or an ascended range of points separated by a colon. Normally the series of points are separated by commas as shown below:

```
Curve "MyFile", O, 0, 4, P1, P2, P3, P4
```

Sometimes the user defines a series of points using an ascending range of points as shown below:

```
Curve "MyFile", O, 0, 4, P(1:4)
```

In the case shown above the user defined a curve using points P1, P2, P3, and P4. **output command** is optional and is used to control output operation during curve motion. The command can be On or Off for digital outputs or memory outputs. Entering an output command following any point number in the point series causes execution of the output command when the arm reaches the point just before the output command. A maximum of 16 output commands may be included in one **Curve** statement. In the example below, the "On 2" command is executed just as the arm reaches the point P2, then the arm continues to all points between and including P3 and P10.

```
Curve "MyFile", C, 0, 4, P1, P2, ON 2, P(3:10)
```

**Description**

**Curve** creates data that moves the manipulator arm along the curve defined by the point series **pointList** and stores the data in a file on the controller. The CVMove instruction uses the data in the file created by **Curve** to move the manipulator in a continuous path type fashion.

The curve file is stored in the compact flush inside of the controller. Therefore, **Curve** starts writing into the compact flush. Frequent writing into the compact flush will shorten the compact flush lifetime. We recommend using **Curve** only for saving the point data.
**Curve** calculates independent X, Y, Z, U, V, W coordinate values for each point using a cubic spline function to create the trajectory. Therefore, if points are far apart from each other or the orientation of the robot is changed suddenly from point to point, the desired trajectory may not be realized.

It is not necessary to specify speeds or accelerations prior to executing the **Curve** instruction. Arm speed and acceleration parameters can be changed anytime prior to executing CVMove by using the SpeedS or AccelS instructions.

Points defined in a local coordinate system may be used in the series to locate the curve at the desired position. By defining all of the specified points in the point series for the **Curve** instruction as points with local attributes, the points may be changed as points on the local coordinate system by the Local instruction following the **Curve** instruction.

**Note**

**Use tangential correction when possible**

It is recommended that you use tangential correction whenever possible, especially when using CVMove in a continuous loop through the same points. If you do not use tangential correction, the robot may not follow the correct path at higher speeds.

**Open Curve Min and Max Number of Points Allowed**

Open Curves may be specified by using from 3 to 200 points.

**Closed Curve Min and Max Number of Points Allowed**

Closed Curves may be specified by using from 3 to 50 points.

**Potential Errors**

**Attempt to Move Arm Outside Work Envelope**

The **Curve** instruction cannot check the movement range for the defined curve path. This means that a user defined path may cause the robot arm to move outside the normal work envelope. In this case an "out of range" error will occur.

**See Also**

AccelS Function, Arc, CVMove, ECP, Move, SpeedS

**Curve Statement Example**

The following example designates the free curve data file name as MYCURVE.CVT, creates a curve tracing P1-P7, switches ON output port 2 at P2, and decelerates the arm at P7.

Set up curve

```
> curve "mycurve", O, 0, 4, P1, P2, On 2, P(3:7)
```

Move the arm to P1 in a straight line

```
> jump P1
```

Move the arm according to the curve definition called mycurve

```
> cvmove "mycurve"
```
CVMove Statement

Performs the continuous spline path motion defined by the Curve instruction.

**Syntax**

\[
\text{CVMove} \ fileName \ [\text{CP}] \ [\text{searchExpr}] \ [\text{SYNC}]
\]

**Parameters**

- **fileName** String expression for the file name. This file must be previously created by the Curve instruction and stored on a PC hard disk.
  
  You cannot specify a file path and fileName doesn’t have any effect from ChDisk. See ChDisk for the details.

- **CP** Optional. Specifies continuous path motion after the last point.

- **searchExpr** Optional. A Till or Find expression.
  
  Till | Find
  
  Till Sw(expr) = \{On | Off\}
  
  Find Sw(expr) = \{On | Off\}

- **SYNC** Reserves a motion command. A robot will not move until the SyncRobots gives instructions.

**Description**

CVMove performs the continuous spline path motion defined by the data in the file fileName, which is located in the controller memory. The file must be previously created with the Curve command. Multiple files may exist at the same time on the system. If there is no file name extension, then CVT is assumed.

The user can change the speed and acceleration for the continuous path motion for CVMove by using the SpeedS and AccelS instructions.

When the Curve instruction has been previously executed using points with Local definitions, you can change the operating position by using the Local instruction.

When executing CVMove, be careful that the robot doesn’t collide with peripheral equipment. When you attempt to change the hand orientation of the 6-axis robot between adjacent points suddenly, due to the nature of cubic spline function, the 6-axis robot may start changing its orientation from the previous and following points and move in an unexpected trajectory. Verify the trajectory thoroughly prior to a CVMove execution and be careful that the robot doesn’t collide with peripheral equipment.

Specifying points closely each other and at equal interval. Do not change the hand orientation between adjacent points suddenly.

The CP parameter causes acceleration of the next motion command to start when the deceleration starts for the current motion command. In this case the robot will not stop at the destination coordinate and will continue to move to the next point.

**See Also**

AccelS Function, Arc, Curve, Move, SpeedS, Till, TillOn

**CVMove Statement Example**

The following example designates the free curve data file name as MYCURVE.CVT, creates a curve tracing P1-P7, switches ON output port 2 at P2, and decelerates the arm at P7.

**Set up curve**

\[
> \text{curve} \ "\text{mycurve}\", \ 0, \ 0, \ 4, \ P1, \ P2, \ On \ 2, \ P(3:7)
\]

**Move the arm to P1 in a straight line**

\[
> \text{jump} \ P1
\]

**Move the arm according to the curve definition called mycurve**

\[
> \text{cvmove} \ "\text{mycurve}\"
\]
CX, CY, CZ, CU, CV, CW, CR, CS, CT Statements

Sets the coordinate value of a point data.
CV, CW are for only 6-axis robots.
CR is only for Joint type robots.
CS, CT are only for robots with additional axes.

Syntax

\[
\begin{align*}
\text{CX}(\text{point}) &= \text{value} \\
\text{CY}(\text{point}) &= \text{value} \\
\text{CZ}(\text{point}) &= \text{value} \\
\text{CU}(\text{point}) &= \text{value} \\
\text{CV}(\text{point}) &= \text{value} \\
\text{CW}(\text{point}) &= \text{value} \\
\text{CR}(\text{point}) &= \text{value} \\
\text{CS}(\text{point}) &= \text{value} \\
\text{CT}(\text{point}) &= \text{value}
\end{align*}
\]

Parameters

\[
\begin{align*}
\text{point} &\quad \text{P}\text{number} \text{ or } \text{P}(\text{expr}) \text{ or point label.} \\
\text{value} &\quad \text{Real expression representing the new coordinate value in millimeters.}
\end{align*}
\]

See Also

CX, CY, CZ, CU, CV, CW, CR, CS, CT Functions

CX, CY, CZ, CU, CV, CW, CR, CS, CT Statements Example

\[
\text{cx}(\text{pick}) = 25.34
\]
CX, CY, CZ, CU, CV, CW, CR, CS, CT Functions

Retrieves a coordinate value from a point
CV, CW functions are only for 6-axis robots.
CS, CT are only for robots with additional axes.

Syntax

\[
\begin{align*}
&CX \ (point) \\
&CY \ (point) \\
&CZ \ (point) \\
&CU \ (point) \\
&CV \ (point) \\
&CW \ (point) \\
&CR \ (point) \\
&CS \ (point) \\
&CT \ (point)
\end{align*}
\]

Parameters

\[
point \quad \text{Point expression.}
\]

Return Values

Returns the specified coordinate value. The return values for CX, CY, CZ are real numbers in millimeters. The return values for CU, CV, CW are real numbers in degrees.
Return values of CS, CT functions: Real values in mm or deg. It depends on the additional axis setting.

Description

Used to retrieve an individual coordinate value from a point.

To obtain the coordinate from the current robot position, use \text{Here} for the point parameter.

See Also

Point expression
CX, CY, CZ, CU, CV, CW, CR, CS, CT Statements

CX, CY, CZ, CU, CV, CW, CR, CS, CT Functions Example

The following example extracts the X axis coordinate value from point "pick" and puts the coordinate value in the variable \( x \).

```plaintext
Function cxtest
    Real x
    x = CX(pick)
    Print "The X Axis Coordinate of point 'pick' is", x
Fend
```
Date Statement

Displays the date.

Syntax
Date

Return Values
The current date is displayed.

See Also
Time, Date$

Date Example
Example from the command window.

> Date
2009/08/01
Date$ Function

Returns the system date.

Syntax

Date$

Return Values

A string containing the date in the format yyyy/mm/dd.

See Also

Date, Time, Time$

Date$ Function Example

Print "Today's date: ", Date$
Declare Statement

Declares an external function in a dynamic link library (DLL).

Syntax

```
Declare funcName, dllFile, [ alias ] [, (argList)] As type
```

Parameters

- **funcName**: The name of the function as it will be called from your program.
- **dllFile**: The path and name of the library file. This must be a literal string (characters delimited by quotation marks). You may also use a macro defined by #define. If there is no path specified, then RC+ will look for the file in the current project directory. If not found, then it is assumed that the file is in the Windows system32 directory. The file extension can be omitted, but is always assumed to be .DLL.
- **alias**: Optional. The actual name of the function in the DLL or the function index. The name is case sensitive. The alias must be a literal string (characters delimited by quotation marks). If you use an index, you must use a # character before the index. If omitted, a function name specified by **funcName** can be used as a name of function in DLL.
- **argList**: Optional. List of the DLL arguments. See syntax below.
- **type**: Required. You must declare the type of function.

The arglist argument has the following syntax:

```
[ (ByRef | ByVal) ] varName [( )] As type
```

- **ByRef**: Optional. Specify ByRef when you refer to the variable to be seen by the calling function. In this case, the argument change in a function can be reflected to the variable of the calling side. You can change the values received as a reference.
- **ByVal**: Optional. Specify ByVal when you do not want any changes in the value of the variable to be seen by the calling function. This is the default.
- **varName**: Required. Name of the variable representing the argument; follows standard variable naming conventions. If you use an array variable as argument, you must specify ByRef.
- **type**: Required. You must declare the type of argument.

Description

Use Declare to call DLL functions from the current program. Declare must be used outside of functions.

The Declare statement checks that the DLL file and function exist at compile time.

Passing Numeric Variables ByVal

**SPEL**:

```
Declare MyDLLFunc, "mystuff.dll", "MyDLLFunc", (a As Long) As Long
```

**VC++**

```
long _stdcall MyDllFunc(long a);
```

Passing String Variables ByVal

**SPEL**:

```
Declare MyDLLFunc, "mystuff.dll", "MyDLLFunc", (a$ As String) As Long
```

**VC++**

```
long _stdcall MyDllFunc(char *a);
```
Passing Numeric Variables ByRef

SPEL: Declare MyDLLFunc, "mystuff.dll", "MyDLLFunc", (ByRef a As Long) As Long
VC++ long _stdcall MyDllFunc(long *a);

Passing String Variables ByRef

SPEL: Declare MyDLLFunc, "mystuff.dll", "MyDLLFunc", (ByRef a$ As String) As Long
VC++ long _stdcall MyDllFunc(char *a);

When you pass a string using ByRef, you can change the string in the DLL. Maximum string length is 255 characters. You must ensure that you do not exceed the maximum length.

Passing Numeric Arrays ByRef

SPEL: Declare MyDLLFunc, "mystuff.dll", "MyDLLFunc", (ByRef a() As Long) As Long
VC++ long _stdcall MyDllFunc(long *a);

Returning Values from DLL Function

The DLL function can return a value for any data type, including String. However, for a string, you must return a pointer to a string allocated in the DLL function. And the function name must end in a dollar sign, as with all SPEL* string variables and functions. Note that the alias doesn't have a dollar sign suffix.

For example:

```
Declare ReturnLong, "mystuff.dll", "ReturnLong", As Long
Declare ReturnString$, "mystuff.dll", "ReturnString", As String
Function main
    Print "ReturnLong = ", ReturnLong
    Print "ReturnString$ = ", ReturnString$
Fend
```

See Also

Function...Fend

Declare Example

```
' Declare a DLL function. Since there is no path specified,
' the file can be in the current project directory or in
' the Windows system32 directory
Declare MyDLLTest, "mystuff.dll", "MyDLLTest" As Long
Function main
    Print MyDLLTest
Fend

' Declare a DLL function with two integer arguments
' and use a #define to define the DLL file name
#define MYSTUFF "mystuff.dll"
Declare MyDLLCall, MYSTUFF, "MyTestFunc", (var1 As Integer, var2 As Integer) As Integer

' Declare a DLL function using a path and index.
Declare MyDLLTest, "c:\mydlls\mystuff.dll", "#1" As Long
```
DegToRad Function

Converts degrees to radians.

Syntax

DegToRad(degrees)

Parameters

degrees Real expression representing the degrees to convert to radians.

Return Values

A double value containing the number of radians.

See Also

ATan, ATan2, RadToDeg Function

DegToRad Function Example

\[
s = \cos(DegToRad(x))
\]
Del Statement

Deletes one or more files.

Syntax

Del fileName

Parameters

fileName

The path and name of the file(s) to delete. The filename should be specified with an extension. See ChDisk for the details.

Description

Deletes the specified file(s).

Del Example

Example from the command window.

> Del TEST.PTS ' Deletes the point file from the current directory.

> Del c:TEST.PTS ' NG
!! Error: 7213 The file specified by path does not exist.
> Del c:\TEST.PTS 'OK
Dir Statement

Displays the contents of the specified directory.

Syntax

(1) Dir
(2) Dir [ filename As String ]
(3) Dir [ fileName ]

Parameters

filename Path name of the file to search for.
fileName File name to search for. The filename and extension may contain wildcard characters (*, ?).

Description

(1) If omitted the parameter, it is like making a file name as *.* and the all files in the current directory is displayed.
(2) The all files in the specified directory is displayed.
(3) The specified file is displayed. If omitted the file path, the file in the current directory is displayed.

See ChDisk for the details of path.

Dir command works similar to the dir command in DOS and displays filename, directory name, file size and date for specified directories and files.

Note

This statement is executable only with the PC disk.

See Also

ChDir, ChDrive, ChDisk

Dir Command Example

Examples from the Command window.

> Dir ' Displays all files in the current directory.

> Dir C:\TEST ' Displays all files in the directory “C:\TEST”

> Dir TEST.* ' Displays the file “TEST” in the current directory.

> Dir *.DAT ' Displays the file extension is “.DAT” in the current directory.
DispDev Statement

Sets the current display device.

Syntax

```
DispDev (deviceID)
```

Parameters

- **deviceID**
  - The device ID for the desired display device.
  - 21 Self
  - 24 TP
  
The following parameters are also available.
  
- 21 DEVID_SELF
- 24 DEVID_TP

See Also

- DispDev Function

DispDev Statement Example

```
DispDev DEVID_TP
```
DispDev Function

Returns the current display device.

Syntax

DispDev

Return Values

Integer value containing the deviceID.

21 Self
24 TP

See Also

DispDev Statement

DispDev Function Example

Print "The current display device is ", DispDev
Dist Function

Returns the distance between two robot points.

Syntax

Dist (point1, point2)

Parameters

point1, point2 Specifies two robot point expressions.

Return Values

Returns the distance between both points (real value in mm).

Description

Even if you are using the additional axis, only the robot travel distance is returned.
It doesn’t include the travel distance of additional axis while you use the additional axis as running axis.
For the Joint type robot, the return value of this function means nothing.

See Also

CU, CV, CW, CX, CY, CZ

Dist Function Example

Real distance

distance = Dist(P1, P2)
Do...Loop Statement

Repeats a block of statements while a condition is True or until a condition becomes True.

Syntax

Do [{ While | Until } condition ]
{ statements }
{ Exit Do }
{ statements }
Loop

Or, you can use this syntax:

Do
{ statements }
{ Exit Do }
{ statements }
Loop [{ While | Until } condition ]

The Do Loop statement syntax has these parts:

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>condition</td>
<td>Optional. Numeric expression or string expression that is True or False. If condition is Null, condition is treated as False.</td>
</tr>
<tr>
<td>statements</td>
<td>One or more statements that are repeated while, or until, condition is True.</td>
</tr>
</tbody>
</table>

Description

Any number of Exit Do statements may be placed anywhere in the Do...Loop as an alternate way to exit a Do...Loop. Exit Do is often used after evaluating some condition, for example, If...Then, in which case the Exit Do statement transfers control to the statement immediately following the Loop.

When used within nested Do...Loop statements, Exit Do transfers control to the loop that is one nested level above the loop where Exit Do occurs.

See Also

For...Next, Select...Send

Do Example

Do While Not Lof(1)
Line Input #1, tLine$
Print tLine$
Loop
Double Statement

Declares variables of type Double. (8 byte double precision number).

Syntax

```
Double varName [(subscripts)] [, varName [(subscripts)]]...
```

Parameters

- `varName`: Variable name which the user wants to declare as type Double.
- `subscripts`: Optional. Dimensions of an array variable; up to 3 dimensions may be declared. The subscripts syntax is as follows:
  `(ubound1, [ubound2], [ubound3])`
  ubound1, ubound2, ubound3 each specify the maximum upper bound for the associated dimension.
  The elements in each dimension of an array are numbered from 0 and the available number of array elements is the upper bound value + 1.
  When specifying the upper bound value, make sure the number of total elements is within the range shown below:

<table>
<thead>
<tr>
<th>Type</th>
<th>Number of Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local variable</td>
<td>2000</td>
</tr>
<tr>
<td>Global Preserve variable</td>
<td>4000</td>
</tr>
<tr>
<td>Global variable and module variable</td>
<td>100000</td>
</tr>
</tbody>
</table>

Description

Double is used to declare variables as type Double. Local variables should be declared at the top of a function. Global and module variables must be declared outside of functions. Valid number of digits for Double is 14.

See Also

Boolean, Byte, Global, Integer, Long, Real, String

Double Example

The following example shows a simple program which declares some variables using Double.

```epson
Function doubletest
    Double var1
    Double A(10)          'Single dimension array of double
    Double B(10, 10)      'Two dimension array of double
    Double C(5, 5, 5)     'Three dimension array of double
    Double arrayvar(10)
    Integer i
    Print "Please enter a Number:"
    Input var1
    Print "The variable var1 = ", var1
    For i = 1 To 5
        Print "Please enter a Number:"
        Input arrayvar(i)
        Print "Value Entered was ", arrayvar(i)
    Next i
End
```

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ECP Statement

Selects or displays the current ECP (external control point).

Syntax
(1) ECP  \( ECPNumber \)
(2) ECP

Parameters
\( ECPNumber \)  Optional. Integer expression from 0-15 representing which of 16 ECP definitions to use with subsequent motion instructions. ECP 0 makes the ECP selection invalid.

Return Values
Displays current ECP when used without parameters.

Description
ECP selects the external control point specified by the ECPnumber (\( ECPNumber \)).

Note
This command will only work if the External Control Point option is active.

Power Off and Its Effect on the ECP Selection
Turning main power off clears the ECP selection.

See Also
ECPSet

ECP Statement Example

```plaintext
>ecpset 1, 100, 200, 0, 0
>ecp 1
```
ECP Function

Returns the current ECP (external control point) number.

Syntax

ECP

Return Values

Integer containing the current ECP number.

Note

This command will only work if the External Control Point option is active.

See Also

ECP Statement

ECP Function Example

    Integer savECP
    savECP = ECP
    ECP 2
    Call Dispense
    ECP savECP
ECPClr Statement

Cleans (undefines) an external control point.

Syntax

ECPClr ECPNumber

Parameters

ECPNumber Integer expression representing which of the 15 external control points to clear (undefine). (ECP0 is the default and cannot be cleared.)

Note

This command will only work if the External Control Point option is active.

See Also

Arm, ArmClr, ArmSet, ECPS, Local, LocalClr, Tool, TLSet

ECPClr Example

ECPClr 1
ECPDef Function

Returns ECP definition status.

Syntax

ECPDef (ECPNumber)

Parameters

ECPNumber Integer expression representing which ECP to return status for.

Return Values

True if the specified ECP has been defined, otherwise False.

See Also

Arm, ArmClr, ArmSet, ECPSet, Local, LocalClr, Tool, TLClr, TLSet

ECPDef Example

Function DisplayECPDef(ecpNum As Integer)
    If ECPDef(ecpNum) = False Then
        Print "ECP ", ecpNum, "is not defined"
    Else
        Print "ECP ", ecpNum, ": ",
        Print ECPSet(ecpNum)
    EndIf
EndFunction
# ECPSet Statement

Defines or displays an external control point.

## Syntax

1. `ECPSet ECPNum, ECPPoint`
2. `ECPSet ECPNum`
3. `ECPSet`

## Parameters

- **ECPNum** Integer number from 1-15 representing which of 15 external control points to define.
- **ECPPoint** Pnumber or P(expr) or point label or point expression.

## Return Values

- When parameters are omitted, displays the current `ECPSet` definitions.
- When only the `ECP` number is specified, displays the specified `ECPSet` definitions.

## Description

Defines an external control point.

## Note

This command will only work if the External Control Point option is active.

## ECPSet Example

```
ECPSet 1, P1
ECPSet 2, 100, 200, 0, 0
```
ECPSet Function

Returns a point containing the external control point definition for the specified ECP.

Syntax

\[
\text{ECPSet}(\text{ECPNumber})
\]

Parameters

\text{ECPNumber} \quad \text{Integer expression representing the number of the ECP to retrieve.}

Return Values

A point containing the ECP definition.

Note

This command will only work if the External Control Point option is active.

See Also

ECPSet Statement

ECPSet Function Example

\[
P1 = \text{ECPSet}(1)
\]
Elbow Statement

Sets the elbow orientation of a point.

Syntax
(1) Elbow point, [value ]
(2) Elbow

Parameters
point  Pnumber or P(expr) or point label.
value  Integer expression.
       1 = Above (/A)
       2 = Below (/B)

Return Values
When both parameters are omitted, the elbow orientation is displayed for the current robot position.
If value is omitted, the elbow orientation for the specified point is displayed.

See Also
Elbow Function, Hand, J4Flag, J6Flag, Wrist

Elbow Statement Example

Elbow P0, Below
Elbow pick, Above
Elbow P(myPoint), myElbow

P1 = 0.000,  490.000,  515.000,   90.000,  -40.000,  180.000

Elbow P1, Above
Go P1

Elbow P1, Below
Go P1
Elbow Function

Returns the elbow orientation of a point.

Syntax

Elbow ([point])

Parameters

point  Optional. Point expression. If point is omitted, then the elbow orientation of the current robot position is returned.

Return Values

1  Above (/A)
2  Below (/B)

See Also

Elbow Statement, Hand, Wrist, J4Flag, J6Flag

Elbow Function Example

Print Elbow(pick)
Print Elbow(P1)
Print Elbow
Print Elbow(P1 + P2)
Eof Function

Returns end of file status.

Syntax
Eof ( fileNumber )

Parameters
fileNumber  Integer number from 30 ~ 60 or expression representing the file number to check.

Return Values
True if file pointer is at end of file, otherwise False.

Description
Eof is functional only if the file is opened for reading mode.
An error occurs if the file was opened with the AOpen or WOpen statements.

See Also
Lof

Eof Example

Integer fileNum
String data$

fileNum = FreeFile
UOpen "TEST.DAT" As #fileNum
Do While Not Eof(fileNum)
    Line Input #fileNum, data$
    Print "data = ", data$
Loop
Close #fileNum
Era Function

Returns the joint number for which an error occurred.

Syntax

Era(taskNum)

Parameters

- **taskNum**: Integer expression representing a task number from 0 ~ 32.
  Task number omission or 0 specifies the current task.

Return Values

The joint number that caused the error in the range 0-6 as described below:

- 0 - The current error was not caused by a servo axis.
- 1 - The error was caused by joint number 1
- 2 - The error was caused by joint number 2
- 3 - The error was caused by joint number 3
- 4 - The error was caused by joint number 4
- 5 - The error was caused by joint number 5
- 6 - The error was caused by joint number 6
- 7 - The error was caused by joint number 7
- 8 - The error was caused by joint number 8 (additional S axis)
- 9 – The error was caused by joint number 9 (additional T axis)

Description

Era is used when an error occurs to determine if the error was caused by one of the robot joints and to return the number of the joint which caused the error. If the current error was not caused by any joint, Era returns zero.

See Also

Erl, Err, ErrMsg$, Ert, OnErr, Trap

Era Function Example

Function main
  OnErr Goto eHandler
  Do
    Call PickPlace
  Loop
  Exit Function
  eHandler:
    Print "The Error code is ", Err
    Print "The Error Message is ", ErrMsg$(Err)
    errTask = Ert
    If errTask > 0 Then
      Print "Task number in which error occurred is ", errTask
      Print "The line where the error occurred is Line ", Erl(errTask)
      If Era(errTask) > 0 Then
        Print "Joint which caused the error is ", Era(errTask)
      EndIf
    EndIf
  EndIf
End
EResume Statement

Resumes execution after an error-handling routine is finished.

Syntax

```
EResume [{ label | Next }]
```

Description

**EResume**

If the error occurred in the same procedure as the error handler, execution resumes with the statement that caused the error. If the error occurred in a called procedure, execution resumes at the Call statement in the procedure containing the error handler.

**EResume Next**

If the error occurred in the same procedure as the error handler, execution resumes with the statement immediately following the statement that caused the error. If the error occurred in a called procedure, execution resumes with the statement immediately following the Call statement that last in the procedure containing the error handler.

**EResume { label }**

If the error occurred in the same procedure as the error handler, execution resumes at the statement containing the label.

See Also

OnErr

**EResume Statement Example**

```plaintext
Function main
    Integer retry

    OnErr GoTo eHandler
    Do
        RunCycle
    Loop
    Exit Function

eHandler:
    Select Err
    Case MyError
        retry = retry + 1
        If retry < 3 Then
            EResume ' try again
        Else
            Print "MyError has occurred ", retry, " times"
        EndIf
    Send
Send
```

Fend
Erf$ Function

Returns the name of the function in which the error occurred.

Syntax

Erf$([taskNumber])

Parameters

taskNumber  Integer expression representing a task number from 0 ~ 32.
            Task number omission or 0 specifies the current task.

Return Values

The name of the function where the last error occurred.

Description

Erf$ is used with OnErr. Erf$ returns the function name in which the error occurred. Using Erf$ combined with Err, Ert, Erl and Era the user can determine much more about the error which occurred.

See Also

Era, Ert, Er, ErrMsg$, Ert, OnErr

Erf$ Function Example

The following example shows a simple program using the Ert function to determine which task the error occurred in along with; Erf$: the name of the function the error occurred in; Erl: the line number where the error occurred; Era: if a joint caused the error....

Function main
    OnErr Goto eHandler
    Do
        Call PickPlace
    Loop
    Exit Function
    eHandler:
    Print "The Error code is ", Err
    Print "The Error Message is ", ErrMsg$(Err)
    errTask = Ert
    If errTask > 0 Then
        Print "Task number in which error occurred is ", errTask
        Print "Function at which error occurred is ", Erf$(errTask)
        Print "The line where the error occurred is Line ", Erl(errTask)
        If Era(errTask) > 0 Then
            Print "Joint which caused the error is ", Era(errTask)
        EndIf
    EndIf
    EndIf
End
Erl Function

Returns the line number in which the error occurred.

Syntax

\[
\text{Erl}(\text{taskNumber})
\]

Parameters

\[\text{taskNumber}\]

Integer expression representing a task number from 0 ~ 32. Task number omission or 0 specifies the current task.

Return Values

The line number where the last error occurred.

Description

\text{Erl} is used with \text{OnErr}. \text{Erl} returns the line number in which the error occurred. Using \text{Erl} combined with \text{Err}, \text{Ert} and \text{Era} the user can determine much more about the error which occurred.

See Also

\text{Era, Erl$}, \text{Err, ErrMsg$}, \text{Ert}, \text{OnErr}

Erl Function Example

The following example shows a simple program using the \text{Ert} function to determine which task the error occurred in along with; \text{Erl}: where the error occurred; \text{Era}: if a joint caused the error.

```
Function main
   OnErr Goto eHandler
   Do
      Call PickPlace
      Loop
      Exit Function
   eHandler:
      Print "The Error code is ", Err
      Print "The Error Message is ", ErrMsg$(Err)
      errTask = Ert
      If errTask > 0 Then
         Print "Task number in which error occurred is ", errTask
         Print "The line where the error occurred is Line ", Erl(errTask)
         If Era(errTask) > 0 Then
            Print "Joint which caused the error is ", Era(errTask)
         EndIf
      EndIf
   EndIf
End
```
Err Function

Returns the most recent error status.

Syntax

\[
\text{Err} \ [\text{taskNumber}]
\]

Parameters

- **taskNumber**: Optional. Integer expression representing a task number from 0 ~ 32. 
  0 specifies the current task.

Return Values

Returns a numeric error code in integer form.

Description

Err allows the user to read the current error code. This along with the SPEL\(^*\) Error Handling capabilities allows the user to determine which error occurred and react accordingly. Err is used with OnErr.

To get the controller error, use SysErr function.

See Also

Era, Erf\$, Erl, ErrMsg\$, EResume, Ert, OnErr, Return, SysErr

Err Example

The following example shows a simple utility program which checks whether points P0-P399 exist. If the point does not exist, then a message is printed on the screen to let the user know this point does not exist. The program uses the CX instruction to test each point for whether or not it has been defined. When a point is not defined control is transferred to the error handler and a message is printed on the screen to tell the user which point was undefined.

```
Function errtest
    Integer i, errnum
    Real x

    OnErr GoTo eHandle
    For i = 0 To 399
        x = CX(P(i))
    Next i
    Exit Function
    
    '*********************************************
    '* Error Handler                            *
    '*********************************************
eHandle:
    errnum = Err
    ' Check if using undefined point
    If errnum = 78 Then
        Print "Point number P", i, " is undefined!"
    Else
        Print "ERROR: Error number ", errnum, " Occurred."
    EndIf
    EResume Next
End
```
ErrMsg$ Function

Returns the error message which corresponds to the specified error number.

Syntax
ErrMsg$(errNumber, langID)

Parameters
errNumber  Integer expression containing the error number to get the message for.
langID  Optional. Integer expression containing the language ID based on the following values.
  0 - English
  1 - Japanese
  2 - German
  3 - French
If omitted, English is used.

Return Values
Returns the error message which is described in the Error Codes table.

See Also
Era, Erl, Err, Ert, OnErr, Trap

ErrMsg$ Example
The following example shows a simple program using the Ert function to determine which task the error occurred in along with; Erl: where the error occurred; Era: if a joint caused the error....

Function main
  OnErr Goto eHandler
  Do
    Call PickPlace
  Loop
  Exit Function
eHandler:
  Print "The Error code is ", Err
  Print "The Error Message is ",ErrMsg$(Err)
  errTask = Ert
  If errTask > 0 Then
    Print "Task number in which error occurred is ", errTask
    Print "The line where the error occurred is Line ", Erl(errTask)
    If Era(errTask) > 0 Then
      Print "Joint which caused the error is ", Era(errTask)
    EndIf
  EndIf
  EndIf
Fend
Error Statement

Generates a user error.

Syntax

(1) Error task Number, errorNumber
(2) Error errorNumber

Parameters

- **taskNumber**: Optional. Integer expression representing a task number from 0 ~ 32. 0 specifies the current task.
- **errorNumber**: Integer expression representing a valid error number. User error numbers range is from 8000 to 8999.

Description

Use the Error statement to generate system or user defined errors. You can define user error labels and descriptions by using the User Error Editor in the EPSON RC+ 6.0 development environment.

See Also

Era, Erl, Err, OnErr

Error Statement Example

```c
#define ER_VAC 8000

If Sw(vacuum) = Off Then
    Error ER_VAC
EndIf
```
ErrorOn Funcion

Returns the error status of the controller.

Syntax

ErrorOn

Return Values

True if the controller is in error status, otherwise False.

Description

ErrorOn function is used only for NoEmgAbort task (special task using NoEmgAbort at Xqt) and background task.

See Also

ErrorOn, SafetyOn, SysErr, Wait, Xqt

ErrorOn Function Example

The following example shows a program that monitors the controller error and switches the I/O On/Off according to the error number when error occurs.

Notes

Forced Flag

This program example uses Forced flag for On/Off command.
Be sure that the I/O outputs change during error, or at Emergency Stop or Safety Door Open when designing the system.

After Error Occurrence

As this program, finish the task promptly after completing the error handling.

```plaintext
Function main

   Xqt ErrorMonitor, NoEmgAbort
   :
   :
Fend

Function ErrorMonitor

   Wait ErrorOn
   If 4000 < SysErr Then
      Print "Motion Error = ", SysErr
      Off 10, Forced
      On 12, Forced
   Else
      Print "Other Error = ", SysErr
      Off 11, Forced
      On 13, Forced
   EndIf
Fend
```
Ert Function

Returns the task number in which an error occurred.

Syntax

Ert

Return Values

The task number in which the error occurred.

Description

Ert is used when an error occurs to determine in which task the error occurs. The number returned will be between 1 ~ 32.

See Also

Era, Erl, Err, ErrMsg$, OnErr, Trap

Ert Function Example

The following example shows a simple program using the Ert function to determine which task the error occurred in along with;  Ert: where the error occurred; Err: what error occurred; Era: if a joint caused the error....

```
Function main
  OnErr Goto eHandler
  Do
    Call PickPlace
  Loop
Exit Function

  eHandler:
  Print "The Error code is ", Err
  Print "The Error Message is ", ErrMsg$(Err)
  errTask = Ert
  If errTask > 0 Then
    Print "Task number in which error occurred is ", errTask
    Print "The line where the error occurred is Line ", Erl(errTask)
    If Era(errTask) > 0 Then
      Print "Joint which caused the error is ", Era(errTask)
    EndIf
  EndIf
EndIf
Fend
```
EStopOn Function

Return the Emergency Stop status.

Syntax
EstopOn

Return Values
True if the status is Emergency Stop, otherwise False.

Description
EStopOn function is used only for NoEmgAbort task (special task using NoEmgAbort at Xqt).

See Also
ErrorOn, SafetyOn, Wait, Xqt

EstopOn Function Example
The following example shows a program that monitors the Emergency Stop and switches the I/O On/Off when Emergency Stop occurs.

Notes
Forced Flag
This program example uses Forced flag for On/Off command.
Be sure that the I/O outputs change during error, or at Emergency Stop or Safeguard Open when designing the system.

Error Handling
As this program, finish the task promptly after completing the error handling.

Outputs OFF during Emergency Stop
As this program example, when the task executes I/O On/Off after the Emergency Stop, uncheck the [Controller]-[Preferences]-[Outputs off during emergency stop] check box. If this check box is checked, the execution order of turn Off by the controller and turn On using the task are not guaranteed.

Function main

Xqt EStopMonitor, NoEmgAbort
:
:
Fend

Function EStopMonitor
Wait EStopOn
Print "EStop !!!"
Off 10, Forced
On 12, Forced
Fend
Eval Function

Executes a Command window statement from a program and returns the error status.

Syntax

Eval( command [, reply$ ] )

Parameters

command  A string expression containing a command you want to execute.

reply$         Optional. A string variable that contains the reply from the command. If the command is in the error status, it will return "Error: error code". If the reply is over 255 characters, the extra characters will be truncated.

Return Values

The error code returned from executing the command. Even if the command execution results in an error, the function itself will not be an error. Also, the system log doesn’t record it. When the command is completed successfully, it returns 0.

Description

You can execute any command (executable commands from Command window) from communication port such as TCP/IP by using Eval. It takes more time to execute this function than by using a normal statement.

Use the reply$ parameter to retrieve the reply from the command. For example, if the command was "Print Sw(1)", then reply$ would be a "1" or "0".

See Also

Error Codes

Eval Function Example

This example shows how to execute a command being read over RS-232. After the command is executed, the error code is returned to the host. For example, the host could send a command like "motor on".

```
Integer errCode
String cmd$

OpenCom #1
Do
  Line Input #1, cmd$
  errCode = Eval(cmd$
  Print #1, errCode
Loop
```
Exit Statement

Exits a loop construct or function.

Syntax

Exit { Do | For | Function }

Description

The Exit statement syntax has these forms:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exit Do</td>
<td>Provides a way to exit a Do...Loop statement. It can be used only inside a Do...Loop statement. Exit Do transfers control to the statement following the Loop statement. When used within nested Do...Loop statements, Exit Do transfers control to the loop that is one nested level above the loop where Exit Do occurs.</td>
</tr>
<tr>
<td>Exit For</td>
<td>Provides a way to exit a For loop. It can be used only in a For...Next loop. Exit For transfers control to the statement following the Next statement. When used within nested For loops, Exit For transfers control to the loop that is one nested level above the loop where Exit For occurs.</td>
</tr>
<tr>
<td>Exit Function</td>
<td>Immediately exits the Function procedure in which it appears. Execution continues with the statement following the statement that called the Function.</td>
</tr>
</tbody>
</table>

See Also

Do...Loop, For...Next, Function...Fend

Exit Statement Example

For i = 1 To 10
  If Sw(i) = On Then
    Exit For
  EndIf
  Jump P(i)
Next i
ExportPoints Statement

Exports a point file to the specified path.

Syntax

ExportPoints fileName, destination

Parameters

fileName        String expression containing the specific file to be exported.  
The extension must be .PTS.  You cannot specify a file path and fileName 
doesn't have any effect from ChDisk.  See ChDisk for the details.

destination     Specify the path and file name to save the file.  
The extension must be .PTS.  See ChDisk for the details.

Description

ExportPoints copies a specified point file to a folder on the PC.  
If the file already exists in the folder, it will be overwritten.

Potential Errors

File Does Not Exist
   If the specified path does not exist, an error will occur.

A Path Cannot be Specified
   If fileName contains a path, an error will occur.

See Also

Dir, LoadPoints, SavePoints, FileExists, FolderExists

ExportPoints Statement Example

Function main
   LoadPoints "robot1.pts"
   ;
   SavePoints "robot1.pts"
   If FolderExists("c:\mypoints\") Then
      ExportPoints "robot1.pts", "c:\mypoints\model1.pts"
   EndIf
EndFend
FbusIO_GetBusStatus Function

Returns the status of the specified Fieldbus.

Syntax
FbusIO_GetBusStatus(busNumber)

Parameters
busNumber  Integer expression representing the Fieldbus system number. This number must be 16. This is the ID for the bus connected to the Fieldbus master board on the PC side of the controller.

Return Values
0 - OK
1 - Disconnected
2 - Power off

Description
FbusIO_GetBusStatus can be used to verify the general status of the Fieldbus.

Note
This command will only work if the Fieldbus Master option is active.

See Also
FbusIO_GetDeviceStatus, FbusIO_SendMsg

FbusIO_GetBusStatus Function Example

Long sts
sts = FbusIO_GetBusStatus(16)
FbusIO_GetDeviceStatus Function

Returns the status of the specified Fieldbus device.

Syntax

FbusIO_GetDeviceStatus(busNumber, deviceID)

Parameters

busNumber  Integer expression representing the Fieldbus system number. This number must be 16. This is the ID for the bus connected to the Fieldbus master board on the PC side of the controller.

deviceID  Integer expression representing the Fieldbus ID of the device.

Return Values

0 - OK  
1 - Disconnected  
2 - Power off  
3 - Synchronization error. Device is booting, or has incorrect baud rate.

Description

FbusIO_GetDeviceStatus can be used to verify the general status of a Fieldbus device.

Note

This command will only work if the Fieldbus Master option is active.

See Also

FbusIO_GetBusStatus, FbusIO_SendMsg

FbusIO_GetDeviceStatus Function Example

Long sts
sts = FbusIO_GetDeviceStatus(1, 10)
FbusIO_SendMsg Statement

Sends an explicit message to a Fieldbus device and returns the reply.

Syntax

\[ \text{FbusIO\_SendMsg} \ busNumber, \ deviceID, \ msgParam, \ sendData(), \ recvData() \]

Parameters

- **busNumber**: Integer expression representing the Fieldbus system number. This number must be 16. This is the ID for the bus connected to the Fieldbus master board on the PC side of the controller.
- **deviceID**: Integer expression representing the Fieldbus ID of the device.
- **msgParam**: Integer expression for the message parameter. Not used with DeviceNet.
- **sendData**: Array of type Byte containing data that is sent to the device. This array must be dimensioned to the number of bytes to send. If there are no bytes to send, specify 0.
- **recvData**: Array of type Byte that contains the data received from the device. This array will automatically be redimensioned to the number of bytes received.

Description

FBusIO_SendMsg is used to query one Fieldbus device. Refer to the device manufacturer for information on messaging support.

Note

This command will only work if the Fieldbus Master option is active.

See Also

FbusIO_GetBusStatus, FbusIO_GetDeviceStatus

FbusIO_SendMsg Statement Example

```plaintext
' Send explicit message to DeviceNet device
Byte sendData(5)
Byte recvData(0)
Integer i

sendData(0) = &H0E   ' Command
sendData(1) = 1     ' Class
sendData(3) = 1     ' Instance
sendData(5) = 7     ' Attribute
' msgParam is 0 for DeviceNet
FbusIO_SendMsg 1, 1, 0, sendData(), recvData()
' Display the reply
For i = 0 to UBound(recvData)
   Print recvData(i)
Next i

' Send message to Profibus device
Byte recvData(0)
Integer i

' msgParam is the service number
FbusIO_SendMsg 16, 1, 56, 0, recvData()
' Display the reply
For i = 0 to UBound(recvData)
   Print recvData(i)
Next i
```
FileDateTime$ Function

Returns the date and time of a file.

Syntax

```
FileDateTime$ ( filename )
```

Parameters

- `filename`: A string expression containing the file name to check. The drive and path can also be included. If only file name is specified, the file in the current directory is displayed. See ChDisk for the details.

Note

- Do not use a network path, otherwise an error occurs.

Return Values

- Returns the date and time of the last update in the following format:

```
m/d/yyyy hh:mm:ss
```

See Also

- FileExists, FileLen

FileDateTime$ Function Example

```
String myPath$
myPath$ = "c:\TEST\TEST.DAT"

If FileExists(myPath$) Then
    Print "Last access date and time: ", FileDateTime$(myPath$)
    Print "Size: ", FileLen(myPath$)
EndIf
```
FileExists Function

Checks if a file exists.

Syntax

FileExists ( filename )

Parameters

filename

A string expression containing the file name to check. The drive and path can also be included.
If only the file name is specified, the file is checked in the current directory.
See ChDisk for the details.

Note

Do not use a network path, otherwise an error occurs.

Return Values

True if the file exists, False if not.

See Also

FolderExists, FileLen, FileDateTime$

FileExists Function Example

String myPath$
myPath$ = "c:\TEST\TEST.DAT"

If FileExists(myPath$) Then
    Print "Last access date and time: ", FileDateTime$(myPath$)
    Print "Size: ", FileLen(myPath$)
EndIf
FileLen Function

Returns the length of a file.

Syntax

\[ \text{FileLen ( filename )} \]

Parameters

- \( \text{fileName} \) A string expression containing the file name to check. The drive and path can also be included.
  If only the file name is specified, the file is checked in the current directory.
  See ChDisk for the details.

Note

- Do not use a network path, otherwise an error occurs.

Return Values

- Returns the number of bytes in the file.

See Also

- FileDateTime$, FileExists

FileLen Function Example

```
String myPath$
myPath$ = "c:\TEST\TEST.DAT"

If FileExists(myPath$) Then
    Print "Last access date and time: ", FileDateTime$(myPath$)
    Print "Size: ", FileLen(myPath$)
EndIf
```
Find Statement

Specifies or displays the condition to store coordinates during motion.

Syntax

**Find** [ *condition* ]

Parameters

*condition*  
The following functions and operators are available.

- **Functions**: Sw, In, InW, Oport, Out, OutW, MemSw, MemIn, MemW, Ctr
- **Operators**: And, Or, Xor

**<Example>**  
Find Sw(5) = On

Find Sw(5) = On And Sw(6) = Off

Input status specified as a trigger

**[Event]** comparative operator ( =, <>, >=, >, <, <=) **[Integer expression]**

The following functions and variables can be used in the **Event**:

- **Functions**: Sw, In, InW, Oport, Out, OutW, MemSw, MemIn, MemInW, Ctr, GetRobotInsideBox, GetRobotInsidePlane
- **Variables**: Byte, Integer, Long global preserve variable, Global variable, module variable

In addition, using the following operators you can specify multiple event conditions.

- **Operator**: And, Or, Xor

**Example**:  
Trap 1, Sw(5) = On Call, TrapFunc

Trap 1, Sw(5) = On And Till(6) = Off, Call TrapFunc

Description

Find statement can be used by itself or as a modifier of a motion command.

The **Find** condition must include at least one of the functions above.

When variables are included in the Find condition, their values are computed when setting the Find condition. No use of variable is recommended. Otherwise, the condition may be an unintended condition. Multiple Find statements are permitted. The most recent Find condition remains current.

When parameters are omitted, the current Find definition is displayed.

Notes

**Find Setting at Main Power On**

At power on, the Find condition is:

Find Sw(0) = On  *Input bit 0 is on

**Use of PosFound Function to Verify Find**

Use PosFound function to verify if the Find condition has been satisfied after executing a motion command using Find modifier.

**Use Variables in Event Condition Expression**

- Available variables are Integer type (Byte, Integer, Long)
- Array variables are not available
- Local variables are not available
- If a variable value cannot satisfy the event condition for more than 0.01 second, the system cannot retrieve the change in variables.
- Up to 64 can wait for variables in one system (including the ones used in the event condition expressions such as Wait). If it is over 64, an error occurs during the project build.
- If you try to transfer a variable waiting for variables as a reference with Byref, an error occurs.
Find Statement

- When a variable is included in the right side member of the event condition expression, the value is calculated when starting the motion command. We recommend not using variables in an integer expression to avoid making unintended conditions.

See Also
FindPos, Go, Jump, PosFound

Find Statement Example

```
Find Sw(5) = On
Go P10 Find
If PosFound Then
   Go FindPos
Else
   Print "Cannot find the sensor signal."
EndIf
```
FindPos Function

Returns a robot point stored by Fine during a motion command.

Syntax

```
FindPos
```

Return Values

A robot point that was stored during a motion command using Find.

See Also

Find, Go, Jump, PosFound, CurPos, InPos

FindPos Function Example

```
Find Sw(5) = On
Go P10 Find
If PosFound Then
   Go FindPos
Else
   Print "Cannot find the sensor signal."
EndIf
```
Fine Statement

Specifies and displays the positioning accuracy for target points.

Syntax

(1) **Fine** axis1, axis2, axis3, axis4, [axis5, axis6], [axis7], [axis8, axis9]
(2) **Fine**

Parameters

axis1 Integer expression ranging from (0-65535) which represents the allowable positioning error for the 1st joint.
axis2 Integer expression ranging from (0-65535) which represents the allowable positioning error for the 2nd joint.
axis3 Integer expression ranging from (0-65535) which represents the allowable positioning error for the 3rd joint.
axis4 Integer expression ranging from (0-65535) which represents the allowable positioning error for the 4th joint.
axis5 Optional. Integer expression ranging from (0-65535) which represents the allowable positioning error for the 5th joint.
axis6 Optional. Integer expression ranging from (0-65535) which represents the allowable positioning error for the 6th joint.
axis7 Optional. Integer expression ranging from (0-65535) which represents the allowable positioning error for the 7th joint. Only for the Joint type 7-axis robot.
axis8 Optional. Integer expression ranging from (0-65535) which represents the allowable positioning error for the 7th joint. Only for the additional S axis.
axis9 Optional. Integer expression ranging from (0-65535) which represents the allowable positioning error for the 7th joint. Only for the additional T axis.

Return Values

When used without parameters, **Fine** displays the current fine values for each axis.

Description

**Fine** specifies, for each joint, the allowable positioning error for detecting completion of any given move.

This positioning completion check begins after the CPU has completed sending the target position pulse to the servo system. Due to servo delay, the robot will not yet have reached the target position. This check continues to be executed every few milliseconds until each joint has arrived within the specified range setting. Positioning is considered complete when all axes have arrived within the specified ranges. Once positioning is complete program control is passed to the next statement, however, servo system keeps the control of the robot target position.

When relatively large ranges are used with the Fine instruction, the positioning will be confirmed relatively early in the move, and executes the next statement.

The default **Fine** settings depend on the robot type. Refer to your robot manual for details.
Notes

Cycle Times and the Fine Instruction
The Fine value does not affect the acceleration or deceleration control of the manipulator arm. However, smaller Fine values can cause the system to run slower because it may take the servo system extra time (a few milliseconds) to get within the acceptable position range. Once the arm is located within the acceptable position range (defined by the Fine instruction), the CPU executes the next user instruction.

Initialization of Fine (by Motor On, SLock, SFree)
Any time the following commands are used the Fine value is initialized to default values: SLock, SFree, Motor instructions.
Make sure that you reset Fine values after one of the above commands execute.

Potential Errors
If Fine positioning is not completed within about 2 seconds, Error 4024 will occur. This error normally means the servo system balance needs to be adjusted. (Call your distributor for assistance)

See Also
Accel, AccelR, AccelS, Arc, Go, Jump, Move, Speed, SpeedR, SpeedS, Pulse

Fine Statement Example
The examples below show the Fine statement used in a program function, and used from the monitor window.

```plaintext
Function finetest
  Fine 5, 5, 5, 5  'reduce precision to +/- 5 Pulse
  Go P1
  Go P2
Fend

> Fine 10, 10, 10, 10
>
> Fine
10, 10, 10, 10
```
Fine Function

Returns Fine setting for a specified joint.

Syntax
Fine(joint)

Parameters
joint Integer expression representing the joint number for which to retrieve the Fine setting. The additional S axis is 8 and T axis is 9.

Return Values
Real value.

See Also
Accel, AccelS, Arc, Go, Jump, Move, Speed, SpeedS, Pulse

Fine Function Example
This example uses the Fine function in a program:

Function finetst
  Integer a
  a = Fine(1)
Fend
Fix Function

Returns the integer portion of a real number.

Syntax

\[ \text{Fix}(\text{number}) \]

Parameters

\( \text{number} \quad \text{Real expression containing number to fix.} \)

Return Values

An integer value containing the integer portion of the real number.

See Also

Int

Fix Function Example

\[
\text{>print Fix(1.123)}
\]

\[
1
\]

\[
>
\]
Flush

Writes a file's buffer into the file.

Syntax

Flush #fileNumber

Parameters

#fileNumber Integer value from 30 ~ 63 or expression

Description

Writes a file's buffer into the specified file.
Flush cannot be used if the file was opened with ROpen.

Flush Example

    Integer fileNum, i

    fileNum = FreeFile
    UOpen "TEST.DAT" As #fileNum
    For i = 0 To 100
        Print #fileNum, i
    Next i
    Flush #fileNum
    Close #fileNum
FmtStr$ Function

Format a numeric expression.

Syntax
FmtStr$ (numeric expression, strFormat)

Parameters
- numeric expression: Numeric expression to be formatted.
- strFormat: Format specification string.

Return Values
A string containing the formatted expression.

Description
Use FmtStr$ to format a numeric expression into a string.

Numeric Format Specifiers

<table>
<thead>
<tr>
<th>Character</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Display the number with no formatting.</td>
</tr>
<tr>
<td>(0)</td>
<td>Digit placeholder. Display a digit or a zero. If the expression has a digit in the position where the 0 appears in the format string, display it; otherwise, display a zero in that position. If the number has fewer digits than there are zeros (on either side of the decimal) in the format expression, display leading or trailing zeros. If the number has more digits to the right of the decimal separator than there are zeros to the right of the decimal separator in the format expression, round the number to as many decimal places as there are zeros. If the number has more digits to the left of the decimal separator than there are zeros to the left of the decimal separator in the format expression, display the extra digits without modification.</td>
</tr>
<tr>
<td>(#)</td>
<td>Digit placeholder. Display a digit or nothing. If the expression has a digit in the position where the # appears in the format string, display it; otherwise, display nothing in that position. This symbol works like the 0 digit placeholder, except that leading and trailing zeros aren't displayed if the number has the same or fewer digits than there are # characters on either side of the decimal separator in the format expression.</td>
</tr>
<tr>
<td>(.)</td>
<td>Decimal placeholder. In some locales, a comma is used as the decimal separator. The decimal placeholder determines how many digits are displayed to the left and right of the decimal separator. If the format expression contains only number signs to the left of this symbol, numbers smaller than 1 begin with a decimal separator. To display a leading zero displayed with fractional numbers, use 0 as the first digit placeholder to the left of the decimal separator. The actual character used as the decimal separator in the formatted output depends on the Number Format recognized by your system.</td>
</tr>
<tr>
<td>(,)</td>
<td>Thousand separator. In some locales, a period is used as a thousand separator. The thousand separator separates thousands from hundreds within a number that has four or more places to the left of the decimal separator. Standard use of the thousand separator is specified if the format contains a thousand separator surrounded by digit placeholders (0 or #). Two adjacent thousand separators or a thousand separator immediately to the left of the decimal separator (whether or not a decimal is specified) means &quot;scale the number by dividing it by 1000, rounding as needed.&quot; For example, you can use the format string &quot;##0,,&quot; to represent 100 million as 100. Numbers smaller than 1 million are displayed as 0. Two adjacent thousand separators in any position other than immediately to the left of the decimal separator are treated simply as specifying the use of a thousand separator. The actual character used as the thousand separator in the formatted output depends on the Number Format recognized by your system.</td>
</tr>
</tbody>
</table>
FmtStr$ Function

See Also
Left$, Right$, Str$

FmtStr$ Example

Function SendDateCode

    String d$, f$

    f$ = FmtStr$(10, "000.00")
    OpenCom #1
    Print #1, f$
    CloseCom #1
Fend
FolderExists Function

Checks if a folder exists.

Syntax

```
FolderExists(pathName)
```

Parameters

- **pathName**: A string expression containing the path of the folder to check. The drive can also be included. See ChDisk for the details.

Note

This function is executable only with the PC disk.

Return Values

- True if the folder exists, False if not.

See Also

- FileExists, MkDir

FolderExists Function Example

```
If Not FolderExists("c:\TEST") Then
    MkDir "c:\TEST"
EndIf
```
For...Next Statement

The For...Next instructions are used together to create a loop where instructions located between For and Next are executed multiple times as specified by the user.

Syntax

```
For var = initValue To finalValue [Step increment ]
statements
Next [var]
```

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>var</code></td>
<td>The counting variable used with the For...Next loop. This variable is normally defined as an integer but may also be defined as a Real variable.</td>
</tr>
<tr>
<td><code>initValue</code></td>
<td>The initial value for the counter <code>var</code>.</td>
</tr>
<tr>
<td><code>finalValue</code></td>
<td>The final value of the counter <code>var</code>. Once this value is met, the For...Next loop is complete and execution continues starting with the statement following the Next instruction.</td>
</tr>
<tr>
<td><code>increment</code></td>
<td>An optional parameter which defines the counting increment for each time the Next statement is executed within the For...Next loop. This variable may be positive or negative. However, if the value is negative, the initial value of the variable must be larger than the final value of the variable. If the increment value is left out the system automatically increments by 1.</td>
</tr>
<tr>
<td><code>statements</code></td>
<td>Any valid SPEL+ statements can be inserted inside the For...Next loop.</td>
</tr>
</tbody>
</table>

Description

For...Next executes a set of statements within a loop a specified number of times. The beginning of the loop is the For statement. The end of the loop is the Next statement. A variable is used to count the number of times the statements inside the loop are executed.

The first numeric expression (`initValue`) is the initial value of the counter. This value may be positive or negative as long as the `finalValue` variable and Step increment correspond correctly.

The second numeric expression (`finalValue`) is the final value of the counter. This is the value which once reached causes the For...Next loop to terminate and control of the program is passed on to the next instruction following the Next instruction.

Program statements after the For statement are executed until a Next instruction is reached. The counter variable (`var`) is then incremented by the Step value defined by the `increment` parameter. If the Step option is not used, the counter is incremented by 1 (one).

The counter variable (`var`) is then compared with the final value. If the counter is less than or equal to the final value, the statements following the For instruction are executed again. If the counter variable is greater than the final value, execution branches outside of the For...Next loop and continues with the instruction immediately following the Next instruction.
Notes

Negative Step Values:
If the value of the Step increment \( \text{increment} \) is negative, the counter variable \( \text{var} \) is decremented (decreased) each time through the loop and the initial value must be greater than the final value for the loop to work.

Variable Following Next is Not Required:
The variable name following the Next instruction may be omitted. However, for programs that contain nested For...Next loops, it is recommended to include the variable name following the Next instruction to aid in quickly identifying loops.

When a variable comes out of the loop, the value is not a final value.

See Also
Do...Loop

For...Next Example

Function forsample
    Integer i
    For i = 0 To 3
        Next
    Print i ' Displays 4
Fend

Function fornext
    Integer counter
    For counter = 1 to 10
        Go Pctr
        Next counter
    For counter = 10 to 1 Step -1
        Go Pctr
        Next counter
Fend
Force_Calibrate Statement

Sets zero offsets for all axes for the current force sensor.

Syntax

    Force_Calibrate

Parameters

    On | Off

Torque Control can be either On or Off.

Description

You should call Force_Calibrate for each sensor when your application starts. This will account for the weight of the components mounted on the sensor.

Note

This command will only work if the Force Sensing option is active.

See Also

    Force_Sensor Statement

Force_Calibrate Statement Example

    Force_Calibrate
Force_ClearTrigger

Clears all trigger conditions for the current force sensor.

Syntax

Force_ClearTrigger

Description

Use Force_ClearTrigger to clear all conditions for the current force sensor's trigger.

Note

This command will only work if the Force Sensing option is active.

See Also

Force_Sensor Statement

Force_ClearTrigger Statement Example

    Force_ClearTrigger
Force_GetForces Statement

Returns the forces and torques for all force sensor axes in an array.

Syntax

Force_GetForces array()

Parameters

array() Real array with upper bound of 6.

Return Values

The array elements are filled in as follows:

<table>
<thead>
<tr>
<th>Axis</th>
<th>Constant</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>X Force</td>
<td>FORCE_XFORCE</td>
<td>1</td>
</tr>
<tr>
<td>Y Force</td>
<td>FORCE_YFORCE</td>
<td>2</td>
</tr>
<tr>
<td>Z Force</td>
<td>FORCE_ZFORCE</td>
<td>3</td>
</tr>
<tr>
<td>X Torque</td>
<td>FORCE_XTORQUE</td>
<td>4</td>
</tr>
<tr>
<td>Y Torque</td>
<td>FORCE_YTORQUE</td>
<td>5</td>
</tr>
<tr>
<td>Z Torque</td>
<td>FORCE_ZTORQUE</td>
<td>6</td>
</tr>
</tbody>
</table>

Description

Use Force_GetForces to read all force and torque values at once.

Note

This command will only work if the Force Sensing option is active.

See Also

Force_GetForce Statement

Force_GetForces Statement Example

```cpp
Real fValues(6)
Force_GetForces fValues()
```
**Force_GetForce Function**

Returns the force for a specified axis.

**Syntax**

```
Force_GetForce (axis)
```

**Parameters**

- `axis` Integer expression representing the axis.

<table>
<thead>
<tr>
<th>Axis</th>
<th>Constant</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>X Force</td>
<td>FORCE_XFORCE</td>
<td>1</td>
</tr>
<tr>
<td>Y Force</td>
<td>FORCE_YFORCE</td>
<td>2</td>
</tr>
<tr>
<td>Z Force</td>
<td>FORCE_ZFORCE</td>
<td>3</td>
</tr>
<tr>
<td>X Torque</td>
<td>FORCE_XTORQUE</td>
<td>4</td>
</tr>
<tr>
<td>Y Torque</td>
<td>FORCE_YTORQUE</td>
<td>5</td>
</tr>
<tr>
<td>Z Torque</td>
<td>FORCE_ZTORQUE</td>
<td>6</td>
</tr>
</tbody>
</table>

**Return Values**

Returns a real value.

**Description**

Use `Force_GetForce` to read the current force setting for one axis. The units are determined by the type of force sensor.

**Note**

This command will only work if the Force Sensing option is active.

**See Also**

- `Force_GetForces`

**Force_GetForce Function Example**

```
Print Force_GetForce(1)
```
Force_Sensor Statement

Sets the current force sensor for the current task.

Syntax

```
Force_Sensor sensorNumber
```

Parameters

- `sensorNumber`: Integer expression representing the sensor number.

Description

When using multiple force sensors on the same system, you must set the current force sensor before using other force sensing commands.

If your system has only one sensor, then you don't need to use `Force_Sensor` because the default sensor number is 1.

Note

This command will only work if the Force Sensing option is active.

See Also

- `Force_Sensor Function`

**Force_Sensor Statement Example**

```
Force_Sensor 1
```
Force_Sensor Function

Returns the current force sensor for the current task.

Syntax
Force_Sensor

Description
Force_Sensor returns the current sensor number for the current task. When a task starts, the sensor number is automatically set to 1.

Note
This command will only work if the Force Sensing option is active.

See Also
Force_Sensor Statement

Force_Sensor Function Example

    var = Force_Sensor
Force_SetTrigger Statement

Sets the force trigger for the Till command.

Syntax

Force_SetTrigger axis, Threshold, CompareType

Parameters

axis

Integer expression containing the desired force sensor axis.

<table>
<thead>
<tr>
<th>Axis</th>
<th>Constant</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>X Force</td>
<td>FORCE_XFORCE</td>
<td>1</td>
</tr>
<tr>
<td>Y Force</td>
<td>FORCE_YFORCE</td>
<td>2</td>
</tr>
<tr>
<td>Z Force</td>
<td>FORCE_ZFORCE</td>
<td>3</td>
</tr>
<tr>
<td>X Torque</td>
<td>FORCE_XTORQUE</td>
<td>4</td>
</tr>
<tr>
<td>Y Torque</td>
<td>FORCE_YTORQUE</td>
<td>5</td>
</tr>
<tr>
<td>Z Torque</td>
<td>FORCE_ZTORQUE</td>
<td>6</td>
</tr>
</tbody>
</table>

Threshold

Real expression containing the desired threshold in units for the sensor being used.

CompareType

Comparison Constant Value
Less than or equal FORCE_LESS 0
Greater than or equal FORCE_GREATER 1

Description

To stop motion with a force sensor, you must set the trigger for the sensor, then use Till Force in your motion statement.

You can set the trigger with multiple axes. Call Force_SetTrigger for each axis. To disable an axis, set the threshold at 0.

Note

This command will only work if the Force Sensing option is active.

See Also

Force_Calibrate

Force_SetTrigger Statement Example

Set trigger to stop motion when force is less than −1 on Z axis.

Force_SetTrigger 3, -1, 0
SpeedS 3
AccelS 5000
Move Place Till Force
FreeFile Function

Returns / reserves a file number that is currently not being used.

Syntax

FreeFile

Return Values

Integer between 30 and 63.

See Also

AOpen, BOpen, ROpen, UOpen, WOpen, Close

FreeFile Function Example

Integer fileNum, i, j

fileNum = FreeFile
WOpen "TEST.DAT" As #fileNum
For i = 0 To 100
    Print #fileNum, i
Next i
Close #fileNum

fileNum = FreeFile
ROpen "TEST.DAT" As #fileNum
For i = 0 To 100
    Input #fileNum, j
    Print "data = ", j
Next i
Close #fileNum
Function...Fend Statement

A function is a group of program statements which includes a Function statement as the first statement and an Fend statement as the last statement.

Syntax

```
Function funcName [(argList)] [As type]
  statements
Fend
```

Parameters

- **funcName**: The name which is given to the specific group of statements bound between the Function and Fend instructions. The function name must contain alphanumeric characters and may be up to 64 characters in length. Underscores are also allowed.
- **argList**: Optional. List of variables representing arguments that are passed to the Function procedure when it is called. Multiple variables are separated by commas.

The arglist argument has the following syntax:

```
[ {ByRef | ByVal} ] varName [( )] As type
```

- **ByRef**: Optional. Specify ByRef when you refer to the variable to be seen by the calling function. In this case, the argument change in a function can be reflected to the variable of the calling side.
- **ByVal**: Optional. Specify ByVal when you do not want any changes in the value of the variable to be seen by the calling function. This is the default.
- **varName**: Required. Name of the variable representing the argument; follows standard variable naming conventions. If you use an array variable as argument, you should specify ByRef.
- **As type**: Required. You must declare the type of argument.

Return Values

Value whose data type is specified with the As clause at the end of the function declaration.

Description

The Function statement indicates the beginning of a group of SPEL+ statements. To indicate where a function ends we use the Fend statement. All statements located between the Function and Fend statements are considered part of the function.

The Function...Fend combination of statements could be thought of as a container where all the statements located between the Function and Fend statements belong to that function. Multiple functions may exist in one program file.

See Also

Call, Fend, Halt, Quit, Return, Xqt
Function...Fend Example

The following example shows 3 functions which are within a single file. The functions called task2 and task3 are executed as background tasks while the main task called main executes in the foreground.

Function main
  Xq 2, task2 'Execute task2 in background
  Xq 3, task3 'Execute task3 in background
  '....more statements here
Fend

Function task2
  Do
    On 1
    On 2
    Off 1
    Off 2
  Loop
Fend

Function task3
  Do
    On 10
    Wait 1
    Off 10
  Loop
Fend
GetCurrentUser$ Function

Returns the current EPSON RC+ user.

Syntax
   GetCurrentUser$

Return Values
   String containing the current user logID.

Note
   This command will only work if the Security option is active.

See Also
   LogIn Statement

GetCurrentUser$ Function Example

   String currUser$
   
   currUser$ = GetCurrentUser$
GetRobotInsideBox Function

Returns a robot which is in the approach check area.

Syntax
GetRobotInsideBox ( AreaNum )

Parameters
AreaNum Integer value (1 ~ 15) representing the approach check area you want to return the status for.

Return Values
Return the robot that is in the approach check area specified with AreaNum in bit.
Bit 0 : Robot 1 ........ Bit 15 : Robot 16
If the robot doesn’t configure the approach check area, bit is always 0.
For example, Robot 1, Robot 3 are in the approach check area, bit 0, bit 2 will be On and 3 will be returned.

See Also
Box, InsideBox

GetRobotInsideBox function Example
The following program uses the GetRobotInsideBox function.
Wait for the status that no robots are in the approach check area.

Function WaitNoBox
    Wait GetRobotInsideBox(1) = 0

Wait for the status that Robot 2 is only one in the approach check area.

Function WaitInBoxRobot2
    Wait GetRobotInsideBox(1) = &H2

The following program uses the GetRobotInsideBox function in the parallel processing of the motion command. When a robot is in the specific approach check area while it is running, it turns ON the I/O. One robot is connected to the controller in this case.

Function Main
    Motor On
    Power High
    Speed 30; Accel 30, 30

    Go P1 !D0; Wait GetRobotInsideBox(1) = 1; On 1!

Fend

Note
D0 must be described.
GetRobotInsidePlane Function

Returns a robot which is in the approach check plane.

Syntax

GetRobotInsidePlane ( PlaneNum )

Parameters

PlaneNum Integer value (1 ~ 15) representing the approach check plane you want to return the status for.

Return Values

Returns the number of the robot that is in the approach check plane specified with PlaneNum in bit.

- Bit 0 : Robot 1 ........ Bit 15 : Robot 16
- If the robot doesn't configure the approach check plane, it always returns bit 0.
- For example, Robot 1, Robot 3 are in the approach check plane, bit 0, bit 2 will be On and 3 will be returned.

See Also

InsidePlane, Plane

GetRobotInsidePlane function Example

The following program uses the GetRobotInsidePlane function.

Wait for the status that no robots are in the approach check plane.

```plaintext
Function WaitNoPlane

Wait GetRobotInsidePlane(1) = 0
```

Wait for the status Robot 2 is only one in the approach check plane.

```plaintext
Function WaitInPlaneRobot2

Wait GetRobotInsidePlane(1) = &H2
```

The following program uses the GetRobotInsidePlane function in the parallel processing of the motion command. When a robot is in the specific approach check plane while it is running, it turns ON the I/O. One robot is connected to the controller in this case.

```plaintext
Function Main

Motor On
Power High
Speed 30; Accel 30, 30

Go P1 !D0; Wait GetRobotInsidePlane(1) = 1; On 1!

Fend
```

Note

D0 must be described.
Global Statement

Declares variables with the global scope. Global variables can be accessed from anywhere.

Syntax

\[
\text{Global} \ [ \text{Preserve} \ ] \ data\text{Type} \ var\text{Name} \ [(\text{subscripts})] \ [, \ var\text{Name} [(\text{subscripts})], ...]
\]

Parameters

<table>
<thead>
<tr>
<th>Preserve</th>
<th>If Preserve is specified, then the variable retains its values. The values are cleared by project changes. If Preserve is omitted, the variable doesn’t retain its values.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>dataType</strong></td>
<td>Data type including Boolean, Integer, Long, Real, Double, Byte, or String.</td>
</tr>
<tr>
<td><strong>varName</strong></td>
<td>Optional. Name. Names may be up to 32 characters in length.</td>
</tr>
<tr>
<td><strong>subscripts</strong></td>
<td>Optional. Dimensions of an array variable; up to 3 dimensions may be declared. The subscripts syntax is as follows (ubound1, [ubound2], [ubound3]) ubound1, ubound2, ubound3 each specify the maximum upper bound for the associated dimension. The elements in each dimension of an array are numbered from 0 to the upper bound value. The total available number of array elements for global variables is 10000 for strings and 100000 for all other types. The total available number of array elements for global preserve variables is 400 for strings and 4000 for all other types. To calculate the total elements used in an array, use the following formula. (If a dimension is not used, substitute 0 for the ubound value.) ( \text{total elements} = (\text{ubound1} + 1) \times (\text{ubound2} + 1) \times (\text{ubound3} + 1) )</td>
</tr>
</tbody>
</table>

Description

Global variables are variables which can be used in more than 1 file within the same project. They are cleared whenever a function is started from the Run window or Operator window unless they are declared with the Preserve option.

When declared in Preserve option, the variable retains the value at turning off the controller.

Global Preserve variables can be used with the VB Guide option.

It is recommended that global variable names begin with a "g_" prefix to make it easy to recognize globals in a program. For example:

Global Long g_PartsCount

See Also

Boolean, Byte, Double, Integer, Long, Real, String
Global Statement

Global Statement Example
The following example shows 2 separate program files. The first program file defines some global variables and initializes them. The second file then uses these global variables.

FILE1 (MAIN.PRG)
Global Integer status1
Global Real numsts

Function Main
Integer I

    status1 = 10

The following example shows 2 separate program files. The first program file defines some global variables and initializes them. The second file then also uses these global variables.

FILE1 (MAIN.PRG)

Global Integer g_Status
Global Real g_MaxValue

Function Main

    g_Status = 10
    g_MaxValue = 1.1
    .
    .

Fend

FILE2 (TEST.PRG)

Function Test

    Print "status1 = , g_Status
    Print "MaxValue = , g_MaxValue
    .
    .

Fend
Go Statement

Moves the arm using point to point motion from the current position to the specified point or X,Y,Z,U, V, W position. The Go instruction can move any combination of 1-6 joints at the same time.

Syntax

```
Go destination [CP] [LJM [orientationFlag]] [searchExpr] ![...!] [SYNC]
```

Parameters

- **destination**: The target destination of the motion using a point expression.
- **CP**: Optional. Specifies continuous path motion.
- **LJM**: Optional. Convert the target destination using LJM function.
- **orientationFlag**: Optional. Specifies a parameter that selects an orientation flag for LJM function.
- **searchExpr**: Optional. A Till or Find expression.
  - **Till**: 
    - `Till Sw(expr) = {On | Off}`
  - **Find**: 
    - `Find Sw(expr) = {On | Off}`
- **SYNC**: Optional. Parallel Processing statements can be added to execute I/O and other commands during motion.

Description

Go simultaneously moves all joints of the robot arm using point to point motion. The destination for the Go instruction can be defined in a variety of ways:
- Using a specific point to move to. For example: `Go P1`.
- Using an explicit coordinate position to move to. For example: `Go XY(50, 400, 0, 0)`.
- Using a point with a coordinate offset. For example: `Go P1 +X(50)`.
- Using a point but with a different coordinate value. For example: `Go P1 :X(50)`.

The path is not predictable because the each joint interpolates between the current point and the target point. Be careful of the interference with peripherals.

The Speed instruction determines the arm speed for motion initiated by the Go instruction. The Accel instruction defines the acceleration.

With CP parameter, the arm can accelerate for the next motion command while the arm starts decelerating to a stop. In this case, the arm is not positioned at the target point.

With LJM parameter, the arm moves to the point into where the target point is converted using LJM function, with the current point as reference point.

```
Go LJM (P1, Here,1)
```

can be

```
Go P1 LJM 1
```

At this point, the original point data P1 does not change.

LJM parameter is available for the 6-axis and RS series robots.

When using **orientationFlag** with the default value, it can be omitted.

```
Go P1 LJM
```
**Notes**

**Difference between Go and Move**

The Move instruction and the Go instruction each cause the robot arm to move. However, the primary difference between the 2 instructions is that the Go instruction causes point to point motion where as the Move instruction causes the arm to move in a straight line. The Go instruction is used when the user is primarily concerned with the orientation of the arm when it arrives on point. The Move instruction is used when it is important to control the path of the robot arm while it is moving.

**Difference between Go and Jump**

The Jump instruction and the Go instruction each cause the robot arm to move in a point to point type fashion. However, the JUMP instruction has 1 additional feature. Jump causes the robot end effector to first move up to the LimZ value, then in a horizontal direction until it is above the target point, and then finally down to the target point. This allows Jump to be used to guarantee object avoidance and more importantly to improve cycle times for pick and place motions.

**Proper Speed and Acceleration Instructions with Go**

The Speed and Accel instructions are used to specify the speed and acceleration of the manipulator during motion caused by the Go instruction. Pay close attention to the fact that the Speed and Accel instructions apply to point to point type motion (like that for the Go instruction) while linear and circular interpolation motion uses the SpeedS and AccelS instructions.

**Using Go with the Optional Till Modifier**

The optional Till modifier allows the user to specify a condition to cause the robot to decelerate to a stop at an intermediate position prior to completing the motion caused by the Go instruction. If the Till condition is not satisfied, the robot travels to the target position. The Go with Till modifier can be used in 2 ways as described below:

1. **Go with Till Modifier**
   Checks if the current Till condition becomes satisfied. If satisfied, this command completes by decelerating and stopping the robot at an intermediate position prior to completing the motion caused by the Go instruction.

2. **Go with Till Modifier, Sw(Input bit number) Modifier, and Input Condition**
   This version of the Go with Till modifier allows the user to specify the Till condition on the same line with the Go instruction rather than using the current definition previously defined for Till. The condition specified is simply a check against one of the inputs. This is accomplished through using the Sw instruction. The user can check if the input is On or Off and cause the arm to stop based on the condition specified. This feature works almost like an interrupt where the motion is interrupted (stopped) once the Input condition is met. If the input condition is never met during the robot motion then the arm successfully arrives on the point specified by destination.

**Using Go with the Optional Find Modifier**

The optional Find modifier allows the user to specify a condition to cause the robot to record a position during the motion caused by the Go instruction. The Go with Find modifier can be used in 2 ways as described below:

1. **Go with Find Modifier**
   Checks if the current Find condition becomes satisfied. If satisfied, the current position is stored in the special point FindPos.

2. **Go with Find Modifier, Sw(Input bit number) Modifier, and Input Condition**
   This version of the Go with Find modifier allows the user to specify the Find condition on the same line with the Go instruction rather than using the current definition previously defined for Find. The condition specified is simply a check against one of the inputs. This is accomplished through using the Sw instruction. The user can check if the input is On or Off and cause the current position to be stored in the special point FindPos.

**Go Instruction Always Decelerates to a Stop**

The Go instruction always causes the arm to decelerate to a stop prior to reaching the final destination of the move.
Potential Errors

Attempt to Move Outside of Robots Work Envelope
When using explicit coordinates with the Go instruction, you must make sure that the coordinates defined are within the robot's valid work envelope. Any attempt to move the robot outside of the valid work envelope will result in an error.

See Also

!...! Parallel Processing, Accel, Find, Jump, Move, Pass, Pn= (Point Assignment), Pulse, Speed, Sw, Till

Go Example

The example shown below shows a simple point to point move between points P0 and P1 and then moves back to P0 in a straight line. Later in the program the arm moves in a straight line toward point P2 until input #2 turns on. If input #2 turns On during the Move, then the arm decelerates to a stop prior to arriving on point P2 and the next program instruction is executed.

Function sample

```plaintext
Integer i
Home
Go P0
Go P1
For i = 1 to 10
  Go P(i)
Next i
Go P2 Till Sw(2) = On
If Sw(2) = On Then
  Print "Input #2 came on during the move and"
  Print "the robot stopped prior to arriving on"
  Print "point P2."
Else
  Print "The move to P2 completed successfully."
  Print "Input #2 never came on during the move."
EndIf
Fend
```

Some syntax examples from the command window are shown below:

```
>Go Here +X(50)           ' Move only in the X direction 50 mm from the current position
>Go P1                    ' Simple example to move to point P1
>Go P1 :U(30)             ' Move to P1 but use +30 as the position for the U joint to move to
>Go P1 /L                 ' Move to P1 but make sure the arm ends up in lefty position
>Go XY(50, 450, 0, 30)    ' Move to position X=50, Y=450, Z=0, U=30
```

<Another Coding Example>

```
Till Sw(1) = Off And Sw(2) = On ' Specifies Till conditions for inputs 1 & 2
Go P1 Till                      ' Stop if current Till condition
Go P2 Till Sw(2) = On           ' defined on previous line is met
Go P3 Till                      ' Stop if Input Bit 2 is On
                                ' Stop if current Till condition defined on
                                ' previous line is met
```
**GoSub** transfers program control to a subroutine. Once the subroutine is complete, program control returns back to the line following the **GoSub** instruction which initiated the subroutine.

**Syntax**

```
GoSub { label }
{ label: }
statements
Return
```

**Parameters**

- **label**

When the user specifies a label, the program execution will jump to the line on which this label resides. The label can be up to 32 characters in length. However, the first character must be an alphabet character (not numeric).

**Description**

The **GoSub** instruction causes program control to branch to the user specified statement label. The program then executes the statement on that line and continues execution through subsequent line numbers until a Return instruction is encountered. The Return instruction then causes program control to transfer back to the line which immediately follows the line which initiated the **GoSub** in the first place. (i.e. the **GoSub** instruction causes the execution of a subroutine and then execution returns to the statement following the **GoSub** instruction.) Be sure to always end each subroutine with Return. Doing so directs program execution to return to the line following the **GoSub** instruction.

**Potential Errors**

- **Branching to Non-Existent Statement**
  
  If the **GoSub** instruction attempts to branch control to a non-existent label then an Error 3108 will be issued.

- **Return Found Without GoSub**
  
  A Return instruction is used to "return" from a subroutine back to the original program which issued the **GoSub** instruction. If a Return instruction is encountered without a **GoSub** having first been issued then an Error 2383 will occur. A stand alone Return instruction has no meaning because the system doesn't know where to Return to.

**See Also**

- GoTo, OnErr, Return
GoSub Statement Example
The following example shows a simple function which uses a GoSub instruction to branch to a label and execute some I/O instructions then return.

Function main
  Integer var1, var2

  GoSub checkio 'GoSub using Label
  On 1
  On 2
  Exit Function

checkio: 'Subroutine starts here
  var1 = In(0)
  var2 = In(1)
  If var1 = 1 And var2 = 1 Then
    On 1
  Else
    Off 1
  EndIf
  Return 'Subroutine ends here
Fend
GoTo Statement

The **GoTo** instruction causes program control to branch unconditionally to a designated statement label.

### Syntax

**GoTo** { *label* }

### Parameters

- **label**: Program execution will jump to the line on which the label resides. The label can be up to 32 characters. However, the first character must be an alphabetic character (not numeric).

### Description

The **GoTo** instruction causes program control to branch to the user specified label. The program then executes the statement on that line and continues execution from that line on. **GoTo** is most commonly used for jumping to an exit label because of an error.

### Notes

**Using Too Many GoTo's**

Please be careful with the **GoTo** instruction since using too many **GoTo**'s in a program can make the program difficult to understand. The general rule is to try to use as few **GoTo** instructions as possible. Some **GoTo**'s are almost always necessary. However, jumping all over the source code through using too many **GoTo** statements is an easy way to cause problems.

### See Also

- GoSub, OnErr

### GoTo Statement Example

The following example shows a simple function which uses a GoTo instruction to branch to a line label.

```plaintext
Function main
    If Sw(1) = Off Then
        GoTo mainAbort
    EndIf
    Print "Input 1 was On, continuing cycle"
    .
    Exit Function

mainAbort:
    Print "Input 1 was OFF, cycle aborted!"
Fend
```
Halt Statement

Temporarily suspends execution of a specified task.

Syntax

Halt taskIdentifier

Parameters

taskIdentifier

- Task name or integer expression representing the task number.
- A task name is the function name used in an Xqt statement or a function started from the Run window or Operator window. If an integer expression is used, the range is from 1 to 16 for normal tasks and from 257 to 261 for trap tasks.

Description

Halt temporarily suspends the task being executed as specified by the task name or number.

To continue the task where it was left off, use Resume. To stop execution of the task completely, use Quit. To display the task status, click the Task Manager Icon on the EPSON RC+ Toolbar to run the Task manager.

Halt also stops the task when the specified task is NoPause task, NoEmgAbort task (special task using NoPause or NoEmgAbort at Xqt), trap tasks, or the background tasks. However, stopping these tasks needs enough consideration. Normally, Halt is not recommended for the special task.

See Also

Quit, Resume, Xqt

Halt Statement Example

The example below shows a function named “flicker” that is started by Xqt, then is temporarily stopped by Halt and continued again by Resume.

```plaintext
Function main
  Xqt flicker   'Execute flicker function
  Do
    Wait 3       'Execute task flicker for 3 seconds
    Halt flicker
    Wait 3       'Halt task flicker for 3 seconds
    Resume flicker
  Loop
Fend

Function flicker
  Do
    On 1
    Wait 0.2
    Off 1
    Wait 0.2
  Loop
Fend
```
Hand Statement

Sets the hand orientation of a point.

Syntax
(1) Hand point, [Lefty | Righty]
(2) Hand

Parameters
point Pnumber or P(expr) or point label.
Lefty | Righty Hand orientation.

Return Values
When both parameters are omitted, the hand orientation is displayed for the current robot position.
If Lefty | Righty is ommited, the hand orientation for the specified point is displayed.

See Also
Elbow, Hand Function, J4Flag, J6Flag, Wrist, J1Flag, J2Flag

Hand Statement Example

Hand P0, Lefty
Hand pick, Righty
Hand P(myPoint), myHand

P1 = -364.474, 120.952, 469.384, 72.414, 1.125, -79.991

Hand P1, Righty
Go P1

Hand P1, Lefty
Go P1
Hand Function

Returns the hand orientation of a point.

Syntax

Hand [[point]]

Parameters

point Optional. Point expression. If point is omitted, then the hand orientation of the current robot position is returned.

Return Values

1 Righty (/R)
2 Lefty (/L)

See Also

Elbow, Wrist, J4Flag, J6Flag, J1Flag, J2Flag

Hand Function Example

Print Hand(pick)
Print Hand(P1)
Print Hand
Print Hand(P1 + P2)
Here Statement

Teach a robot point at the current position.

Syntax
Here point

Parameters
point Pnumber or P(expr) or point label.

Note
The Here statement and Parallel Processing
You cannot use both of the Here statement and parallel processing in one motion command like this:
Go Here :Z(0) ! D10; MemOn 1 !
Be sure to change the program like this:
P999 = Here
Go P999 Here :Z(0) ! D10; MemOn 1 !

See Also
Here Function

Here Statement Example
Here P1
Here pick
Here Function

Returns current robot position as a point.

Syntax
Here

Return Values
A point representing the current robot position.

Description
Use Here to retrieve the current position of the current manipulator.

See Also
Here Statement

Here Function Example

P1 = Here
Hex$ Function

Returns a string representing a specified number in hexadecimal format.

Syntax

\[ \text{Hex$}(\text{number}) \]

Parameters

- \( \text{number} \) Integer expression.

Return Values

Returns a string containing the ASCII representation of the number in hexadecimal format.

Description

\text{Hex$} \) returns a string representing the specified number in hexadecimal format. Each character is from 0-9 or A-F. \text{Hex$} \) is especially useful for examining the results of the \text{Stat} \) function.

See Also

\text{Str$}, \text{Stat}, \text{Val}

\text{Hex$ Function Example}

- \text{print hex$(\text{stat}(0)) \)
  \text{A00000}
- \text{print hex$(255) \)
  \text{FF}

> print hex$(\text{stat}(0))
A00000
> print hex$(255)
FF
Hofs Statement

Displays or sets the offset pulses between the encoder origin and the home sensor.

Syntax

(1) Hofs  j1Pulses, j2Pulses, j3Pulses, j4Pulses, [j5pulses, j6pulses], [j7pulses], [j8pulses, j9pulses]

(2) Hofs

Parameters

j1Pulses  Integer expression representing joint 1 offset pulses.

j2Pulses  Integer expression representing joint 2 offset pulses.

j3Pulses  Integer expression representing joint 3 offset pulses.

j4Pulses  Integer expression representing joint 4 offset pulses.

j5Pulses  For 6 axis robots. Integer expression representing joint 5 offset pulses.

j6Pulses  For 6 axis robots. Integer expression representing joint 6 offset pulses.

j7Pulses  For 7 axis robots. Integer expression representing joint 7 offset pulses.

j8Pulses  For additional S axis. Integer expression representing joint 8 (additional S axis) offset pulses.

j9Pulses  For additional T axis. Integer expression representing joint 9 (additional T axis) offset pulses.

Return Values

Displays current Hofs values when used without parameters.

Description

Hofs displays or sets the home position offset pulses. Hofs specifies the offset from the encoder 0 point (Z phase) to the mechanical 0 point.

Although the robot motion control is based on the zero point of the encoder mounted on each joint motor, the encoder zero point may not necessarily match the robot mechanical zero point. The Hofs offset pulse correction pulse is used to carry out a software correction to the mechanical 0 point based on the encoder 0 point.

Note

Hofs Values SHOULD NOT be Changed unless Absolutely Necessary

The Hofs values are correctly specified prior to delivery. There is a danger that unnecessarily changing the Hofs value may result in position errors and unpredictable motion. Therefore, it is strongly recommended that Hofs values not be changed unless absolutely necessary.

To Automatically Calculate Hofs Values

To have Hofs values automatically calculated, move the arm to the desired calibration position, and execute Calib. The controller then automatically calculates Hofs values based on the CalPls pulse values and calibration position pulse values.

Saving and Restoring Hofs

Hofs can be saved and restored using the Save and Load commands in the [System Configuration] dialog-[Robot]-[Calibration] from the System Configuration menu.
See Also
Calib, CalPls, Home, Hordr, MCal, SysConfig

Hofs Statement Example
These are simple examples on the monitor window that first sets the joint 1 home offset value to be -545, the joint 2 home offset value to be 514, and the joint 3 and the joint 4 Home offset values to be both 0. It then displays the current home offset values.

> hofs -545, 514, 0, 0

> hofs
-545, 514, 0, 0
>
Hofs Function

Returns the offset pulses used for software zero point correction.

Syntax

\[ \text{Hofs}(\text{jointNumber}) \]

Parameters

\( \text{jointNumber} \)  
Integer expression representing the joint number to retrieve the Hofs value for.  
The additional S axis is 8 and T axis is 9.

Return Values

The offset pulse value (integer value, in pulses).

See Also

Calib, CalPls, Home, Hordr, MCal, SysConfig

Hofs Function Example

This example uses the Hofs function in a program:

```plaintext
Function DisplayHofs
    Integer i
    Print "Hofs settings:"
    For i = 1 To 4
        Print "Joint ", i, " = ", Hofs(i)
    Next i
End
```


Home Statement

Moves the robot arm to the user defined home position.

Syntax

Home

Description

Executes low speed Point to Point motion to the Home (standby) position specified by HomeSet, in the homing order defined by Hordr.

Normally, for SCARA robots (including RS series), the Z joint (J3) returns first to the HomeSet position, then the J1, J2 and J4 joints simultaneously return to their respective HomeSet coordinate positions. The Hordr instruction can change this order of the axes returning to their home positions.

Note

Home Status Output:

When the robot is in its Home position, the controller’s system Home output is turned ON.

Potential Errors

Attempting to Home without HomeSet Values Defined

Attempting to Home the robot without setting the HomeSet values will result in an Error 2228 being issued.

See Also

HomeClr, HomeDef, HomeSet, Hordr

Home Example

The Home instruction can be used in a program such as this:

```plaintext
Function InitRobot
    Reset
    If Motor = Off Then
        Motor On
    EndIf
    Home
EndFunction
```

Or it can be issued from the Command window like this:

```
> home
> 
```
HomeClr Function

Clears the home position definition.

**Syntax**

```
HomeClr
```

**See Also**

HomeDef, HomeSet

**HomeClr Function Example**

This example uses the `HomeClr` function in a program:

```vbs
Function ClearHome
    If HomeDef = True Then
        HomeClr
    EndIf
EndFunction
```
Returns whether home position has been defined or not.

Syntax
HomeDef

Return Values
True if home position has been defined, otherwise False.

See Also
HomeClr, HomeSet

HomeDef Function Example
This example uses the HomeDef function in a program:

```spel
Function DisplayHomeSet
    Integer i

    If HomeDef = False Then
        Print "Home is not defined"
    Else
        Print "Home values:"
        For i = 1 To 4
            Print "J", i, " = ", HomeSet(i)
        Next i
    EndIf
EndFunction
```
HomeSet Statement

Specifies and displays the Home position.

Syntax

(1) HomeSet j1Pulses, j2Pulses, j3Pulses, j4Pulses,
    [j5Pulses, j6Pulses], [j7Pulses], [j8Pulses, j9Pulses]

(2) HomeSet

Parameters

j1Pulses  The home position encoder pulse value for joint 1.
j2Pulses  The home position encoder pulse value for joint 2.
j3Pulses  The home position encoder pulse value for joint 3.
j4Pulses  The home position encoder pulse value for joint 4.
j5Pulses  Optional for 6-axis robots. The home position encoder pulse value for joint 5.
j6Pulses  Optional for 6-axis robots. The home position encoder pulse value for joint 6.
j7Pulses  Optional for Joint type 7-axis robots. The home position encoder pulse value for joint 7.
j8Pulses  Optional for additional S axis. The home position encoder pulse value for joint 8 (additional S axis).
j9Pulses  Optional for additional T axis. The home position encoder pulse value for joint 9 (additional T axis).

Return Values

Displays the pulse values defined for the current Home position when parameters are omitted.

Description

Allows the user to define a new home (standby) position by specifying the encoder pulse values for each of the robot joints.

Potential Errors

Attempting to Home without HomeSet Values Defined:

Attempting to Home the robot without setting the HomeSet values will result in an Error 2228 being issued.

Attempting to Display HomeSet Values without HomeSet Values Defined:

Attempting to display home position pulse values without HomeSet values defined causes an Error 2228.
HomeSet Statement

See Also
Home, Hordr, Mcal, Pls

HomeSet Example
The following examples are done from the monitor window:

> homeset 0,0,0,0  'Set Home position at 0,0,0,0
> homeset
  0 0
  0 0
> home           'Robot homes to 0,0,0,0 position

Using the Pls function, specify the current position of the arm as the Home position.

> homeset Pls(1), Pls(2), Pls(3), Pls(4)
HomeSet Function

Returns pulse values of the home position for the specified joint.

Syntax

HomeSet(jointNumber)

Parameters

jointNumber Integer expression representing the joint number to retrieve the HomeSet value for. The additional S axis is 8 and T axis is 9.

Return Values

Returns pulse value of joint home position. When jointNumber is 0, returns 1 when HomeSet has been set or 0 if not.

See Also

HomeSet Statement

HomeSet Function Example

This example uses the HomeSet function in a program:

Function DisplayHomeSet

    Integer i

    If HomeSet(0) = 0 Then
        Print "HomeSet is not defined"
    Else
        Print "HomeSet values:"
        For i = 1 To 4
            Print "J", i, " = ", HomeSet(i)
        Next i
    EndIf
End


Hordr Statement

Specifies or displays the order of the axes returning to their Home positions.

Syntax

1. Hordr step1, step2, step3, step4, [step5], [step6], [step7], [step8], [step9]
2. Hordr

Parameters

- \textit{step1}: Bit pattern that defines which joints should home during the 1st step of the homing process.
- \textit{step2}: Bit pattern that defines which joints should home during the 2nd step of the homing process.
- \textit{step3}: Bit pattern that defines which joints should home during the 3rd step of the homing process.
- \textit{step4}: Bit pattern that defines which joints should home during the 4th step of the homing process.
- \textit{step5}: Bit pattern that defines which joints should home during the 5th step of the homing process.
- \textit{step6}: Bit pattern that defines which joints should home during the 6th step of the homing process.
- \textit{step7}: Bit pattern that defines which joints should home during the 7th step of the homing process.
- \textit{step8}: Bit pattern that defines which joints should home during the 8th step of the homing process.
- \textit{step9}: Bit pattern that defines which joints should home during the 9th step of the homing process.

Return Values

Displays current Home Order settings when parameters are omitted.

Description

\textit{Hordr} specifies joint motion order for the Home command. (i.e. Defines which joint will home 1st, which joint will home 2nd, 3rd, etc.)

The purpose of the \textit{Hordr} instruction is to allow the user to change the homing order. The homing order is broken into 4, 6, or 9 separate steps, depending on robot type. The user then uses \textit{Hordr} to define the specific joints which will move to the Home position during each step. It is important to realize that more than one joint can be defined to move to the Home position during a single step. This means that all joints can potentially be homed at the same time. For SCARA robots (including RS series, 4 axis robots), it is recommended that the Z joint normally be defined to move to the Home position first (in Step 1) and then allow the other joints to follow in subsequent steps.

The \textit{Hordr} instruction expects that a bit pattern be defined for each of the steps. Each joint is assigned a specific bit. When the bit is set to 1 for a specific step, then the corresponding joint will home. When the bit is cleared to 0, then the corresponding axis will not home during that step. The joint bit patterns are assigned as follows:
Hordr Statement

Joint:  1    2    3    4    5    6    7    8    9
Bit Number:  bit 0  bit 1  bit 2  bit 3  bit 4  bit 5  bit 6  bit 7  bit 8
Binary Code:  &B0001  &B0010  &B0100  &B1000  &B100  &B100  &B100  &B100  &B100

See Also
Home, HomeSet

Hordr Statement Example
Following are some command window examples for SCARA robots (including RS series, 4 axis robots):

This example defines the home order as J3 in the first step, J1 in second step, J2 in third step, and J4 in the fourth step. The order is specified with binary values.

```
>hordr  &B0100, &B0001, &B0010, &B1000
```

This example defines the home order as J3 in the first step, then J1, J2 and J4 joints simultaneously in the second step. The order is specified with decimal values.

```
>hordr  4, 11, 0, 0
```

This example displays the current home order in decimal numbers.

```
>hordr
4, 11, 0, 0
>
```
Hordr Function

Returns Hordr value for a specified step.

Syntax

\[
\text{Hordr}(\text{stepNumber})
\]

Parameters

\text{stepNumber} \quad \text{Integer expression representing which Hordr step to retrieve.}

Return Values

Integer containing the Hordr value for the specified step.

See Also

Home, HomeSet

Hordr Function Example

```plaintext
Integer a
a = Hordr(1)
```
Hour Statement

Displays the accumulated controller operating time.

Syntax

Hour

Description

Displays the amount of time the controller has been turned on and running SPEL. (Accumulated Operating Time) Time is always displayed in units of hours.

See Also

Time

Hour Example

The following example is done from the Command window:

```>
hour
2560
>```
Hour Function

Returns the accumulated controller operating time.

Syntax

Hour

Return Values

Returns accumulated operating time of the controller (real number, in hours).

See Also

Time

Hour Function Example

Print "Number of controller operating hours: ", Hour
If...Then...Else...EndIf Statement

Executes instructions based on a specified condition.

Syntax

(1) If condition Then
    stmtT1
    .
    [Elseif condition Then]
    stmtT1
    .
    [Else]
    stmtF1
    .
    .
EndIf

(2) If condition Then stmtT1 [; stmtT2...]
    [Else stmtF1 [; stmtF2...]]

Parameters

condition Any valid test condition which returns a True (any number besides 0) or False result (returned as a 0). (See sample conditions below)
stmtT1 Executed when the condition is True. (Multiple statements may be put here in a blocked If...Then...Else style.)
stmtF1 Executed when the condition is False. (Multiple statements may be put here in a blocked If...Then...Else style.)

Description

(1) If...Then...Else executes stmtT1, etc. when the conditional statement is True. If the condition is False then stmtF1, etc. are executed. The Else portion of the If...Then...Else instruction is optional. If you omit the Else statement and the conditional statement is False, the statement following the EndIf statement will be executed. For blocked If...Then...Else statements the EndIf statement is required to close the block regardless of whether an Else is used or not.

(2) If...Then...Else can also be used in a non blocked fashion. This allows all statements for the If...Then...Else to be put on the same line. Please note that when using If...Then...Else in a non blocked fashion, the EndIf statement is not required. If the If condition specified in this line is satisfied (True), the statements between the Then and Else are executed. If the condition is not satisfied (False), the statements following Else are executed. The Else section of the If...Then...Else is not required. If there is no Else keyword then control passes on to the next statement in the program if the If condition is False.

The logical output of the conditional statement is any number excluding 1 when it is True, and 0 when it is False.

Notes

Sample Conditions:

a = b : a is equal to b
a < b : b is larger than a
a >= b : a is greater than or equal to b
a <= b : a is not equal to b
a > b : b is smaller than a
a <= b : a is less than or equal to b

Logical operations And, Or and Xor may also be used.
If...Then...Else...EndIf Statement

True in the Conditions:
Constant True is -1 and the type is Boolean, so you need to be careful when using it in a comparing condition with other type variable.

```plaintext
Function main
    Integer i
    i = 3
    If i = True Then
        Print "i=TRUE"
    EndIf
EndFend
```

When you execute the program above, “i=TRUE” is displayed. The judgement of condition including the Boolean type is done with “0" or “non-0". If the value of “i” is not "0", it is considered that the condition is established and “i=TRUE” is displayed.

See Also
Else, Select...Case, Do...Loop

If/Then/Else Statement Example

<Single Line If...Then...Else>
The following example shows a simple function which checks an input to determine whether to turn a specific output on or off. This task could be a background I/O task which runs continuously.

```plaintext
Function main
    Do
        If Sw(0) = 1 Then On 1 Else Off 1
    Loop
EndFend
```

<Blocked If...Then...Else>
The following example shows a simple function which checks a few inputs and prints the status of these inputs

```plaintext
If Sw(0) = 1 Then Print "Input0 ON" Else Print "Input0 OFF"
If Sw(1) = 1 Then
    If Sw(2) = 1 Then
        Print "Input1 On and Input2 ON"
    Else
        Print "Input1 On and Input2 OFF"
    EndIf
Else
    If Sw(2) = 1 Then
        Print "Input1 Off and Input2 ON"
    Else
        Print "Input1 Off and Input2 OFF"
    EndIf
EndIf
```

<Other Syntax Examples>

```plaintext
If x = 10 And y = 3 Then GoTo 50
If test <= 10 Then Print "Test Failed"
If Sw(0) = 1 Or Sw(1) = 1 Then Print "Everything OK"
```
ImportPoints Statement

Imports a point file into the current project for the specified robot.

Syntax

ImportPoints sourcePath, filename, [robotNumber]

Parameters

sourcePath String expression containing the specific path and file to import into the current project. The extension can be .PTS or .PNT (EPSON RC+ 3.x and 4.x format). See ChDisk for the details.

filename String expression containing the specific file to be imported to in the current project for the current robot. The extension must be .PTS. You cannot specify a file path and filename doesn’t have any effect from ChDisk. See ChDisk for the details.

robotNumber Optional. Integer expression that specifies which robot the point file should be associated with. If robotNumber = 0, then the point file is imported as a common point file. If robotNumber is omitted, the current robot number is used.

Description

ImportPoints copies a point file into the current project and adds it to the project files for the specified robot. The point file is then compiled and is ready for loading using the LoadPoints command. If the file already exists for the current robot, it will be overwritten and recompiled.

The point data is stored in the compact flush inside of the controller. Therefore, ImportPoints starts writing into the compact flush. Frequent writing into the compact flush will shorten the compact flush lifetime. We recommend using ImportPoints only for saving the point data.

Potential Errors

File Does Not Exist
If sourcePath does not exist, an error will occur.

A Path Cannot be Specified
If fileName contains a path, an error will occur.

Point file for another robot.
If fileName is a point file for another robot, an error will occur.

See Also
Dir, LoadPoints, Robot, SavePoints

ImportPoints Statement Example

Function main
Robot 1
ImportPoints "c:\mypoints\modell.pts", "robot1.pts"
LoadPoints "robot1.pts"
Fend
In Function

Returns the status of the specified Byte port. Each port contains 8 input channels.

Syntax

\[ \text{In}(\text{bytePortNumber}) \]

Parameters

\textit{bytePortNumber} Integer number representing one eight bit port (one byte).

Return Values

Returns an integer value between 0-255. The return value is 8 bits, with each bit corresponding to 1 input channel.

Description

\textit{In} provides the ability to look at the value of 8 input channels at the same time. The \textit{In} instruction can be used to store the 8 I/O channels status into a variable or it can be used with the \textit{Wait} instruction to Wait until a specific condition which involves more than 1 I/O channel is met.

Since 8 channels are checked at a time, the return values range from 0-255. Please review the chart below to see how the integer return values correspond to individual input channels.

<table>
<thead>
<tr>
<th>Input Channel Result (Using Byte port #0)</th>
<th>Return Value</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>5</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>15</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>255</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input Channel Result (Using Byte port #2)</th>
<th>Return Value</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>On</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>255</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

See Also

\textit{InBCD, MemIn, MemOff, MemOn, MemSw, Off, On, OpBCD, Oport, Out, Sw, Wait}
In Function Example

For the example below lets assume that input channels 20, 21, 22, and 23 are all connected to sensory devices such that the application should not start until each of these devices are returning an On signal indicating everything is OK to start. The program example gets the 8 input channels status of byte port 2 and makes sure that channels 20, 21, 22, and 23 are each On before proceeding. If they are not On (i.e. returning a value of 1) an error message is given to the operator and the task is stopped.

In the program, the variable "var1" is compared against the number 239 because in order for inputs 20, 21, 22, and 23 to all be On, then the result of In(2) will be 240 or larger. (We don't care about Inputs 16, 17, 18, and 19 in this case so any values between 240-255 will allow the program to proceed.)

Function main
Integer var1
var1 = In(2)   'Get 8 input channels status of byte port 2
If var1 > 239 Then
  Go P1
  Go P2
  'Execute other motion statements here
  '.
Else
  Print "Error in initialization!"
  Print "Sensory Inputs not ready for cycle start"
  Print "Please check inputs 20,21,22, and 23 for"
  Print "proper state for cycle start and then"
  Print "start program again"
EndIf
Fend

We cannot set inputs from the command window but we can check them. For the examples shown below, we will assume that the Input channels 1, 5, and 15 are On. All other inputs are Off.

> print In(0)  
  34
> print In(1)  
  128
> print In(2)  
  0
InBCD Function

Returns the input status of 8 inputs using BCD format. *(Binary Coded Decimal)*

**Syntax**

\[ \text{InBCD}(\text{portNumber}) \]

**Parameters**

- `portNumber` Integer number representing one eight bit port (one byte).

**Return Values**

Returns as a Binary Coded Decimal (0-9), the input status of the input port (0-99).

**Description**

The `InBCD` simultaneously reads 8 input lines using the BCD format. The `portNumber` parameter for the `InBCD` instruction defines which group of 8 inputs to read where `portNumber = 0` means inputs 0-7, `portNumber = 1` means inputs 8-15, etc.

The resulting value of the 8 inputs is returned in BCD format. The return value may have 1 or 2 digits between 0 and 99. The 1st digit (or 10's digit) corresponds to the upper 4 outputs of the group of 8 outputs selected by `portNumber`. The 2nd digit (or 1's digit) corresponds to the lower 4 outputs of the group of 8 outputs selected by `portNumber`.

Since valid entries in BCD format range from 0-9 for each digit, every I/O combination cannot be met. The table below shows some of the possible I/O combinations and their associated return values assuming that `portNumber` is 0.

**Input Settings (Input number)**

<table>
<thead>
<tr>
<th>Return Value</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>02</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>03</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>08</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>09</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>10</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>11</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>99</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
</tbody>
</table>

Notice that the Binary Coded Decimal format only allows decimal values to be specified. This means that through using Binary Coded Decimal format it is impossible to retrieve a valid value if all inputs for a specific port are turned on at the same time when using the `InBCD` instruction. The largest value possible to be returned by `InBCD` is 99. In the table above it is easy to see that when 99 is the return value for `InBCD`, all inputs are not on. In the case of a return value of 99, inputs 0, 3, 4, and 7 are On and all the others are Off.
Notes

Difference between InBCD and In

The InBCD and In instructions are very similar in the SPEL+ language. However, there is one major difference between the two. This difference is shown below:
- The InBCD instruction uses the Binary Coded Decimal format for specifying the return value format for the 8 inputs. Since Binary Coded Decimal format precludes the values of &HA, &HB, &HC, &HD, &HE or &HF from being used, all combinations for the 8 inputs cannot be satisfied.
- The In instruction works very similarly to the InBCD instruction except that In allows the return value for all 8 inputs to be used. (i.e. 0-255 vs. 0-99 for InBCD) This allows all possible combinations for the 8 bit input groups to be read.

See Also

In, MemOff, MemOn, MemOut, MemSw, Off, On, OpBCD, Oport, Out, Sw, Wait

InBCD Example

Some simple examples from the Command window are as follows:

Assume that inputs 0, 4, 10, 16, 17, and 18 are all On (The rest of the inputs are Off).

> Print InBCD (0)
11
> Print InBCD (1)
04
> Print InBCD (2)
07
>
Inertia Statement

Specifies load inertia and eccentricity for current robot.

Syntax

\[
\text{Inertia} \ [ \text{loadInertia} \ ] \ [ \text{eccentricity} \ ]
\]

Parameters

- \text{loadInertia} Optional. Real expression that specifies total moment of inertia in kgm\(^2\) around the center of the end effector joint, including end effector and part.
- \text{eccentricity} Optional. Real expression that specifies eccentricity in mm around the center of the end effector joint, including end effector and part.

Return Values

When parameters are omitted, the current Inertia parameters are displayed.

Description

Use the \text{Inertia} statement to specify the total moment of inertia for the load on the end effector joint. This allows the system to more accurately compensate acceleration, deceleration, and servo gains for end effector joint. You can also specify the distance from the center of end effector joint to the center of gravity of the end effector and part using the \text{eccentricity} parameter.

See Also

- Inertia Function

Inertia Statement Example

\[
\text{Inertia} \ 0.02, 1
\]
Inertia Function

Returns inertia parameter value.

Syntax

\texttt{Inertia(paramNumber)}

Parameters

\texttt{paramNumber} Integer expression which can have the following values:

0: Causes function to return 1 if robot supports inertia parameters or 0 if not.
1: Causes function to return load inertia in kgm2.
2: Causes function to return eccentricity in mm.

Return Values

Real value of the specified setting.

See Also

Inertia Statement

Inertia Function Example

\begin{verbatim}
Real loadInertia, eccentricity

loadInertia = Inertia(1)
eccentricity = Inertia(2)
\end{verbatim}
InPos Function

Returns the position status of the specified robot.

Syntax

InPos

Return Values

True if position has been completed successfully, otherwise False.

See Also

CurPos, FindPos, WaitPos

InPos Function Example

Function main

    P0 = XY(0, -100, 0, 0)
    P1 = XY(0, 100, 0, 0)

    Xqt MonitorPosition
    Do
        Jump P0
        Wait .5
        Jump P1
        Wait .5
    Loop

Fend

Function MonitorPosition

    Boolean oldInPos, pos

    Do
        Pos = InPos
        If pos <> oldInPos Then
            Print "InPos = ", pos
        EndIf
        oldInPos = pos
    Loop

Fend
Input Statement

Receives input data from the display device and stored in a variable(s).

Syntax

Input varName [ , varName, varName,... ]

Parameters

varName

Variable name. Multiple variables can be used with the Input command as long as they are separated by commas.

Description

Input receives data from the display device and assigns the data to the variable(s) used with the Input instruction.

When executing the Input instruction, a (?) prompt appears at the display device. After inputting data press the return key (Enter) on the keyboard.

Notes

Rules for Numeric Input

When inputting numeric values and non-numeric data is found in the input other than the delimiter (comma), the Input instruction discards the non-numeric data and all data following that non-numeric data.

Rules for String Input

When inputting strings, numeric and alpha characters are permitted as data.

Other Rules for the Input Instruction

- When more than one variable is specified in the instruction, the numeric data input intended for each variable has to be separated by a comma (",") character.
- Numeric variable names and string variable names are allowed. However, the input data type must match the variable type.

Potential Errors

Number of variables and input data differ

For multiple variables, the number of input data must match the number of Input variable names. When the number of the variables specified in the instruction is different from the number of numeric data received from the keyboard, an Error 2505 will occur.

See Also

Input #, Line Input, Line Input #, Print, String
Input Statement Example

This is a simple program example using Input statement.

```speplib
Function InputNumbers
    Integer A, B, C
    Print "Please enter 1 number"
    Input A
    Print "Please enter 2 numbers separated by a comma"
    Input B, C
    Print "A = ", A
    Print "B = ", B, "C = ", C
End
```

A sample session of the above program running is shown below:
(Use the Run menu or F5 key to start the program)

```
Please enter 1 number
?-10000
Please enter 2 numbers separated by a comma
?25.1, -99
-10000
25.1 -99
B = 25.1 C = -99
>
Input # Statement

Allows string or numeric data to be received from a file, communications port, or database and stored in one or more variables.

Syntax

Input  #portNumber, varName [, varName, varName,... ]

Parameters

#portNumber

The ID number that specifies a file, communication port, database, or device.
The File number can be specified in ROpen, WOpen, and AOpen statements.
Communication port number can be specified in OpenCom (RS-232C) and OpenNet (TCP/IP) statements.
The database number can be specified in OpenDB statement.

Device ID is:
21 RC+
24 TP

varName

Variable name to receive the data.

Description

The Input # instruction receives numeric or string data from the device specified by handle, and assigns the data to the variable(s).

Notes

Rules for Numeric Input

When inputting numeric values and non-numeric data is found in the input other than the delimiter (comma), the Input instruction discards the non-numeric data and all data following that non-numeric data.

Rules for String Input

When inputting strings, numeric and alpha characters are permitted as data.

Maximum data length

This command can handle up to 256 bytes.
However, the target is the database, it can handle up to 4096 bytes.

Other Rules for the Input Instruction

- When more than one variable is specified in the instruction, the numeric data input intended for each variable has to be separated by a comma (",") character or blank (" ").
- When more than one string variable or both of numeric variable and string variable is specified, the numeric data has to be separated by a comma (","), character or blank (" ").
- The input data type must match the variable type.

The following programs are examples to exchange the string variable and numeric variable between the controllers using a communication port.

Sending end (Either pattern is OK.)

Print #PortNum, "$Status", InData, OutData
Print #PortNum, "$Status", ",", InData, OutData

Receiving end

Input #PortNum, Response$, InData, OutData
Input # Statement

Potential Errors

Number of variables and input data differ
When the number of the variables specified in the instruction is different from the number of numeric
data received from the device, an Error 30 will occur.

See Also
Input, Line Input, Line Input #, Print #

Input # Statement Example
This function shows some simple Input # statement examples.

```
Function GetData
  Integer A
  String B$

  OpenCom #1
  Print #1, "Send"
  Input #1, A    'Get a numeric value from Port#1
  Input #1, B$   'Get a string from Port#1
  CloseCom #1
Fend
```
InputBox Statement

Displays a prompt in a dialog box, waits for the operator to input text or choose a button, and returns the contents of the box.

Syntax

\[
\text{InputBox } \text{prompt, title, default, data$}
\]

Parameters

- **prompt**: String expression displayed as a message in the dialog box.
- **title**: String expression displayed in the title bar of the dialog box.
- **default**: String expression displayed in the text box as the default response. If no default is desired, use an empty string ("").
- **data$**: A string variable which will contain what the operator entered. If the operator clicks Cancel, this string will be "@".

Description

InputBox displays the dialog and waits for the operator to click OK or Cancel. data is a string that contains what the operator typed in.

See Also

MsgBox

InputBox Statement Example

This function shows an InputBox example.

```vbscript
Function GetPartName$ As String
    String prompt$, title$, data$
    prompt$ = "Enter part name:" 
    title$ = "Sample Application"
    InputBox prompt$, title$, "", data$
    If data$ <> "@" Then
        GetPartName$ = data$
    EndIf
EndFunction
```

The following picture shows the example output from the InputBox example code shown above.
InReal Function

Returns the input data of 2 words (32 bits) as the floating-point data (IEEE754 compliant) of 32 bits.

Syntax

InReal(WordPortNumber)

Parameter

WordPortNumber Integer expression representing the I/O Input Word.

Return Values

Returns the input port status in Real type number.

Description

From the input word port specified by the word port number, retrieve the 2 input word values as IEEE754 Real type value. Input word label can be used for the word port number parameter. InReal Function cannot be used for the Wait command, or the condition of Till, Find, Sense.

See Also

In, InW, InBCD, Out, OutW, OpBCD, OutReal

InW Function Example

Real realVal

realVal = InReal(0)
InsideBox Function

Returns the check status of the approach check area.

Syntax
InsideBox(AreaNum [, robotNumber | All])

Parameters
AreaNum Integer expression from 1 to 15 representing which approach check area to return status for.

robotNumber Integer value that contains the robot number you want to search.
If omitted, the current robot will be specified.
If you specify All, True is returned if one robot is in the check area.

Return Values
True if the robot end effector approaches the specified approach check area, otherwise False.

Note
You can use the Wait statement with InsideBox to wait for the result of the InsideBox function in EPSON RC+ 5.0, however you cannot in EPSON RC+ 6.0. In this case, use the GetRobotInsideBox function instead of the InsideBox function.

See Also
Box, BoxClr, BoxDef, GetRobotInsideBox, InsidePlane

InsideBox Function Example

The following program checks Robot 1 is in the check area (Box 3) or not.

Function PrintInsideBox
  If InsideBox(3,1) = True Then
    Print ”Inside Box3”
  Else
    Print ”Outside Box3”
  Endif
Endf
InsidePlane Function

Returns the check status of the approach check plane.

Syntax

InsidePlane(PlaneNum [, robotNumber | All])

Parameters

PlaneNum Integer expression from 1 to 15 representing which approach check plane to return status for.

robotNumber Integer value that contains the robot number you want to search.
If omitted, the current robot will be specified.
If you specify All, True is returned if one robot is in the check area.

Return Values

True if the robot end effector approaches the specified approach check plane, otherwise False.

See Also

InsideBox, GetRobotInsidePlane, Plane, PlaneClr, PlaneDef

Note

You can use the Wait statement with InsidePlane to wait for the result of the InsidePlane function in EPSON RC+ 5.0, however you cannot in EPSON RC+ 6.0.
In this case, use the GetRobotInsidePlane function instead of the InsidePlane function.

InsidePlane Function Example

This is an example to check Robot 1 is in the check plane (Plane 3).

Function PrintInsidePlane
  If InsidePlane(3,1) = True Then
    Print "Inside Plane3"
  Else
    Print "Outside Plane3"
  Endif
Endf
InStr Function

Returns position of one string within another.

Syntax

InStr(string, searchString)

Parameters

string String expression to be searched.
searchString String expression to be searched for within string.

Return Values

Returns the position of the search string if the location is found, otherwise -1.

See Also

Mid$

Instr Function Example

Integer pos

pos = InStr("abc", "b")
Int Function

Converts a Real number to Integer. Returns the largest integer that is less than or equal to the specified value.

Syntax

\[
\text{Int}(\text{number})
\]

Parameters

\(\text{number}\) A real number expression.

Return Values

Returns an Integer value of the real number used in \(\text{number}\).

Description

\(\text{Int}(\text{number})\) takes the value of \(\text{number}\) and returns the largest integer that is less than or equal to \(\text{number}\).

Note

For Values Less than 1 (Negative Numbers)

If the parameter \(\text{number}\) has a value of less than 1 then the return value have a larger absolute value than \(\text{number}\). (For example, if number = -1.35 then -2 will be returned.)

See Also

Abs, Atan, Atan2, Cos, Mod, Not, Sgn, Sin, Sqr, Str$, Tan, Val

Int Function Example

Some simple examples from the Command window are as follows:

\[
\begin{align*}
> & \text{Print } \text{Int}(5.1) \\
& 5 \\
> & \text{Print } \text{Int}(0.2) \\
& 0 \\
> & \text{Print } \text{Int}(-5.1) \\
& -6
\end{align*}
\]
Integer Statement

Declares variables of type Integer. (2 byte whole number).

Syntax

```
Integer varName [(subscripts)] [, varName [(subscripts)]]...
```

Parameters

<table>
<thead>
<tr>
<th>varName</th>
<th>Variable name which the user wants to declare as type integer.</th>
</tr>
</thead>
<tbody>
<tr>
<td>subscripts</td>
<td>Optional. Dimensions of an array variable; up to 3 dimensions may be declared. The subscripts syntax is as follows: (ubound1, [ubound2], [ubound3]) ubound1, ubound2, ubound3 each specify the maximum upper bound for the associated dimension. The elements in each dimension of an array are numbered from 0 and the available number of array elements is the upper bound value + 1. When specifying the upper bound value, make sure the number of total elements is within the range shown below:</td>
</tr>
<tr>
<td></td>
<td>Local variable 2000</td>
</tr>
<tr>
<td></td>
<td>Global Preserve variable 4000</td>
</tr>
<tr>
<td></td>
<td>Global variable and module variable 100000</td>
</tr>
</tbody>
</table>

Description

`Integer` is used to declare variables as type integer. Variables of type integer can contain whole numbers with values from -32768 to 32767. Local variables should be declared at the top of a function. Global and module variables must be declared outside of functions.

See Also

Boolean, Byte, Double, Global, Long, Real, String

Integer Statement Example

The following example shows a simple program that declares some variables using `Integer`.

```
Function inttest
    Integer A(10)         'Single dimension array of integer
    Integer B(10, 10)     'Two dimension array of integer
    Integer C(5, 5, 5) 'Three dimension array of integer
    Integer var1, arrayvar(10)
    Integer i
    Print "Please enter an Integer Number"
    Input var1
    Print "The Integer variable var1 = ", var1
    For i = 1 To 5
        Print "Please enter an Integer Number"
        Input arrayvar(i)
        Print "Value Entered was ", arrayvar(i)
    Next i
End
```
InW Function

Returns the status of the specified input word port. Each word port contains 16 input bits.

Syntax

\[ \text{InW}(\text{WordPortNum}) \]

Parameters

\text{WordPortNum} \quad \text{Integer expression representing the I/O Input Word.}

Return Values

Returns the current status of inputs (long integers from 0 to 65535).

See Also

\text{In, Out, OutW}

InW Function Example

\begin{verbatim}
Long word0
word0 = InW(0)
\end{verbatim}
IOLabel$ Function

Returns the I/O label for a specified input or output bit, byte, or word.

Syntax

\[
\text{IOLabel$}(\text{IOType}, \text{IOWidth}, \text{portNumber})
\]

Parameters

- \(\text{IOType}\): Integer expression representing the type of I/O.
  - 0 - Input
  - 1 - Output
  - 2 - Memory

- \(\text{IOWidth}\): Integer expression representing the width of the port: 1(bit), 8(byte), or 16(word).

- \(\text{portNumber}\): Integer expression representing the bit, byte, or word port number to return the label for.

Return Values

String containing the label.

See Also

PLabel$, IONumber

IOLabel$ Function Example

```plaintext
Integer i

For i = 0 To 15
    Print "Input ", i, ": ", IOLabel$(0, 1, i)
Next i
```
IONumber Function

Returns the I/O number of the specified I/O label.

Syntax
IONumber(IOlabel)

Parameters
IOlabel String expression that specifies the standard I/O or memory I/O label.

Return Values
Returns the I/O port number (bit, byte, word) of the specified I/O label. If there is no such I/O label, an error will be generated.

See Also
IOLabel$

IONumber Function Example

Integer IObit

IObit = IONumber("myIO")

IObit = IONumber("Station" + Str$(station) + "InCycle")
J1Angle Statement

Sets the J1Angle attribute of a point.

Syntax
(1) J1Angle point, [ Step ]
(2) J1Angle

Parameters
point Pnumber or P(expr) or point label.
Step Optional. Real value that specifies the set value.

Description
The J1Angle attribute can be used for the RS robot series. It specifies the angle of the Joint 1 when both X and Y coordinate values of a point are "0" (singularity). For other robot series points, J1Angle has no meaning.
If Step is omitted, the J1Angle value for the specified point will be displayed.
If both parameters are omitted, the J1Angle value of the current robot position will be displayed.

See Also
Hand, J1Angle function, J1Flag, J2Flag

J1Angle Example

J1Angle P0, 10.0
J1Angle P(mypoint), 0.0
J1Angle Function

Returns the J1Angle attribute of a point.

Syntax

\[
\text{J1Angle} \left( \text{point} \right)
\]

Parameters

- \text{point}  
  Point expression
  
  Optional. If omitted, returns the J1Angle setting of the current robot position.

Return Values

Returns the angle of Joint 1 when both X and Y coordinate values of a point are “0” (singularity) in a real value. The J1Angle attribute can be used for the RS series.

See Also

Hand, J1Flag, J2Flag

J1Angle function Example

Print \text{J1Angle(pick)}
Print \text{J1Angle(P1)}
Print \text{J1Angle}
J1Flag Statement

Specifies the J1Flag attribute of a point.

Syntax

(1) J1Flag point, [value ]
(2) J1Flag

Parameters

point Pnumber or P(expr) or point label.
value Optional. Integer expression.

0 (/J1F0) J1 range is -90 to +270 degrees
1 (/J1F1) J1 range is from -270 to -90 or +270 to +450 degrees

Return Values

The J1Flag attribute specifies the range of values for joint 1 for one point. If value is omitted, the J1Flag value for the specified point is displayed. When both parameters are omitted, the J1Flag value is displayed for the current robot position.

See Also

Hand, J1Flag Function, J2Flag

J1Flag Statement Example

J1Flag P0, 1
J1Flag P(mypoint), 0
Returns the J1Flag attribute of a point.

Syntax

J1Flag [([point])]

Parameters

point Optional. Point expression. If point is omitted, then the J1Flag setting of the current robot position is returned.

Return Values

0 /J1F0
1 /J1F1

See Also

Hand, J1Flag Statement, J2Flag

J1Flag Function Example

Print J1Flag(pick)
Print J1Flag(P1)
Print J1Flag
Print J1Flag(Pallet(1, 1))
J2Flag Statement

Sets the J2Flag attribute of a point.

Syntax
(1) J2Flag point, [value ]
(2) J2Flag

Parameters
point P number or P(expr) or point label.
value Optional. Integer expression.
0 (J2F0) J2 range is -180 to +180 degrees
1 (J2F1) J2 range is from -360 to -180 or +180 to +360 degrees

Return Values
The J2Flag attribute specifies the range of values for joint 2 for one point. If value is omitted, the J2Flag value for the specified point is displayed. When both parameters are omitted, the J2Flag value is displayed for the current robot position.

See Also
Hand, J1Flag, J2Flag Function

J2Flag Statement Example

J2Flag P0, 1
J2Flag P(mypoint), 0
J2Flag Function

Returns the J2Flag attribute of a point.

Syntax

\[ \text{J2Flag } [\text{point}] \]

Parameters

point Optional. Point expression. If point is omitted, then the J2Flag setting of the current robot position is returned.

Return Values

0 /J2F0
1 /J2F1

See Also

Hand, J1Flag, J2Flag Statement

J2Flag Function Example

Print J2Flag(pick)
Print J2Flag(P1)
Print J2Flag
Print J2Flag(P1 + P2)
Sets the J4Flag attribute of a point.

Syntax
(1) J4Flag point, [value ]
(2) J4Flag

Parameters
point Pnumber or P(expr) or point label.
value Optional. Integer expression.
0 (/J4F0) J4 range is -180 to +180 degrees
1 (/J4F1) J4 range is from -360 to -180 or +180 to +360 degrees

Return Values
The J4Flag attribute specifies the range of values for joint 4 for one point. If value is omitted, the
J4Flag value for the specified point is displayed. When both parameters are omitted, the J4Flag value
is displayed for the current robot position.

See Also
Elbow, Hand, J4Flag Function, J6Flag, Wrist

J4Flag Statement Example

J4Flag P0, 1
J4Flag P(mypoint), 0
J4Flag Function

Returns the J4Flag attribute of a point.

Syntax

\[ \text{J4Flag} \left[ (\text{point}) \right] \]

Parameters

point  Optional. Point expression. If point is omitted, then the J4Flag setting of the current robot position is returned.

Return Values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>/J4F0</td>
</tr>
<tr>
<td>1</td>
<td>/J4F1</td>
</tr>
</tbody>
</table>

See Also

Elbow, Hand, Wrist, J4Flag Statement, J6Flag

J4Flag Function Example

Print J4Flag(pick)
Print J4Flag(P1)
Print J4Flag
Print J4Flag(Pallet(1, 1))
Sets the J6Flag attribute of a point.

Syntax

(1) J6Flag point, [value ]
(2) J6Flag

Parameters

point Pnumber or P(expr) or point label.
value Integer expression.  Range is 0 - 127 (/J6F0 - /J6F127).  J6 range for the specified point
is as follows:

\[-180 \times (value+1) < J6 <= 180 \times value \) and \( 180 \times value < J6 <= 180 \times (value+1) \)

Return Values

The J6Flag attribute specifies the range of values for joint 6 for one point.  If value is omitted, the
J6Flag value for the specified point is displayed.  When both parameters are omitted, the J6Flag value
is displayed for the current robot position.

See Also

Elbow, Hand, J4Flag, J6Flag Function, Wrist

J6Flag Statement Example

J6Flag P0, 1
J6Flag P(mypoint), 0
J6Flag Function

Returns the J6Flag attribute of a point.

Syntax

\[ \text{J6Flag} ([point]) \]

Parameters

point  
Optional. Point expression. If point is omitted, then the J6Flag setting of the current robot position is returned.

Return Values

0 - 127  /J6F0 - /J6F127

See Also

Elbow, Hand, Wrist, J4Flag, J6Flag Statement

J6Flag Function Example

\begin{verbatim}
Print J6Flag(pick)
Print J6Flag(P1)
Print J6Flag
Print J6Flag(P1 + P2)
\end{verbatim}
JA Function

Returns a robot point specified in joint angles.

Syntax

JA (j1, j2, j3, j4, [j5, j6], [j7], [j8, j9])

Parameters

j1 – j9
Real expressions representing joint angles.
For linear joints, specifies in units of mm.
j5 and j6 are for the 6-axis robot and Joint type 6-axis robot.
j7 is for the Joint type 7-axis robot.
j8 and j9 are for the additional ST axis.

Return Values

A robot point whose location is determined by the specified joint angles.

Description

Use JA to specify a robot point using joint angles.

When the points returned from JA function specify a singularity of the robot, the joint angles of the robot
do not always agree with the joint angles supplied to the JA function as arguments during the execution of
a motion command for the points. To operate the robot using the joint angles specified for the JA function,
avoid a singularity of the robot.

For example:

> go ja(0,0,90,0,−90)
> where
WORLD:  X:  0.000 mm  Y:  655.000 mm  Z:  675.000 mm  U:  0.000 deg  V:  -90.000 deg  W:  -90.000 deg
JOINT:  1:  0.000 deg  2:  0.000 deg  3:  0.000 deg  4:  0.000 deg  5:  0.000 deg  6:  0.000 deg
PULSE:  1:        0 pls  2:        0 pls  3:        0 pls  4:        0 pls  5:        0 pls  6:        0 pls

> go ja(0,0,90,0.001,−90)
> where
WORLD:  X:  -0.004 mm  Y:  655.000 mm  Z:  675.000 mm  U:  0.000 deg  V:  -90.000 deg  W:  -89.999 deg
JOINT:  1:  0.000 deg  2:  0.000 deg  3:  0.000 deg  4:  90.000 deg  5:  0.001 deg  6:  -90.000 deg
PULSE:  1:        0 pls  2:        0 pls  3:        0 pls  4:  2621440 pls  5:       29 pls  6: -1638400 pls

See Also

AglToPls, XY

JA Function Example

P10 = JA(60, 30, -50, 45)
Go JA(135, 90, -50, 90)
P3 = JA(0, 0, 0, 0, 0, 0)
Joint Statement

Displays the current position for the robot in joint coordinates.

Syntax
Joint

See Also
Pulse, Where

Joint Statement Example

```
>joint
JOINT:  1:   -6.905 deg 2:   23.437 deg 3:   -1.999 mm  4:  -16.529 deg
>
```
JRange Statement

 Defines the permissible working range of the specified joint in pulses.

 Syntax

 \[
 \text{JRange } \text{jointNumber, lowerLimit, upperLimit}
 \]

 Parameters

 - **jointNumber**: Integer expression between 1 ~ 9 representing the joint for which JRange will be specified. The additional S axis is 8 and T axis is 9.
 - **lowerLimit**: Long integer expression representing the encoder pulse count position for the lower limit range of the specified joint.
 - **upperLimit**: Long integer expression representing the encoder pulse count position for the upper limit range of the specified joint.

 Description

 Defines the permissible working range for the specified joint with upper and lower limits in encoder pulse counts. JRange is similar to the Range command. However, the Range command requires that all joint range limits be set while the JRange command can be used to set each joint working limits individually thus reducing the number of parameters required. To confirm the defined working range, use the Range command.

 Notes

 - **Lower Limits Must Not Exceed Upper Limits**: The Lower limit defined in the JRange command must not exceed the Upper limit. A lower limit in excess of the Upper limit will cause an error, making it impossible to execute a motion command.
 - **Factors Which can Change JRange**: Once JRange values are set they remain in place until the user modifies the values either by the Range or JRange commands. Turning controller power off will not change the JRange joint limit values.

 Maximum and Minimum Working Ranges:

 Refer to the specifications in the Robot manual for maximum working ranges for each robot model since these vary from model to model.

 See Also

 Range, JRange Function

 JRange Statement Example

 The following examples are done from the Command window:

 - \( > \text{JRange } 2, -6000, 7000 \)  'Define the 2nd joint range
 - \( > \text{JRange } 1, 0, 7000 \)  'Define the 1st joint range
JRange Function

Returns the permissible working range of the specified joint in pulses.

Syntax

\[ \text{JRange}(\text{jointNumber}, \text{paramNumber}) \]

Parameters

- **jointNumber**: Specifies reference joint number (integer from 1 ~ 9) by an expression or numeric value.
  - The additional S axis is 8 and T axis is 9.
- **paramNumber**: Integer expression containing one of two values:
  1: Specifies lower limit value.
  2: Specifies upper limit value.

Return Values

- Range setting (integer value, pulses) of the specified joint.

See Also

- Range, JRange Statement

JRange Function Example

```plaintext
Long i, oldRanges(3, 1)

For i = 0 To 3
    oldRanges(i, 0) = JRange(i + 1, 1)
    oldRanges(i, 1) = JRange(i + 1, 2)
Next i
```
JS Function

Jump Sense detects whether the arm stopped prior to completing a Jump, Jump3, or Jump3CP instruction which used a Sense input or if the arm completed the move.

Syntax

JS

Return Values

Returns a True or a False.

- **True**: When the arm was stopped prior to reaching its target destination because a Sense Input condition was met, JS returns a True.
- **False**: When the arm completes the normal move and reaches the target destination as defined in the Jump instruction, JS returns a False.

Description

JS is used in conjunction with the Jump and Sense instructions. The purpose of the JS instruction is to provide a status result as to whether an input condition (as defined by the Sense instruction) is met during motion caused by the Jump instruction or not. When the input condition is met, JS returns a True. When the input condition is not met and the arm reaches the target position, JS returns a False.

JS is simply a status check instruction and does not cause motion or specify which Input to check during motion. The Jump instruction is used to initiate motion and the Sense instruction is used to specify which Input (if any) to check during Jump initiated motion.

Note

**JS Works only with the Most Recent Jump, Jump3, Jump3CP Instruction:**

JS can only be used to check the most recent Jump instruction's input check (which is initiated by the Sense instruction.) Once a 2nd Jump instruction is initiated, the JS instruction can only return the status for the 2nd Jump instruction. The JS status for the first Jump is gone forever. So be sure to always do any JS status check for Jump instructions immediately following the Jump instruction to be checked.

See Also

JT, Jump, Jump3, Jump3CP, Sense

JS Function Example

Function SearchSensor As Boolean
    Sense Sw(5) = On
    Jump P0
    Jump P1 Sense
    If JS = TRUE Then
        Print "Sensor was found"
        SearchSensor = TRUE
    EndIf
EndIf
Fend

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JT Function

Returns the status of the most recent Jump, Jump3, or Jump3CP instruction for the current robot.

Syntax

JT

Return Values

JT returns a long with the following bits set or clear:

- Bit 0: Set to 1 when rising motion has started or rising distance is 0.
- Bit 1: Set to 1 when horizontal motion has started or horizontal distance is 0.
- Bit 2: Set to 1 when descent motion has started or descent distance is 0.
- Bit 16: Set to 1 when rising motion has completed or rising distance is 0.
- Bit 17: Set to 1 when horizontal motion has completed or horizontal distance is 0.
- Bit 18: Set to 1 when descent motion has completed or descent distance is 0.

Description

Use JT to determine the status of the most recent Jump command that was stopped before completion by Sense, Till, abort, etc.

See Also

JS, Jump, Jump3, Jump3CP, Sense, Till

JT Function Example

```plaintext
Function SearchTill As Boolean

    Till Sw(5) = On
    Jump P0
    Jump P1 Till
    If JT And 4 Then
        Print "Motion stopped during descent"
        SearchTill = TRUE
    EndIf
EndFunction
```
**JTran Statement**

Perform a relative move of one joint.

**Syntax**

\[ \text{JTran} \ jointNumber, \ distance \]

**Parameters**

- **jointNumber**: Integer expression representing which joint to move.
  The additional S axis is 8 and T axis is 9.
- **distance**: Real expression representing the distance to move in degrees for rotational joints or millimeters for linear joints.

**Description**

Use **JTran** to move one joint a specified distance from the current position.

**See Also**

- Go, Jump, Move, Ptran

**JTran Statement Example**

\[ \text{JTran} \ 1, \ 20 \]
Jump Statement

Moves the arm from the current position to the specified destination point using point to point motion by first moving in a vertical direction up, then horizontally and then finally vertically downward to arrive on the final destination point.

Syntax

Jump  \textit{destination}  [C\textit{archNumber}]  [LimZ \textit{zLimit}]  [CP]  [searchExpr]  [!] [SYNC]

Parameters

- \textit{destination}: The target destination of the motion using a point expression.
- \textit{archNumber}: Optional. The arch number (\textit{archNumber}) specifies which Arch Table entry to use for the Arch type motion caused by the Jump instruction. \textit{archNumber} must always be proceeded by the letter C. (Valid entries are C0-C7.)
- \textit{zLimit}: Optional. This is a Z limit value which represents the maximum position the Z joint will travel to during the Jump motion. This can be thought of as the Z Height Ceiling for the Jump instruction. Any valid Z joint Coordinate value is acceptable.
- CP: Optional. Specifies continuous path motion.
- \textit{searchExpr}: Optional. A Sense, Till or Find expression.
  - Sense | Till | Find
  - Sense Sw\textit{expr} = \{On | Off\}
  - Till Sw\textit{expr} = \{On | Off\}
  - Find Sw\textit{expr} = \{On | Off\}
- \textit{!...!}: Optional. Parallel Processing statements can be added to the Jump instruction to cause I/O and other commands to execute during motion.
- SYNC: Reserves a motion command. The robot will not move until SyncRobots is executed.

Description

**Jump** moves the arm from the current position to \textit{destination} using what is called Arch Motion. Jump can be thought of as 3 motions in 1. For example, when the Arch table entry defined by \textit{archNumber} is 7, the following 3 motions will occur.

1) The move begins with only Z-joint motion until it reaches the Z joint height calculated by the Arch number used for the Jump command.
2) Next the arm moves horizontally (while still moving upward in Z) towards the target point position until the upper Z Limit (defined by LimZ ) is reached. Then the arm begins to move downward in the Z direction (while continuing X, Y and U joint motion) until the final X, and Y and U joint positions are reached.
3) The Jump instruction is then completed by moving the arm down with only Z-joint motion until the target Z-joint position is reached.

The coordinates of \textit{destination} (the target position for the move) must be taught previously before executing the Jump instruction. The coordinates cannot be specified in the Jump instruction itself. Acceleration and deceleration for the Jump is controlled by the Accel instruction. Speed for the move is controlled by the Speed instruction.

\textit{archNumber} Details

The Arch for the Jump instruction can be modified based on the \textit{archNumber} value optionally specified with the Jump instruction. This allows the user to define how much Z to move before beginning the X, Y, and U joint motion. (This allows the user to move the arm up and out of the way of parts, feeders and other objects before beginning horizontal motion.) Valid \textit{archNumber} entries for the Jump instruction are between C0-C7. The Arch table entries for C0-C6 are user definable with the Arch instruction. However, C7 is a special Arch entry which always defines what is called Gate Motion. Gate Motion means that the robot first moves Z all the way to the coordinate defined by LimZ before beginning any X, Y, or U joint motion. Once the LimZ Z limit is reached, X, Y and U joint motion begins. After the X, Y, and U joints each reaches its final destination position, then the Z joint can begin
moving downward towards the final Z joint coordinate position as defined by destination (the target point). Gate Motion looks as follows:

LimZ Details
LimZ zLimit specifies the upper Z coordinate value for the horizontal movement plane in the current local coordinate system. The specified arch settings can cause the X, Y, and U joints to begin movement before reaching LimZ, but LimZ is always the maximum Z height for the move. When the LimZ optional parameter is omitted, the previous value specified by the LimZ instruction is used for the horizontal movement plane definition.

It is important to note that the LimZ zLimit height limit specification is the Z value for the local robot coordinate system. It is not the Z value for Arm or Tool. Therefore take the necessary precautions when using tools or hands with different operating heights.

Sense Details
The Sense optional parameter allows the user to check for an input condition or memory I/O condition before beginning the final Z motion downward. If satisfied, this command completes with the robot stopped above the target position where only Z motion is required to reach the target position. It is important to note that the robot arm does not stop immediately upon sensing the Sense input modifier.

Till Details
The optional Till qualifier allows the user to specify a condition to cause the robot to decelerate to a stop prior to completing the Jump. The condition specified is simply a check against one of the I/O inputs or one of the memory I/O. This is accomplished through using either the Sw or MemSw function. The user can check if the input is On or Off and cause the arm to decelerate and stop based on the condition specified.

The Stat function can be used to verify whether the Till condition has been satisfied and this command has been completed, or the Till condition has not been satisfied and the robot stopped at the target position.
Notes

Jump cannot be executed for 6-axis robots
Use Jump3 or Jump3CP for 6-axis robots.

Jump Motion trajectory changes depending on motion and speed
Jump motion trajectory is comprised of vertical motion and horizontal motion. It is not a continuous path trajectory. The actual Jump trajectory of arch motion is not determined by Arch parameters alone. It also depends on motion and speed.

Always use care when optimizing Jump trajectory in your applications. Execute Jump with the desired motion and speed to verify the actual trajectory.

When speed is lower, the trajectory will be lower. If Jump is executed with high speed to verify an arch motion trajectory, the end effector may crash into an obstacle with lower speed.

In a Jump trajectory, the depart distance increases and the approach distance decreases when the motion speed is set high. When the fall distance of the trajectory is shorter than the expected, lower the speed and/or the deceleration, or change the fall distance to be larger.

Even if Jump commands with the same distance and speed are executed, the trajectory is affected by motion of the robot arms. As a general example, for a SCARA robot the vertical upward distance increases and the vertical downward distance decreases when the movement of the first arm is large. When the vertical fall distance decreases and the trajectory is shorter than the expected, lower the speed and/or the deceleration, or change the fall distance to be larger.

Omitting archNumber Parameter
If the archnum optional parameter is omitted, the default Arch entry for use with the Jump instruction is C7. This will cause Gate Motion, as described above.

Difference between Jump and Jump3, Jump3CP
The Jump3 and Jump3CP instructions can be used for 6-axis robots. On the other hand the Jump instruction cannot be used for 6-axis robots. For SCARA robots (including RS series), using the Jump instruction shortens the joint motion time for depart and approach motion. The depart and approach motions in Jump3 can be executed along the Z axis and in other directions.

Difference between Jump and Go
The Go instruction is similar to Jump in that they both cause Point to Point type motion, however there are many differences. The most important difference is that the Go instruction simply causes Point to Point motion where all joints start and stop at the same time (they are synchronized). Jump is different since it causes vertical Z movement at the beginning and end of the move. Jump is ideal for pick and place type applications.

Decelerating to a Stop With the Jump Instruction
The Jump instruction always causes the arm to decelerate to a stop prior to reaching the destination point.

Proper Speed and Acceleration Instructions with Jump:
The Speed and Accel instructions are used to specify the speed and acceleration of the robot during Jump motion. Pay close attention to the fact that Speed and Accel apply to point to point type motion (Go, Jump, Etc.). while linear and circular interpolated motion instructions such as Move or Arc use the SpeedS and AccelS instructions. For the Jump instruction, it is possible to separately specify speeds and accelerations for Z joint upward motion, horizontal travel including U joint rotation, and Z joint downward motion.
Pass function of Jump

When the CP parameter is specified for Jump with 0 downward motion, the Jump horizontal travel does not decelerate to a stop but goes on smoothly to the next PTP motion.

When the CP parameter is specified for a PTP motion command right before a Jump with 0 upward motion, the PTP motion does not decelerate to a stop but connects smoothly with the Jump horizontal travel.

This is useful when you want to replace the horizontal travel of Jump (a PTP motion) with several PTP motions.

(Example)

Go P1
Jump P2 :Z(-50) C0 LimZ -50 CP
Go P3 :Z(0) CP
Jump P4 C0 LimZ 0

Potential Errors

LimZ Value Not High Enough

When the current arm position of the Z joint is higher than the value set for LimZ and a Jump instruction is attempted, an Error 4005 will occur.

See Also

Accel, Arc, Arch, Go, JS, JT, LimZ, Point Expression, Pulse, Sense, Speed, Stat, Till

Jump Statement Example

The example shown below shows a simple point to point move between points P0 and P1 and then moves back to P0 using the Jump instruction. Later in the program the arm moves using the Jump instruction. If input #4 never goes high then the arm starts the approach motion and moves to P1. If input #4 goes high then the arm does not execute the approach motion.

Function jumptest

Home
Go P0
Go P1
Sense Sw(4) = On
Jump P0 LimZ -10
Jump P1 LimZ -10 Sense 'Check input #4
If Js(0) = 1 Then
Print "Input #4 came on during the move and"
Print "the robot stopped prior to arriving on"
Print "point P1."
Else
Print "The move to P1 completed successfully."
Print "Input #4 never came on during the move."
EndIf
Fend

< Jump P10+X50 C0 LimZ-20 Sense !D50;On 0;D80;On 1!
Jump3, Jump3CP Statements

3D gate motion. Jump3 is a combination of two CP motions and one PTP motion. Jump3CP is a combination of three CP motions.

Syntax

(1) Jump3  
\[\text{depart, approach, destination } [\text{archNumber}] [\text{CP}] [\text{LJM} [\text{orientationFlag}]] [\text{searchExpr}] [\text{SYNC}]\]

(2) Jump3CP  
\[\text{depart, approach, destination } [\text{ROT}] [\text{archNumber}] [\text{CP}] [\text{LJM} [\text{orientationFlag}]] [\text{searchExpr}] [\text{SYNC}]\]

Parameters

- **depart**  
The departure point above the current position using a point expression.
- **approach**  
The approach point above the destination position using a point expression.
- **destination**  
The target destination of the motion using a point expression.
- **ROT**  
Optional. Decides the speed/acceleration/deceleration in favor of tool rotation.
- **archNumber**  
Optional. The arch number \((\text{archNumber})\) specifies which Arch Table entry to use for the Arch type motion caused by the Jump instruction. \(\text{archNumber}\) must always be proceeded by the letter C. (Valid entries are C0-C7.)
- **CP**  
Optional. Specifies continuous path motion.
- **LJM**  
Optional. Converts the target destination using LJM function.
- **orientationFlag**  
Optional. Specifies a parameter that selects an orientation flag for LJM function.
- **searchExpr**  
Optional. A Sense, Till or Find expression.
  
  Sense | Till | Find
  Sense \(\text{Sw}(\text{expr})\) = \{On | Off\}
  Till \(\text{Sw}(\text{expr})\) = \{On | Off\}
  Find \(\text{Sw}(\text{expr})\) = \{On | Off\}

- **!!**  
Optional. Parallel Processing statements can be added to the Jump instruction to cause I/O and other commands to execute during motion.
- **SYNC**  
Reserves a motion command. The robot will not move until \text{SyncRobots} is executed.

Description

Moves the arm from the current position to the destination point with 3D gate motion. 3D gate motion consists of depart motion, span motion, and approach motion. The depart motion form the current position to the depart point is always CP motion. The span motion from the depart point to the start approach point is PTP motion in Jump3, and the CP motion in Jump3CP. The approach motion from the starting approach point to the target point is always CP motion.
Arch motion is achieved by specifying the arch number. The arch motion for Jump3, Jump3CP is as shown in the figure below. For arch motion to occur, the Depart distance must be greater than the arch upward distance and the Approach distance must be greater than the arch downward distance.

Jump3CP uses the SpeedS speed value and AccelS acceleration and deceleration values. Refer to Using Jump3CP with CP below on the relation between the speed/acceleration and the acceleration/deceleration. If, however, the ROT modifier parameter is used, Jump3CP uses the SpeedR speed value and AccelR acceleration and deceleration values. In this case SpeedS speed value and AccelS acceleration and deceleration value have no effect.

Usually, when the move distance is 0 and only the tool orientation is changed, an error will occur. However, by using the ROT parameter and giving priority to the acceleration and the deceleration of the tool rotation, it is possible to move without an error. When there is not an orientational change with the ROT modifier parameter and movement distance is not 0, an error will occur.

Also, when the tool rotation is large as compared to move distance, and when the rotation speed exceeds the specified speed of the manipulator, an error will occur. In this case, please reduce the speed or append the ROT modifier parameter to give priority to the rotational speed/acceleration/deceleration.

Notes

LimZ does not affect Jump3 and Jump3CP
LimZ has no affect on Jump3 or Jump3CP since the span motion is not necessarily perpendicular to the Z axis of the coordinate system.

Jump3 span motion is PTP (point to point)
It is difficult to predict Jump3 span motion trajectory. Therefore, be careful that the robot doesn't collide with peripheral equipment and that robot arms don't collide with the robot.

Using Jump3, Jump3CP with CP
The CP parameter causes the arm to move to destination without decelerating or stopping at the point defined by destination. This is done to allow the user to string a series of motion instructions together to cause the arm to move along a continuous path while maintaining a specified speed throughout all the motion. The Jump3 and Jump3CP instructions without CP always cause the arm to decelerate to a stop prior to reaching the point destination.

Pass function of Jump3
When the CP parameter is specified for Jump3 with 0 approach motion, the Jump3 span motion does not decelerate to a stop but goes on smoothly to the next PTP motion.
Jump3, Jump3CP Statements

When the CP parameter is specified for a PTP motion command right before Jump3 with 0 depart motion, the PTP motion does not decelerate to a stop but connects smoothly with the Jump3 span motion. This is useful when you want to replace the span motion of Jump3 (a PTP motion) with several PTP motions.

Pass function of Jump3CP

When the CP parameter is specified for Jump3CP with 0 approach motion, the Jump3CP span motion does not decelerate to a stop but goes on smoothly to the next CP motion. When the CP parameter is specified for a CP motion command right before Jump3CP with 0 depart motion, the CP motion does not decelerate to a stop but connects smoothly with the Jump3CP span motion. This is useful when you want to replace the span motion of Jump3CP (a CP motion) with several CP motions.

(Example 1)

Jump3 P1,P2,P2 CP
Go P3,P4 CP
Jump3 P4,P5,P5+tlz(50)

(Example 2)

Jump3CP P1,P2,P2 CP
Move P3,P4 CP
Jump3CP P4,P5,P5+tlz(50)

Using Jump3, Jump3CP with LJM

With LJM parameter, the program using LJM function can be more simple. For example, the following four-line program

\[
P11 = \text{LJM}(P1, \text{Here}, 2) \\
P12 = \text{LJM}(P2, P11, 2) \\
P13 = \text{LJM}(P3, P12, 2) \\
\text{Jump3} P11, P12, P13
\]

can be... the one-line program.

Jump3 P1, P2, P3 LJM 2

LJM parameter is available for 6-axis and RS series robots. Jump3CP span motion is straight line (CP) motion and it cannot switch the wrist orientation along the way. Therefore, do not use the \textit{orientationFlag} (LJM 1) of LJM function which is able to switch the wrist orientation.

Caution for Arch motion

Jump3 Motion trajectory changes depending on motion and speed

Jump3 motion trajectory is comprised of depart, span, and approach motions. It is not a continuous path trajectory. The actual Jump3 trajectory of arch motion is not determined by \textbf{Arch} parameters alone. It also depends on motion and speed.

Always use care when optimizing Jump3 trajectory in your applications. Execute Jump3 with the desired motion and speed to verify the actual trajectory.

When speed is lower, the trajectory will be lower. If Jump3 is executed with high speed to verify an arch motion trajectory, the end effector may crash into an obstacle with lower speed.

In a Jump3 trajectory, the depart distance increases and the approach distance decreases when the motion speed is set high. When the approach distance of the trajectory is shorter than the expected, lower the speed and/or the deceleration, or change the approach distance to be larger.

Even if Jump commands with the same distance and speed are executed, the trajectory is affected by motion of the robot arms.
Potential acceleration errors

When the majority of depart (approach) motion uses the same joint as the span motion

An acceleration error may occur during an arch motion execution by the Jump3 and Jump3CP commands. This error is issued frequently when the majority of the motion during depart or approach uses the same joint as the span motion. To avoid this error, reduce the acceleration/deceleration speed of the span motion using Accel command for Jump3 or using AccelS command for Jump3CP. Depending on the motion and orientation of the robot, it may also help to reduce the acceleration and deceleration of the depart motion (approach motion) using the AccelS command.

See Also
Accel, Arc, Arch, Go, JS, JT, Point Expression, Pulse, Sense, Speed, Stat, Till

Jump3 Statement Example

` 6 axis robot motion which works like Jump of SCARA robot
  Jump3  Here :Z(100), P3 :Z(100), P3

  Depart and approach use Z tool coordinates
  Jump3  Here -TLZ(100), P3 -TLZ(100), P3

  Depart uses base Z and approach uses tool Z
  Jump3  Here +Z(100), P3 -TLZ(100), P3

  Example for the depart motion from P1 in Tool 1 and the approach motion to P3 in Tool 2
  Arch 0,20,20
  Tool 1
  Go P1

  P2 = P1 -TLZ(100)
  Tool 2
  Jump3 P2, P3-TLZ(100), P3 C0`
LatchEnable Statement

This function does not work with EPSON RC+ 6.0 Ver.6.2.0.

Enable / Disable the latch function for the robot position by the R-I/O input.

Syntax

```
LatchEnable { On | Off }
```

Parameters

<table>
<thead>
<tr>
<th>On</th>
<th>Off</th>
</tr>
</thead>
<tbody>
<tr>
<td>On : Enables the latch function of the robot position.</td>
<td></td>
</tr>
<tr>
<td>Off : Disables the latch function of the robot position.</td>
<td></td>
</tr>
</tbody>
</table>

Result

When the parameter is omitted, displays that the current latch function is ON or OFF.

Description

Enables / Disables the latch function for the robot position using the trigger input signals connected to the R-I/O. It latches the robot position with the first trigger input after you enable the latch function. To repeatedly latch the robot position, execute LatchEnable Off and then execute LatchEnable On again. To use the command repeatedly, it needs at least 60 ms interval for each command processing time but you do not need to consider the command executing time.

Note

Before enabling the latch function, set the trigger input port and trigger signal logic using SetLatch.

See Also

LatchPos Function, LatchState Function, SetLatch

LatchEnable Example

```plaintext
Function main
    SetLatch 24, SETLATCH_TRIGGERMODE_LEADINGEDGE
    LatchEnable On  ' Enables the latch function
    Go P1
    Wait LatchState = True  ' Wait a trigger
    Print LatchPos  ' Display the latched position
    LatchEnable Off  ' Disable the latch function
Fend
```
LatchState Function

This function does not work with EPSON RC+ 6.0 Ver.6.2.0.

Returns the latch state of robot position using the R-I/O.

Syntax
LatchState

Return Values
Returns True when the robot position has been latched, False when the latch is not finished. When confirmed the latch completion, acquires the lached position information by LatchPos Function.

See Also
LatchEnable, LatchPos Function, SetLatch, Wait

LatchState Function Example

Function main
  SetLatch 24, SETLATCH_TRIGGERMODE_LEADINGEDGE
  LatchEnable On                           ' Enables the latch function
  Go P1
  Wait LatchState = True                   ' Wait a trigger
  Print LatchPos                           ' Display the latched position
  LatchEnable Off                          ' Disable the latch function
Fend
LatchPos Function

This function does not work with EPSON RC+ 6.0 Ver.6.2.0.

Returns the robot position latched using the R-I/O input signal.

Syntax
LatchPos

Return Values
Returns the robot position, according to the Tool and Arm settings at function call, latched using the R-I/O input signal in point data. Executing this function needs approx. 15 msec for processing.

See Also
LatchEnable, LatchState Function, SetLatch

LatchPos Function Example

Function main
SetLatch 24, SETLATCH_TRIGGERMODE_LEADINGEDGE
LatchEnable On ' Enables the latch function
Go P1
Wait LatchState = True ' Wait a trigger
Print LatchPos ' Display the latched position
LatchEnable Off ' Disable the latch function
Fend

To assign the return value of LatchPos to the point data:

P2 = LatchPos
LCase$ Function

Returns a string that has been converted to lowercase.

Syntax

LCase$(string)

Parameters

string A valid string expression.

Return Values

The converted lower case string.

See Also

LTrim$, Trim$, RTrim$, UCase$

LCase$ Function Example

str$ = "Data"
str$ = LCase$(str$)  ' str$ = "data"
Left$ Function

Returns a substring from the left side of a string expression.

Syntax

\[ \text{Left$}(\text{string}, \text{count}) \]

Parameters

- **string**: String expression from which the leftmost characters are copied.
- **count**: The number of characters to copy from \text{string} starting with the leftmost character.

Return Values

- Returns a string of the leftmost \textit{number} characters from the character string specified by the user.

Description

\textbf{Left$} returns the leftmost \textit{number} characters of a string specified by the user. \textbf{Left$} can return up to as many characters as are in the character string.

See Also

- Asc, Chr$, InStr, Len, Mid$, Right$, Space$, Str$, Val

Left$ Function Example

The example shown below shows a program which takes a part data string as its input and parses out the part number, part name, and part count.

```vbscript
Function ParsePartData(DataIn$ As String, ByRef PartNum$ As String, ByRef PartName$ As String, ByRef PartCount As Integer)
    Integer pos
    String temp$

    pos = Instr(DataIn$, ",")
    PartNum$ = \textbf{Left$}(DataIn$, pos - 1)

    DataIn$ = Right$(DataIn$, Len(DataIn$) - pos)
    pos = Instr(DataIn$, ",")
    PartName$ = \textbf{Left$}(DataIn$, pos - 1)

    PartCount = Val(Right$(DataIn$, Len(DataIn$) - pos))
End Function
```

Some other example results from the Left$ instruction from the Command window.

```vbscript
> Print \textbf{Left$}("ABCDEFG", 2)
AB
> Print \textbf{Left$}("ABC", 3)
ABC
```
Len Function

Returns the number of characters in a character string.

Syntax

\[ \text{Len}(\text{string}) \]

Parameters

\text{string} \quad \text{String expression.}

Return Values

Returns an integer number representing the number of characters in the string \text{string} which was given as an argument to the \text{Len} instruction.

Description

\text{Len} returns an integer number representing the number of characters in a string specified by the user. \text{Len} will return values between 0-255 (since a string can contain between 0-255 characters).

See Also

\text{Asc}, \text{Chr$}, \text{InStr}, \text{Left$}, \text{Mid$}, \text{Right$}, \text{Space$}, \text{Str$}, \text{Val}

Len Function Example

The example shown below shows a program which takes a part data string as its input and parses out the part number, part name, and part count.

\begin{verbatim}
Function ParsePartData(DataIn$ As String, ByRef PartNum$ As String, ByRef PartName$ As String, ByRef PartCount As Integer)
    Integer pos
    String temp$
    pos = Instr(DataIn$, ",")
    PartNum$ = Left$(DataIn$, pos - 1)
    DataIn$ = Right$(DataIn$, Len(DataIn$) - pos)
    pos = Instr(DataIn$, ",")
    PartName$ = Left$(DataIn$, pos - 1)
    PartCount = Val(Right$(DataIn$, Len(DataIn$) - pos))
Fend
\end{verbatim}

Some other example results from the \text{Len} instruction from the command window.

\begin{verbatim}
> ? \text{len}("ABCDEFG")
7
> ? \text{len}("ABC")
3
> ? \text{len}("")
0
> 
\end{verbatim}
LimitTorque Statement

Sets / returns the upper torque value in High power mode.

Syntax

1. LimitTorque AllMax
2. LimitTorque j1Max, j2Max, j3Max, j4Max
3. LimitTorque j1Max, j2Max, j3Max, j4Max, j5Max, j6Max
4. LimitTorque

Parameters

AllMax Specify the percentage of high power torque upper limit value for all axes to the maximum momentary torque of each axis by an integer number

j #n Max Specify the percentage of high power torque upper limit value for axis #n to the maximum momentary torque of axis #n by an integer number

Return Values

Returns the current LimitTorque value if the parameter is omitted.

Description

Sets the upper limit value of torque in high power mode. Normally, the maximum torque is set and there is no need to change this setting value. This statement is useful to restrict the torque not to exceed which is necessary for the specific motion in order to reduce damage to the manipulator and equipment caused by collision with peripherals.

The upper limit value is a measured peak torque in specific motion measured by PTRQ with allowance considering the variation added (approximately 10%).

The torque lower than the upper limit for Low power mode cannot be set by this command. The smallest values vary for models and joints. Display the setting value and confirm the actual upper limit value after setting the value.

In any of the following cases, LimitTorque becomes the default value.

- Controller startup
- Motor On
- SFree, SLock, or Brake is executed
- Reset or Reset Error is executed
- Task end by STOP switch or Quit All

Note

Too low LimitTorque setting

LimitTorque limits the torque for the specific motion as the upper limit value to operate the manipulator with the set acceleration/deceleration regardless of the torque size necessary for the motion. As a result of this, if the motion requires larger torque than the set upper limit value, the robot may not be able to operate properly and cause vibrational motion, noise, or position deviation and overrun. Make sure to measure PTRQ before using the torque control. If the above problems occur, set the upper limit value larger and adjust the value so that the manipulator can operate properly.
LimitTorque Statement

See Also
LimitTorque Function, Power, PTrq, RealTorque

LimitTorque Example
Following is the example which operates the manipulator with the maximum torque of Joint #1 at 80 %.

```plaintext
Function main
  Motor On
  Power high
  Speed 100; Accel 100,100
  LimitTorque 80,100,100,100  \n  \n  \n  Jump P1  \n  \n  Fend
```

*Restricts the maximum torque of Joint #1 to 80 %
*Executes the Jump motion
LimitTorque Function

Returns the setting value of LimitTorque command.

Syntax

LimitTorque(jointNumber)

Parameters

jointNumber Integer expression ranging from 1 to 9.
Additional S axis is 8, and T axis is 9.

Return Values

Returns an integer number representing the setting value of LimitTorque command.

See Also

LimitTorque

Len Function Example

Print LimitTorque(1) 'Displays the LimitTorque value of Joint #1.
LimZ Statement

Determines the default value of the Z joint height for Jump commands.

Syntax
(1) LimZ zLimit
(2) LimZ

Parameters
zLimit A coordinate value within the movable range of the Z joint.

Return Values
Displays the current LimZ value when parameter is omitted.

Description
LimZ determines the maximum Z joint height which the arm move to when using the Jump instruction, wherein the robot arm raises on the Z joint, moves in the X-Y plane, then lowers on the Z joint. LimZ is simply a default Z joint value used to define the Z joint ceiling position for use during motion caused by the Jump instruction. When a specific LimZ value is not specified in the Jump instruction, the last LimZ setting is used for the Jump instruction.

Note
Resetting LimZ to 0
Restarting the controller, or executing the SFree, SLock, Motor On commands will initialize LimZ to 0.

LimZ Value is Not Valid for Arm, Tool, or Local Coordinates:
LimZ Z joint height limit specification is the Z joint value for the robot coordinate system. It is not the Z joint value for Arm, Tool, or Local coordinates. Therefore take the necessary precautions when using tools or end effectors with different operating heights.

LimZ does not affect Jump3 and Jump3CP
LimZ has no affect on Jump3 or Jump3CP since the span motion is not necessarily perpendicular to the Z axis of the coordinate system.

See Also
Jump

LimZ Statement Example
The example below shows the use of LimZ in Jump operations.

```plaintext
Function main
LimZ -10  ' Set the default LimZ value
Jump P1  ' Move up to Z=-10 position for Jump
Jump P2 LimZ -20  ' Move up to Z=-20 position for Jump
Jump P3  ' Move up to Z=-10 position for Jump
Fend
```
Returns the current LimZ setting.

Syntax
LimZ

Return Values
Real number containing the current LimZ setting.

See Also
LimZ Statement

LimZ Function Example

Real savLimz
savLimz = LimZ
LimZ -25
Go pick
LimZ savLimz
Line Input Statement

Reads input data of one line and assigns the data to a string variable.

Syntax

Line Input stringVar$  

Parameters

stringVar$  A string variable name. (Remember that the string variable must end with the $ character.)

Description

Line Input reads input data of one line from the display device and assigns the data to the string variable used in the Line Input instruction. When the Line Input instruction is ready to receive data from the user, it causes a "?" prompt to be displayed on the display device. The input data line after the prompt is then received as the value for the string variable. After inputting the line of data press the [ENTER] key.

See Also

Input, Input #, Line Input#, ParseStr

Line Input Example

The example below shows the use of Line Input.

```
Function Main
  String A$
  Line Input A$  'Read one line input data into A$
  Print A$
End
```

Run the program above using the F5 key or Run menu from EPSON RC+ main screen. A resulting run session may be as follows:

```
?A, B, C
A, B, C
```
Line Input # Statement

Reads data of one line from a file, communication port, database, or the device.

Syntax

Line Input  #portNumber, stringVar$

Parameters

portNumber  The communications handle or the device ID. Communication handles can be specified in OpenCom (RS232) and OpenNet (TCP/IP) statements.

Device ID integers are as follows.
21 RC+
23 OP
24 TP

stringVar$  A string variable. (Remember that string variables must end with a $ character.)

Description

Line Input # reads string data of one line from the device specified with the portNumber parameter, and assigns the data to the string variable stringVar$.

See Also

Input, Input #, Line Input

Line Input # Example

This example receives the string data from the communication port number 1, and assigns the data to the string variable A$.

Function littest
    String a$
    Print #1, "Please input string to be sent to robot"
    Line Input #1, a$
    Print "Value entered = ", a$
    Fend

Example:

Function littest
    String a$
    Print #1, "Please input string to be sent to robot"
    Line Input #1, a$
    Print "Value entered = ", a$
    Fend
LJM Function

Returns the point data with the orientation flags converted to enable least joint motion when moving to a specified point based on the reference point.

Syntax

\[
\text{LJM} \ (\text{Point}, \ [\text{refPoint}, \ [\text{orientationFlag}]])
\]

Parameters

Point
Specifies point data.

refPoint
Specifies the reference point data. When this is omitted, the reference point is the current position (Here).

orientationFlag
- 6-axis robot
  1: Converts the wrist orientation (Wrist Flag), J4Flag or J6Flag. (default)
  2: Converts the J4Flag or J6Flag.
- RS series
  1: Converts the hand orientation (Hand Flag), J1Flag or J2Flag. (default)
  2: Converts the hand orientation (Hand Flag), J1Flag or J2Flag.
  Prevents the U axis from moving out of motion range at flag convert.

Description

When the 6-axis robot moves to a point calculated by such as pallet or relative offsets, the wrist part may rotate to an unintended direction. The point calculation above does not depend on robot models and results in motion without converting the required point flag. LJM function can be used to convert the point flag to prevent the unintended wrist rotation.

In the same way, when the RS series robot moves to a point calculated by such as pallet or relative offsets, Arm #1 may rotate to an unintended direction. LJM function can be used to convert the point flag to prevent the unintended rotation of Arm #1.

In addition, the U axis of an RS series robot may go out of motion range when the orientation flag is converted, which will cause an error.
To prevent this error, the LJM function adjusts the U axis target angle so that it is inside the motion range. This is available when “2” is selected for \text{orientationFlag}.

Returns the specified point for all robots except the 6-axis and RS series robot.

Note

The reference point omission and Parallel Processing

You cannot use both of the parallel point omission and parallel processing in one motion command like this:

\[
\text{Go LJM(P10)} \ ! \ D10; \ \text{MemOn 1} !
\]

Be sure to change the program like this:

\[
P999 = \text{Here} \\
\text{Go LJM(P10,P999)} \ ! \ D10; \ \text{MemOn 1} !
\]

See Also

Pallet
LJM Function Example

Function main
Integer i, j

P0 = XY(300, 300, 300, 90, 0, 180)
P1 = XY(200, 280, 150, 90, 0, 180)
P2 = XY(200, 330, 150, 90, 0, 180)
P3 = XY(-200, 280, 150, 90, 0, 180)

Pallet 1, P1, P2, P3, 10, 10

Motor On
Power High
Speed 50; Accel 50, 50
SpeedS 1000; AccelS 5000

Go P0
P11 = P0 - TLZ(50)

For i = 1 To 10
  For j = 1 To 10
    'Specify points
    P10 = P11
    P12 = Pallet(1, i, j)
P11 = P12 - TLZ(50)

    'Converting each point to LJM
    P10 = LJM(P10)
P11 = LJM(P11, P10)
P12 = LJM(P12, P11)

    'Execute motion
    Jump3 P10, P11, P12 C0
  Next
Next

Fend

Function main2

P0 = XY(300, 300, 300, 90, 0, 180)
P1 = XY(400, 0, 150, 90, 0, 180)
P2 = XY(400, 500, 150, 90, 0, 180)
P3 = XY(-400, 0, 150, 90, 0, 180)
Pallet 1, P1, P2, P3, 10, 10

Motor On
Power High
Speed 50; Accel 50, 50
SpeedS 1000; AccelS 5000

Go P0

Do
  'Specify points
  P10 = Here - TLZ(50)
P12 = Pallet(1, Int(Rnd(9)) + 1, Int(Rnd(9)) + 1)
P11 = P12 - TLZ(50)

  If TargetOK(P11) And TargetOK(P12) Then
    'Point check
    'Converting each point to LJM
    P10 = LJM(P10)
P11 = LJM(P11, P10)
P12 = LJM(P12, P11)
    'Execute motion
    Jump3 P10, P11, P12 C0
    Loop
  EndIf

Loop
Fend
LoadPoints Statement

Loads a point file into the point memory area for the current robot.

Syntax

LoadPoints fileName [, Merge]

Parameters

fileName
String expression containing the specific file to load into the current robot's point memory area. The extension must be .PTS. The file must exist in the current project for the current robot.
You cannot specify a file path and fileName doesn’t have any effect from ChDisk. See ChDisk for the details.

Merge
Optional. If supplied, then the current points are not cleared before loading the new points. Points in the file are added to the current points. If a point exists in the file, it will overwrite the point in memory.

Description

LoadPoints loads point files from disk into the main memory area of the controller for the current robot.
Use Merge to combine point files. For example, you could have one main point file that includes common points for locals, parking, etc in the range 0 - 100. Then use Merge to load other point files for each part being run without clearing the common points. The range could be 101 - 999.

Potential Errors

A Path Cannot be Specified
If fileName contains a path, an error will occur. Only a file name in the current project can be specified.

File Does Not Exist
If fileName does not exist, an error will occur.

Point file not for the current robot
If fileName is not a point file for the current robot, the following error will be issued: Point file not found for current robot. To correct this, add the Point file to the robot in the Project editor, or execute SavePoints or ImportPoints.

See Also

Dir, ImportPoints, Robot, SavePoints

LoadPoints Statement Example

Function main
  ' Load common points for the current robot
  LoadPoints "R1Common.pts"

  ' Merge points for part model 1
  LoadPoints "R1Modell.pts", Merge

  Robot 2
  ' Load point file for the robot 2
  LoadPoints "R2Modell.pts"

  Fend
Local Statement

Defines and displays local coordinate systems.

Syntax

(1) **Local localNumber, ( pLocal1 : pBase1 ), ( pLocal2 : pBase2 ), [ { L | R } ], [ BaseU ]
(2) **Local localNumber, pCoordinateData
(3) **Local localNumber, pOrigin, [pXaxis], [pYaxis], [ { X | Y } ]
(4) **Local localNumber

Parameters

*localNumber*  
The local coordinate system number. A total of 15 local coordinate systems (of the integer value from 1 to 15) may be defined.

*pLocal1*, *pLocal2*  
Point variables with point data in the local coordinate system.

*pBase1*, *pBase2*  
Point variables with point data in the base coordinate system.

*L | R*  
Optional. Align local origin to left (first) or right (second) base points.

*BaseU*  
Optional. When supplied, U axis coordinates are in the base coordinate system. When omitted, U axis coordinates are in the local coordinate system.

*pCoordinateData*  
Point data representing the coordinate data of the origin and direction.

*pOrigin*  
Integer expression representing the origin point using robot coordinate system.

*pXaxis*  
Optional. Integer expression representing a point along the X axis using robot coordinate system if X alignment is specified.

*pYaxis*  
Optional. Integer expression representing a point along the Y axis using robot coordinate system if Y alignment is specified.

*X | Y*  
If X alignment is specified, then pXaxis lies on the X axis of the local. The Y axis and Z axis are calculated to be orthogonal to X in the plane that is created by the 3 local points. If Y alignment is specified, then pYaxis lies on the Y axis of the local. The X axis and Z axis are calculated to be orthogonal to Y in the plane that is created by the 3 local points.

Description

(1) **Local** defines a local coordinate system by specifying 2 points, *pLocal1* and *pLocal2*, contained in it that coincide with two points, *pBase1* and *pBase2*, contained in the base coordinate system.

Example:

Local 1, (P1:P11), (P2:P12)

P1 and P2 are local coordinate system points. P11 and P12 are base coordinate system points.

If the distance between the two specified points in the local coordinate system is not equal to that between the two specified points in the base coordinate system, the XY plane of the local coordinate system is defined in the position where the midpoint between the two specified points in the local coordinate system coincides with that between the two specified points in the base coordinate system.

Similarly, the Z axis of the local coordinate system is defined in the position where the midpoints coincide with each other.
(2) Defines a local coordinate system by specifying the origin and axis rotation angles with respect to the base coordinate system.

Example:
- Local 1, XY(x, y, z, u)
- Local 1, XY(x, y, z, u, v, w)
- Local 1, P1

(3) Defines a 3D local coordinate system by specifying the origin point, x axis point, and y axis point. Only the X, Y, and Z coordinates of each point are used. The U, V, and W coordinates are ignored. When the X alignment parameter is used, then pXaxis is on the X axis of the local and only the Z coordinate of pYaxis is used. When the Y alignment parameter is used, then pYaxis is on the Y axis of the local and only the Z coordinate of pXaxis is used.

Example:
- Local 1, P1, P2, P3
- Local 1, P1, P2, P3, X
- Local 1, P1, P2, P3, Y

(4) Displays the specified local settings.

Using L and R parameters
While Local basically uses midpoints for positioning the axes of your local coordinate system as described above, you can optionally specify left or right local by using the L and R parameters.

Left Local
Left local defines a local coordinate system by specifying point pLocal1 corresponding to point pBase1 in the base coordinate system (Z axis direction is included.)

Right Local
Right local defines a local coordinate system by specifying point pLocal2 corresponding to point pBase2 in the base coordinate system. (Z axis direction is included.)

Using the BaseU parameter
If the BaseU parameter is omitted, then the U axis of the local coordinate system is automatically corrected in accordance with the X and Y coordinate values of the specified 4 points. Therefore, the 2 points in the base coordinate system may initially have any U coordinate values.

It may be desired to correct the U axis of the local coordinate system based on the U coordinate values of the two points in the base coordinate system, rather than having it automatically corrected (e.g. correct the rotation axis through teaching). To do so, supply the BaseU parameter.

See Also
ArmSet, Base, ECPSets, LocalClr, TLSets, Where
Local Examples

Here are some examples from the command window:

Left aligned local:

```plaintext
> p1 = 0, 0, 0, 0/1
> p2 = 100, 0, 0, 0/1
> p11 = 150, 150, 0, 0
> p12 = 300, 150, 0, 0
> local 1, (P1:P11), (P2:P12), L
> p21 = 50, 0, 0, 0/1
> go p21
```

Local defined with only the origin point:

```plaintext
> local 1, 100, 200, -20
```

Local defined with only the origin point rotated 45 degrees about the X axis:

```plaintext
> local 2, 50, 200, 0, 0, 45
```

3D Local with p2 aligned with the X axis of the local:

```plaintext
> local 3, p1, p2, p3, x
```

3D Local with p3 aligned with the Y axis of the local:

```plaintext
> local 4, p1, p2, p3, y
```
Local Function

Returns the local number of a point.

Syntax
Local(localNumber)

Parameters
localNumber local coordinate system number (integer from 1 to 15) using an expression or numeric value.

Return Values
Specified local coordinate system data as point data.

See Also
Local Statement

Local Function Example

P1 = Local(1)
LocalClr Statement

Clears (undefines) a local coordinate system.

Syntax

LocalClr localNumber

Parameters

localNumber Integer expression representing which of 15 locals (integer from 1 to 15) to clear (undefine).

See Also

Arm, ArmSet, ECPSet, Local, Tool, TLClr, TLSet

LocalClr Example

LocalClr 1
LocalDef Function

Returns local definition status.

Syntax

LocalDef (localCoordinateNumber)

Parameters

localCoordinateNumber Integer expression representing which local coordinate to return status for.

Return Values

True if the specified local has been defined, otherwise False.

See Also

Arm, ArmClr, ArmSet, ECPSet, Local, LocalClr, Tool, TLClr, TLSet

LocalDef Example

Function DisplayLocalDef(localNum As Integer)

    If LocalDef (localNum) = False Then
        Print "Local ", localNum, " is not defined"
    Else
        Print "Local 1: ",
        Print Local(localNum)
    EndIf

EndFunction
Lof Function

Checks whether the specified RS-232 or TCP/IP port has any lines of data in its buffer.

Syntax

Lof ( fileNumber As Integer )

Parameters

fileNumber A Number specified with OpenCom (RS-232C) or OpenNet (TCP/IP) statement.

Return Values

The number of lines of data in the buffer. If there is no data in the buffer, Lof returns 0.

Description

Lof checks whether or not the specified port has received data lines. The data received is stored in the buffer irrespective of the Input# instruction. You can wait for the return value of Lof function by executing Wait.

Note

When using PC COM port (1001, 1002), you cannot use Lof function with Wait command.

See Also

ChkCom, ChkNet, Input#, Wait

Lof Function Example

This Command window example prints out the number of lines of data received through the communication port number 1.

>print lof(1)
5
>

F
LogIn Statement

Log into EPSON RC+ 6.0 as another user.

Syntax

```
LogIn logID, password
```

Parameters

- `logID` - String expression that contains user login id.
- `password` - String expression that contains user password.

Description

You can utilize EPSON RC+ 6.0 security in your application. For example, you can display a menu that allows different users to log into the system. Each type of user can have its own security rights. For more details on security, see the EPSON RC+ 6.0 User's Guide.

When you are running programs in the development environment, the user before programs are started will be restored after programs stop running.

When running the Operator Window in Auto Mode, the application is logged in as a guest user, unless Auto LogIn is enabled, in which case the application is logged in as the current Windows user if such user has been configured in the EPSON RC+ 6.0 system.

Note

This command will only work if the Security option is active.

See Also

- GetCurrentUser$ Function

LogIn Statement Example

```
Integer errorCode
errorCode = LogIn("operator", "oprpass")
```
Long Statement

Declares variables of type long integer. (4 byte whole number).

Syntax

Long varName [(subscripts)] [, varName [(subscripts)]]...

Parameters

varName Variable name which the user wants to declare as type Long.

subscripts Optional. Dimensions of an array variable; up to 3 dimensions may be declared. The subscripts syntax is as follows

(ubound1, [ubound2], [ubound3])

ubound1, ubound2, ubound3 each specify the maximum upper bound for the associated dimension.

The elements in each dimension of an array variable are numbered from 0 and the available number of array elements is the upper bound value + 1.

When specifying the upper bound value, make sure the number of total elements is within the range shown below:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Local variable</td>
<td>2000</td>
</tr>
<tr>
<td>Global Preserve variable</td>
<td>4000</td>
</tr>
<tr>
<td>Global variable and module variable</td>
<td>100000</td>
</tr>
</tbody>
</table>

Description

Long is used to declare variables as type Long. Variables of type Long can contain whole numbers with values between -2,147,483,648 to 2,147,483,647. Local variables should be declared at the top of a function. Global and module variables must be declared outside of functions.

See Also

Boolean, Byte, Double, Global, Integer, Real, String

Long Statement Example

The following example shows a simple program which declares some variables as Longs using Long.

```
Function longtest
    Long A(10) ' Single dimension array of long
    Long B(10, 10) ' Two dimension array of long
    Long C(5, 5, 5) ' Three dimension array of long
    Long var1, arrayVar(10)
    Long i
    Print "Please enter a Long Number"
    Input var1
    Print "The Integer variable var1 = ", var1
    For i = 1 To 5
        Print "Please enter a Long Number"
        Input arrayVar(i)
        Print "Value Entered was ", arrayVar(i)
    Next I
End
```
**LSet$ Function**

Returns the specified string with trailing spaces appended up to the specified length.

**Syntax**

LSet$ (string, length)

**Parameters**

- **string**: String expression.
- **length**: Integer expression for the total length of the string returned.

**Return Values**

Specified string with trailing spaces appended.

**See Also**

RSet$, Space$

**LSet$ Function Example**

```plaintext
temp$ = "123"
temp$ = LSet$(temp$, 10) ' temp$ = "123       "
```
LShift Function

Shifts numeric data to the left by a user specified number of bits.

Syntax

\[ \text{LShift}(\text{number}, \text{shiftBits}) \]

Parameters

- **number**: Integer expression to be shifted.
- **shiftBits**: The number of bits (integer from 0 to 31) to shift number to the left.

Return Values

Returns a numeric result which is equal to the value of number after shifting left shiftBits number of bits.

Description

LShift shifts the specified numeric data (number) to the left (toward a higher order digit) by the specified number of bits (shiftBits). The low order bits shifted are replaced by 0.

The simplest explanation for LShift is that it simply returns the result of number \(*\ 2^{\text{shiftBits}}\).

Note

Numeric Data Type:

The numeric data number may be any valid numeric data type. LShift works with data types: Byte, Integer, Long, and Real.

See Also

And, Not, Or, RShift, Xor

LShift Function Example

```pe
Function lshiftst
   Integer i
   Integer num, snum
   num = 1
   For i = 1 to 10
      Print "i =", i
      snum = LShift(num, i)
      Print "The shifted num is ", snum
   Next i
End
```

Some other example results from the LShift instruction from the command window.

```pe
> Print LShift(2,2)
8
> Print LShift(5,1)
10
> Print LShift(3,2)
12
> 
```
LTrim$ Function

Returns a string equal to specified string without leading spaces.

Syntax

LTrim$ (string)

Parameters

string String expression.

Return Values

Specified string with leading spaces removed.

See Also

RTrim$, Trim$

LTrim$ Function Example

    str$ = " data "
    str$ = LTrim$(str$)  ' str$ = "data "
Mask Operator

Bitwise mask for Wait statement condition expression.

Syntax

\[
\text{Wait } expr1 \text{ Mask } expr2
\]

Parameters

- \( expr1 \): Any valid expression input condition for Wait.
- \( expr2 \): Any valid expression which returns a numeric result.

Description

The Mask operator is a bitwise And for Wait statement input condition expressions.

See Also

Wait

Mask Operator Example

```
' Wait for the lower 3 bits of input port 0 to equal 1
Wait In(0) Mask 7 = 1
```
MCal Statement

Executes machine calibration for robots with incremental encoders.

Syntax
MCal

Description
It is necessary to calibrate robots which have incremental encoders. This calibration must be executed after turning on the main power. If you attempt motion command execution, or any command which requires the current position data without first executing machine calibration, an error will occur.

Machine calibration is executed according to the moving joint order which is specified with the MCordr command. The default value of MCordr at the time of shipment differs from model to model, so please refer to the proper manipulator manual for details.

Potential Errors

Attempt to Execution a Motion command without Executing Mcal First
If you attempt motion command execution, or any command which requires the current position data (e.g. Plist* instruction) without first executing machine calibration, an error will occur.

Absolute encoder robots
Absolute encoder robots do not need MCAL.

Robot Installation Note

Z Joint Space Required for Homing
When the Z joint homes it first moves up and then moves down and settles into the home position. This means it is very important to properly install the robot so that enough space is provided for the arm to home the Z joint. It is recommended that a space of 6 mm be provided above the upper limit. (Do not install tooling or fixtures within a 6 mm space above the robot so enough room is left for proper Z joint homing.)

See Also
Hofs, Home, Hordr, Mcorg, MCordr

Mcal Example
The following example is done from the monitor window:

> Motor On
> Mcal
>
> Motor On
> Mcal
>
MCaIComplete Function

Returns status of MCal.

Syntax
    MCalComplete

Return Values
    True if MCal has been completed, otherwise False.

See Also
    MCal

MCaIComplete Example

    If Not MCalComplete Then
        MCal
    EndIf
MCordr Statement

Specifies and displays the moving joint order for machine calibration Mcal. Required only for robots with incremental encoders.

Syntax

1. MCordr
2. MCordr

Parameters

Step1 Bit pattern that tells which axes should be calibrated during the 1st step of the Mcal process. Any number of axes between 0 to all 4 axes may calibrate during the 1st step.

Step2 Bit pattern that tells which axes should be calibrated during the 2nd step of the Mcal process. Any number of axes between 0 to all 4 axes may calibrate during the 2nd step.

Step3 Bit pattern that tells which axes should be calibrated during the 3rd step of the Mcal process. Any number of axes between 0 to all 4 axes may calibrate during the 3rd step.

Step4 Bit pattern that tells which axes should be calibrated during the 4th step of the Mcal process. Any number of axes between 0 to all 4 axes may calibrate during the 4th step.

Step5 Bit pattern that tells which axes should be calibrated during the 5th step of the Mcal process. Any number of axes between 0 to all 4 axes may calibrate during the 5th step.

Step6 Bit pattern that tells which axes should be calibrated during the 6th step of the Mcal process. Any number of axes between 0 to all 4 axes may calibrate during the 6th step.

Step7 Bit pattern that tells which axes should be calibrated during the 7th step of the Mcal process. Any number of axes between 0 to all 4 axes may calibrate during the 7th step.

Step8 Bit pattern that tells which axes should be calibrated during the 8th step of the Mcal process. Any number of axes between 0 to all 4 axes may calibrate during the 8th step.

Step9 Bit pattern that tells which axes should be calibrated during the 9th step of the Mcal process. Any number of axes between 0 to all 4 axes may calibrate during the 9th step.

Return Values

Displays current Machine Calibration Order when parameters are omitted.

Description

After the system is powered on, Mcal instruction must be issued prior to any robot arm operation. When the Mcal instruction is issued each of the 4 axes of the robot will move to their respective calibration positions.

Specifies joint motion order for the Mcal command. (i.e. Defines which joint will home 1st, which joint will Mcal 2nd, 3rd, etc.)

The purpose of the MCordr instruction is to allow the user to change the homing order. The homing order is broken into 9 separate steps. The user then uses MCordr to define the specific axes which will move to the calibration position (done with the Mcal command) during each step. It is important to realize that more than 1 joint can be defined to move to the calibration position during a single step. This means that all four axes can potentially be calibrated at the same time. However, it is
recommended that the Z joint normally be defined to move to the calibration position first (in Step 1) and then allow the other Axes to follow in subsequent steps. (See notes below)

The **MCordr** instruction expects that a bit pattern be defined for each of the 9 steps. Since there are 4 axes, each joint is assigned a specific bit. When the bit is high (1) (for a specific step), then the corresponding joint will calibrate. When the bit is low (0), then the corresponding joint will not calibrate during that step. The joint bit patterns are assigned as follows:

<table>
<thead>
<tr>
<th>Joint:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit Number:</td>
<td>bit 0</td>
<td>bit 1</td>
<td>bit 2</td>
<td>bit 3</td>
</tr>
<tr>
<td>Binary Code:</td>
<td>&amp;B000001</td>
<td>&amp;B000100</td>
<td>&amp;B000100</td>
<td>&amp;B001000</td>
</tr>
</tbody>
</table>

5 | 6 | 7 | 8 | 9
| bit 4 | bit 5 | bit 6 | bit 7 | bit 8 |
| &B010000 | &B100000 | &B100000 | &B100000 | &B100000 |

### Notes

**Difference Between MCordr and Hordr**

While at first glance the Hordr and **MCordr** commands may appear very similar there is one major difference which is important to understand. **MCordr** is used to define the Robot Calibration joint order (used with Mcal) while Hordr is used to define the Homing joint order (used with the Home command).

**Default MCal Order (Factory Setting)**

The default joint calibration order from the factory is that joint 3 will home in Step 1. Then joints 1, 2, and 4 joints will all home at the same time in step 2. (Steps 3 and 4 are not used in the default configuration.) The default **MCordr** values are as follows:

```plaintext
MCordr &B0100, &B1011, 0, 0
```

**Z Joint should normally be calibrated first**

The reason for moving the Z joint first (and by itself) is to allow the tooling to be moved above the work surface before beginning any horizontal movement. This will help prevent the tooling from hitting something in the work envelope during the homing process.

**MCordr values are maintained**

The **MCordr** Table values are permanently saved and are not changed until either the user changes them or the robot is redefined.

### See Also

Mcal

**MCordr Statement Example**

Following are some monitor window examples:

This example defines the calibration order as J3 in the first step, J1 in second step, J2 in third step, and J4 in the fourth step. The order is specified with binary values.

```plaintext
>mcordr &B0100, &B0001, &B0010, &B1000
```

This example defines the calibration order as J3 in the first step, then J1, J2 and J4 joints simultaneously in the second step. The order is specified with decimal values.

```plaintext
>mcordr 4, 11, 0, 0
```

This example displays the current calibration order in decimal numbers.

```plaintext
>mcordr 4, 11, 0, 0
>```
MCordr Function

Returns an MCordr parameter setting.

Syntax

MCordr (paramNumber)

Parameters

paramNumber  Specifies reference setting numbers (integers from 1 to 9) by an expression or numeric value.

Return Values

Returns binary values (integers) representing the joint of the specified setting number to execute machine calibration.

Description

Returns the joint motion order to execute machine calibration by Mcal.

See Also

Mcal

MCordr Function Example

This example uses the MCordr function in a program:

Integer a
a = MCordr(1)
MemIn Function

Returns the status of the specified memory I/O port. Each port contains 8 memory bits.

Syntax

\[ \text{MemIn}(\text{portNumber}) \]

Parameters

\( \text{portNumber} \) Integer expression representing memory I/O bytes.

Return Values

Returns an integer value between 0-255. The return value is 8 bits, with each bit corresponding to 1 memory I/O bit.

Description

MemIn provides the ability to look at the value of 8 memory I/O bits at the same time. The MemIn instruction can be used to store the 8 memory I/O bit status into a variable or it can be used with the Wait instruction to Wait until a specific condition which involves more than 1 memory I/O bit is met.

Since 8 bits are retrieved at a time, the return value ranges from 0-255. Please review the chart below to see how the integer return values correspond to individual memory I/O bits.

### Memory I/O Bit Result (Using Port #0)

<table>
<thead>
<tr>
<th>Return Value</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>5</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>15</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>255</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
</tr>
</tbody>
</table>

### Memory I/O Bit Result (Using Port #31)

<table>
<thead>
<tr>
<th>Return Value</th>
<th>255</th>
<th>254</th>
<th>253</th>
<th>252</th>
<th>251</th>
<th>250</th>
<th>249</th>
<th>248</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>7</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>32</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>255</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
</tr>
</tbody>
</table>

Notes

**Difference Between MemIn and MemSw**

The MemSw instruction allows the user to read the value of 1 memory I/O bit. The return value from MemSw is either a 1 or a 0 which indicates that the memory I/O bit is either On or Off. MemSw can check each of the memory I/O bits individually. The MemIn instruction is very similar to the MemSw instruction in that it also is used to check the status of the memory I/O bits. However there is 1 distinct difference. The MemIn instruction checks 8 memory I/O bits at a time vs. the single bit checking functionality of the MemSw instruction. MemIn returns a value between 0-255 which tells the user which of the 8 I/O bits are On and which are Off.

**See Also**

In, InBCD, Off, MemOff, On, MemOn, OpBCD, Oport, Out, MemOut, Sw, MemSw, Wait
MemIn Example

The program example below gets the current value of the first 8 memory I/O bits and then makes sure that all 8 I/O are currently set to 0 before proceeding. If they are not 0 an error message is given to the operator and the task is stopped.

```
Function main
    Integer var1

    var1 = MemIn(0) 'Get 1st 8 memory I/O bit values
    If var1 = 0 Then
        Go P1
        Go P2
    Else
        Print "Error in initialization!"
        Print "First 8 memory I/O bits were not all set to 0"
    EndIf
Fend

Other simple examples from the Command window are as follows:

> memout 0, 1
> print MemIn(0)
  1
> memon 1
> print MemIn(0)
  3
> memout 31,3
> print MemIn(31)
  3
> memoff 249
> print MemIn(31)
  1
> 
```
MemInW Function

Returns the status of the specified memory I/O word port.
Each word port contains 16 memory I/O bits.

Syntax
MemInW(WordPortNum)

Parameters
WordPortNum  Integer expression representing the I/O word port.

Return Values
Returns the current status of the memory I/O (long integers from 0 to 65535).

See Also
MemIn, MemOut, MemOutW

MemInW Function Example

Long word0

word0 = MemInW(0)
MemOff Statement

Turns Off the specified bit of the memory I/O.

Syntax

```
MemOff { bitNumber | memIOLabel }
```

Parameters

- **bitNumber**: Integer expression representing memory I/O bits.
- **memIOLabel**: Memory I/O label.

Description

The **MemOff** turns Off the specified bit of memory I/O. The 256 memory I/O bits are typically excellent choices for use as status bits for uses such as On/Off, True/False, Done/Not Done, etc. The **MemOn** instruction turns the memory bit On, the **MemOff** instruction turns it Off, and the **MemSw** instruction is used to check the current state of the specified memory bit. The **Wait** instruction can also be used with the memory I/O bit to cause the system to wait until a specified memory I/O status is set.

Note

**Memory outputs off**

All memory I/O bits are turned off when the controller are restarted. They are not turned off by Emergency stop, safeguard open, program end, Reset command, or EPSON RC+ restart.

See Also

- In, MemIn, InBCD, Off, On, MemOn, OpBCD, Oport, Out, MemOut, Sw, MemSw, Wait

MemOff Statement Example

The example shown below shows 2 tasks each with the ability to initiate motion instructions. However, a locking mechanism is used between the 2 tasks to ensure that each task gains control of the robot motion instructions only after the other task is finished using them. This allows 2 tasks to each execute motion statements as required and in an orderly predictable fashion. **MemSw** is used in combination with the **Wait** instruction to wait until the memory I/O #1 is the proper value before it is safe to move again. **MemOn** and **MemOff** are used to turn on and turn off the memory I/O for proper synchronization.

```plaintext
Function main
    Integer I
    MemOff 1
    Xqt 2, task2
    For i = 1 to 100
        Wait MemSw(1) = Off
        Go P(i)
        MemOn 1
    Next I
Fend

Function task2
    Integer I
    For i = 101 to 200
        Wait MemSw(1) = On
        Go P(i)
        MemOff 1
    Next I
Fend
```
MemOff Statement

Other simple examples from the command window are as follows:

> MemOn 1  'Switch memory I/O bit #1 on
> Print MemSw(1)
1
> MemOff 1  'Switch memory I/O bit #1 off
> Print MemSw(1)
0
MemOn Statement

Turns On the specified bit of the memory I/O.

Syntax
MemOn { bitNumber | memIOLabel }

Parameters
bitNumber Integer expression representing memory I/O bits.
memIOLabel Memory I/O label.

Description
MemOn turns on the specified bit of the robot memory I/O. The 256 memory I/O bits are typically used as task communication status bits. The MemOn instruction turns the memory bit On, the MemOff instruction turns it Off, and the MemSw instruction is used to check the current state of the specified memory bit. The Wait instruction can also be used with the memory bit to cause the system to wait until a specified status is set.

Note
Memory outputs off
All memory I/O bits are turned off when the controller are restarted. They are not turned off by Emergency stop, safeguard open, program end, Reset command, or EPSON RC+ restart.

See Also
In, MemIn, InBCD, Off, MemOff, On, OpBCD, Oport, Out, MemOut, Sw, MemSw, Wait

MemOn Statement Example

The example shown below shows 2 tasks each with the ability to initiate motion instructions. However, a locking mechanism is used between the 2 tasks to ensure that each task gains control of the robot motion instructions only after the other task is finished using them. This allows 2 tasks to each execute motion statements as required and in an orderly predictable fashion. MemSw is used in combination with the Wait instruction to wait until the memory I/O #1 is the proper value before it is safe to move again. MemOn and MemOff are used to turn on and turn off the memory I/O for proper synchronization.

Function main
  Integer I
  MemOff 1
  Xqt 2, task2
  For i = 1 to 100
    Wait MemSw(1) = Off
    Go P(i)
    MemOn 1
  Next I
Fend

Function task2
  Integer I
  For i = 101 to 200
    Wait MemSw(1) = On
    Go P(i)
    MemOff 1
  Next I
Fend
MemOn Statement

Other simple examples from the command window are as follows:

```plaintext
> memon 1
> print memsw(1)
1
> memoff 1
> print memsw(1)
0
```
MemOut Statement

Simultaneously sets 8 memory I/O bits.

Syntax

MemOut portNumber, outData

Parameters

portNumber  Integer expression representing memory I/O bit port number. The portNumber selection
               corresponds to the following:
               
               | Portnum | Outputs |
               |---------|---------|
               | 0       | 0-7     |
               | 1       | 8-15    |
               | ...     | ...     |

outData  Integer expression between 0-255 representing the output pattern for the output group
         selected by portNumber. If represented in hexadecimal form the range is from &H0 to
         &HFF. The lower digit represents the least significant digits (or the 1st 4 outputs) and the
         upper digit represents the most significant digits (or the 2nd 4 outputs).

Description

MemOut simultaneously sets 8 memory I/O bits using the combination of the portNumber and outData
values specified by the user to determine which outputs will be set. The portNumber parameter
specifies which group of 8 outputs to use where portNumber = 0 means outputs 0-7, portNumber = 1
means outputs 8-15, etc.

Once a portNumber is selected, a specific output pattern must be defined. This is done using the
outData parameter. The outData parameter may have a value between 0-255 and may be
represented in hexadecimal or integer format. (i.e. &H0-&HFF or 0-255)

The table below shows some of the possible I/O combinations and their associated outData values
assuming that portNumber is 0, and 1 accordingly.

<table>
<thead>
<tr>
<th>OutData Value</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>02</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>03</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>08</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>09</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>10</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>11</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>99</td>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>255</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
</tr>
</tbody>
</table>
Output Settings When \textit{portNumber}=1 (Output number)

<table>
<thead>
<tr>
<th>OutData Value</th>
<th>15</th>
<th>14</th>
<th>13</th>
<th>12</th>
<th>11</th>
<th>10</th>
<th>9</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>02</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>03</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>08</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>09</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>10</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>11</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>99</td>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>255</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
</tr>
</tbody>
</table>

See Also
In, MemIn, InBCD, MemOff, MemOn, MemSw, Off, On, OpBCD, Oport, Out, Sw, Wait

\textbf{MemOut Example}

The example below shows main task starting a background task called \textit{iotask}. The \textit{iotask} is a simple task to toggle memory I/O bits 0 - 3 On and Off. The MemOut instruction makes this possible using only 1 command rather than turning each memory I/O bit on and off individually.

\begin{verbatim}
Function main
  Xqt 2, iotask
  Go P1
  .
  .
Fend

Function iotask
  Do
    MemOut 0, &H
    Wait 1
    MemOut 0, &H0
    Wait 1
  Loop
Fend
\end{verbatim}

Other simple examples from the command window are as follows:

\begin{verbatim}
> MemOut 1,6  \quad \text{‘Turns on memory I/O bits 9 & 10}
> MemOut 2,1  \quad \text{‘Turns on memory I/O bit 8}
> MemOut 3,91 \quad \text{‘Turns on memory I/O bits 24, 25, 27, 28, and 30}
\end{verbatim}
MemOutW Statement

Simultaneously sets 16 memory I/O bits.

Syntax

\[ \text{MemOutW} \text{ wordPortNum, outputData} \]

Parameters

- \text{wordPortNum} \hspace{1cm} \text{Integer expression representing memory I/O words.}
- \text{outputData} \hspace{1cm} \text{Specifies output data (integers from 0 to 65535) using an expression or numeric value.}

Description

Changes the current status of memory I/O port group specified by the word port number to the specified output data.

See Also

MemIn, MemInW, MemOut

MemOutW Example

\[ \text{MemOutW} \ 0, \ 25 \]
MemSw Function

Returns the status of the specified memory I/O bit.

Syntax

\[ \text{MemSw(bitNumber)} \]

Parameters

\[ \text{bitNumber} \]  
Integer expression representing the memory I/O bit number.

Return Values

Returns a 1 when the specified bit is On and a 0 when the specified bit is Off.

Description

MemSw returns the status of one memory I/O bit. Valid entries for MemSw range from bit 0 to bit 511. MemOn turns the specified bit on and MemOff turns the specified bit Off.

See Also

In, MemIn, InBCD, MemOff, MemOn, MemOut, Off, On, OpBCD, Oport, Out, Sw, Wait

MemSw Example

The example shown below shows 2 tasks each with the ability to initiate motion instructions. However, a locking mechanism is used between the 2 tasks to ensure that each task gains control of the robot motion instructions only after the other task is finished using them. This allows 2 tasks to each execute motion statements as required and in an orderly predictable fashion. MemSw is used in combination with the Wait instruction to wait until the memory I/O bit 1 is the proper value before it is safe to move again.

```
Function main
  Integer I
  MemOff 1
  Xqt 2, task2
  For i = 1 to 100
    Wait MemSw(1) = Off
    Go P(i)
    MemOn 1
  Next I
Fend

Function task2
  Integer I
  For i = 101 to 200
    Wait MemSw(1) = On
    Go P(i)
    MemOff 1
  Next I
Fend
```

Other simple examples from the Command window are as follows:

```
> memon 1
> print memsw(1)
1
> memoff 1
> print memsw(1)
0
```
MHour Function

Returns the accumulated MOTOR ON time of the robot motors.

Syntax
MHour ([robotNumber])

Parameters
robotNumber Specify the robot number to check the MOTOR ON time by an integer value.
If omitted, currently selected robot will be used.

Return Values
Returns the accumulated MOTOR ON time of the motors by an integer value.

See Also
Time, Hour

MHour Function Example

Robot 2
Print MHour
Print MHour(1)
Mid$ Function

Returns a substring of a string starting from a specified position.

Syntax

Mid$(string, position, [count])

Parameters

string Source string expression.
position The starting position in the character string for copying count characters.
count Optional. The number of characters to copy from string starting with the character defined by position. If omitted, then all characters from position to the end of the string are returned.

Return Values

Returns a substring of characters from string.

Description

Mid$ returns a substring of as many as count characters starting with the position character in string.

See Also

Asc, Chr$, InStr, Left$, Len, Right$, Space$, Str$, Val

Mid$ Function Example

The example shown below shows a program that extracts the middle 2 characters from the string "ABCDEFGHIJ" and the remainder of the string starting at position 5.

Function midtest

    String basestr$, m1$, m2$
    basestr$ = "ABCDEFGHIJ"
    m1$ = Mid$(basestr$, (Len(basestr$) / 2), 2)
    Print "The middle 2 characters are: ", m1$
    m2$ = Mid$(basestr$, 5)
    Print "The string starting at 5 is: ", m2$

Fend
MkDir Statement

Creates a subdirectory on a controller disk drive.

Syntax

MkDir dirName

Parameters

dirName  String expression that defines the path and name of the directory to create. See ChDisk for the details.

Description

Creates a subdirectory in the specified path. If omitted, a subdirectory is created in the current directory.

Note

- This statement is executable only with PC disk

See Also

ChDir, ChDrive, Dir, RenDir, RmDir

MkDir Example

The following examples are done from the command window:

> MkDir \Data
> MkDir \Data\PTS
> MkDir \TEST1 \TEST2
Mod Operator

Returns the remainder obtained by dividing a numeric expression by another numeric expression.

Syntax

\[ \text{number} \mod \text{divisor} \]

Parameters

- **number**: The number being divided (the dividend).
- **divisor**: The number which *number* is divided by.

Return Values

Returns the remainder after dividing *number* by *divisor*.

Description

*Mod* is used to get the remainder after dividing 2 numbers. The remainder is a whole number. One clever use of the *Mod* instruction is to determine if a number is odd or even. The method in which the *Mod* instruction works is as follows: *number* is divided by *divisor*. The remainder left over after this division is then the return value for the *Mod* instruction.

See Also

Abs, Atan, Atan2, Cos, Int, Not, Sgn, Sin, Sqr, Str$, Tan, Val

Mod Operator Example

The example shown below determines if a number (var1) is even or odd. When the number is even the result of the Mod instruction will return a 0. When the number is odd, the result of the Mod instruction will return a 1.

```plaintext
Function modtest
    ....Integer var1, result

    ....Print "Enter an integer number:"
    ....Input var1
    ....result = var1 Mod 2
    ....Print "Result = ", result
    ....If result = 0 Then
    ........Print "The number is EVEN"
    ....Else
    ........Print "The number is ODD"
    ....EndIf
End
```

Some other example results from the Mod instruction from the Command window.

```
> Print 36 Mod 6
> 0

> Print 25 Mod 10
> 5
```

Motor Statement

Turns motor power for all axes on or off for the current robot.

Syntax
Motor ON | OFF

Parameters
ON | OFF
The keyword **ON** is used to turn the Motor Power on. The keyword **OFF** is used to turn Motor Power Off.

Description
The **Motor On** command is used to turn Motor Power On and release the brakes for all axes. **Motor Off** is used to turn Motor Power Off and set the brakes.

In order to move the robot, motor power must be turned on.

After an emergency stop, or after an error has occurred that requires resetting with the Reset command, execute Reset, and then execute **Motor On**.

**Motor On** sets the robot control parameter as below:
- **Power**: Low
- **Fine**: Default values
- **Speed**: Default values
- **SpeedR**: Default values
- **SpeedS**: Default values
- **Accel**: Default values
- **AccelS**: Default values
- **AccelR**: Default values
- **PTPBoost**: Default values
- **LimZ**: 0

See Also
Brake, Power, Reset, SFree, SLock

Motor Example
The following examples are done from the command window:

```plaintext
> Motor On
> Motor Off
```
Motor Function

Returns status of motor power for the current robot.

Syntax
Motor

Return Values
0 = Motors off, 1 = Motors on.

See Also
Motor Statement

Motor Function Example

```
If Motor = Off Then
    Motor On
EndIf
```
Move Statement

Moves the arm from the current position to the specified point using linear interpolation (i.e. moving in a straight line) at a constant tool center point velocity).

Syntax

```
Move destination [ROT] [ECP] [CP] [searchExpr] ![...!] [SYNC]
```

Parameters

- **destination**: The target destination of the motion using a point expression.
- **ROT**: Optional. Decides the speed/acceleration/deceleration in favor of tool rotation.
- **ECP**: Optional. External control point motion. This parameter is valid when the ECP option is enabled.
- **CP**: Optional. Specifies continuous path motion.
- **searchExpr**: Optional. A Till or Find expression.
  - **Till** | **Find**
  - Till Sw(expr) = {On | Off}
  - Find Sw(expr) = {On | Off}
- **!...!**: Optional. Parallel Processing statements can be added to execute I/O and other commands during motion.
- **SYNC**: Reserves a motion command. The robot will not move until SyncRobots is executed.

Description

**Move** moves the arm from the current position to **destination** in a straight line. **Move** coordinates all axes to start and stop at the same time. The coordinates of **destination** must be taught previously before executing the **Move** instruction. Acceleration and deceleration for the **Move** is controlled by the AccelS instruction. Speed for the move is controlled by the SpeedS instruction. If the SpeedS speed value exceeds the allowable speed for any joint, power to all four joint motors will be turned off, and the robot will stop.

**Move** uses the SpeedS speed value and AccelS acceleration and deceleration values. Refer to Using **Move with CP** below on the relation between the speed/acceleration and the acceleration/deceleration. If, however, the ROT modifier parameter is used, **Move** uses the SpeedR speed value and AccelR acceleration and deceleration values. In this case SpeedS speed value and AccelS acceleration and deceleration value have no effect.

Usually, when the move distance is 0 and only the tool orientation is changed, an error will occur. However, by using the ROT parameter and giving priority to the acceleration and the deceleration of the tool rotation, it is possible to move without an error. When there is not an orientational change with the ROT modifier parameter and movement distance is not 0, an error will occur.

Also, when the tool rotation is large as compared to move distance, and when the rotation speed exceeds the specified speed of the manipulator, an error will occur. In this case, please reduce the speed or append the ROT modifier parameter to give priority to the rotational speed/acceleration/deceleration.

When ECP is used, the trajectory of the external control point corresponding to the ECP number specified by ECP instruction moves straight with respect to the tool coordinate system. In this case, the trajectory of tool center point does not follow a straight line.
The optional Till qualifier allows the user to specify a condition to cause the robot to decelerate to a stop prior to completing the Move. The condition specified is simply a check against one of the inputs. This is accomplished through using the Sw instruction. The user can check if the input is On or Off and cause the arm to stop based on the condition specified. This feature works almost like an interrupt where the Move is interrupted (stopped) once the Input condition is met. If the input condition is never met during the Move then the arm successfully arrives on the point specified by destination. For more information about the Till qualifier see the Till command.

Notes

Move Cannot

Move cannot execute range verification of the trajectory prior to starting the move itself. Therefore, even for target positions that are within an allowable range, it is possible for the system to find a prohibited position along the way to a target point. In this case, the arm may abruptly stop which may cause shock and a servo out condition of the arm. To prevent this, be sure to perform range verifications at low speed prior to using Move at high speeds. In summary, even though the target position is within the range of the arm, there are some Moves which will not work because the arm cannot physically make it to some of the intermediate positions required during the Move.

Using Move with CP

The CP parameter causes the arm to move to destination without decelerating or stopping at the point defined by destination. This is done to allow the user to string a series of motion instructions together to cause the arm to move along a continuous path while maintaining a specific speed throughout all the motion. The Move instruction without CP always causes the arm to decelerate to a stop prior to reaching the point destination destination.

Proper Speed and Acceleration Instructions with Move

The SpeedS and AccelS instructions are used to specify the speed and acceleration of the manipulator during Move motion. Pay close attention to the fact that SpeedS and AccelS apply to linear and circular interpolated motion while point to point motion uses the Speed and Accel instructions.

Potential Errors

Attempt to Change Only Tool Orientation

Changing only tool orientation during the move is impossible. If this is attempted, an error will occur. In this case, use the ROT parameter.
Joint Overspeed Errors
When the motion requested results in the speed of one of the axes to exceed its maximum allowable speed an overspeed error occurs. In the case of a motor overspeed error, the robot arm is brought to a stop and servo power is turned off.

Attempt to Pass the Original Point (RS series)
It is impossible to operate the arm of RS series to pass near an original point. If attempted this, an overspeed error will occur. For the operation near an original point, take the following actions.
- Lower the speed of SpeedS
- Find a different path to prevent an original point
- Use PTP motion such as Go command instead of Move command.

See Also
AccelS, Arc, CP, Go, Jump, Jump3, Jump3CP, SpeedS, Sw, Till

Move Statement Example
The example shown below shows a simple point to point move between points P0 and P1 and then moves back to P0 in a straight line. Later in the program the arm moves in a straight line toward point P2 until input #2 turns on. If input #2 turns On during the Move, then the arm decelerates to a stop prior to arriving on point P2 and the next program instruction is executed.

Function movetest
  Home
  Go P0
  Go P1
  Move P2 Till Sw(2) = On
  If Sw(2) = On Then
    Print "Input #2 came on during the move and"
    Print "the robot stopped prior to arriving on"
    Print "point P2."
  Else
    Print "The move to P2 completed successfully."
    Print "Input #2 never came on during the move."
  EndIf
Fend

This example uses Move with CP. The diagram below shows arc motion which originated at the point P100 and then moves in a straight line through P101, at which time the arm begins to form an arc. The arc is then continued through P102 and on to P103. Next the arm moves in a straight line to P104 where it finally decelerates to a stop. Note that the arm doesn't decelerate between each point until its final destination of P104. The following function would generate such a motion.

Function CornerArc
  Go P100
  Move P101 CP  'Do not stop at P101
  Arc P102, P103 CP  'Do not stop at P103
  Move P104  'Decelerate to stop at P104
Fend
**MsgBox Statement**

Displays a message in a dialog box and waits for the operator to choose a button.

**Syntax**

```
MsgBox message$, [type], [title$], [answer]
```

**Parameters**

- **message$**  
  The message that will be displayed.

- **type**  
  Optional. A numeric expression that is the sum of values specifying the number and type of buttons to display, the icon style to use, the identity of the default button. EPSON RC+ 6.0 includes predefined constants that can be used for this parameter. The following table shows the values that can be used.

<table>
<thead>
<tr>
<th>Symbolic constant</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB_OK</td>
<td>0</td>
<td>Display OK button only.</td>
</tr>
<tr>
<td>MB_OKCANCEL</td>
<td>1</td>
<td>Display OK and cancel buttons.</td>
</tr>
<tr>
<td>MB_ABORTRETRYIGNORE</td>
<td>2</td>
<td>Display Abort, Retry, and Ignore buttons.</td>
</tr>
<tr>
<td>MB_YESNOCANCEL</td>
<td>3</td>
<td>Display Yes, No, and Cancel buttons.</td>
</tr>
<tr>
<td>MB_YESNO</td>
<td>4</td>
<td>Display Yes and No buttons.</td>
</tr>
<tr>
<td>MB_RETRYCANCEL</td>
<td>5</td>
<td>Display Retry and Cancel buttons.</td>
</tr>
<tr>
<td>MB_ICONSTOP</td>
<td>16</td>
<td>Stop sign.</td>
</tr>
<tr>
<td>MB_ICONQUESTION</td>
<td>32</td>
<td>Question mark.</td>
</tr>
<tr>
<td>MB_ICONEXCLAMATION</td>
<td>64</td>
<td>Exclamation mark.</td>
</tr>
<tr>
<td>MB_DEFBUTTON1</td>
<td>0</td>
<td>First button is default.</td>
</tr>
<tr>
<td>MB_DEFBUTTON2</td>
<td>256</td>
<td>Second button is default.</td>
</tr>
</tbody>
</table>

- **title$**  
  Optional. String expression that is displayed in the title bar of the message box.

- **answer**  
  Optional. An integer variable that receives a value indicating the action taken by the operator. EPSON RC+ 6.0 includes predefined constants that can be used for this parameter. The table below shows the values returned in `answer`.

<table>
<thead>
<tr>
<th>Symbolic constant</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDOK</td>
<td>1</td>
<td>OK button selected.</td>
</tr>
<tr>
<td>IDCANCEL</td>
<td>2</td>
<td>Cancel button selected.</td>
</tr>
<tr>
<td>IDABORT</td>
<td>3</td>
<td>Abort button selected.</td>
</tr>
<tr>
<td>IDRETRY</td>
<td>4</td>
<td>Retry button selected.</td>
</tr>
<tr>
<td>IDYES</td>
<td>6</td>
<td>Yes button selected.</td>
</tr>
<tr>
<td>IDNO</td>
<td>7</td>
<td>No button selected.</td>
</tr>
</tbody>
</table>

**Description**

`MsgBox` displays specified messages. If you want blank lines, use `Chr$(13)+Chr$(10)` in the message. See the example.

**See Also**

- `InputBox`
**MsgBox Example**

This example displays a message box that asks the operator if he/she wants to continue or not. The message box will display two buttons: Yes and No. A question mark icon will also be displayed. After MsgBox returns (after the operator clicks a button), then the answer is examined. If it's no, then all tasks are stopped with the Quit command.

```plaintext
Function msgtest
    String msg$, title$
    Integer mFlags, answer

    msg$ = "Operation complete" + Chr$(13) + Chr$(10) + "Ready to continue?"
    title$ = "Sample Application"
    mFlags = MB_YESNO + MB_ICONQUESTION
    MsgBox msg$, mFlags, title$, answer
    If answer = IDNO then
        Quit All
    EndIf
EndFunction
```

A picture of the message box that this code will create is shown below.
**MyTask Function**

**Returns the task number of the current program.**

**Syntax**

```
MyTask
```

**Return Values**

The task number of the current task. Valid entries are as below:

- **Normal task**: 1 ~ 32
- **Background tasks**: 65 ~ 80
- **Trap tasks**: 257 ~ 267

**Description**

`MyTask` returns the task number of the current program with a numeral. The `MyTask` instruction is inserted inside a specific program and when that program runs the `MyTask` function will return the task number that the program is running in.

**See Also**

`Xqt`

**MyTask Function Example**

The following program switches On and Off the I/O ports from 1 to 8.

```plaintext
Function main
  Xqt 2, task 'Execute task 2.
  Xqt 3, task 'Execute task 3.
  Xqt 4, task 'Execute task 4.
  Xqt 5, task 'Execute task 5.
  Xqt 6, task 'Execute task 6.
  Xqt 7, task 'Execute task 7.
  Xqt 8, task 'Execute task 8.
  Call task
  Fend

Function task
  Do
    On MyTask 'Switch On I/O port which has the same number as current task number
    Off MyTask 'Switch Off I/O port which has the same number as current task number
  Loop
  Fend
```

---

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The For/Next instructions are used together to create a loop where instructions located between the For and Next instructions are executed multiple times as specified by the user.

Syntax

```
For var1 = initval To finalval [Step Increment]
  statements
Next var1
```

Parameters

- `var1` The counting variable used with the For/Next loop. This variable is normally defined as an integer but may also be defined as a Real variable.
- `initval` The initial value for the counter `var1`.
- `finalval` The final value of the counter `var1`. Once this value is met, the For/Next loop is complete and execution continues starting with the statement following the Next instruction.
- `Increment` An optional parameter which defines the counting increment for each time the Next statement is executed within the For/Next loop. This variable may be positive or negative. However, if the value is negative, the initial value of the variable must be larger than the final value of the variable. If the increment value is left out the system automatically increments by 1.
- `statements` Any valid SPEL+ statements can be inserted inside the For/Next loop.

Return Values

None

Description

For/Next executes a set of statements within a loop a specified number of times. The beginning of the loop is the For statement. The end of the loop is the Next statement. A variable is used to count the number of times the statements inside the loop are executed.

The first numeric expression (`initval`) is the initial value of the counter. This value may be positive or negative as long as the `finalval` variable and Step increment correspond correctly.

The second numeric expression (`finalval`) is the final value of the counter. This is the value which once reached causes the For/Next loop to terminate and control of the program is passed on to the next instruction following the Next instruction.

Program statements after the For statement are executed until a Next instruction is reached. The counter variable (`var1`) is then incremented by the Step value defined by the `increment` parameter. If the Step option is not used, the counter is incremented by one.

The counter variable (`var1`) is then compared with the final value (`finalval`). If the counter is less than or equal to the final value (`finalval`), the statements following the For instruction are executed again. If the counter variable is greater than the final value (`finalval`), execution branches outside of the For/Next loop and continues with the instruction immediately following the Next instruction.

Nesting of For/Next statements is supported up to 10 levels deep. This means that a For/Next Loop can be put inside of another For/Next loop and so on and so on until there are 10 “nests” of For/Next loops.
Notes

Negative Step Values
If the value of the Step increment *(increment)* is negative, the counter variable *(var1)* is decremented *(decreased)* each time through the loop and the initial value *(initval)* must be greater than the final value *(finalval)* for the loop to work.

See Also
For

For/Next Example

```plaintext
Function fornext
    Integer ctr
    For ctr = 1 to 10
        Go Pctr
    Next ctr
    '   
    For ctr = 10 to 1 Step -1
        Go Pctr
    Next ctr
Fend
```
Not Operator

Performs the bitwise complement on the value of the operand.

Syntax

Not operand

Parameters

operand Integer expression.

Return Values

1's complement of the value of the operand.

Description

The Not function performs the bitwise complement on the value of the operand. Each bit of the result is the complement of the corresponding bit in the operand, effectively changing 0 bits to 1, and 1 bits to 0.

See Also

Abs, And, Atan, Atan2, Cos, Int, LShift, Mod, Or, RShift, Sgn, Sin, Sqr, Str$, Tan, Val, Xor

Not Operator Example

This is a simple Command window example on the usage of the Not instruction.

```
>print not(1)
-2
>
```
Off Statement

Turns Off the specified output and after a specified time can turn it back on.

Syntax

Off { bitNumber | outputLabel }, [ time ], [ parallel ] [ Forced ]

Parameters

- **bitNumber**: Integer expression representing which Output to turn Off.
- **outputLabel**: Output label.
- **time**: Optional. Specifies a time interval in seconds for the output to remain Off. After the time interval expires, the Output is turned back on. (Minimum time interval is 0.01 seconds)
- **parallel**: Optional. When a timer is set, the parallel parameter may be used to specify when the next command executes:
  - 0 - immediately after the output is turned off
  - 1 - after the specified time interval elapses. (default value)
    Valid range is 0-2147483 seconds in 0.01 second intervals.
- **Forced**: Optional. Usually omitted.

Description

**Off** turns off (sets to 0) the specified output.

If the **time** interval parameter is specified, the output bit specified by **bitNumber** is switched off, and then switched back on after the **time** interval elapses. If prior to executing Off, the Output bit was already off, then it is switched On after the time interval elapses.

The **parallel** parameter settings are applicable when the time interval is specified as follows:

- **1**: Switches the output off, switches it back on after specified interval elapses, then executes the next command. (This is also the default value for the parallel parameter. If this parameter is omitted, this is the same as setting the parameter to 1.)
- **0**: Switches the output off, and simultaneously executes the next command.

Notes

**Output bits Configured as Remote Control output**

If an output bit which was set up as a system output is specified, an error will occur. Remote control output bits are turned on or off automatically according to system status.

**Outputs and When an Emergency Stop Occurs:**

EPSON RC+ has a feature which causes all outputs to go off when an E-Stop occurs. This feature is set or disabled from Setup | Controller | Preferences.

**Forced Flag**

This flag is used to turn Off the I/O output at Emergency Stop and Safety Door Open from NoPause task or NoEmgAbort task (special task using NoPause or NoEmgAbort at Xqt). Be sure that the I/O outputs change by Emergency Stop and Safety Door Open when designing the system.

**See Also**

In, InBCD, MemOn, MemOff, MemOut, MemSw, OpBCD, Oport, Out, Wait
Off Statement Example
The example shown below shows main task start a background task called iotask. The iotask is a simple task to turn discrete output bits 1 and 2 on and then off, Wait 10 seconds and then do it again.

Function main
    Xqt 2, iotask
    Go P1
    .
    .
    .
    Fend

Function iotask
    Do
    On 1
    On 2
    Off 1
    Off 2
    Wait 10
    Loop
    Fend

Other simple examples from the Command window are as follows:
> on 1
> off 1, 10  ' Turn Output 1 off, wait 10 secs, turn on again
> on 2
> off 2
OLAccel Statement

Sets up the automatic adjustment of acceleration/deceleration that is adjusted according to the overload rating.

Syntax
OLAccel {On | Off}

Parameters
On  | Off
On: Enables the automatic adjustment of acceleration/deceleration that is adjusted according to the overload rating.
Off: Disables the automatic adjustment of acceleration/deceleration that is adjusted according to the overload rating.

Description
OLAccel can be used to enable the automatic adjustment function of acceleration and deceleration that is adjusted according to the robot loading rate (OLRate). When OLAcel is On, the acceleration and deceleration are automatically adjusted in accordance with the robot loading rate at PTP motion commands. This is done to prevent the over load error by reducing the acceleration/deceleration automatically when the loading rate is exceeding a certain value at PTP motion. Heretofore, when users were executing motion with heavy duty that may cause over load error, users had to stop the robot by the program or adjust the speed and acceleration to prevent the error. OLAcel statement lessens these measures. However, this statement do not prevent over load error at all types of cycles. When the cycle has very heavy duty and load, the over load error may occur. In this case, users need to stop the robot or adjust the speed and acceleration. In some operation environment, the motor temperature may rise by operating the robot without over load error and result in over heat error.

This statement is unnecessary at proper load operation. Use OLRate in the test cycle to check whether the over load error may occur or not.

The OLAcel value initializes to the default values (low acceleration) when any one of the following conditions occurs:

- Controller Startup
- Motor On
- SFree, SLock, Brake
- Reset, Reset Error
- Stop button or QuitAll stops tasks

Notes
If OLAcel On is executed to a robot that does not support the automatic adjustment function of acceleration and deceleration, an error occurs.

See Also
OLAccel Function, OLRate
OLAccel Statement Example

```epson
>olrate on
>olrate
OLACCEL is ON

Function main
Motor On
Power High
Speed 100
Accel 100, 100
OLAccel On
Xqt 2, MonitorOLRate
  Do
    Jump P0
    Jump P1
  Loop
Fend

Function MonitorOLRate
  Do
    'Displays OLRate
    OLRate
    Wait 1
  Loop
Fend
```
OLAccel Function

Returns the automatic adjustment setting.

Syntax

OLAccel

Return Values

Off = Automatic adjustment of acceleration/deceleration that is adjusted according to the overload rating is disabled.
On = Automatic adjustment of acceleration/deceleration that is adjusted according to the overload rating is enabled.

See Also

OLAccel, OLRate

OLAccel Function Example

If OLAccel = Off Then
    Print “OLAccel is off”
EndIf
OLRate Statement

Display overload rating for one or all joints for the current robot.

Syntax

\texttt{OLRate [jointNumber]}

Parameters

\textit{jointNumber} Integer expression from 1 ~ 9. 
The additional S axis is 8 and T axis is 9.

Description

\texttt{OLRate} can be used to check whether a cycle is causing stress on the servo system. Factors such as temperature and current can cause servo errors during applications with high duty cycles. \texttt{OLRate} can help to check if the robot system is close to having a servo error.

During a cycle, run another task to command \texttt{OLRate}. If \texttt{OLRate} exceeds 1.0 for any joint, then a servo error will occur.

Servo errors are more likely to occur with heavy payloads. By using \texttt{OLRate} during a test cycle, you can help insure that the speed and acceleration settings will not cause a servo error during production cycling.

To get valid readings, you must execute \texttt{OLRate} while the robot is moving.

See Also

\texttt{OLRate Function}

\texttt{OLRate Statement Example}

```plaintext
> olrate
 0.10000  0.20000
 0.30000  0.40000
 0.50000  0.60000

Function main
  Power High
  Speed 50
  Accel 50, 50
  Xqt 2, MonitorOLRate
  Do
    Jump P0
    Jump P1
  Loop
  Fend

Function MonitorOLRate
  Do
    OLRate  ' Display OLRate
    Wait 1
  Loop
  Fend
```
OLRate Function

Returns overload rating for one joint for the current robot.

Syntax

\[
\text{OLRate}(\text{jointNumber})
\]

Parameters

\text{jointNumber} \quad \text{Integer expression from 1 ~ 9.}

The additional S axis is 8 and T axis is 9.

Return Values

Returns the OLRate for the specified joint. Values are between 0.0 and 2.0.

Description

\text{OLRate} can be used to check whether a cycle is causing stress on the servo system. Factors such as temperature and current can cause servo errors during applications with high duty cycles. \text{OLRate} can help to check if the robot system is close to having a servo error.

During a cycle, run another task to command \text{OLRate}. If \text{OLRate} exceeds 1.0 for any joint, then a servo error will occur.

Servo errors are more likely to occur with heavy payloads. By using \text{OLRate} during a test cycle, you can help insure that the speed and acceleration settings will not cause a servo error during production cycling.

To get valid readings, you must execute \text{OLRate} while the robot is moving.

See Also

\text{OLRate Statement}

\text{OLRate Function Example}

Function main
  Power High
  Speed 50
  Accel 50, 50
  Xqt 2, MonitorOLRate
  Do
    Jump P0
    Jump P1
  Loop
Fend

Function MonitorOLRate
  Integer i
  Real olRates(4)
  Do
    For i = 1 to 4
      olRates(i) = OLRate(i)
      If olRate(i) > .5 Then
        Print "Warning: OLRate(" i, ") is over .5"
      EndIf
    Next i
  Loop
Fend
On Statement

Turns on the specified output and after a specified time can turn it back off.

Syntax

On { bitNumber | outputLabel }, [ time ], [ parallel ] [.Forced]

Parameters

- **bitNumber**: Integer expression representing which Output to turn On.
- **outputLabel**: Output label.
- **time**: Optional. Specifies a time interval in seconds for the output to remain On. After the time interval expires, the Output is turned back off. (Minimum time interval is 0.01 seconds)
- **parallel**: Optional. When a timer is set, the parallel parameter may be used to specify when the next command executes:
  - 0 - immediately after the output is turned on
    (The maximum time interval is 10 seconds.)
  - 1 - after the specified time interval elapses. (default value)
    Valid range is 0-2147483 seconds in 0.01 second intervals.
- **Forced**: Optional. Usually omitted.

Description

- **On** turns On (sets to 1) the specified output.
- If the **time** interval parameter is specified, the output bit specified by **outnum** is switched On, and then switched back Off after the **time** interval elapses.

The **parallel** parameter settings are applicable when the time interval is specified as follows:

- **1**: Switches the output On, switches it back Off after specified interval elapses, then executes the next command. (This is also the default value for the parallel parameter. If this parameter is omitted, this is the same as setting the parameter to 1.)
- **0**: Switches the output On, and simultaneously executes the next command.

Notes

- **Output bits Configured as remote**
  - If an output bit which was set up as remote is specified, an error will occur. Remote output bits are turned On or Off automatically according to system status. For more information regarding remote, refer to the EPSON RC+ User's Guide. The individual bits for the remote connector can be set as remote or I/O from the EPSON RC+ remote configuration dialog accessible from the setup menu.

- **Outputs and When an Emergency Stop Occurs**
  - The Controller has a feature which causes all outputs to go off when an E-Stop occurs. This feature is set or disabled from one of the Option Switches. To configure this go to the Setup | Controller | Preferences.

- **Forced Flag**
  - This flag is used to turn On the I/O output at Emergency Stop and Safety Door Open from NoPause task, NoEmgAbort task (special task using NoPause or NoEmgAbort at Xqt), or background tasks.
  - Be sure that the I/O outputs change by Emergency Stop and Safety Door Open when designing the system.

See Also

- In, InBCD, MemOff, MemOn, Off, OpBCD, Oport, Out, Wait
On Statement

On Statement Example
The example shown below shows main task start a background task called iotask. The iotask is a simple task to turn discrete output bits 1 and 2 on and then off, Wait 10 seconds and then do it again.

Function main
    Xqt iotask
    Go P1
    .
    .
    .
Fend

Function iotask
    Do
    On 1
    On 2
    Off 1
    Off 2
    Wait 10
    Loop
Fend

Other simple examples from the command window are as follows:

> on 1
> off 1, 10  'Turn Output 1 off, wait 10 secs, turn on again
> on 2
> off 2
OnErr Statement

Sets up interrupt branching to cause control to transfer to an error handling subroutine when an error occurs. Allows users to perform error handling.

Syntax

OnErr GoTo {label | 0}

Parameters

<table>
<thead>
<tr>
<th>label</th>
<th>Statement label to jump to when an error occurs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Parameter used to clear OnErr setting.</td>
</tr>
</tbody>
</table>

Description

OnErr enables user error handling. When an error occurs without OnErr being used, the task is terminated and the error is displayed. However, when OnErr is used it allows the user to "catch" the error and go to an error handler to automatically recover from the error. Upon receiving an error, OnErr branches control to the designated label specified in the EResume instruction. In this way the task is not terminated and the user is given the capability to automatically handle the error. This makes work cells run much smoother since potential problems are always handled and recovered from in the same fashion.

When the OnErr command is specified with the 0 parameter, the current OnErr setting is cleared. (i.e. After executing OnErr 0, if an error occurs program execution will stop)

See Also

Err, EResume

OnErr Example

The following example shows a simple utility program which checks whether points P0-P399 exist. If the point does not exist, then a message is printed on the screen to let the user know this point does not exist. The program uses the CX instruction to test each point for whether or not it has been defined. When a point is not defined control is transferred to the error handler and a message is printed on the screen to tell the user which point was undefined.

```
Function errDemo
    Integer i, errNum

    OnErr GoTo errHandler

    For i = 0 To 399
        temp = CX(P(i))
    Next i

    Exit Function

'*************************************************
'* Error Handler
'*************************************************

errHandler:
    errNum = Err
    ' Check if using undefined point
    If errNum = 7007 Then
        Print "Point number P", i, " is undefined!"
    Else
        Print "ERROR: Error number ", errNum, " occurred while"
        Print " trying to process point P", i, " !"
    EndIf
    EResume Next
Fend
```
OpBCD Statement

Simultaneously sets 8 output lines using BCD format. (Binary Coded Decimal)

Syntax

OpBCD portNumber, outData [, Forced]

Parameters

portNumber Integer expression representing I/O output bytes. Where the portNumber selection corresponds to the following outputs:

<table>
<thead>
<tr>
<th>PortNumber</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0-7</td>
</tr>
<tr>
<td>1</td>
<td>8-15</td>
</tr>
<tr>
<td>2</td>
<td>16-23</td>
</tr>
<tr>
<td>3</td>
<td>24-31</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

outData Integer expression between 0-99 representing the output pattern for the output group selected by portNumber. The 2nd digit (called the 1's digit) represents the lower 4 outputs in the selected group and the 1st digit (called the 10's digit) represents the upper 4 outputs in the selected group.

Forced Optional. Usually omitted.

Description

OpBCD simultaneously sets 8 output lines using the BCD format. The standard and expansion user outputs are broken into groups of 8. The portNumber parameter for the OpBCD instruction defines which group of 8 outputs to use where portNumber = 0 means outputs 0-7, portNumber = 1 means outputs 8-15, etc.

Once a port number is selected (i.e. a group of 8 outputs has been selected), a specific output pattern must be defined. This is done in Binary Coded Decimal format using the outdata parameter. The outdata parameter may have 1 or 2 digits. (Valid entries range from 0 to 99.) The 1st digit (or 10's digit) corresponds to the upper 4 outputs of the group of 8 outputs selected by portNumber. The 2nd digit (or 1's digit) corresponds to the lower 4 outputs of the group of 8 outputs selected by portNumber.

Since valid entries in BCD format range from 0-9 for each digit, every I/O combination cannot be met. The table below shows some of the possible I/O combinations and their associated outnum values assuming that portNumber is 0.

<table>
<thead>
<tr>
<th>Output Settings (Output number)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outnum Value</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>01</td>
</tr>
<tr>
<td>02</td>
</tr>
<tr>
<td>03</td>
</tr>
<tr>
<td>08</td>
</tr>
<tr>
<td>09</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>99</td>
</tr>
</tbody>
</table>

Notice that the Binary Coded Decimal format only allows decimal values to be specified. This means that through using Binary Coded Decimal format it is impossible to turn on all outputs with the OpBCD instruction. Please note that the maximum value for either digit for outnum is 9. This means that the largest value possible to use with OpBCD is 99. In the table above it is easy to see that 99 does not turn all Outputs on. Instead it turns outputs 0, 3, 4, and 7 On and all the others off.
Notes

Difference between OpBCD and Out

The **OpBCD** and Out instructions are very similar in the SPEL+ language. However, there is one major difference between the two. This difference is shown below:

- The **OpBCD** instruction uses the Binary Coded Decimal format for specifying an 8 bit value to use for turning the outputs on or off. Since Binary Coded Decimal format precludes the values of &HA, &HB, &HC, &HD, &HE or &HF from being used, all combinations for setting the 8 output group cannot be satisfied.

- The Out instruction works very similarly to the OpBCD instruction except that Out allows the range for the 8 bit value to use for turning outputs on or off to be between 0-255 (vs. 0-99 for OpBCD). This allows all possible combinations for the 8 bit output groups to be initiated according to the users specifications.

Output bits Configured as Remote:

If an output bit which was set up as remote is specified to be turned on by **OpBCD**, an error will occur. Remote output bits are turned On or Off automatically according to system status. For more information regarding remote, refer to the EPSON RC+ User’s Guide. The individual bits for the remote connector can be set as remote or I/O from the EPSON RC+ remote configuration dialog accessible from the setup menu.

Outputs and When an Emergency Stop Occurs:

The Controller has a feature which causes all outputs to go off when an E-Stop occurs. This feature is set or disabled from one of the Option Switches. To configure this go to Setup | Controller | Preferences.

Forced Flag

This flag is used to turn On the I/O output at Emergency Stop and Safety Door Open from NoPause task, NoEmgAbort task (special task using NoPause or NoEmgAbort at Xqt), or background tasks. Be sure that the I/O outputs change by Emergency Stop and Safety Door Open when designing the system.

---

See Also

In, InBCD, MemOff, MemOn, MemSw, Off, On, Oport, Out, Sw, Wait

OpBCD Function Example

The example shown below shows main task start a background task called iotask. The iotask is a simple task to flip flop between turning outputs 1 & 2 on and then outputs 0 and 3 on. When 1 & 2 are turned on, then 0 & 3 are also turned off and vice versa.

```plaintext
Function main
  Xqt 2, iotask
  Go P1
  .
  .
Fend

Function iotask
  Do
    OpBCD 0, 6
    OpBCD 0, 9
    Wait 10
  Loop
Fend
```

Other simple examples from the command window are as follows:

- `> OpBCD 1, 6`  'Turns on Outputs 1 and 2
- `> OpBCD 2, 1`  'Turns on Output 8
- `> OpBCD 3, 91`  'Turns on Output 24, 28, and 31

---

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**OpenDB Statement**

Opens a database or Excel workbook.

**Syntax**

```
OpenDB #fileNumber, { SQL | Accel | Excel }, [ DBserverName As String ],
   { DBname As String | filename As String }
```

**Parameters**

- **fileNumber**: Integer number from 501 ~ 508
- **SQL | Accel | Excel**: Selects a database type you want to open from [SQL], [Access], and [Excel].
- **DBserverName**: If you select [SQL], the SQL server name is specified. If omitted, LOCAL server is specified. The SQL server on the network cannot be specified. If you select [Access] or [Excel], the SQL server name is not specified.
- **DBname | filename**: If you select [SQL] as a database, a database name on the SQL server is specified. If you select [Access], Access file name is specified. If omitted the path of Access file name, it searches in the current folder. See ChDisk for the details. If you select [Excel], Excel file name is specified. You can specify Excel 2007 book or Excel 97-2003 book file as Excel file. If you omitted Excel file name, it searches in the current folder. See ChDisk for the details.

**Description**

Opens the specified database using the specified file number. The specified database must exists in the disk. Otherwise, it causes an error. The specified file number can be used to indentify the database while it is open, but cannot be used to refer to the different database until you close the database with the CloseDB command. The file number is used with the database operation commands (SelectDB, Input#, Print#).

**See Also**

SelectDB, CloseDB, Input#, Print#

**OpenDB Example**

Using the SQL database

The following example uses the SQL server 2000 sample database, Northwind and loads the data from a table.

```pascal
Integer count, i, eid
String Lastname$, Firstname$, Title$

OpenDB #501, SQL, "(LOCAL)", "Northwind"
count = SelectDB(#501, "Employees")
For i = 0 To count - 1
   Input #501, eid, Lastname$, Firstname$, Title$
   Print eid, ",", Lastname$, ",", Firstname$, ",", Title$
Next
CloseDB #501
```

Using Access database
The following example uses Microsoft Access 2007 sample database “Students” and loads the data from a table.

```
Integer count, i, eid
String Lastname$, Firstname$, dummy$

OpenDB #502, Access, "c:\MyDataBase\Students.accdb"
count = SelectDB(#502, "Students")
For i = 0 To count - 1
    Input #502, eid, dummy$, Lastname$, Firstname$
    Print eid, ",", Lastname$, ",", Firstname$
Next
CloseDB #502
```

Information:
By installing AccessRuntime, you can use Access even if the official version of Microsoft Access is not installed.
AccessRuntime is available on Microsoft download center.

Using Excel workbook
The following example uses Microsoft Excel workbook “StudentsList” and loads the data from a sheet.

```
Integer count, i, eid
String Lastname$, Firstname$

OpenDB #503, Excel, "c:\MyDataBase\Students.xls"
count = SelectDB(#503, "[Students$]")
For i = 0 To count - 1
    Input #503, eid, Lastname$, Firstname$
    Print eid, ",", Lastname$, ",", Firstname$
Next
CloseDB #503
```
OpenCom Statement

Open an RS-232 communication port.

Syntax

OpenCom #portNumber

Parameters

portNumber  Integer expression for RS-232C port number to open.
The range of port number is:
  Real Part  1 ~ 8
  Windows Part  1001 ~ 1002

Description
You need to connect the specified RS-232C port to the controller.

See Also
ChkCom, CloseCom, SetCom

OpenCom Statement Example

Integer PortNo

PortNo = 1001
OpenCom #PortNo
Print #PortNo, "Data from COM1"
CloseCom #PortNo
OpenCom Function

Acquires the task number that executes OpenCom.

Syntax

```
OpenCom (portNumber)
```

Parameters

- `portNumber` Integer expression for RS-232C port number.
  - The range of port number is:
    - Real Part 1 ~ 8
    - Windows Part 1001 ~ 1002

Description

Acquires the task number that executes OpenCom.

See Also

ChkCom, CloseCom, OpenCom, SetCom

OpenCom Function Example

```
Print OpenCom(PortNo)
```
OpenNet Statement

Open a TCP/IP network port.

Syntax

\[
\text{OpenNet} \; \#\text{portNumber} \; \text{As} \; \{ \text{Client} \; | \; \text{Server} \}
\]

Parameters

\[
\text{portNumber} \quad \text{Integer expression for TCP/IP port number to open. Range is 201 - 216.}
\]

Description

OpenNet opens a TCP/IP port for communication with another computer on the network.

One system should open as Server and the other as Client. It does not matter which one executes first.

See Also

ChkNet, CloseNet, SetNet

OpenNet Statement Example

For this example, two controllers have their TCP/IP settings configured as follows:

Controller #1:
Port: #201
Host Name: 192.168.0.2
TCP/IP Port: 1000

Function tcpip
    \[
    \text{OpenNet} \; \#201 \; \text{As Server}
    \]
    \[
    \text{WaitNet} \; \#201
    \]
    \[
    \text{Print} \; \#201, \; \"\text{Data from host 1}\"
    \]
Fend

Controller #2:
Port: #201
Host Name: 192.168.0.1
TCP/IP Port: 1000

Function tcpip
    String data$
    \[
    \text{OpenNet} \; \#201 \; \text{As Client}
    \]
    \[
    \text{WaitNet} \; \#201
    \]
    \[
    \text{Input} \; \#201, \; \text{data$}
    \]
    \[
    \text{Print} \; \"\text{received }\", \; \text{data$}, \; \"\text{ from host 1}\"
    \]
Fend
OpenNet Function

Acquires the task number that executes OpenNet.

Syntax
OpenNet (portNumber)

Parameters
portNumber Integer expression for TCP/IP port number. Range is 201 - 216.

Description
Acquires the task number that executes OpenNet.

See Also
ChkNet, CloseNet, OpenNet, SetNet

OpenNet Function Example

Print OpenNet(PortNo)
Oport Function

Returns the state of the specified output.

Syntax

Oport(outnum)

Parameters

outnum  Integer expression representing I/O output bits.

Return Values

Returns the specified output bit status as either a 0 or 1.

0: Off status
1: On status

Description

Oport provides a status check for the outputs. It functions much in the same way as the Sw instruction does for inputs. Oport is most commonly used to check the status of one of the outputs which could be connected to a feeder, conveyor, gripper solenoid, or a host of other devices which works via discrete I/O. Obviously the output checked with the Oport instruction has 2 states (1 or 0). These indicate whether the specified output is On or Off.

Notes

Difference between Oport and Sw

It is very important for the user to understand the difference between the Oport and Sw instructions. Both instructions are used to get the status of I/O. However, the type of I/O is different between the two. The Sw instruction works inputs. The Oport instruction works with the standard and expansion hardware outputs. These hardware ports are discrete outputs which interact with devices external to the controller.

See Also

In, InBCD, MemIn, MemOn, MemOff, MemOut, MemSw, Off, On, OpBCD, Out, Sw, Wait
**OPort Function Example**

The example shown below turns on output 5, then checks to make sure it is on before continuing.

```plaintext
Function main
  TMOut 10
  OnErr errchk
  Integer errnum
  On 5    'Turn on output 5
  Wait Oport(5)
  Call mkpart1
  Exit Function

errchk:
  errnum = Err(0)
  If errnum = 94 Then
    Print "TIME Out Error Occurred during period"
    Print "waiting for Oport to come on. Check"
    Print "Output #5 for proper operation. Then"
    Print "restart this program."
  Else
    Print "ERROR number ", errnum, "Occurred"
    Print "Program stopped due to errors!"
  EndIf
  Exit Function
Fend
```

Other simple examples are as follows from the command window:

```plaintext
> On 1
> Print Oport(1)
  1
> Off 1
> Print Oport(1)
  0
> 
```
Or Operator

Performs a bitwise or logical OR operation on two operands.

Syntax

\[ expr1 \text{ Or } expr2 \]

Parameters

\[ expr1, expr2 \]  Integer or Boolean expressions.

Return Values

Bitwise OR value of the operands if the expressions are integers. Logical OR if the expressions are Boolean.

Description

For integer expressions, the \textbf{Or} operator performs the bitwise OR operation on the values of the operands. Each bit of the result is 1 if one or both of the corresponding bits of the two operands is 1. For Boolean expressions, the result is True if either of the expressions evaluates to True.

See Also

And, LShift, Mod, Not, RShift, Xor

Or Operator Example

Here is an example of a bitwise OR.

```plaintext
>print 1 or 2
3
```

Here is an example of a logical OR.

```plaintext
If a = 1 or b = 2 Then
  c = 3
EndIf
```
Out Statement

Simultaneously sets 8 output bits.

Syntax

Out portNumber, outData [, Forced]

Parameters

portNumber Integer expression representing I/O output bytes. The portnum selection corresponds to the following outputs:

<table>
<thead>
<tr>
<th>Portnum</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0-7</td>
</tr>
<tr>
<td>1</td>
<td>8-15</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

outData Integer number between 0-255 representing the output pattern for the output group selected by portNumber. If represented in hexadecimal form the range is from &H0 to &HFF. The lower digit represents the least significant digits (or the 1st 4 outputs) and the upper digit represents the most significant digits (or the 2nd 4 outputs).

Forced Optional. Usually omitted.

Description

Out simultaneously sets 8 output lines using the combination of the portNumber and outData values specified by the user to determine which outputs will be set. The portNumber parameter defines which group of 8 outputs to use where portNumber = 0 means outputs 0-7, portNumber = 1 means outputs 8-15, etc..

Once a portnum is selected (i.e. a group of 8 outputs has been selected), a specific output pattern must be defined. This is done using the outData parameter. The outData parameter may have a value between 0-255 and may be represented in Hexadecimal or Integer format. (i.e. &H0-&HFF or 0-255)

The table below shows some of the possible I/O combinations and their associated outData values assuming that portNumber is 0, 1 accordingly.

<table>
<thead>
<tr>
<th>Output Settings When portNumber=0 (Output number)</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>OutData Value</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>01</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>02</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>03</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>08</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>09</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>10</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>11</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>99</td>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>255</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
</tr>
</tbody>
</table>
Output Settings When `portNumber`=1 (Output number)

<table>
<thead>
<tr>
<th>OutData Value</th>
<th>15</th>
<th>14</th>
<th>13</th>
<th>12</th>
<th>11</th>
<th>10</th>
<th>9</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>03</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>08</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>09</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>10</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>11</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>99</td>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>255</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>On</td>
</tr>
</tbody>
</table>

Notes

Difference between OpBCD and Out

The `Out` and OpBCD instructions are very similar in the SPEL+ language. However, there is one major difference between the two. This difference is shown below:
- The OpBCD instruction uses the Binary Coded Decimal format for specifying 8 bit value to use for turning the outputs on or off. Since Binary Coded Decimal format precludes the values of &HA, &HB, &HC, &HD, &HE or &HF from being used, all combinations for setting the 8 output group cannot be satisfied.
- The `Out` instruction works very similarly to the OpBCD instruction except that `Out` allows the range for the 8 bit value to use for turning outputs on or off to be between 0-255 (vs. 0-99 for OpBCD). This allows all possible combinations for the 8 bit output groups to be initiated according to the users specifications.

Forced Flag

This flag is used to turn On the I/O output at Emergency Stop and Safety Door Open from NoPause task, NoEmgAbort task (special task using NoPause or NoEmgAbort at Xqt), or background tasks. Be sure that the I/O outputs change by Emergency Stop and Safety Door Open when designing the system.

See Also

In, InBCD, MemOff, MemOn, MemOut, MemSw, Off, On, Oport, Sw, Wait

Out Example

The example shown below shows main task start a background task called iotask. The iotask is a simple task to flip flop between turning output bits 0-3 On and then Off. The Out instruction makes this possible using only 1 command rather than turning each output On and Off individually.

```
Function main
  Xqt iotask
  Do
    Go P1
    Go P2
  Loop
Fend

Function iotask
  Do
    Out 0, &H0F
    Out 0, &H00
    Wait 10
  Loop
Fend
```
Other simple examples from the command window are as follows:

- `Out 1, 6` 'Turns on Outputs 9 & 10
- `Out 2, 1` 'Turns on Output 8
- `Out 3, 91` 'Turns on Outputs 24, 25, 27, 28, and 30
Out Function

Returns the status of one byte of outputs.

Syntax

Out(portNumber)

Parameters

PortNumber Integer expression representing I/O output bytes. Where the portNumber selection corresponds to the following outputs:

<table>
<thead>
<tr>
<th>Portnum</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0-7</td>
</tr>
<tr>
<td>1</td>
<td>8-15</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

Return Values

The output status 8 bit value for the specified port.

See Also

Out Statement

Out Function Example

Print Out(0)
The output data of real value is the floating-point data (IEEE754 compliant) of 32 bits. Set the status of output port 2 word (32 bits).

**Syntax**

```
OutReal WordPortNumber, OutputData [,Forced]
```

**Parameters**

- `WordPortNumber`: Integer expression representing I/O output words.
- `OutputData`: Specifies the integer expression representing the output data (Real type value).

**Description**

Outputs the specified IEEE754 Real value to the output word port specified by word port number and the following output word port.
Output word lable can be used for the word port number parameter.

**Note**

**Forced Flag**

This flag is used to turn On the I/O output at Emergency Stop and Safety Door Open from NoPause task or NoEmgAbort task (special task initiated by specifying NoPause or NoEmgAbort at Xqt).

Carefully design the system because the I/O output changes by Emergency Stop and Safety Door Open.

**See Also**

- In, InW, InBCD, InReal, Out, OutW, OpBCD, OutReal Function

**OutReal Example**

```
OutReal 0, 2.543
```
OutReal Function

Retrieve the output port status as the 32 bits floating-point data (IEEE754 compliant).

Syntax

OutReal (WordPortNumber)

Parameter

WordPortNumber Integer expression representing I/O output words.

Return Values

Returns the specified output port status in 32 bits floating-point data (IEEE754 compliant).

See Also

In, InW, InBCD, InReal, Out, OutW, OpBCD, OutReal

OutReal Function Example

Real rdata01

rdata01 = OutReal(0)
OutW Statement

Simultaneously sets 16 output bits.

Syntax

```
OutW wordPortNum, outputData [,Forced]
```

Parameters

- `wordPortNum`: Integer expression representing I/O output words.
- `outputData`: Specifies output data (integers from 0 to 65535) using an expression or numeric value.
- `Forced`: Optional. Usually omitted.

Description

Changes the current status of user I/O output port group specified by the word port number to the specified output data.

Notes

**Forced Flag**

This flag is used to turn On the I/O output at Emergency Stop and Safety Door Open from NoPause task, NoEmgAbort task (special task using NoPause or NoEmgAbort at Xqt), or background tasks. Be sure that the I/O outputs change by Emergency Stop and Safety Door Open when designing the system.

See Also

In, InW, Out

OutW Example

```
OutW 0, 25
```
OutW Function

Returns the status of one word (2 bytes) of outputs.

Syntax

\texttt{OutW(wordPortNum)}

Parameters

\textit{wordPortNum} \hspace{1cm} \text{Integer expression representing I/O output words.}

Return Values

The output status 16 bit value for the specified port.

See Also

OutW Statement

OutW Function Example

\texttt{OutW 0, \&H1010}
PAgl Function

Return a joint value from a specified point.

Syntax

\[ \text{PAgl}\ (\text{point, jointNumber}) \]

Parameters

- **point**: Point expression.
- **jointNumber**: Specifies the joint number (integer from 1 to 9) using an expression or numeric value. The additional S axis is 8 and T axis is 9.

Return Values

Returns the calculated joint position (real value, deg for rotary joint, mm for prismatic joint).

See Also

- Agl, CX, CY, CZ, CU, CV, CW, CR, CS, CT, PPls

**PAgl Function Example**

```
Real joint1

joint1 = PAgl(P10, 1)
```
Pallet Statement

Defines and displays pallets.

Syntax

Pallet [Outside] [ palletNumber, Pi, Pj, Pk, columns, rows ]

Parameters

Outside
Optional. Allow row and column indexes outside of the range of the specified rows and columns.

palletNumber
Pallet number represented by an integer number from 0 to 15.

Pi, Pj, Pk
Point variables which define standard 3 point pallet position.

Pm
Optional. Point variable which is used with Pi, Pj and Pk to define 4 point pallet.

columns
Integer expression representing the number of points on the Pi-to-Pj side of the pallet. Range is from 1-32767.

rows
Integer expression representing the number of points on the Pi-to-Pk side of the pallet. Range is from 1-32767.

Return Values
Displays all defined pallets when parameters are omitted.

Description
Defines a pallet by teaching the robot, as a minimum, points Pi, Pj and Pk and by specifying the number of points from Pi to Pj and from Pi to Pk.

If the pallet is a well ordered rectangular shape, only 3 of the 4 corner points need to be specified. However, in most situations it is better to use 4 corner points for defining a pallet.

To define a pallet, first teach the robot either 3 or 4 corner points, then define the pallet as follows:

A pallet defined with 4 points: P1, P2, P3 and P4 is shown below. There are 3 positions from P1-P2 and 4 positions from P1-P3. This makes a pallet which has 12 positions total. To define this pallet the syntax is as follows:

Points that represent divisions of a pallet are automatically assigned division numbers, which, in this example, begin at P1. These division numbers are also required by the Pallet Function.

When Outside is specified, row and column indexes outside of the range of rows and columns can be specified.
For example:

Pallet Outside 1, P1, P2, P3, 4, 5
Jump Pallet(1, -2, 10)

Sample

Notes

**The Maximum Pallet Size**
The total number of points defined by a specific pallet must be less than 32,767.

**Incorrect Pallet Shape Definitions**
Be aware that incorrect order of points or incorrect number of divisions between points will result in an incorrect pallet shape definition.

**Pallet Plane Definition**
The pallet plane is defined by the Z axis coordinate values of the 3 corner points of the pallet. Therefore, a vertical pallet could also be defined.
Pallet Definition for a Single Row Pallet
A single row pallet can be defined with a 3 point Pallet statement or command. Simply teach a point at each end and define as follows: Specify 1 as the number of divisions between the same point.

> Pallet 2, P20, P21, P20, 5, 1 'Defines a 5×1 pallet

Additional Axes Coordinate Values
When the coordinate values of the 3 (or 4) points specified with the Pallet statement include the additional ST axis coordinate values, Pallet includes these additional coordinates in the position calculations. In the case where the additional axis is used as the running axis, the motion of the running axis is considered and calculated with the Pallet definition. You need to define a pallet larger than the robot motion range considering the position of the running axis. Even if you define additional axes that are not affected by the pallet definition, be careful of the positions of additional axes when defining the pallet.

See Also
Pallet Function

Pallet Statement Example
The following instruction from the command window sets the pallet defined by P1, P2 and P3 points, and divides the pallet plane into 15 equally distributed pallet point positions, with the pallet point number 1, the pallet point number 2 and the pallet point number 3 sitting along the P1-to-P2 side.

> pallet 1, P1, P2, P3, 3, 5
> jump pallet(1, 2) 'Jump to position on pallet

The resulting Pallet is shown below:

```
P3
13 14 15
10 11 12
 7  8  9
 4  5  6
 1  2  3
P1   P2
```
Pallet Function

Specifies a position in a previously defined pallet.

Syntax
(1) Pallet ( palletNumber, palletPosition )
(2) Pallet ( palletNumber, column, row )

Parameters
- palletNumber: Pallet number represented by integer expression from 0 to 15.
- palletPosition: The pallet position represented by an integer from 1 to 32767.
- column: The pallet column represented by an integer expression from −32768 to 32767.
- row: The pallet row represented by an integer expression from −32768 to 32767.

Description
Pallet returns a position in a pallet which was previously defined by the Pallet statement. Use this function with motion commands such as Go and Jump to cause the arm to move to the specified pallet position.

The pallet position number can be defined arithmetically or simply by using an integer.

Notes

Pallet Motion of 6-axis Robot
When the 6-axis robot moves to a point calculated by such as pallet or relative offsets, the wrist part may rotate to an unintended direction. The point calculation above does not depend on robot models and results in motion without converting the required point flag. LJM function prevents the unintended wrist rotation.

Pallet Motion of RS series
In the same way as the 6-axis, when the RS series robot moves to a point calculated by such as pallet or relative offsets, Arm #1 may rotate to an unintended direction. LJM function can be used to convert the point flag to prevent the unintended rotation of Arm #1.

In addition, the U axis of RS series may go out of the motion range when the orientation flag is converted, and it causes an error.
To prevent this error, LJM function adjusts the U axis target angle to inside the motion range. It is available when the orientation flag “2” is selected.

Additional Axes Coordinate Values
When the coordinate values of the 3 (or 4) points specified with the Pallet statement include the additional ST axis coordinate values, Pallet includes these additional coordinates in the position calculations. In the case where the additional axis is used as the running axis, the motion of the running axis is considered and calculated with the Pallet definition. You need to define a pallet larger than the robot motion range considering the position of the running axis. Even if you define additional axes that are not affected by the pallet definition, be careful of the positions of additional axes when defining the pallet.

See Also
LJM, Pallet
Pallet Function Example

The following program transfers parts from pallet 1 to pallet 2.

```
Function main
    Integer index
    Pallet 1, P1, P2, P3, 3, 5      'Define pallet 1
    Pallet 2, P12, P13, P11, 5, 3   'Define pallet 2
    For index = 1 To 15
        Jump Pallet(1, index)     'Move to point index on pallet 1
        On 1                      'Hold the work piece
        Wait 0.5                 
        Jump Pallet(2, index)     'Move to point index on pallet 2
        Off 1                     'Release the work piece
        Wait 0.5                 
    Next I
Fend

Function main
    Integer i, j
    P0 = XY(300, 300, 300, 90, 0, 180)
    P1 = XY(200, 280, 150, 90, 0, 180)
    P2 = XY(200, 330, 150, 90, 0, 180)
    P3 = XY(-200, 280, 150, 90, 0, 180)
    Pallet 1, P1, P2, P3, 10, 10
    Motor On
    Power High
    Speed 50; Accel 50, 50
    SpeedS 1000; AccelS 5000
    Go P0
    P11 = P0 -TLZ(50)
    For i = 1 To 10
        For j = 1 To 10
            'Specify points
            P10 = P11     'Depart point
            P12 = Pallet(1, i, j)     'Target point
            P11 = P12 -TLZ(50)     'Start approach point
            'Converting each point to LJM
            P10 = LJM(P10)
            P11 = LJM(P11, P10)
            P12 = LJM(P12, P11)
            'Execute motion
            Jump3 P10, P11, P12 C0
        Next j
    Next i
Fend
```
Function main2
   P0 = XY(300, 300, 300, 90, 0, 180)
   P1 = XY(400, 0, 150, 90, 0, 180)
   P2 = XY(400, 500, 150, 90, 0, 180)
   P3 = XY(-400, 0, 150, 90, 0, 180)
   Pallet 1, P1, P2, P3, 10, 10

Motor On
Power High
Speed 50; Accel 50, 50
SpeedS 1000; AccelS 5000

Go P0

Do
   ' Specify points
   P10 = Here -TLZ(50) ' Depart point
   P12 = Pallet(1, Int(Rnd(9)) + 1, Int(Rnd(9)) + 1) ' Target point
   P11 = P12 -TLZ(50) ' Start approach point

   If TargetOK(P11) And TargetOK(P12) Then ' Point check
      ' Converting each point to LJM
      P10 = LJMP10
      P11 = LJMP11, P10
      P12 = LJMP12, P11
      ' Execute motion
      Jump3 P10, P11, P12 C0
   EndIf
Loop
Fend
**ParseStr Statement / Function**

Parse a string and return array of tokens.

**Syntax**

```
ParseStr inputString$, tokens$(), delimiters$
numTokens = ParseStr(inputString$, tokens$(), delimiters$)
```

**Parameters**

- `inputString$`: String expression to be parsed.
- `tokens$()`: Output array of strings containing the tokens. The array declared by ByRef cannot be specified.
- `delimiters$`: String expression containing one or more token delimiters.

**Return Values**

When used as a function, the number of tokens parsed is returned.

**See Also**

Redim, String

**ParseStr Statement Example**

```pl
String toks$(0)
Integer i

ParseStr "1 2 3 4", toks$(), ", "

For i = 0 To UBound(toks)
    Print "token ", i, ", " = ", toks$(i)
Next i
```
Pass Statement

Executes simultaneous four joint Point to Point motion, passing near but not through the specified points.

Syntax

```
Pass point [, {On | Off | MemOn | MemOff} bitNumber [, point ... ]] [LJM [orientationFlag]]
```

Parameters

- **point**
  - `Pnumber` or `P(expr)` or point label.
  - When the point data is continued and in the ascending order or the descending order, specify two point numbers binding with colon as `P(1:5)`.

- **bitNumber**
  - The I/O output bit or memory I/O bit to turn on or off. Integer number between 0 - 511 or output label.

- **LJM**
  - Optional. Convert the depart point, approach point, and target destination using LJM function.

- **orientationFlag**
  - Optional. Specifies a parameter that selects an orientation flag for LJM function.

Description

- **Pass** moves the robot arm near but not through the specified point series.

To specify a point series, use points (P0,P1, ...) with commas between points.

To turn output bits on or off while executing motion, insert an On or Off command delimited with commas between points. The On or Off is executed before the robot reaches the point immediately preceding the On or Off.

If **Pass** is immediately followed by another **Pass**, control passes to the following **Pass** without the robot stopping at the preceding **Pass** final specified point.

If **Pass** is immediately followed by a motion command other than another Pass, the robot stops at the preceding **Pass** final specified point, but Fine positioning will not be executed.

If **Pass** is immediately followed by a command, statement, or function other than a motion command, the immediately following command, statement or function will be executed prior to the robot reaching the final point of the preceding Pass.

If Fine positioning at the target position is desired, follow the Pass with a Go, specifying the target position as shown in the following example:

```
Pass P5; Go P5; On 1; Move P10
```

The larger the acceleration / deceleration values, the nearer the arm moves toward the specified point. The **Pass** instruction can be used such that the robot arm avoids obstacles.
With LJM parameter, the program using LJM function can be more simple.

For example, the following four-line program

\[
\begin{align*}
  P11 &= \text{LJM}(P1, \text{Here, } 1) \\
  P12 &= \text{LJM}(P2, P11, 1) \\
  P13 &= \text{LJM}(P3, P12, 1) \\
  \text{Pass} &= P11, P12, P13
\end{align*}
\]

can be... one-line program.

\[
\begin{align*}
  \text{Pass} &= P1, P2, P3 \text{ LJM } 1
\end{align*}
\]

LJM parameter is available for 6-axis and RS series robots.

When using \textit{orientationFlag} with the default value, it can be omitted.

\[
\begin{align*}
  \text{Pass} &= P1, P2, P3 \text{ LJM}
\end{align*}
\]

\textbf{See Also}

Accel, Go, Jump, Speed

\textbf{Pass Example}

The example shows the robot arm manipulation by Pass instruction:

```
Function main
  Jump P1
  \textbf{Pass} P2  \' Move the arm toward P2, and perform the next instruction before reaching P2.
  \textbf{On} 2
  \textbf{Pass} P3
  \textbf{Pass} P4
  \textbf{Off} 0
  \textbf{Pass} P5
  \textbf{Fend}
```
Pause Statement

Temporarily stops program execution all tasks for which pause is enabled.

Syntax

Pause

Description

When the Pause is executed, program execution for all tasks with pause enabled (tasks that do not use NoPause or NoEmgAbort in Xqt command) is suspended. Also, if any task is executing a motion statement, it will be paused even if pause is not enabled for that task. However, Pause cannot stop the background tasks.

Notes

QP and its Affect on Pause

The QP instruction is used to cause the arm to stop immediately upon Pause or to complete the current move and then Pause the program. See the QP instruction help for more information.

Pause Statement Example

The example below shows the use of the Pause instruction to temporarily stop execution. The task executes program statements until the line containing the Pause command. At that point the task is paused. The user can then click the Run Window Continue Button to resume execution.

```
Function main
    Xqt monitor
    Go P1
    On 1
    Jump P2
    Off 1
    Pause ' Suspend program execution
    Go P40
    Jump P50
    Fend
```
PauseOn Function

Returns the pause status.

Syntax
PauseOn

Return Values
True if the status is pause, otherwise False.

Description
PauseOn function is used only for NoPause, NoEmgAbort task (special task using NoPause or NoEmgAbort at Xqt), and background tasks.

See Also
ErrorOn, EstopOn, SafetyOn, Xqt

PauseOn Function Example
The following example shows a program that monitors the controller pause and switches the I/O On/Off when pause occurs. However, when the status changes to pause by Safety Door open, the I/O does not turn On/Off.

Function main

    Xqt PauseMonitor, NoPause

    Fend

Function PauseMonitor

    Boolean IsPause
    IsPause = False
    Do
        Wait 0.1
        If SafetyOn = On Then
            If IsPause = False Then
                Print "Safety On"
                IsPause = True
            EndIf
        ElseIf PauseOn = On Then
            If IsPause = False Then
                Print "InPause"
                If SafetyOn = Off Then
                    Off 10
                    On 12
                EndIf
                IsPause = True
            EndIf
        Else
            If IsPause = True Then
                Print "OutPause"
                On 10
                Off 12
                IsPause = False
            EndIf
        EndIf
    Loop

Fend
PDef Function

Returns the definition status of a specified point.

Syntax

\[
PDef \ (\text{point})
\]

Parameters

- \text{point} \quad \text{An integer value or Pnumber or P(expr) or point label.}

Cautions for compatibility

- No variables can be specified for \text{point} parameter
- To use variables, write \text{PDef(P(varName))}.

Return Values

- True if the point is defined, otherwise False.

See Also

- Here Statement, Pdel

PDef Function Example

\[
\begin{align*}
\text{If Not } & \text{PDef(i) Then} \\
& \text{Here P1} \\
& \text{Endif} \\
& \text{Integer i} \\
& \text{For } i = 0 \text{ to 10} \\
& \quad \text{If PDef(P(i)) Then} \\
& \quad \quad \text{Print "P(";}i\text{;") is defined"} \\
& \quad \text{End If} \\
& \text{Next}
\end{align*}
\]
PDel Statement

Deletes specified position data.

Syntax

\[
PDel \ firstPointNum\ ,\ [\ lastPointNum\ ]
\]

Parameters

- **firstPointNum**
  - The first point number in a sequence of points to delete. `firstPointNum` must be an integer.

- **lastPointNum**
  - The last point number in a sequence of points to delete. `lastPointNum` must be an integer.

Description

Deletes specified position data from the controller's point memory for the current robot. Deletes all position data from `firstPointNum` up to and including `lastPointNum`. To prevent Error 2 from occurring, `firstPointNum` must be less than `lastPointNum`.

PDel Example

> p1=10,300,-10,0/L
> p2=0,300,-40,0
> p10=-50,350,0,0
> \texttt{pdel 1,2} \quad \text{’Delete points 1 and 2}
> \texttt{plist}
> P10 = -50.000, 350.000, 0.000, 0.000 /R /0
> \texttt{pdel 50} \quad \text{’Delete point 50}
> \texttt{pdel 100,200} \quad \text{’Delete from point 100 to point 200}
> \]
PG_FastStop Statement

Stop the PG axes immediately.

Syntax
PG_FastStop

Description
The PG_FastStop stops the current PG robot immediately with no deceleration. To stop normally, use the PG_SlowStop statement.

See Also
PG_Scan, PG_SlowStop

PG_FastStop Example
The following program moves the PG axis for 10 seconds and stops it.

```plaintext
Function main
    Motor On
    PG_Scan 0
    Wait 10
    PG_FastStop "Immediately stops the continuous motion"
Fend
```
**PG_LSpeed Statement**

Sets the pulse speed of the time when the PG axis starts accelerating and finishes decelerating.

**Syntax**

\[
\text{PG\_LSpeed} \quad \text{accelSpeed As Integer, [ decelSpeed As Integer ]}.\]

**Parameters**

- \text{speed} \quad \text{Integer expression that contains the pulse speed (1 ~ 32767 pulse/second)}
- \text{decalSpeed} \quad \text{Integer expression that contains the pulse speed (1 ~ 32767 pulse/second)}

**Description**

PG\_LSpeed specifies the pulse speed when the PG axis starts accelerating and finishes decelerating. It is useful when setting the initial/ending speed of a stepping motor to higher within the range of max starting frequency to offer the best performance of motor, or setting the speed to lower to prevent the stepping motor from stepping out. The default is 300 pulse/second and do not change to use.

If omitted the finishing speed of deceleration, the speed set value is used.

The PG\_LSpeed value initializes to the default values when any one of the following conditions occurs:

- Controller Startup
- Motor On
- SFree, SLock, Brake
- Reset, Reset Error
- Stop button or QuitAll stops tasks

**See Also**

PG\_LSpeed function

**PG\_LSpeed Example**

You can use the PG\_LSpeed in the command window or in the program. The followinf exambles show the both cases.

```plaintext
Function pglspeedtst
  Motor On
  Power High
  Speed 30;Accel 30,30
  \hspace{1cm} \textbf{PG\_LSpeed} 1000
  Go P0
Fend

To set the PG\_LSpeed value from the command window.

\[
> \text{PG\_LSpeed} \quad 1000,1100
> \]
```
PG_LSpeed Function

Returns the pulse speed at the time when the current PG axis starts accelerating and finishes decelerating.

Syntax

```
PG_LSpeed [ (paramNumber) ]
```

Parameters

- `paramNumber`: One of the numbers below that specifies the number of set value.
  - If omitted, 1 is used.
  - 1: Pulse speed at acceleration starts
  - 2: Pulse speed at deceleration finishes

Return Values

Integer value from 1 ~ 32767 in units of pulse/second.

See Also

- `PG_LSpeed`

PG_LSpeed function Example

```plaintext
Integer savPGLSpeed
savPGLSpeed = PG_LSpeed(1)
```
PG_Scan Statement

Starts the continuous spinning motion of the PG robot axes.

Syntax

`PG_Scan direction As Integer`

Parameters

<table>
<thead>
<tr>
<th>direction</th>
<th>Spinning direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>+ (CW) direction</td>
</tr>
<tr>
<td>1</td>
<td>- (CCW) direction</td>
</tr>
</tbody>
</table>

Description

The PG_Scan starts the continuous spinning motion of the current PG robot.
To execute the continuous spinning motion, you need to enable the PG parameter continuous spinning by the robot configuration.
When the program execution task is completed, the continuous spinning stops.

See Also

PG_Scan, PG_FastStop

PG_Scan Example

The following example spins the PG axis for 10 seconds and stops it suddenly.

```
Function main
  Motor On
  Power High
  Speed 10; Accel 10,10
  PG_Scan 0
  Wait 10
  PG_SlowStop
Fend
```
PG_SlowStop Statement

Stops slowly the PG axis spinning continuously.

Syntax
PG_SlowStop

Description
PG_SlowStop decelates the continuous spinning motion of the current PG robot and bring it to a stop.

See Also
PG_Scan, PG_FastStop

PG_SlowStop Example

The following example spins the PG axis for 10 seconds and stop it suddenly.

```plaintext
Function main
  Motor On
  PG_Scan 0
  Wait 10
  PG_SlowStop ' Stops suddenly the continuous spinning motion
Fend
```
PLabel Statement

Defines a label for a specified point.

Syntax

\[ \text{PLabel} \ pointNumber, \ newLabel \]

Parameters

- \( \text{pointNumber} \) An integer expression representing a point number.
- \( \text{newLabel} \) A string expression representing the label to use for the specified point.

See Also

PDef Function, PLabel Function, PNumber Function

PLabel Statement Example

\[ \text{PLabel 1, } \text{"pick"} \]
PLabel$ Function

Returns the point label associated with a point number.

Syntax
PLabel$(point)

Parameter
point An integer value or Pnumber or P(expr) or point label.

Cautions for compatibility
No variables can be specified for point parameter
To use variables, write PLabel$(P(varName)).

See Also
PDef Function, PLabel Statement, PNumber Function

PLabel$ Function Example
Print PLabel$(1)
Print PLabel$(P(i))
Plane Statement

Specifies and displays the approach check plane.

Syntax

1. Plane PlaneNum, [robotNumber], pCoordinateData
2. Plane PlaneNum, [robotNumber], pOrigin, pXaxis, pYaxis
3. Plane PlaneNum, [robotNumber]
4. Plane

Parameters

- **PlaneNum**: Integer value representing the plane number from 1 to 15.
- **robotNumber**: Integer values representing the robot number
  If omitted, the current robot is used.
- **pCoordinateData**: Point data representing the coordinate data of the approach check plane.
- **pOrigin**: Integer expression representing the origin point using the robot coordinate system.
- **pXaxis**: Integer expression representing a point along the X axis using the robot coordinate system if X alignment is specified.
- **pYaxis**: Integer expression representing a point along the Y axis using the robot coordinate system if Y alignment is specified.

Return Values

- When using syntax (3), the setting of the specified plane is displayed.
- When using syntax (4), the settings of all plane numbers for the current robot are displayed.

Description

**Plane** is used to set the approach check plane. The approach check plane is for checking whether the robot end effector is in one of the two areas divided by the specified approach check plane. The position of the end effector is calculated by the current tool. The approach check plane is set using the XY plane of the base coordinate system. The approach check plane detects the end effector when it approaches the area on the + Z side of the approach check plane.

When the approach check plane is used, the system detects approaches in any motor power status during the controller is ON.

The details of each syntax are as follows.

1. Specifies a coordinate system to create the approach check plane using the point data representing the translation and rotation based on the base coordinate system, and sets the approach check plane.

   Example:
   
   Plane 1, XY(x, y, z, u, v, w)
   Plane 1, P1

2. Defines the approach check plane (XP coordinate) by specifying the origin point, point along the X axis, and point along the Y axis. Uses the X, Y, Z coordinates and ignores U, V, W coordinates. Calculates the Z axis in righty and sets the approach checking direction.

   Example:
   
   Plane 1, P1, P2, P3

3. Displays the setting of the specified approach check plane.

4. Displays all the approach check plane.
You can use the GetRobotInsidePlane function and the InsidePlane function to get the result of the approach check plane. The GetRobotInsidePlane function can be used as the condition for a Wait command. You can provide the detection result to the I/O by setting the remote output setting.

To use one plane with more than one robot, you need to define planes from each robot coordinate system.

![Diagram of planes and robots]

**Notes**

**Tool Selection**

The approach check is executed for the current tool. When you change the tool, the approach check may display the tool approach from inside to outside of the plane or the other way although the robot is not operating.

**Additional axis**

For the robot which has the additional ST axes (including the running axis), the approach check plane to set doesn't depend on the position of an additional axis, but is based on the robot base coordinate system.

**See Also**

Box, GetRobotInsidePlane, InsidePlane, PlaneClr, PlaneDef

**Tip**

Set Plane statement from Robot Manager

EPSON RC+ 6.0 has a point and click dialog box for defining the approach check plane. The simplest method to set the Plane values is by using the Plane page on the Robot Manager.

**Plane Statement Example**

These are examples to set the approach check plane using **Plane** statement.

Check direction is the lower side of the horizontal plane that is −20 mm in Z axis direction in the robot coordinate system:

> plane 1, xy(100, 200, −20, 90, 0, 180)

Approach check plane is the XY coordinate created by moving 50 mm in X axis and 200 mm in Y axis, rotating 45 degrees around Y axis:

> plane 2, xy(50, 200, 0, 0, 45, 0)

Set the approach check plane using the tool coordinate system of the robot. (6-axis robot)

> plane 3, here
Plane Function

Returns the specified approach check plane.

Syntax

Plane(PlaneNum, [robotNumber])

Parameters

PlaneNum  Integer expression representing the plane number from 1 to 15.
robotNumber Integer values representing the robot number
If omitted, the current robot is used.

Return Values

Returns coordinate data for specified approach check plane.

See Also

GetRobotInsidePlane, InsidePlane, Plane, PlaneClr, PlaneDef

Plane Function Example

P1 = Plane(1)
PlaneClr Statement

Clears (undefines) a Plane definition.

Syntax
PlaneClr PlaneNum, [ robotNumber ]

Parameters
- **PlaneNum**: Integer expression representing the plane number from 1 to 15.
- **robotNumber**: Integer value representing the robot number
  If omitted, the current robot is used.

See Also
- GetRobotInsidePlane, InsidePlane, Plane, PlaneDef

PlaneClr Statement Example

```
PlaneClr 1
```
PlaneDef Function

Returns the setting of the approach check plane.

Syntax

PlaneDef (PlaneNum, [robotNumber])

Parameters

PlaneNum  Integer expression representing the plane number from 1 to 15.

robotNumber  Integer value representing the robot number

If omitted, the current robot is used.

Return Values

True if approach detection plane is defined for the specified plane number, otherwise False.

See Also

GetRobotInsidePlane, Box, InsidePlane, Plane, PlaneClr

PlaneDef Function Example

Function DisplayPlaneDef(planeNum As Integer)

    If PlaneDef(planeNum) = False Then
        Print "Plane ", planeNum, "is not defined"
    Else
        Print "Plane 1: ",
        Print Plane(PlaneNum)
    EndIf
EndIf
Displays point data in memory for the current robot.

**Syntax**

1. PList
2. PList `pointNumber`
3. PList `startPoint`
4. PList `startPoint`, `endPoint`

**Parameters**

- `pointNumber` The number range is 0 to 999.
- `startPoint` The start point number. The number range is 0 to 999.
- `endPoint` The end point index. The number range is 0 to 999.

**Return Values**

Point data.

**Description**

Plist displays point data in memory for the current robot.

When there is no point data within the specified range of points, no data will be displayed. When a start point number is specified larger than the end point number, then an error occurs.

1. PList
   Displays the coordinate data for all points.
2. PList `pointIndex`
   Displays the coordinate data for the specified point.
3. PList `startPoint`
   Displays the coordinate data for all points starting with `startPoint`.
4. PList `startPoint`, `endPoint`
   Displays the coordinate data for all points starting with `startPoint` and ending with `endPoint`.

**PList Example**

Display type depends on the robot type and existence of additional axes. The following examples are for a Scara robot without additional axes.

Displays the specified point data:

```
> plist 1
P1   = XY( 200.000,  0.000, -20.000,  0.000 ) /R /0
>
```

Displays the point data within the range of 10 and 20. In this example, only three points are found in this range.

```
> plist 10, 20
P10  = XY( 290.000,  0.000, -20.000,  0.000 ) /R /0
P12  = XY( 300.000,  0.000,  0.000,  0.000 ) /R /0
P20  = XY( 285.000, 10.000, -30.000, 45.000 ) /R /0
>
```
Displays the point data starting with point number 10

> plist 10,
P10 = XY( 290.000, 0.000, -20.000, 0.000 ) /R /0
P12 = XY( 300.000, 0.000, 0.000, 0.000 ) /R /0
P20 = XY( 285.000, 10.000, -30.000, 45.000 ) /R /0
P30 = XY( 310.000, 20.000, -50.000, 90.000 ) /R /0
PLocal Statement

Sets the local attribute for a point.

Syntax

\[ \text{PLocal}(\text{point}) = \text{localNumber} \]

Parameters

- **point**: An integer value or \texttt{Pnumber} or \texttt{P(expr)} or point label.

  Cautions for compatibility
  No variables can be specified for \textit{point} parameter
  To use variables, write \texttt{PLocal(P(varName))}.

- **localNumber**: An integer expression representing the new local number. Range is 0 to 15.

See Also

- PLocal Function

PLocal Statement Example

\[ \text{PLocal}(\text{pick}) = 1 \]
PLocal Function

Returns the local number for a specified point.

Syntax

PLocal(point)

Parameters

point  An integer value or Pnumber or P(expr) or point label.

Caution for compatibility
No variables can be specified for point parameter
To use variables, write PLocal(P(varName)).

Return Values

Local number for specified point.

See Also

PLocal Statement

PLocal Function Example

Integer localNum

localNum = PLocal(pick)
Pls Function

Returns the current encoder pulse count for each joint at the current position.

Syntax

\texttt{Pls(jointNumber)}

Parameters

\texttt{jointNumber}  
The specific joint for which to get the current encoder pulse count.  
The additional S axis is 8 and T axis is 9.

Return Values

Returns a number value representing the current encoder pulse count for the joint specified by \texttt{jointNumber}.

Description

\texttt{Pls} is used to read the current encoder position (or Pulse Count) of each joint. These values can be saved and then used later with the Pulse command.

See Also

CX, CY, CZ, CU, CV, CW, Pulse

Pls Function Example

Shown below is a simple example to get the pulse values for each joint and print them.

```
Function plstest
    Real t1, t2, z, u
    t1 = \texttt{pls}(1)
    t2 = \texttt{pls}(2)
    z = \texttt{pls}(3)
    u = \texttt{pls}(4)
    Print "T1 joint current Pulse Value: ", t1
    Print "T2 joint current Pulse Value: ", t2
    Print "Z joint current Pulse Value: ", z
    Print "U joint current Pulse Value: ", u
Fend
```
PNumber Function

Returns the point number associated with a point label.

Syntax

\[ \text{PNumber}(\text{pointLabel}) \]

Parameters

pointLabel  A point label used in the current point file or string expression containing a point label.

See Also

PDef Function, PLabel$ Function

PNumber Function Example

```plaintext
Integer pNum
String pointName$

pNum = PNumber(pick)
pNum = PNumber("pick")
pointName$ = "place"
pNum = PNumber(pointName$)
```
Point Assignment

Defines a robot point by assigning it to a point expression.

Syntax

\[
\text{point} = \text{pointExpr}
\]

Parameters

\begin{itemize}
\item \textit{point} \quad \text{Expression including numeric number or ( ) (parenthesis)}
\item \textit{Pnumber}
\item \textit{P(expr)}
\item \textit{pointLabel} \quad \text{Point label}
\item \textit{pointExpr} \quad \text{One of the following point data}
\item P point number, Point label, Here, Pallet, Point data function
\item (Here function, XY function, JA function, Pulse function, etc..)
\end{itemize}

Description

Define a robot point by setting it equal to another point or point expression.

See Also

Local, Pallet, PDef, PDel, Plist

Point Assignment Example

The following examples are done from the command window:

Assign coordinates to P1:

\[
> \text{P1} = 300, 200, -50, 100
\]

Specify left arm posture:

\[
> \text{P2} = -400, 200, -80, 100/L
\]

Add 20 to X coordinate of P2 and define resulting point as P3:

\[
> \text{P3} = \text{P2} +X(20)
\]

\[
> \text{plist 3}
\]

\[
\text{P3} = -380, 200, -80, 100/L
\]

Subtract 50 from Y coordinate of P2, substitute -30 for Z coordinate, and define the resulting point P4 as right arm posture:

\[
> \text{P4} = \text{P2} -Y(50); Z(-30) /R
\]

\[
> \text{plist 4}
\]

\[
\text{P4} = \text{XY}(-450, 200, -30, 100)/R
\]

Add 90 to U coord of Pallet(3, 5), and define resulting point as P6:

\[
> \text{P5} = \text{Here}
\]

\[
> \text{P6} = \text{pallet(3,5)} +U(90)
\]
Point Expression

Specifies a robot point for assignment and motion commands.

Syntax

\[
\text{point} \left[ \{ + | - \} \text{point} \right] \left[ \{ \text{local} \} \left[ \text{hand} \right] \left[ \text{elbow} \right] \left[ \text{j4flag} \right] \left[ \text{j6flag} \right] \left[ \text{j1flag} \right] \left[ \text{j2flag} \right] \left[ \text{relativeOffsets} \right] \right] \left[ \text{absoluteCoords} \right]
\]

Parameters

- **point**: The base point specification. This can be one of the following:
  - \( \text{Pnumber} \)
  - \( \text{P} (\text{expr}) \)
  - \( \text{Here} \)
  - \( \text{Pallet}(\text{palletNumber}, \text{palletIndex}) \)
  - \( \text{pointLabel} \)
  - \( \text{XY}(X, Y, Z, U, [V], [W]) \)
  - \( \text{JA}(J1, J2, J3, J4, [J5], [J6]) \)
  - \( \text{Pulse}(J1, J2, J3, J4, [J5], [J6]) \)

- **local**: Optional. Local number from 1 to 15 preceded by a forward slash (\(/0\) to \(/15\)) or at sign (\(@0\) to \(@15\)). The forward slash means that the coordinates will be in the local. The at sign means that the coordinates will be translated into local coordinates.

- **hand**: Optional for SCARA robot (including RS series) and 6-axis robots. Specify /L or /R for lefty or righty hand orientation.

- **elbow**: Optional for 6-axis robots. Specify /A or /B for above or below orientation.

- **wrist**: Optional for 6-axis robots. Specify /F or /NF for flip or no flip orientation.

- **j4flag**: Optional for 6-axis robots. Specify /J4F0 or /J4F1.


- **j1flag**: Optional for RS series. Specify /J1F0 or /J1F1.


- **j1angle**: Optional for RS series. Specify /J1A (real value).

- **relativeOffsets**: Optional. One or more relative coordinate adjustments.

\[
\{ + | - \} \{ X | Y | Z | U | V | W | R | S | T | ST \} (\text{expr})
\]

The TL offsets are relative offsets in the current tool coordinate system.

- **absoluteCoords**: Optional. One or more absolute coordinates.

\[
\{ X | Y | Z | U | V | W | R | S | T | ST \} (\text{expr})
\]

Description

Point expressions are used in point assignment statements and motion commands.

\[
\text{Go} \text{ P1} + \text{ P2} \\
\text{P1} = \text{ P2} + \text{XY}(100, 100, 0, 0)
\]

Using relative offsets

You can offset one or more coordinates relative to the base point. For example, the following statement moves the robot 20 mm in the positive X axis from the current position:

\[
\text{Go} \text{ Here} +X(20)
\]

If you execute the same statement again, the robot will move an additional 20 mm along the X axis, because this is a relative move.

You can also use relative tool offsets:
Point Expression

Go Here +TLX(20) -TLY(5.5)

When the 6-axis robot moves to a point calculated by such as pallet or relative offsets, the wrist part may rotate to an unintended direction. The point calculation above does not depend on robot models and results in motion without converting the required point flag. LJM function prevents the unintended wrist rotation.

Go LJM(Here +X(20))

Using absolute coordinates

You can change one or more coordinates of the base point by using absolute coordinates. For example, the following statement moves the robot to the 20 mm position on the X axis:

Go Here :X(20)

If you execute the same statement again, the robot will not move because it is already in the absolute position for X from the previous move.

Relative offsets and absolute coordinates make is easy to temporarily modify a point. For example, this code moves quickly above the pick point by 10 mm using a relative offset for Z or 10 mm, then moves slowly to the pick point.

Speed fast
Jump pick +Z(10)
Speed slow
Go pick

This code moves straight up from the current position by specifying an absolute value of 0 for the Z joint:

LimZ 0
Jump Here :Z(0)

Using Locals

You can specify a local number using a forward slash or at sign. Each has a separate function.

Use the forward slash to mark the coordinates in a local. For example, adding a /1 in the following statement says that P1 will be at location 0,0,0,0 in local 1.

P1 = XY(0, 0, 0, 0) /1

Use the at sign to translate the coordinates into local coordinates. For example, here is how to set the current position to P1:

P1 = Here @1

See Also

Go, LJM, Local, Pallet, Pdel, Plist, Hand, Elbow, Wrist, J4Flag, J6Flag, J1Flag, J2Flag
**Point Expression Example**

Here are some examples of using point expressions in assignments statements and motion commands:

\[
\begin{align*}
P1 &= \text{XY}(300, 200, -50, 100) \\
P2 &= P1 /R \\
P3 &= \text{pick} /1 \\
P4 &= P5 + P6 \\
P(i) &= \text{XY}(100, 200, \text{CZ}(P100), 0) \\
\text{Go P1} &= \text{-X}(20) :Z(-20) /R \\
\text{Go Pallet(1, 1)} &= \text{-Y}(25.5) \\
\text{Move pick} &= /R \\
\text{Jump Here} &= :Z(0) \\
\text{Go Here} &= :Z(-25.5) \\
\text{Go JA}(25, 0, -20, 180) \\
pick &= \text{XY}(100, 100, -50, 0) \\
P1 &= \text{XY}(300, 200, -50, 100, -90, 0) \\
P2 &= P1 /F /B \\
P2 &= P1 +\text{TLV}(25)
\end{align*}
\]
PosFound Function

Returns status of Find operation.

Syntax

PosFound

Return Values

True if position was found during move, False if not.

See Also

Find

PosFound Function Example

Find Sw(5) = ON
Go P10 Find
If PosFound Then
   Go FindPos
Else
   Print "Error: Cannot find the sensor signal."
EndIf
Power Statement

Switches Power Mode to high or low and displays the current status.

Power Syntax
(1) Power { High | Low }
(2) Power

Parameters
High | Low  The setting can be High or Low. The default is Low.

Return Values
Displays the current Power status when parameter is omitted.

Description
Switches Power Mode to High or Low. It also displays the current mode status.

Low - When Power is set to Low, Low Power Mode is On. This means that the robot will run slow (below 250 mm/sec) and the servo stiffness is set light so as to remove servo power if the robot bumps into an object.

High - When Power is set to High, Low Power Mode is Off. This means that the robot can run at full speed with the full servo stiffness.

The following operations will switch to low power mode. In this case, speed and acceleration settings will be limited to the default value. The default value is described in the each manipulator specification table. See also the EPSON RC+ Users Guide: 2. Safety.

Conditions to cause Power Low:
- Controller Startup
- Motor On
- SFree, SLock, Brake
- Reset, Reset Error
- Stop button or QuitAll stops tasks

Settings limited to the default value
- Speed
- Accel
- SpeedS
- AccelS

Notes
Low Power Mode (Power Low) and Its Effect on Max Speed:
In low power mode, motor power is limited, and effective motion speed setting is lower than the default value. If, when in Low Power mode, a higher speed is specified from the Command window (directly) or in a program, the speed is set to the default value. If a higher speed motion is required, set Power High.

High Power Mode (Power High) and Its Effect on Max Speed:
In high power mode, higher speeds than the default value can be set.
See Also
Accel, AccelS, Speed, SpeedS

Power Example
The following examples are executed from the command window:

> Speed 50  'Specifies high speed in Low Power mode
> Accel 100, 100  'Specifies high accel
> Jump P1  'Moves in low speed and low accel
> Speed
> Low Power Mode
>     50
>     50
> Accel
> Low Power Mode
>     100  100
>     100  100
> Power High  'Set high power mode
> Jump P2  'Move robot at high speed
Power Function

Returns status of power.

Syntax

Power

Return Values

0 = Power Low, 1 = Power High.

See Also

Power Statement

Power Function Example

If Power = 0 Then
    Print "Low Power Mode"
EndIf
Return the pulse position of a specified joint value from a specified point.

Syntax

`PPls(point, jointNumber)`

Parameters

- `point` Point expression.
- `jointNumber` Expression or numeric value specifying the joint number (integer from 1 to 9)
  The additional S axis is 8 and T axis is 9.

Return Values

Returns the calculated joint position (long value, in pulses).

See Also

`Agl, CX, CY, CZ, CU, CV, CW, Pagl`

PPls Example

```plaintext
Long pulses1

pulses1 = PPls(P10, 1)
```
Print Statement

Outputs data to the current display window, including the Run window, Operator window, Command window, and Macro window.

Syntax

Print expression [, expression... ] [, ]

Parameters

expression Optional. A number or string expression.
, (comma) Optional. If a comma is provided at the end of the statement, then a CRLF will not be added.

Return Values

Variable data or the specified character string.

Description

Print displays variable data or the character string on the display device.

An end of line CRLF (carriage return and line feed) is automatically appended to each output unless a comma is used at the end of the statement.

Notes

Make Sure Print is used with Wait or a motion within a loop

Tight loops (loops with no Wait or no motion) are generally not good, especially with Print. The controller may freeze up in the worst case.
Be sure to use Print with Wait command or a motion command within a loop.

Bad example

Do
  Print "1234"
Loop

Good example

Do
  Print "1234"
  Wait 0.1
Loop

See Also

Print #

Print Statement Example

The following example extracts the U Axis coordinate value from a Point P100 and puts the coordinate value in the variable uvar. The value is then printed to the current display window.

```
Function test
  Real uvar
  uvar = CU(P100)
  Print "The U Axis Coordinate of P100 is ", uvar
Fend
```
Print # Statement

Outputs data to the specified file, communications port, database, or device.

Syntax

\[
\text{Print } \#\text{portNumber, expression[, expression...][,]}
\]

Parameters

- **portNumber**: ID number representing a file, communications port, database, or device. File number can be specified in ROpen, WOpen, and AOpen statements. Communications port number can be specified in OpenCom (RS232) and OpenNet (TCP/IP) statements. Database number can be specified in OpenDB statement. Device ID integers are as follows.
  - 21 RC+
  - 24 TP
  - 28 LCD

- **expression**: A numeric or string expression.

- **comma**: Optional. If a comma is provided at the end of the statement, then a CRLF will not be added.

Description

Print # outputs variable data, numerical values, or character strings to the communication port or the device specified by portNumber.

Note

Maximum data length

This command can handle up to 256 bytes. However, if the target is a database, it can handle up to 4096 bytes.

Exchange variable data with other controller

- When more than one string variable or both of numeric variable and string variable is specified, a comma (",") character has to be added expressly to the string data.

  Sending end (Either pattern is OK.)

  \[
  \text{Print } \#\text{PortNum, "$Status", InData, OutData}
  \]

  \[
  \text{Print } \#\text{PortNum, "$Status",",", InData, OutData}
  \]

  Receiving end

  \[
  \text{Input } \#\text{PortNum, Response$, InData, OutData}
  \]

File write buffering

File writing is buffered. The buffered data can be written with Flush statement. Also, when closing a file with Close statement, the buffered data can be written.

See Also

Input#, Print

Print # Example

The following are some simple Print # examples:

```plaintext
Function printex
    String temp$
    Print #1, "$5" 'send the character "5" to serial port 1 temp$ = "hello"
    Print #1, temp$
    Print #2, temp$
    Print #1 " Next message for port 1"
    Print #2 " Next message for port 2"
Fend
```

PTCLR Statement

Clears and initializes the peak torque for one or more joints.

Syntax
PTCLR \[j1, j2, j3, j4, j5, j6, j7, j8, j9\]

Parameters
\[j1 - j9\] Optional. Integer expression representing the joint number. If no parameters are supplied, then the peak torque values are cleared for all joints. The additional S axis is 8 and T axis is 9.

Description
PTCLR clears the peak torque values for the specified joints.

You must execute PTCLR before executing PTRQ.

See Also
ATRQ, PTRQ

PTCLR Statement Example

```plaintext
> ptclr
> go p1
> ptrq 1
  0.227
> ptrq
  0.227  0.118
  0.249  0.083
  0.000  0.000
>
```
**PTPBoost Statement**

Specifies or displays the acceleration, deceleration and speed algorithmic boost parameter for small distance PTP (point to point) motion.

**Syntax**

(1) `PTPBoost boost, [departBoost], [approBoost]`
(2) `PTPBoost`

**Parameters**

- `boost` Integer expression from 0 - 100.
- `departBoost` Optional. Jump depart boost value. Integer expression from 0 - 100.
- `approBoost` Optional. Jump approach boost value. Integer expression from 0 - 100.

**Return Values**

When parameters are omitted, the current PTPBoost settings are displayed.

**Description**

`PTPBoost` sets the acceleration, deceleration and speed for small distance PTP motion. It is effective only when the motion distance is small. The PTPBoostOK function can be used to confirm whether or not a specific motion distance to the destination is small enough to be affected by PTPBoost or not.

`PTPBoost` does not need modification under normal circumstances. Use `PTPBoost` only when you need to shorten the cycle time even if vibration becomes larger, or conversely when you need to reduce vibration even if cycle time becomes longer.

When the `PTPBoost` value is large, cycle time becomes shorter, but the positioning vibration increases. When `PTPBoost` is small, the positioning vibration becomes smaller, but cycle time becomes longer. Specifying inappropriate `PTPBoost` causes errors or can damage the manipulator. This may degrade the robot, or sometimes cause the manipulator life to shorten.

The `PTPBoost` value initializes to its default value when any one of the following is performed:

- Controller Startup
- Motor On
- SFree, SLock, Brake
- Reset, Reset Error
- Stop button or QuitAll stops tasks

**See Also**

- PTPBoostFunction, PTPBoostOK

**PTPBoost Statement Example**

```
PTPBoost 50, 30, 30
```
**PTPBoost Function**

Returns the specified PTPBoost value.

**Syntax**

```
PTPBoost(paramNumber)
```

**Parameters**

`paramNumber`  
Integer expression which can have the following values:

1: boost value  
2: jump depart boost value  
3: jump approach boost value

**Return Values**

Integer value from 0 - 100.

**See Also**

PTPBoost Statement, PTPBoostOK

**PTPBoost Function Example**

Print `PTPBoost(1)`
PTPBoostOK Function

Returns whether or not the PTP (Point to Point) motion from a current position to a target position is a small travel distance.

Syntax

```plaintext
PTPBoostOK(targetPos)
```

Parameters

- `targetPos` Point expression for the target position.

Return Values

True if it is possible to move to the target position from the current position using PTP motion, otherwise False.

Description

Use `PTPBoostOK` to determine if the distance from the current position to the target position is small enough for PTPBoost to be effective.

See Also

- PTPBoost

PTPBoostOK Function Example

```plaintext
If PTPBoostOK(P1) Then
    PTPBoost 50
EndIf
Go P1
```
PTPTime Function

Returns the estimated time for a point to point motion command without executing it.

Syntax
(1) PTPTime(destination, destArm, destTool)
(2) PTPTime(start, startArm, startTool, destination, destArm, destTool)

Parameters
- **start**  
  Point expression for the starting position.
- **destination**  
  Point expression for the destination position.
- **destArm**  
  Integer expression for the destination arm number.
- **destTool**  
  Integer expression for the destination tool number.
- **startArm**  
  Integer expression for the starting point arm number.
- **startTool**  
  Integer expression for the starting point tool number.

Return Values
Real value in seconds.

Description
Use PTPTime to calculate the time it would take for a point to point motion command (Go). Use syntax 1 to calculate time from the current position to the destination. Use syntax 2 to calculate time from a start point to a destination point.

The actual motion operation is not performed when this function is executed. The current position, arm, and tool settings do not change.

If the position is one that cannot be arrived at or if the arm or tool settings are incorrect, 0 is returned.

If a robot includes an additional axis and it is the servo axis, the function will consider the motion time of the additional axis.
If the additional axis is a PG axis, the motion time of the robot will be returned.

See Also
ATRQ, Go, PTRQ

PTPTime Function Example

Real secs

secs = PTPTime(P1, 0, 0, P2, 0, 1)
Print "Time to go from P1 to P2 is:" , secs

Go P1
secs = PTPTime(P2, 0, 1)
Print "Time to go from P1 to P2 is:" , secs
PTran Statement

Perform a relative move of one joint in pulses.

Syntax

\[ \text{PTran} \ joint, \ pulses \]

Parameters

- \textit{joint} 
  Integer expression representing which joint to move.
  The additional S axis is 8 and T axis is 9.

- \textit{pulses} 
  Integer expression representing the number of pulses to move.

Description

Use \texttt{PTran} to move one joint a specified number of pulses from the current position.

See Also

Go, JTran, Jump, Move

PTran Statement Example

\[ \text{PTran} \ 1, \ 2000 \]
Displays the peak torque for the specified joint.

Syntax

PTRQ [jointNumber]

Parameters

jointNumber Optional. Integer expression representing the joint number.
The additional S axis is 8 and T axis is 9.

Return Values

Displays current peak torque values for all joints.

Description

Use PTRQ to display the peak torque value for one or all joints since the PTCLR statement was executed.

Peak torque is a real number from 0 to 1.

See Also

ATRQ, PTCLR, PTRQ Function

PTRQ Statement Example

```plaintext
> ptclr
> go p1
> ptrq 1
  0.227
> ptrq
  0.227 0.118
  0.249 0.083
  0.000 0.000
> 
```
PTRQ Function

Returns the peak torque for the specified joint.

Syntax

PTRQ(jointNumber)

Parameters

jointNumber Integer expression representing the joint number.
The additional S axis si 8 and T axis is 9.

Return Values

Real value from 0 to 1.

See Also

ATRQ, PTCLR, PTRQ Statement

PTRQ Function Example

This example uses the PTRQ function in a program:

Function DisplayPeakTorque
    Integer i
    Print "Peak torques:"
    For i = 1 To 4
        Print "Joint ", i, " = ", PTRQ(i)
    Next i
Fend
Pulse Statement

Moves the robot arm using point to point motion to the point specified by the pulse values for each joint.

Syntax

(1) Pulse J1, J2, J3, J4, [J5, J6], [J7], [J8, J9]

(2) Pulse

Parameters

J1 ~ J4 The pulse value for each of the first four joints. The pulse value has to be within the range defined by the Range instruction and should be an integer or long expression.

J5, J6 Optional. For 6-axis robots and Joint type 6-axis robots.

J7 Optional. For Joint type 7-axis robots.

J8, J9 Optional. For the additional axis.

Return Values

When parameters are omitted, the pulse values for the current robot position are displayed.

Description

Pulse uses the joint pulse value from the zero pulse position to represent the robot arm position, rather than the orthogonal coordinate system. The Pulse instruction moves the robot arm using Point to Point motion.

The Range instruction sets the upper and lower limits used in the Pulse instruction.

Note

**Make Sure Path is Obstacle Free Before Using Pulse**

Unlike Jump, **Pulse** moves all axes simultaneously, including Z joint raising and lowering in traveling to the target position. Therefore, when using **Pulse**, take extreme care so that the hand can move through an obstacle free path.

Potential Errors

**Pulse value exceeds limit:**

If the pulse value specified in Pulse instruction exceeds the limit set by the Range instruction, an error will occur.

See Also

Go, Accel, Range, Speed, Pls, Pulse Function

Pulse Statement Example

Following are examples on the Command window:

This example moves the robot arm to the position which is defined by each joint pulse.

```
> pulse 16000, 10000, -100, 10
```

This example displays the pulse numbers of 1st to 4th axes of the current robot arm position.

```
> pulse
PULSE: 1: 27306 pls 2: 11378 pls 3: -3072 pls 4: 1297 pls
```

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Pulse Function

Returns a robot point whose coordinates are specified in pulses for each joint.

Syntax

\[
Pulse(\ J1,\ J2,\ J3,\ J4,\ [J5,\ J6],\ [J7],\ [J8,\ J9])
\]

Parameters

\[
\begin{array}{ll}
J1 ~ J4 & \text{The pulse value for joints 1 to 4. The pulse value must be within the range defined by the Range instruction and should be an integer or long expression.} \\
J5, J6 & \text{Optional. For 6-axis robots and Joint type 6-axis robots.} \\
J7 & \text{Optional. For Joint type 7-axis robots.} \\
J8, J9 & \text{Optional. For the additional axis.}
\end{array}
\]

Return Values

A robot point using the specified pulse values.

See Also

Go, JA, Jump, Move, Pulse Statement, XY

Pulse Function Example

\[
Jump\ Pulse(1000,\ 2000,\ 0,\ 0)
\]
QP Statement

Switches Quick Pause Mode On or Off and displays the current mode status.

Syntax
(1) QP { On | Off }
(2) QP

Parameters
On | Off
Quick Pause can be either On or Off.

Return Values
Displays the current QP mode setting when parameter is omitted.

Description
If during motion command execution either the Pause switch is pressed, or a pause signal is input to the controller, quick pause mode determines whether the robot will stop immediately, or will Pause after having executed the motion command.

Immediately decelerating and stopping is referred to as a "Quick Pause".

With the On parameter specified, QP turns the Quick Pause mode On.
With the Off parameter specified, QP turns the Quick Pause mode Off.

QP displays the current setting of whether the robot arm is to respond to the Pause input by stopping immediately or after the current arm operation is completed. QP is simply a status instruction used to display whether Quick Pause mode is on or off.

Notes

Quick pause mode defaults to on after power is turned on:
The Quick Pause mode set by the QP instruction remains in effect after the Reset instruction. However, when the PC power or Drive Unit power is turned off and then back on, Quick Pause mode defaults to On.

QP and the Safe Guard Input:
Even if QP mode is set to Off, if the Safe Guard Input becomes open the robot will pause immediately.

See Also
Pause

QP Statement Example
This Command window example displays the current setting of whether the robot arm is to stop immediately on the Pause input. (i.e. is QP mode set On or Off)

> qp
QP ON

> qp on 'Sets QP to Quick Pause Mode
>
QPDecelR Statement

Sets the deceleration speed of quick pause for the change of tool orientation during the CP motion.

Syntax

(1) QPDecelR QPDecelR
(2) QPDecelR

Parameters

QPDecelR Real value representing the deceleration speed of quick pause during the CP motion (deg/sec²).

Result

If omitted the parameter, the current QPDecelR set value will be displayed.

Description

QPDecelR statement is enabled when the ROT parameter is used in the Move, Arc, Arc3, BMove, TMove, and Jump3CP statements. While quick pause is executed in these statements, a joint acceleration error may occur. This is because the deceleration speed of quick pause that is automatically set in a normal quick pause is over the joint allowable deceleration speed. Specifically, the error is likely to occur when the AccelR value in the CP motion is too high or jogging the robot near a singularity. In these cases, use the QPDecelR and set a lower quick pause deceleration speed. But if the setting is too low, the distance for quick pause will increase. Therefore, set the possible value. Normally, you don’t need to set QPDecelR.

You cannot use values lower than the deceleration speed of orientation change in the CP motion set with QPDecelR and AccelR. If you do, a parameter out of range error occurs. Also, after you set QPDecelR, if a higher value than the set QP deceleration speed is set with the AccelR, the QPDecelR will automatically set the QP deceleration speed same as the decleration speed set with the AccelR.

The QPDecelR Statement value initializes to the default max deceleration speed when any one of the following conditions occurs:

- Controller Startup
- Motor On
- SFree, SLock, Brake
- Reset, Reset Error
- Stop button or QuitAll stops tasks

See Also

QPDecelR function, QPDecelS, AccelR

QPDecelR Example

The following program sets the QPDecelR of the Move statement.

```plaintext
Function QPDecelTest
    AccelR 3000
    QPDecelR 4000
    SpeedR 100
    Move P1 ROT
    :
    Fend
```
QPDecelR Function

Returns the set deceleration speed of quick pause for the change of tool orientation during the CP motion.

Syntax
QPDecelR

Return Values
Real value that contains the set deceleration speed of quick pause for the tool orientation change in the CP motion (deg/s²)

See Also
QPDecelR, QPDecelS function

QPDecelR function Example

Real savQPDecelR
savQPDecelR = QPDecelR
QPDecelS Statement

Sets the deceleration speed of quick pause in the CP motion.

Syntax
(1) QPDecelS QPDecelS [ departDecel, approDecel ]
(2) QPDecelS

Parameters
- **QPDecelS**: Real value that specifies the deceleration speed of quick pause in the CP motion. (mm/sec²)
- **departDecel**: Real value that specifies the deceleration speed of quick pause in the Jump3 depart motion (mm/sec²)
- **approDecel**: Real value that specifies the deceleration speed of quick pause in the Jump3 approach motion (mm/sec²)

Return Values
If omitted the parameter, the current QPDecelS set value is displayed.

Description
While quick pause is executed in the CP motion, a joint acceleration error may occur. This is because the deceleration speed of quick pause that is automatically set in a normal quick pause is over the joint allowable deceleration speed. Specifically, the error is likely to occur when the AccelS value in the CP motion is too high or jogging the robot near a singularity. In these cases, use the QPDecelS and set a lower quick pause deceleration speed. But if the setting is too low, the distance for quick pause will increase. Therefore, set the possible value. Normally, you don’t need to set QPDecelS.

You cannot use values lower than the deceleration speed of the CP motion set with AccelS. If you do, a parameter out of range error occurs.

Also, after you set QPDecelS, if a higher value than the set QP deceleration speed is set with the AccelS, the QPDecelS will automatically set the QP deceleration speed same as the declaration speed set with the AccelS.

The QPDecelS Statement value initializes to the default max deceleration speed when any one of the following conditions occurs:

- Controller Startup
- Motor On
- SFree, SLock, Brake
- Reset, Reset Error
- Stop button or QuitAll stops tasks

See Also
QPDecelS Function, QPDecelR, AccelS

QPDecelS Example
The following program sets the QPDecelS of the Move statement.

```plaintext
Function QPDecelTest
  AccelS 3000
  QPDecelS 4000
  SpeedS 100
  Move P1
  ...
  ...
  Fend
```

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QPDecelS Function

Returns the set deceleration speed of quick pause during the CP motion.

Syntax
QPDecelS (paramNumber)

Parameters
paramNumber  Integer expression specifying the one of the following values.
1: Quick pause deceleration speed during the CP motion
2: Quick pause deceleration speed in depart motion during the Jump3 and Jump3CP
3: Quick pause deceleration speed in approach motion during the Jump3 and Jump3CP

Return Values
Real value representing the quick pause deceleration speed (mm/s²)

See Also
QPDecelS, QPDecelR function

QPDecelS function Example

Real savQPDecelS
savQPDecelS = QPDecelS(1)
Quit Statement

Terminates execution of a specified task or all tasks.

Syntax

\[
\text{Quit} \{ \text{taskIdentifier} | \text{All} \}
\]

Parameters

\[\text{taskIdentifier}\]

Task name or integer expression representing the task number. Task name is a function name used in an Xqt statement or a function started from the Run window or Operator window.

Task number range is:
- Normal tasks: 1 ~ 32
- Background task: 65 ~ 80
- Trap tasks: 257 ~ 267

\[\text{All}\]

Specifies this parameter if all tasks except the background task should be terminated.

Description

\text{Quit} stops the tasks that are currently being executed, or that have been temporarily suspended with \text{Halt}.

\text{Quit} also stops the task when the specified task is \text{NoPause} task, \text{NoEmgAbort} task (special task using \text{NoPause} or \text{NoEmgAbort} at Xqt), or the background tasks.

\text{Quit All} stops all tasks including the tasks above other than the background tasks.

\text{Quit All} sets the robot control parameter as below:

Robot Control parameter

- Current robot Speed, SpeedR, SpeedS (Initialized to default values)
- Current robot QPDecelR, QPDecelS (Initialized to default values)
- Current robot LimZ parameter (Initialized to 0)
- Current robot CP parameter (Initialized to Off)
- Current robot SoftCP parameter (Initialized to Off)
- Current robot Fine (Initialized to default values)
- Current robot Power Low (Low Power Mode set to On)
- Current robot PTPBoost (Initialized to default values)
- Current robot TCLim, TCSpeed (Initialized to default values)
- Current robot PgLSpeed (Initialized to default values)

See Also

\text{Exit, Halt, Resume, Xqt}

Quit Example

This example shows two tasks that are terminated after 10 seconds.

\begin{verbatim}
Function main
Xqt winc1 'Start winc1 function
Xqt winc2 'Start winc2 function
Wait 10
Quit winc1 'Terminate task winc1
Quit winc2 'Terminate task winc2
Fend
\end{verbatim}
Function winc1
  Do
    On 1; Wait 0.2
    Off 1; Wait 0.2
  Loop
Fend

Function winc2
  Do
    On 2; Wait 0.5
    Off 2; Wait 0.5
  Loop
Fend
RadToDeg Function

Converts radians to degrees.

Syntax
RadToDeg(radians)

Parameters
radians Real expression representing the radians to convert to degrees.

Return Values
A double value containing the number of degrees.

See Also
ATan, ATan2, DegToRad Function

RadToDeg Function Example

s = Cos(RadToDeg(x))
Randomize Statement

Initializes the random-number generator.

Syntax
(1) Randomize seedValue
(2) Randomize

Parameter
seedValue Specify a real value (0 or more) to be basis to retrieve a random number.

See Also
Rnd Function

Randomize Example

Function main
Real r
Randomize
Integer randNum

    randNum = Int(Rnd(10)) + 1
    Print "Random number is:", randNum
Fend
**Range Statement**

Specifies and displays the motion limits for each of the servo joints.

**Syntax**

(1) **Range**  
\[ j1\text{Min}, j1\text{Max}, j2\text{Min}, j2\text{Max}, j3\text{Min}, j3\text{Max}, j4\text{Min}, j4\text{Max}, j5\text{Min}, j5\text{Max}, j6\text{Min}, j6\text{Max}, j7\text{Min}, j7\text{Max}, j8\text{Min}, j8\text{Max}, j9\text{Min}, j9\text{Max} \]

(2) **Range**

**Parameters**

- **j1Min**  
The lower limit for joint 1 specified in pulses.
- **j1Max**  
The upper limit for joint 1 specified in pulses.
- **j2Min**  
The lower limit for joint 2 specified in pulses.
- **j2Max**  
The upper limit for joint 2 specified in pulses.
- **j3Min**  
The lower limit for joint 3 specified in pulses.
- **j3Max**  
The upper limit for joint 3 specified in pulses.
- **j4Min**  
The lower limit for joint 4 specified in pulses.
- **j4Max**  
The upper limit for joint 4 specified in pulses.
- **j5Min**  
Optional for 6-Axis robots and Joint type 6-axis robots. The lower limit for joint 5 specified in pulses.
- **j5Max**  
Optional for 6-Axis robots and Joint type 6-axis robots. The upper limit for joint 5 specified in pulses.
- **j6Min**  
Optional for 6-Axis robots and Joint type 6-axis robots. The lower limit for joint 6 specified in pulses.
- **j6Max**  
Optional for 6-Axis robots and Joint type 6-axis robots. The upper limit for joint 6 specified in pulses.
- **j7Min**  
Optional for Joint type 7-axis robots. The lower limit for joint 7 specified in pulses.
- **j7Max**  
Optional for Joint type 7-axis robots. The upper limit for joint 7 specified in pulses.
- **j8Min**  
Optional for the additional S axis. The lower limit for joint 8 specified in pulses.
- **j8Max**  
Optional for the additional S axis. The upper limit for joint 8 specified in pulses.
- **j9Min**  
Optional for the additional T axis. The lower limit for joint 9 specified in pulses.
- **j9Max**  
Optional for the additional T axis. The upper limit for joint 9 specified in pulses.

**Return Values**

Displays the current Range values when Range is entered without parameters

**Description**

Range specifies the lower and upper limits of each motor joint in pulse counts. These joint limits are specified in pulse units. This allows the user to define a maximum and minimum joint motion range for each of the individual joints. XY coordinate limits can also be set using the XYLim instruction.

The initial Range values are different for each robot. The values specified by this instruction remain in effect even after the power is switched off.

When parameters are omitted, the current Range values are displayed.
Range Statement

Potential Errors

Attempt to Move Out of Acceptable Range
  If the robot arm attempts to move through one of the joint limits error an will occur

Axis Does Not Move
  If the lower limit pulse is equal to or greater than the upper limit pulse, the joint does not move.

See Also
  JRange, SysConfig, XYLim

Range Example
  This simple example from the command window displays the current range settings and then changes them.

        > range
        -18205, 182045, -82489, 82489, -36864, 0, -46695, 46695
        >
        > range 0, 32000, 0, 32224, -10000, 0, -40000, 40000
        >
Read Statement

Reads characters from a file or communications port.

Syntax

Read #portNumber, stringVar$, count

Parameters

- **portNumber**
  - ID number representing a file or communications port to read from.
  - File number can be specified in ROpen, WOpen, and AOpen statements.
  - Communication port number can be specified in OpenCom (RS-232C) or OpenNet (TCP/IP) statements.

- **stringVar$**
  - Name of a string variable that will receive the character string.

- **count**
  - Maximum number of bytes to read.

See Also

ChkCom, ChkNet, OpenCom, OpenNet, Write

Read Statement Example

```plaintext
Integer numOfChars
String data$

numOfChars = ChkCom(1)

If numOfChars > 0 Then
    Read #1, data$, numOfChars
EndIf
```
ReadBin Statement

Reads binary data from a file or communications port.

Syntax

ReadBin #portNumber, var
ReadBin #portNumber, array(), count

Parameters

portNumber: ID number representing a file or communications port to read from. File number can be specified in BOpen statement. Communication port number can be specified in OpenCom (RS-232C) or OpenNet (TCP/IP) statements.

var: Name of a byte, integer, or long variable that will receive the data.

array(): Name of a byte, integer, or long array variable that will receive the data. Specify a one dimension array variable.

count: Specify the number of bytes to read. The specified count has to be less than or equal to the number of array elements.

See Also

Write, WriteBin

ReadBin Statement Example

Integer data
Integer dataArray(10)

numOfChars = ChkCom(1)

If numOfChars > 0 Then
    ReadBin #1, data
EndIf

NumOfChars = ChkCom(1)
If numOfChars > 10 Then
    ReadBin #1, dataArray(), 10
EndIf
Real Statement

Declares variables of type Real (4 byte real number).

Syntax

Real varName [(subscripts)] [ , varName [(subscripts)]]...

Parameters

varName Variable name which the user wants to declare as type Real.

subscripts Optional. Dimensions of an array variable; up to 3 dimensions may be declared. The subscripts syntax is as follows
(ubound1, [ubound2], [ubound3])
ubound1, ubound2, ubound3 each specify the maximum upper bound for the associated dimension.
The elements in each dimension of an array are numbered from 0 and the available number of array elements is the upper bound value + 1.
When specifying the upper bound value, make sure the number of total elements is within the range shown below:

- Local variable: 2000
- Global Preserve variable: 4000
- Global variable and module variable: 100000

Description

Real is used to declare variables as type Real. Local variables should be declared at the top of a function. Global and module variables must be declared outside functions. Number of valid digits are six digits for Real type.

See Also

Boolean, Byte, Double, Global, Integer, Long, String

Real Example

The following example shows a simple program which declares some variables using Real.

Function realtest
  Real var1
  Real A(10) 'Single dimension array of real
  Real B(10, 10) 'Two dimension array of real
  Real C(5, 5, 5) 'Three dimension array of real
  Real arrayVar(10)
  Integer i
  Print "Please enter a Real Number:" 
  Input var1
  Print "The Real variable var1 = ", var1
  For i = 1 To 5
    Print "Please enter a Real Number:" 
    Input arrayVar(i)
    Print "Value Entered was ", arrayVar(i)
  Next i
End
RealPls Function

Returns the pulse value of the specified joint.

Syntax

RealPls(jointNumber)

Parameters

jointNumber  The specific joint for which to get the current pulse count.
The additional S axis is 8 and T axis is 9.

Return Values

Returns an integer value representing the current encoder pulse count for the joint specified by jointNumber.

Description

RealPls is used to read the current encoder position (or Pulse Count) of each joint. These values can be saved and then used later with the Pulse command.

See Also

CX, CY, CZ, CU, CV, CW, Pulse

RealPls Function Example

Function DisplayPulses

Long joint1Pulses

joint1Pulses = RealPls(1)
Print "Joint 1 Current Pulse Value: ", joint1Pulses
Fend
RealPos Function

Returns the current position of the specified robot.

Syntax
RealPos

Return Values
A robot point representing the current position of the specified robot.

Description
RealPos is used to read the current position of the robot.

See Also
CurPos, CX, CY, CZ, CU, CV, CW, RealPls

RealPos Function Example

```plaintext
Function ShowRealPos
  Print RealPos
  Fend
  P1 = RealPos
```
RealTorque Function

Returns the current torque instruction value of the specified joint.

Syntax

RealTorque(jointNumber)

Parameters

jointNumber  Specifies the joint number to acquire the torque instruction value using an expression or numeric value.
             The additional S axis is 8 and T axis is 9.

Return values

Returns the real value (0-1) representing the proportion in the maximum torque on current power mode.

See also

TC, TCSpeed, TCLim

RealTorque Function Example

Print "Current Z axis torque instruction value:", RealTorque(3)
Recover Statement

Executes safeguard position recovery and returns status.
This is for the experienced user and you need to understand the command specification before use.

Syntax
(1) Recover robotNumber | All
(2) Recover robotNumber | All , WithMove | WithoutMove

Parameters
robotNumber Robot number that you want to execute recovery for.
If omitted, all robots are executed recovery
All All robots execute recovery
If omitted, same as All.
WithMove A constant whose value is 0.
Turns motor on and executes safeguard position recovery.
If omitted, same as WithMove.
WithoutMove A constant whose value is 1.
Turns the robot motor on. Not usually used.
Realizes the special recovery with AbortMotion.

Return Values
Boolean value. True if recover was completed, False if not.

Description
To execute Recover statement from a program, you need to set the [Enable advanced task commands] checkbox in the Setup menu | System Configuration | Controller | Preferences] page.

Recover can be used after the safeguard is closed to turn on the robot motors and move the robot back to the position it was in when the safeguard was open with low power PTP motion. After Recover has completed successfully, you can execute the Cont method to continue the cycle.

When more than one robot is used in the controller and All is specified, all robots are recovered.

See Also
AbortMotion, Cont, Recover function, RecoverPos

Recover Statement Example

CAUTION
■ When executing the Recover command from a program, you must understand the command specification and confirm that the system has the proper conditions for this command. Improper use such as continuous execution of a command within a loop may deteriorate the system safety.
Function main
   Xqt 2, monitor, NoPause
   Do
      Jump P1
      Jump P2
   Loop
   Fend

Function monitor
   Do
      If Sw(SGOpenSwitch) = On then
         Wait Sw(SGOpenSwitch) = Off and Sw(RecoverSwitch) = On
         Recover All
      EndIf
   Loop
   Fend
Recover Function

Executes safeguard position recovery and returns status.
This is for the experienced user and you need to understand the command specification before use.

Syntax

(1) Recover
(2) Recover ( robotNumber | All )
(3) Recover ( robotNumber | All , WithMove | WithoutMove )

Parameters

robotNumber  Robot number that you want to execute recovery for.
             If omitted, all robots are executed recovery
All          All robots execute recovery
             If omitted, same as All.
WithMove     A constant whose value is 0.
             Turns motor on and executes safeguard position recovery.
             If omitted, same as WithMove.
WithoutMove  A constant whose value is 1.
             Turns the robot motor on. Not usually used.
             Realizes the special recovery with AbortMotion.

Return Values

Boolean value. True if recover was completed, False if not.

Description

To execute Recover statement from a program, you need to set the [Enable advanced task commands] checkbox in the Setup menu | System Configuration | Controller | Preferences] page.

Recover can be used after the safeguard is closed to turn on the robot motors and move the robot back to the position it was in when the safeguard was open with low power PTP motion. After Recover has completed successfully, you can execute the Cont method to continue the cycle.

When more than one robot is used in the controller and All is specified, all robots are recovered.

See Also

AbortMotion, Cont, Recover function, RecoverPos

Recover Function Example

CAUTION

When executing the Recover command from a program, you must understand the command specification and confirm that the system has the proper conditions for this command. Improper use such as continuous execution of a command within a loop may deteriorate the system safety.

See Also

AbortMotion, Cont, Recover, RecoverPos
Recover function Example

```plaintext
Boolean sts
Integer answer

sts = Recover
If sts = True Then
    MsgBox "Ready to continue", MB_ICONQUESTION + MB_YESNO, "MyProject",
    answer
    If answer = IDYES Then
        Cont
    EndIf
EndIf
```
RecoverPos Function

Returns the position where a robot was in when safeguard was open. This is for the experienced and you need to understand the command specification before use.

Syntax

RecoverPos ([robotNumber])

Parameters

robotNumber  Integer value that specifies a robot number
If omitted, the current robot number is used.

Return Values

Returns the position the specified robot was in when the safeguard was open.
In the case where the safeguard was not open or the robot has completed the recovery, the coordinates of the returned point data are 0.

Description

This function returns the robot recovery position when using the Cont or Recover commands.

See Also

AbortMotion, Cont, Recover, Recover function, RealPos

RecoverPos function Example

If the straight distance of recovery is less than 10 mm, it executes recovery. If more than 10 mm, it finishes the program.

If Dist(RecoverPos, RealPos) < 10 Then
  Recover All
Else
  Quit All
EndIf
Redim Statement

Redimension an array at run-time.

Syntax

Redim [Preserve] arrayName (subscripts)

Parameters

Preserve  Optional. Specifies to preserve the previous contents of the array. If omitted, the array will be cleared.

arrayName  Name of the array variable; follows standard variable naming conventions. The array must have already been declared.

subscripts  New dimensions of an array variable may be declared. You must supply the same number of dimensions as when the variable was declared. The subscripts syntax is as follows

(ubound1, [ubound2], [ubound3])

ubound1, ubound2, ubound3 each specify the maximum upper bound for the associated dimension.

The elements in each dimension of an array are numbered from 0 and the available number of array elements is the upper bound value + 1.

When specifying the upper bound value, make sure the number of total elements is within the range shown below:

<table>
<thead>
<tr>
<th></th>
<th>Others than String</th>
<th>String</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local variable</td>
<td>2000</td>
<td>200</td>
</tr>
<tr>
<td>Global Preserve variable</td>
<td>4000</td>
<td>400</td>
</tr>
<tr>
<td>Global variable and module variable</td>
<td>100000</td>
<td>10000</td>
</tr>
</tbody>
</table>

Description

Use Redim to change an array's dimensions at run time. Use Preserve to retain previous values. The array variable declared by Byref cannot use Redim.

Frequent Redim will decrease the speed of program execution. Especially, we recommend using the minimum of Redim for the global preserve variables.

See Also

UBound
Redim Statement Example

```plaintext
Integer i, numParts, a(0)
Print "Enter number of parts ">
Input numParts

Redim a(numParts)
For i=0 to UBound(a)
    a(i) = i
Next

' Redimension the array with 20 more elements
Redim Preserve a(numParts + 20)

' The first element values are retained
For i = 0 to UBound(a)
    Print a(i)
Next
```
Rename Statement

Renames a file.

Syntax

Rename  oldFileName, newFileName

Parameters

oldFileName  String expression containing the path and name of the file to rename.
See ChDisk for the details.
newFileName  The new name to be given to the file specified by oldFileName.
See ChDisk for the details.

Description

Changes name of specified file oldFileName to newFileName.
If path is omitted, Rename searches for oldFileName in the current directory.

Rename is only enabled when oldFileName and newFileName are specified in the same drive.
A file may not be renamed to a filename that already exists in the same path.
Wildcard characters are not allowed in either oldFileName or newFileName.

See Also

Copy

Rename Example

Example from the command window:

> Rename A.PRG  B.PRG
RenDir Statement

Rename a directory.

Syntax

```
RenDir oldDirName As String, newDirName As String
```

Parameters

- **oldDirName**: A string expression specifying the path and name of the directory to rename.
- **newDirName**: A string expression specifying the path and new name to be given to the directory specified by `oldDirName`.

See ChDisk for the details of path.

Description

The same path used for `oldDirName` must be included for `newDirName`.

If both paths of the parameters above are omitted and directory name is only specified, the current directory is specified.

Wildcard characters are not allowed in either `oldDirName` or `newDirName`.

Notes

This statement is executable only with the PC disk.

See Also

Dir, MkDir

RenDir Command Example

```
RenDir "c:\mydata", "c:\mydatal"
```
Reset Statement

Resets the controller into an initialized state.

Syntax

(1) Reset
(2) Reset Error

Description

Reset resets the items shown below.
Reset Error finishes all non-background tasks and resets the error status and robot control parameters.
To execute the Reset Error statement from programs you need to set the [Enable advanced task commands] preference in the Setup | System Configuration | Controller | Preference page.

- Emergency Stop Status (reset by Reset only)
- Error status
- Output Bits (reset by Reset only)
  - All Output Bits output set to Off except the I/O for Remote.
  - User can set Option Switch to turn this feature off.

Robot Control parameter

- Current robot Speed, SpeedR, SpeedS (Initialized to default values)
- Current robot QPDecelR, QPDecelS (Initialized to default values)
- Current robot LimZ parameter (Initialized to 0)
- Current robot CP parameter (Initialized to Off)
- Current robot SoftCP parameter (Initialized to Off)
- Current robot Fine (Initialized to default values)
- Current robot Power Low (Low Power Mode set to On)
- Current robot PTPBoost (Initialized to default values)
- Current robot TCLim, TCSpeed (Initialized to default values)
- Current robot PgLSpeed (Initialized to default values)

For servo related errors, Emergency Stop status, and any other conditions requiring a Reset, no command other than Reset will be accepted. In this case first execute Reset, then execute other processing as necessary.

For example, after an emergency stop, first verify safe operating conditions, execute Reset, and then execute Motor On.

Critical error state will not be canceled by Reset.
When critical error occurs, turn Off the controller and solve the cause of the error.

The Reset Statement cannot be executed from a background task or tasks started with the Trap Emergency or Trap Error. Emergency Stop status cannot be reset from programs.

Notes

Reset Outputs Preference

(Setup | System Configuration | Preferences page) If the "Reset turns off outputs" controller preference is on, then when the Reset instruction is issued, all outputs will be turned off. This is important to remember when wiring the system such that turning the outputs off should not cause tooling to drop or similar situations.

See Also

Accel, AccelS, Fine, LimZ, Motor, Off, On, PTPBoost, SFree, SLock, Speed, SpeedS

Reset Statement Example

Example from the command window.

```]
reset
>```
Restart Statement

Restarts the current main program group.
This command is for the experienced user and you should understand the command specification before use.

Syntax

```
Restart
```

Description

- **Restart** stops all tasks and re-executes the last main program group that was running. Background tasks continue to run.
- All Trap settings are reset and even if **Restart** stops tasks, it doesn't execute Trap Abort.
- **Restart** resets the Pause status.
- If you execute **Restart** during error status, reset the error first using a method such as the Reset Error statement.
- **Restart** cannot be used during Emergency Stop status as it causes an error. Emergency Stop status cannot be reset from programs.

CAUTION

When executing the **Restart** command from a program, you must understand the command specification and confirm that the system has the proper conditions for this command. Improper use such as continuous execution of a command within a loop may deteriorate the system safety.

See Also

- Quit, Reset, Trap, Xqt

Restart Statement Example

```
Function main
    Trap Error Xqt eTrap
    Motor On
    Call PickPlac
    Fend

Function eTrap
    Wait Sw(ERresetSwitch)
    Reset Error
    Wait Sw(RestartSwitch)
    Restart
    Fend
```
Resume Statement

Continues a task which was suspended by the Halt instruction.

Syntax
Resume \{ taskIdentifier | All \}

Parameters
\textit{taskIdentifier} \hspace{1cm} Task name or integer expression representing the task number.
Task name is a function name used in an Xqt statement or a function started from the Run window or Operator window.

Task number range is:
- Normal tasks: 1 ~ 32
- Background task: 65 ~ 80
- Trap tasks: 257 ~ 267

\textit{All} \hspace{1cm} Specifies that all tasks should be resumed.

Description
Resume continues the execution of the tasks suspended by the Halt instruction.

See Also
Halt, Quit, Xqt

Resume Statement Example
This shows the use of Resume instruction after the Halt instruction.

Function main
\begin{verbatim}
Xqt 2, flicker ' Execute flicker as task 2
Do
  Wait 3 ' Allow flicker to execute for 3 seconds
  Halt flicker ' Halt the flicker task
  Wait 3
Resume flicker ' Resume the flicker task
Loop
Fend
\end{verbatim}

Function flicker
\begin{verbatim}
Do
  On 1
  Wait 0.2
  Off 1
  Wait 0.2
Loop
Fend
\end{verbatim}
Return Statement

The **Return** statement is used with the **GoSub** statement. GoSub transfers program control to a subroutine. Once the subroutine is complete, **Return** causes program execution to continue at the line following the GoSub instruction which initiated the subroutine.

**Syntax**

Return

**Description**

The **Return** statement is used with the **GoSub** statement. The primary purpose of the **Return** statement is to return program control back to the instruction following the GoSub instruction which initiated the subroutine in the first place.

The **GoSub** instruction causes program control to branch to the user specified statement line number or label. The program then executes the statement on that line and continues execution through subsequent line numbers until a **Return** instruction is encountered. The **Return** instruction then causes program control to transfer back to the line which immediately follows the line which initiated the GoSub in the first place. (i.e. the GoSub instruction causes the execution of a subroutine and then execution **Returns** to the statement following the GoSub instruction.)

**Potential Errors**

**Return Found Without GoSub**

A **Return** instruction is used to "return" from a subroutine back to the original program which issued the GoSub instruction. If a **Return** instruction is encountered without a GoSub having first been issued then an error will occur. A stand alone **Return** instruction has no meaning because the system doesn't know where to **Return** to.

**See Also**

OnErr, GoSub, GoTo

**Return Statement Example**

The following example shows a simple function which uses a GoSub instruction to branch to a label called checkio and check the first 16 user inputs. Then the subroutine returns back to the main program.

```plaintext
Function main
   Integer var1, var2
   GoSub checkio
   On 1
   On 2
   Exit Function

checkio:  'Subroutine starts here
   var1 = In(0)
   var2 = In(1)
   If var1 <> 0 Or var2 <> 0 Then
      Print "Message to Operator here"
   EndIf
finished:
   Return  'Subroutine ends here and returns to line 40
Fend
```

Right$ Function

Returns a substring of the rightmost characters of a string.

Syntax
Right$(string, count)

Parameters
- string: String variable or character string of up to 255 characters from which the rightmost characters are copied.
- count: The number of characters to copy from string starting with the rightmost character.

Return Values
Returns a string of the rightmost count characters from the character string specified by the user.

Description
Right$ returns the rightmost count characters of a string specified by the user. Right$ can return up to as many characters as are in the character string.

See Also
Asc, Chr$, InStr, Left$, Len, Mid$, Space$, Str$, Val

Right$ Example
The example shown below shows a program which takes a part data string as its input and splits out the part number, part name, and part count.

```plaintext
Function SplitPartData(DataIn$ As String, ByRef PartNum$ As String, ByRef PartName$ As String, ByRef PartCount As Integer)
    PartNum$ = Left$(DataIn$, 10)
    DataIn$ = Right$(DataIn$, Len(DataIn$) - pos)
    pos = Instr(DataIn$, ",")
    PartName$ = Mid$(DataIn$, 11, 10)
    PartCount = Val(Right$(DataIn$, 5))
Fend
```

Some other example results from the Right$ instruction from the Command window.
> Print Right$("ABCDEFG", 2)
FG
> Print Right$("ABC", 3)
ABC
RmDir Statement

Removes an empty subdirectory from a controller disk drive.

Syntax

Rmdir dirName

Parameters

dirName String expression for the path and name of the directory to remove.
If the directory name is specified without a path, then the subdirectory in the current
directory is specified.
See ChDisk for the details of path.

Description

Removes the specified subdirectory. Prior to executing Rmdir all of the subdirectory's files must be
deleted.

The current directory or parent directory cannot be removed.
When executed from the Command window, quotes may be omitted.

Notes

- This statement is executable only with the PC disk.

Rmdir Example

Example from the command window:

> Rmdir \mydata
Rnd Function

Return a random number.

Syntax

```
Rnd(maxValue)
```

Parameters

- `maxValue`: Real expression that represents the maximum return value.

Return Values

Random real number from 0 to `range`.

Description

Use Rnd to generate random number values.

See Also

- Int, Randomize

Rnd Function Example

Here's a Rnd example that generates a random number between 1 and 10.

```plaintext
Function main
    Real r
    Integer randNum

    Randomize
    randNum = Int(Rnd(9)) + 1
    Print "Random number is:" , randNum
Fend
```
Robot Statement

Selects the current robot.

Syntax

Robot number

Parameters

number Number of the desired robot. The value ranges from 1 to the number of installed robots.

Description

Robot allows the user to select the default robot for subsequent motion instructions.

On a system with one robot, the Robot statement does not need to be used.

See Also

Accel, AccelS, Arm, ArmSet, Go, Hofs, Home, HOrdr, Local, Move, Pulse, Robot function, Speed, SpeedS

Robot Example

Function main
  Integer I
  For I = 1 to 100
    Robot 1
    Go P(i)
    Robot 2
    Go P(i)
  Next I
Fend
Robot Function

Returns the current robot number.

**Syntax**

```plaintext
Robot
```

**Return Values**

Integer containing the current robot number.

**See Also**

Robot Statement

**Robot Function Example**

```plaintext
Print "The current robot is: ", Robot
```
RobotInfo Function

Returns status information for the robot.

Syntax
RobotInfo(index)

Parameters
index Integer expression that represents the index of the information to retrieve.

Return Values
The specified information is returned as an integer.

Description
The information for each bit of the returned value is shown in the table below:

<table>
<thead>
<tr>
<th>Index</th>
<th>Bit</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>&amp;H1</td>
<td>Undefined</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>&amp;H2</td>
<td>Resetable error has occurred</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>&amp;H4</td>
<td>Non-resetable error has occurred</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>&amp;H8</td>
<td>Motors are on</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>&amp;H10</td>
<td>Current power is high</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>&amp;H20</td>
<td>Undefined</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>&amp;H40</td>
<td>Undefined</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>&amp;H80</td>
<td>Undefined</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>&amp;H100</td>
<td>Robot is halted</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>&amp;H200</td>
<td>Robot not halted (executing motion or in quick pause)</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>&amp;H400</td>
<td>Robot stopped by pause or safeguard</td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td>Undefined</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>Undefined</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>Undefined</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>&amp;H400</td>
<td>TILL condition was satisfied by preceding motion command</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>&amp;H8000</td>
<td>SENSE condition was satisfied by preceding motion command</td>
</tr>
<tr>
<td>16-31</td>
<td>16-31</td>
<td>Undefined</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>&amp;H1</td>
<td>Robot is tracking (Conveyor tracking)</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>&amp;H2</td>
<td>Robot is waiting for recovery motion (WaitRecover status)</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>&amp;H4</td>
<td>Robot is being recovered</td>
</tr>
<tr>
<td>3-31</td>
<td>3-31</td>
<td>Undefined</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>&amp;H1</td>
<td>Robot is at home position</td>
</tr>
<tr>
<td>1-31</td>
<td>1-31</td>
<td>Undefined</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>&amp;H1</td>
<td>Joint 1 servo is engaged</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>&amp;H2</td>
<td>Joint 2 servo is engaged</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>&amp;H4</td>
<td>Joint 3 servo is engaged</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>&amp;H8</td>
<td>Joint 4 servo is engaged</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>&amp;H10</td>
<td>Joint 5 servo is engaged</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>&amp;H20</td>
<td>Joint 6 servo is engaged</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>&amp;H40</td>
<td>Joint 7 servo is engaged</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>&amp;H80</td>
<td>S axis servo is engaged</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>&amp;H100</td>
<td>T axis servo is engaged</td>
</tr>
<tr>
<td>9-31</td>
<td>9-31</td>
<td>Undefined</td>
<td></td>
</tr>
</tbody>
</table>
### RobotInfo Function

<table>
<thead>
<tr>
<th>Index</th>
<th>Bit</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>N/A</td>
<td>0 - 32</td>
<td>Number of tasks executing robot commands&lt;br&gt;0 = command executing from command window or macro&lt;br&gt;-1 = no task is using the manipulator</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>&amp;H1</td>
<td>Joint 1 brake is on</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>&amp;H2</td>
<td>Joint 2 brake is on</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>&amp;H4</td>
<td>Joint 3 brake is on</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>&amp;H8</td>
<td>Joint 4 brake is on</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>&amp;H10</td>
<td>Joint 5 brake is on</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>&amp;H20</td>
<td>Joint 6 brake is on</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>&amp;H40</td>
<td>Joint 7 brake is on</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>&amp;H80</td>
<td>S axis brake is on</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>&amp;H100</td>
<td>T axis brake is on</td>
</tr>
<tr>
<td></td>
<td>9-31</td>
<td></td>
<td>Undefined</td>
</tr>
</tbody>
</table>

**See Also**
CtrlInfo, RobotInfo$, TaskInfo

**RobotInfo Function Example**

```plaintext
If (RobotInfo(3) And &H1) = &H1 Then
    Print "Joint 1 is locked"
Else
    Print "Joint 1 is free"
EndIf
```
RobotInfo$ Function

Returns text information for the robot.

Syntax

RobotInfo$(\text{index})

Parameters

index Integer expression that represents the index of the information to retrieve.

Return Values

A string containing the specified information.

Description

<table>
<thead>
<tr>
<th>Index</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Robot name</td>
</tr>
<tr>
<td>1</td>
<td>Model name</td>
</tr>
<tr>
<td>2</td>
<td>Default point file name</td>
</tr>
<tr>
<td>3</td>
<td>Undefined</td>
</tr>
<tr>
<td>4</td>
<td>Serial number of robot</td>
</tr>
</tbody>
</table>

See Also

CtrlInfo, RobotInfo, TaskInfo

RobotInfo$ Function Example

Print "Robot Name: ", RobotInfo$(0)
RobotModel$ Function

Returns the robot model name.

Syntax
RobotModel$

Return Values
A string containing the model name. This is the name that is shown on the rear panel of the robot.

See Also
RobotType

RobotModel$ Example

Print "The robot model is ", RobotModel$
RobotName$ Function

Returns the robot name.

Syntax

RobotName$

Return Values

A string containing the robot name.

See Also

RobotInfo, RobotModel$

RobotName$ Example

Print "The robot name is ", RobotName$
RobotSerial$ Function

Returns the robot serial number.

Syntax

RobotSerial$

Return Values

A string containing the robot serial number.

See Also

RobotInfo, RobotName$, RobotModel$

RobotSerial$ Example

Print "The robot serial number is ", RobotSerial$
RobotType Function

Returns the robot type.

Syntax

RobotType

Return Values

1: Joint
2: Cartesian
3: SCARA
5: 6-AXIS
6: RS series

See Also

RobotModel$

RobotType Example

If RobotType = 3 Then
    Print "Robot type is SCARA"
EndIf
ROpen Statement

Opens a file for reading.

Syntax

ROpen fileName As #fileNumber
.
.
Close #fileNumber

Parameters

fileName A string expression containing the file name to read from including the path.
If only file name is specified, a file in the current directory is specified.
See ChDisk for the details.

fileNumber Integer expression from 30 - 63

Description

Opens the specified fileName for reading and identifies it by the specified fileNumber. This statement
is used to open and read data from the specified file.

Notes

- PC disk only
- Do not specify a network path, otherwise an error occurs.

The fileNumber identifies the file as long as the file is open and until it is closed the same file number
cannot be used to the other files.
The fileNumber is used for the file operation commands (Input#, Read, Seek, Eof, Close)

Close statement closes the file and releases the file number.

It is recommended that you use the FreeFile function to obtain the file number so that more than one
 task are not using the same number.

See Also
Close, Input #, AOpen, BOpen, UOpen, WOpen, FreeFile

ROpen Statement Example

Integer fileNum, i, j

fileNum = FreeFile
WOOpen "TEST.DAT" As #fileNum
For i = 0 To 100
    Print #fileNum, i
Next i
Close #fileNum

fileNum = FreeFile
ROpen "TEST.DAT" As #fileNum
For i = 0 to 100
    Input #fileNum, j
    Print "data = ", j
Next i
Close #fileNum
RSet$ Function

Returns the specified string with leading spaces added up to the specified length.

Syntax

RSet$ (string, length)

Parameters

string  String expression.
length   Integer expression for the total length of the string returned.

Return Values

Specified string with leading spaces appended.

See Also

LSet$, Space$

RSet$ Function Example

```plaintext
temp$ = "123"
temp$ = RSet$(temp$, 10)  ' temp$ = "       123"
```

```
RShift Function

Shifts numeric data to the right by a user specified number of bits.

Syntax

\[
\text{RShift}(\text{number}, \text{shiftBits})
\]

Parameters

- \text{number}: Numeric expression to be shifted.
- \text{shiftBits}: The number of bits (integer from 0 to 31) to shift \text{number} to the right.

Return Values

Returns a numeric result which is equal to the value of \text{number} after shifting right \text{shiftBits} number of bits.

Description

\text{RShift} shifts the specified numeric data (\text{number}) to the right (toward a lower order digit) by the specified number of bits (\text{shiftBits}). The high order bits shifted are replaced by 0.

The simplest explanation for \text{RShift} is that it simply returns the result of \text{number} / 2^{\text{shiftBits}}. (Number is divided by 2 \text{shiftBit} times.)

Notes

Numeric Data Type:

The numeric data (\text{number}) may be any valid numeric data type. \text{RShift} works with data types: Byte, Integer, and Real.

See Also

And, LShift, Not, Or, Xor

RShift Example

The example shown below shows a program which shows all the possible \text{RShift} values for an Integer data type starting with the integer set to 0.

```plaintext
Function rshiftst
    Integer num, snum, i
    num = 32767
    For i = 1 to 16
        Print "i =", i
        snum = RShift(num, 1)
        Print "RShift(32767, ", i, ") = ", snum
    Next i
Fend
```

Some other example results from the \text{RShift} instruction from the command window.

```plaintext
> Print RShift(10,1)
5
> Print RShift(8,3)
1
> Print RShift(16,2)
4
```
RTrim$ Function

Returns a string equal to specified string without trailing spaces.

Syntax

RTrim$(string)

Parameters

string  String expression.

Return Values

Specified string with trailing spaces removed.

See Also

LTrim$, Trim$

RTrim$ Function Example

```
str$ = "  data  
str$ = RTrim$(str$)  ' str$ = "..data"
```

EndIf
RunDialog Statement

Runs an EPSON RC+ 6.0 dialog from a SPEL* program.

Syntax

(1) RunDialog dialogID
(2) RunDialog DLG_ROBOTMNG, [robotAllowed]

Parameters

dialogID
Integer expression containing a valid dialog ID. These values are predefined constants as shown below.

- DLG_ROBOTMNG 100 Run the Robot Manager dialog
- DLG_IOMON 102 Run I/O Monitor
- DLG_VGUIDE 110 Run Vision Guide dialog

robotAllowed
This parameter is only available when DLG_ROBOTMNG is specified as dialog ID. Specifies a robot that is available in the Robot Manager in bit value.

<table>
<thead>
<tr>
<th>Example</th>
<th>Set value</th>
<th>bit15</th>
<th>bit14</th>
<th>…</th>
<th>bit2</th>
<th>bit1</th>
<th>bit0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robot 1</td>
<td>&amp;H0001</td>
<td>Off</td>
<td>Off</td>
<td></td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>Robot 2</td>
<td>&amp;H0002</td>
<td>Off</td>
<td>Off</td>
<td></td>
<td>Off</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>Robot 1 and 2</td>
<td>&amp;H0003</td>
<td>Off</td>
<td>Off</td>
<td></td>
<td>Off</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>Robot 16</td>
<td>&amp;H1000</td>
<td>On</td>
<td>Off</td>
<td></td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
</tbody>
</table>

Description

Use RunDialog to run EPSON RC+ 6.0 dialogs from a SPEL* task. The task will be suspended until the operator closes the dialog.

When running dialogs that execute robot commands, you should ensure that no other tasks will be controlling the robot while the dialog is displayed, otherwise errors could occur.

See Also

InputBox, MsgBox

RunDialog Example

```plaintext
If Motor = Off Then
  RunDialog DLG_ROBOTMNG
  If Motor = Off Then
    Print "Motors are off, aborting program"
    Quit All
  EndIf
EndIf
```
SafetyOn Function

Return the Safety Door open status.

Syntax
SafetyOn

Return Values
True if the Safety Door is Open, otherwise False.

Description
SafetyOn function is used only for NoPause task, NoEmgAbort task (special task using NoPause or NoEmgAbort at Xqt), and background tasks.

See Also
ErrorOn, EstopOn, PauseOn, Wait, Xqt

SafetyOn Function Example
The following example shows a program that monitors the Safety Door open and switches the I/O On/Off when Safety Door open occurs.

Notes
Forced Flag
This program example uses Forced flag for On/Off command. Be sure that the I/O outputs change during error, or at Emergency Stop or Safety Door Open when designing the system.

Function main

Xqt SafetyOnOffMonitor, NoPause
:
:
Fend

Function SafetyOnOffMonitor
Do
Wait SafetyOn = On
Print "Safety Open"
Off 10, Forced
On 12, Forced

Wait SafetyOn = Off
Print "Safety Close"
On 10, Forced
Off 12, Forced
Loop
Fend
SavePoints Statement

Saves point data in main memory to a disk file for the current robot.

Syntax

**SavePoints** *filename*

Parameters

*fileName*  
String expression containing the file into which points will be stored. The extension must be .PTS. You cannot specify a file path and *fileName* doesn't have any effect from ChDisk. See ChDisk for the details.

Description

**SavePoints** saves points for the current robot to the specified file in the current project directory. A .PTS extension must always be specified. The **SavePoints** command will also add the point file to the project for the current robot if it did not already exist.

The point data is stored in the compact flush inside of the controller. Therefore, SavePoints starts writing into the compact flush. Frequent writing into the compact flush will shorten the compact flush lifetime. We recommend using SavePoints only for saving the point data.

Potential Errors

**Out of Disk Space**  
If there is no space remaining an error will occur.

**Point file for another robot.**  
If *fileName* is a point file for another robot, an error will occur.

**A Path Cannot be Specified**  
If *fileName* contains a path, an error will occur. Only a file name in the current project can be specified.

**Bad File name**  
If a file name is entered which has spaces in the name, or other bad file name characteristics an error will occur.

See Also

ImportPoints, LoadPoints

SavePoints Statement Example

```plaintext
ClearPoints
For i = 1 To 10
  P(i) = XY(i, 100, 0, 0)
Next i
SavePoints "TEST.PTS"
```

Seek Statement

Changes position of file pointer for a specified file.

Syntax

Seek #fileNumber, pointer

Parameters

fileNumber Integer expression from 30 ~ 63
pointer Integer expression for the desired position to seek, starting from 0 to the length of the file.

See Also

BOpen, Read, ROpen, UOpen, Write, WOpen

Seek Statement Example

Integer fileNum
String data$

fileNumber = FreeFile
UOpen "TEST.DAT" As #fileNum
Seek #fileNum, 20
Read #fileNum, data$, 2
Close #fileNum
Select...Send Statement

Executes one of several groups of statements, depending on the value of an expression.

Syntax

```
Select selectExpr
  Case caseExpr
    statements
  [Case caseExpr
    statements ]
  [Default
    statements ]
Send
```

Parameters

- `selectExpr`: Any numeric or string expression.
- `caseExpr`: Any numeric or string expression that evaluates to the same type as `selectExpr`.
- `statements`: One or more valid SPEL+ statements or multi-statements.

Description

If any one `caseExpr` is equivalent to `selectExpr`, then the statements after the Case statement are executed. After execution, program control transfers to the statement following the Send statement.

If no `caseExpr` is equivalent to `selectExpr`, the Default statements are executed and program control transfers to the statement following the Send statement.

If no `caseExpr` is equivalent to `selectExpr` and Default is omitted, nothing is executed and program control transfers to the statement immediately following the Send statement.

`selectExpr` and `caseExpr` may include constants, variables, and logical operators that use And, Or and Xor.

See Also

- If...Then...Else

Select Example

Shown below is a simple example for Select...Send:

```spe
Function Main
  Integer I
  For i = 0 To 10
    Select i
      Case 0
        Off 1;On 2;Jump P1
      Case 3
        On 1;Off 2
        Jump P2;Move P3;On 3
      Case 7
        On 4
      Default
        On 7
    Send
  Next
End
```
SelectDB Statement

Searches the data in the table in an opened database.

Syntax
SelectDB (#fileNumber, TableName, SelectCondition, SortMethod)

Parameters
#fileNumber  Integer value from 501 ~ 508 representing the database number specified with the OpenDB statement
TableName    Table name you want to search in
            If the database type specified with #fileNumber is an Excel workbook, specify an Excel worksheet or named table
            When specifying an Excel sheet, add $ to end of the worksheet name and enclose the name with [ ].
            When specifying an area with a name in an Excel worksheet, enclose the name with [ ].
SelectCondition  Conditions of the search.
            AND, OR are available to specify the multiple conditions.
            If omitted, the all data in the table is serched.
SortMethod    Order to show searched data
            Specify Sort key and Sort order (ascending order [ASC] / descending order [DESC]).
            If the Sort order is omitted, the ascending Sort key order is specified.
            If the SortMethod is omitted, the order is decided by the opened database.

Return Values
Returns total numbers of rows.

Description
Sorts the data which meets the SelectCondition in the specified table of the opened database based on the Sort conditions.
You should execute SelectDB before reading / writing data with the Input# and Print# statements.
If the opened database is an Excel workbook, write a row name to use for the search in the first line of the worksheet and area defined with the name.
For Excel 2007 workbook, the worksheet name must be specified. You cannot access to area defined with the name.

See Also
OpenDB, CloseDB, Input #, Print #
SelectDB function Example

The following example uses the SQL server 2000 sample database, Northwind. The Employees table is searched with the condition TitleOfCourtesy = Ms. with EmployeeID in descending order.

\[
\text{Integer count, i, eid} \\
\text{String Lastname$, Firstname$, Title$} \\
\text{OpenDB #501, SQL, "(LOCAL)", "Northwind"} \\
\text{count = SelectDB(#501, "Employees", "TitleOfCourtesy = 'Ms.'", "EmployeeID DESC")} \\
\text{For i = 0 To count - 1} \\
\text{Input #501, eid, Lastname$, Firstname$, Title$} \\
\text{Print eid, ",", Lastname$, ",", Firstname$, ",", Title$} \\
\text{Next} \\
\text{CloseDB #501}
\]

Using Access database
The following example uses Microsoft Access 2007 sample database “Students” and loads the data whose ID is more than 10 from the table “Students” in the ID descending order.

\[
\text{Integer count, i, eid} \\
\text{String Lastname$, Firstname$, dummy$} \\
\text{OpenDB #502, Access, "c:\MyDataBase\Students.accdb"} \\
\text{count = SelectDB(#502, "Students", "ID > 10'", "ID")} \\
\text{For i = 0 To count - 1} \\
\text{Input #502, eid, dummy$, Lastname$, Firstname$} \\
\text{Print eid, ",", Lastname$, ",", Firstname$} \\
\text{Next} \\
\text{CloseDB #502}
\]

Using Excel workbook
The following example uses Microsoft Excel workbook “Students” and loads the data in worksheet “Student” whose Age is under 25 with the ID in ascending order.

\[
\text{Integer count, i, eid} \\
\text{String Lastname$, Firstname$} \\
\text{OpenDB #503, Excel, "c:\MyDataBase\Students.xls"} \\
\text{count = SelectDB(#503, "[Students$]", "Age < 25", "ID ASC")} \\
\text{For i = 0 To count - 1} \\
\text{Input #503, eid, Lastname$, Firstname$} \\
\text{Print eid, ",", Lastname$, ",", Firstname$} \\
\text{Next} \\
\text{CloseDB #503}
\]
Sense Statement

Specifies and displays input condition that, if satisfied, completes the Jump in progress by stopping the robot above the target position.

Syntax

```
Sense [ condition ]
```

Parameters

- `condition`: Input status specified as a trigger
- `[Event]`: Comparative operator ( =, <=, =>, >, <, <=) `[Integer expression]`

The following functions and variables can be used in the `Event`:

**Functions**: Sw, In, InW, Oport, Out, OutW, MemSw, MemIn, MemInW, Ctr, GetRobotInsideBox, GetRobotInsidePlane

**Variables**: Byte, Integer, Long global preserve variable, Global variable, module variable

In addition, using the following operators you can specify multiple event conditions.
- `Operator`: And, Or, Xor
- `Example`: Sense Sw(5) = On
  Sense Sw(5) = On And Sw(6) = Off

The following functions and operators may be used in the `condition`:

**Functions**: Sw, In, InW, Oport, Out, OutW, MemSw, MemIn, MemW, Ctr

**Operators**: And, Or, Xor

`Example` Sense Sw(5) = On
  Sense Sw(5) = On And Sw(6) = Off

Description

- **Sense** is used to stop approach motion during a Jump, Jump3, and Jump3CP instructions. The **Sense** condition must include at least one of the functions above.

  When variables are included in the **Sense** condition, their values are computed when setting the **Sense** condition. No use of variable is recommended. Otherwise, the condition may be an unintended condition. Multiple **Sense** statements are permitted. The most recent **Sense** condition remains current until superseded with another **Sense** statement.

- **Jump, Jump3, Jump3CP with Sense Modifier**
  Checks if the current **Sense** condition is satisfied. If satisfied, the Jump instruction completes with the robot stopped above the target position. (i.e. When the **Sense** Condition is True, the robot arm remains just above the target position without executing approach motion. When the **Sense** condition is False, the robot arm completes the full Jump instruction motion through to the target position.

  When parameters are omitted, the current Sense definition is displayed.
Sense Statement

Notes

Sense Setting at Main Power On
At power on, the initial Sense condition is:
Sense Sw(0) = On  'Robot does not execute downward motion when Input bit 0 is on

Use of JS and Stat to Verify Sense
Use JS or Stat to verify if the Sense condition has been satisfied after executing a motion command using Sense modifiers.

To use a variables in the event condition expression
- Available variables are Integer type (Byte, Integer, Long)
- Array variables are not available
- Local variables are not available
- If a variable value cannot satisfy the event condition for more than 0.01 second, the system cannot retrieve the change in variables.
- Up to 64 can wait for variables in one system (including the ones used in the event condition expressions such as Wait). If it is over 64, an error occurs during the project build.
- If you try to transfer a variable waiting for variables as a reference with Byref, an error occurs.
- When a variable is included in the right side member of the event condition expression, the value is calculated when the motion command start. We recommend not using variables in an integer expression to avoid making unintended conditions.

See Also
In, JS, Jump, Jump3, Jump3CP, MemIn, MemSw, Stat, Sw

Sense Statement Example
This is a simple example on the usage of the Sense instruction.

    Function test
    .
    TrySense:
    .
    Sense Sw(1) = Off  'Specifies the arm stops above the target when the input bit 1 is Off.
    Jump P1 C2 Sense
    If JS = True Then
    GoSub ERRPRC  'If the arm remains stationary above the point specified,
    GoTo TrySense  'then execute ERRPRC and go to TrySense.
    EndIf
    On 1; Wait 0.2; Off 1
    .
    Fend

<Other Syntax Examples>

> Sense Sw(1)=1 And MemSw(1)=1
> Sense Sw(0) Or (Sw(1) And MemSw(1))
SetCom Statement

Sets or displays parameters for RS-232C port.

Syntax

```plaintext
SetCom #portNumber, [baud ], [ dataBits ], [ stopBits ], [ parity ], [ terminator ], [ HWFlow ],
[ SWFlow ], [ timeOut ]
```

Parameters

- **portNumber**: Integer value representing a RS-232C port number
  - Real Part: 1 ~ 8
  - Windows Part: 1001 ~ 1002

  Specifies which to set parameters for. Valid values are 1-8.

- **baud**: Optional. Specifies the baud rate. Valid values are:
  - 110
  - 2400
  - 300
  - 4800
  - 600
  - 9600
  - 1200
  - 14400
  - (Default: 9600)

  When using the Windows Part port, some data may drop in the baud rate of 19200 or more.

- **dataBits**: Optional. Specifies the number of data bits per character. Valid values are 7 and 8.

- **stopBits**: Optional. Specifies the number of stop bits per character. Valid values are 1 and 2.

- **parity**: Optional. Specifies the parity. Valid values are O (Odd), E (Even), and N (None).

- **terminator**: Optional. Specifies the line termination characters. Valid values are CR, LF, CRLF.

- **HWFlow**: Optional. Specifies hardware control. Valid values are RTS and NONE.

- **SWFlow**: Optional. Specifies software control. Valid values are XON and NONE.

- **timeOut**: Optional. Specifies the maximum time for transmit or receive in seconds. If this value is 0, then there is no time out. Valid range is 0-2147483 seconds in 0.01 second intervals.

Description

When all the parameter is omitted, displays a communication port setting.

If the several ports are used in the communication at one time with more than 19200 baud rate, error 2929 or 2922 may occur. In this case, select the lower baud rate or avoid using several ports at one time.

When using the Windows Part port, some data may drop in the baud rate of 19200 or more.

If any data drops, select the lower baud rate or use the Real Part port.

Parameter is stored to the Compact Flash inside the Controller. When you execute SetCom, the data is written to the Compact Flash. If a data is written to the Compact Flash frequently, it may shorten the Compact Flash life. Using SetCom only when changing the parameter is recommended.

See Also

- OpenCom, CloseCom, SetNet

SetCom Example

```plaintext
SetCom #1, 9600, 8, 1, N, CRLF, NONE, NONE, 0
SetCom #2, 4800
```
SetLatch Statement

This function does not work with EPSON RC+ 6.0 Ver.6.2.0.

Sets the latch function of the robot position using the R-I/O input.

Syntax

SetLatch { #portNumber, triggerMode }

Parameters

#portNumber  Port number of the R-I/O input port to connect the trigger input signal.
The table below shows the port numbers you can specify.
Specify the port number of the unit that the object robot is connected.

<table>
<thead>
<tr>
<th>Control Unit</th>
<th>INPUT</th>
<th>2 points</th>
<th>24, 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OUTPUT</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Drive Unit 1</td>
<td>INPUT</td>
<td>2 points</td>
<td>56, 57</td>
</tr>
<tr>
<td></td>
<td>OUTPUT</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Drive Unit 2</td>
<td>INPUT</td>
<td>2 points</td>
<td>280, 281</td>
</tr>
<tr>
<td></td>
<td>OUTPUT</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

The following constants are defines as the port number.

<table>
<thead>
<tr>
<th>Constant</th>
<th>Port Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SETLATCH_PORT_CU_0</td>
<td>24</td>
</tr>
<tr>
<td>SETLATCH_PORT_CU_1</td>
<td>25</td>
</tr>
<tr>
<td>SETLATCH_PORT_DU1_0</td>
<td>56</td>
</tr>
<tr>
<td>SETLATCH_PORT_DU1_1</td>
<td>57</td>
</tr>
<tr>
<td>SETLATCH_PORT_DU2_0</td>
<td>280</td>
</tr>
<tr>
<td>SETLATCH_PORT_DU2_1</td>
<td>281</td>
</tr>
</tbody>
</table>

triggerMode  The trigger input signal logic to connect with the R-I/O. The logic can be specified with the following constants.

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SETLATCH_TRIGGERMODE_TRAILINGEDGE</td>
<td>0</td>
<td>Negative logic</td>
</tr>
<tr>
<td>SETLATCH_TRIGGERMODE_LEADINGEDGE</td>
<td>1</td>
<td>Positive logic</td>
</tr>
</tbody>
</table>

With the negative logic, it latches the robot position at the switch edge from the input signal High to Low.
With the positive logic, it latches the robot position at the switch edge from the input signal from Low to High.

Description

Sets the condition of the robot position latch using the R-I/O input signals. One robot cannot wait the trigger signals of several ports simultaneously.
Executing SetLatch needs approx. 40 msec for processing.
**SetLatch Statement**

**Note**

If you specify a port number of the unit unrelated to the selected robot, the error "I/O input/output bit number is out of available range" occurs.

**See Also**

LatchEnable, LatchState Function, LatchPos Function

**SetLatch Statement Example**

```plaintext
Function main
    SetLatch 24, SETLATCH_TRIGGERMODE_LEADINGEDGE  ' Positive logic
    LatchEnable On  ' Enable the latch function
    Go P1
    Wait LatchState = True  ' Wait a trigger
    Print LatchPos  ' Display the latched position
    LatchEnable Off  ' Disable the latch function
Fend
```
SetLCD Statement

Sets or displays how the controller's LCD panel displays data.

Syntax

SetLCD
SetLCD displayMode
SetLCD displayMode, Interval

Parameters

displayMode Error message display method
0: Scroll the error message one letter at a time (Default)
1: Scroll the error message one line at a time

Interval Integer value that specifies the display interval in units of millisecond.
Default: 500 millisecond

Description

When all parameters are omitted, displays the LCD setting.

The settings are stored in the Compact Flash inside the Controller. When you execute SetLCD, the data is written to the Compact Flash. If data is written to the Compact Flash frequently, it may shorten the Compact Flash life. Use SetLCD only when you need to change the setting is recommended.

SetCom Statement Example

> setlcd
500
SetIn Statement

For Virtual IO, sets specified input port (8 bits) to the specified value.

Syntax

SetIn portNumber, value

Parameters

- **portNumber**  Integer expression representing the input port number.
- **value**  Integer expression between 0 – 255 to set the specified port to.

Description

SetIn provides the ability to set up to 8 bits of virtual inputs at once.

See Also

SetSW, SetInW

SetIn Statement Example

```plaintext
> setin 0, 1  ' Sets the first bit of port 0 to On.
```
SetInW Statement

For Virtual IO, sets specified input word (16 bits) to the specified value.

Syntax

SetInW portNumber, value

Parameters

  portNumber  Integer expression representing the input port number.
  value       Number between 0 – 65535 to set the specified word to.

Description

SetInW provides the ability to set up to 16 bits of virtual inputs at once.

See Also

SetSw, SetIn

SetInW Statement Example

> setinw 0, 1  ' Sets the first bit of word 0 to On.
SetNet Statement

Sets parameters for a TCP/IP port.

Syntax

```
SetNet  #portNumber, hostAddress, TCP_IP_PortNum, terminator, SWFlow, timeout
```

Parameters

- **portNumber**: Specifies which TCP/IP port to set parameters for. Valid values are 201 - 216.
- **hostAddress**: Specifies the host IP address.
- **TCP_IP_PortNum**: Specifies the TCP/IP port number for this node.
- **terminator**: Specifies the line termination characters. Valid values are CR, LF, CRLF.
- **SWFlow**: Specifies software control. Valid value is NONE.
- **timeOut**: Specifies the maximum time for transmit or receive in seconds. If this value is 0, then there is no time out. Valid range is 0-2147483 seconds in 0.01 second intervals.

Description

Parameter is stored to the Compact Flash inside the Controller. When you execute SetNet, the data is written to the Compact Flash. If a data is written to the Compact Flash frequently, it may shorten the Compact Flash life. Using SetNet only when changing the parameter is recommended.

See Also

OpenNet, CloseNet, SetCom

SetNet Statement Example

```
SetNet  #201, "192.168.0.1", 2001, CRLF, NONE, 0
```
SetSw Statement

For Virtual IO, sets specified input bit to the specified value.

Syntax

\[ \text{SetSw} \ bitNumber, \ value \]

Parameters

- **bitNumber**: Integer expression representing the input bit number.
- **value**: Integer expression with a value of 0 (Off) or 1 (On).

Description

SetSw provides the ability to turn on or off one input bit.

See Also

SetIn, SetInW

SetSw Statement Example

\[ > \text{setsw} \ 2, \ \text{on} \quad \text{Sets the 2nd input bit to On.} \]
SFree Statement

Removes servo power from the specified servo axis.

Syntax

SFree  jointNumber [, jointNumber,...]

Parameters

jointNumber  An integer expression representing a servo joint number (1 ~ 9).

The additional S axis is 8 and T axis is 9.

Description

SFree removes servo power from the specified servo joints. This instruction is used for the direct teaching or the part installation by partially de-energizing a specific joint. To re-engage a joint execute the SLock instruction or Motor On.

SFree initializes the robot control parameter.

See Motor On for the details.

Notes

SFree Sets Some System Items back to Their Initial State:

SFree, for safety purposes, initializes parameters concerning the robot arm speed (Speed and SpeedS ), acceleration (Accel and AccelS ) and the LimZ parameter.

Notes

SFree and its Use with the Z Joint and U Joint for SCARA robots (including RS series)

The Z joint has electromagnetic brakes so setting SFree for the Z joint does not immediately allow the Z joint to be moved. To move the Z joint by hand requires the brake to be released continuously by pressing the brake release switch on the top of the robot arm.

Some model has electronic brake on the U joint. When the robot has the U joint electronic brake, setting SFree for the U joint does not immediately allow the U joint to be moved. To move the U joint by hand requires the brake to be released continuously by pressing the brake release switch on the top of the robot arm.

SFree is Not Valid with 6-Axis robots

All joints of the 6-axis robots have an electromagnetic brake. The brake can be released using the Brake command with the motor off. In the motor off state, SFree is not valid. If you execute SFree with the motor on, an electromagnetic brake will be on. You cannot move any joint by hand using SFree.

Executing motion commands while joints are in SFree state

Attempting to execute a motion command while in the SFree condition will cause an error in the controller's default state. However, to allow motion while 1 or more of the axes are in the SFree state, turn on the "Allow Motion with one or more axes free" controller preference. (This preference can be set from the Setup | Controller | Preferences EPSON RC+ 5.0.)

See Also

Brake, LimZ, Motor, SFree Function, SLock

SFree Statement Example

This is a simple example on the usage of the SFree instruction. The Motion with SFree controller preference must be enabled for this example to work.

Function GoPick
  Speed pickSpeed
  SFree 1, 2  'Release the excitiation of J1 and J2,
  'and control the Z and U joints for part installation.
  Go pick
  SLock 1, 2  'Restore the excitiation of J1 and J2.
  Fend
SFree Function

Returns SFree status for a specified joint.

Syntax

\[ \text{SFree} \left( \text{jointNumber} \right) \]

Parameters

jointNumber \quad \text{Integer expression representing the joint number to check.}\n\quad \text{The additional S axis is 8 and T axis is 9.}

Return Values

True if the joint is free, False if not.

See Also

SFree Statement

SetFree Statement Example

\begin{verbatim}
If SFree(1) Then
    Print "Joint 1 is free"
EndIf
\end{verbatim}
Sgn Function

Determines the sign of the operand.

Syntax

\[ \text{Sgn}(\text{Operand}) \]

Parameters

Operand \quad \text{A numeric expression.}

Return Values

1: If the operand is a positive value.
0: If the operand is a 0
-1: If the operand is a negative value.

Description

The \text{Sgn} function determines the sign of the numeric value of the operand.

See Also

Abs, And, Atan, Atan2, Cos, Int, Mod, Or, Not, Sin, Sqr, Str$, Tan, Val, Xor

Sgn Function Example

This is a simple command window example on the usage of the Sgn function.

\[
\begin{align*}
> \text{print } \text{sgn}(123) \\
& 1 \\
> \text{print } \text{sgn}(-123) \\
& -1
\end{align*}
\]
ShutDown Statement

Shuts down EPSON RC+ and optionally shuts down or restarts Windows.

Syntax

ShutDown [mode] [Forced]

Parameters

mode  Optional. An integer expression that represents the mode setting described below.

<table>
<thead>
<tr>
<th>Symbolic constant</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode ommitted</td>
<td>−1</td>
<td>Displays a dialog allowing the user to choose the shutdown option.</td>
</tr>
<tr>
<td>SHUTDOWN_ALL</td>
<td>0</td>
<td>Shuts down EPSON RC+ and Windows.</td>
</tr>
<tr>
<td>SHUTDOWN_RESTART</td>
<td>1</td>
<td>Shuts down EPSON RC+ and restarts Windows.</td>
</tr>
<tr>
<td>SHUTDOWN_EPSONRC</td>
<td>2</td>
<td>Shuts down EPSON RC+.</td>
</tr>
</tbody>
</table>

Forced  Optional. Use to force a shutdown.

Description

Use ShutDown to shutdown RC+ and optionally shutdown or reboot Windows from your program. You can force a shutdown by using the Forced parameter.

Note

If you shutdown with the Forced parameter while tasks are running, you could lose data. Be sure to save data before shutdown.

See Also

Restart

ShutDown Statement Example

ShutDown 0 ' Shutdown EPSON RC+ and Windows
ShutDown Function

Shuts down EPSON RC+ and optionally shuts down or restarts Windows.

Syntax

ShutDown ( [mode], [Forced] )

Parameters

mode Optional. An integer expression that represents the mode setting described below.

<table>
<thead>
<tr>
<th>Symbolic constant</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode ommitted</td>
<td>−1</td>
<td>Displays a dialog allowing the user to choose the shutdown option.</td>
</tr>
<tr>
<td>SHUTDOWN_ALL</td>
<td>0</td>
<td>Shuts down EPSON RC+ and Windows.</td>
</tr>
<tr>
<td>SHUTDOWN_RESTART</td>
<td>1</td>
<td>Shuts down EPSON RC+ and restarts Windows.</td>
</tr>
<tr>
<td>SHUTDOWN_EPSONRC</td>
<td>2</td>
<td>Shuts down EPSON RC+.</td>
</tr>
</tbody>
</table>

Forced Optional. Use to force a shutdown.

Return Values

Returns the following integer values.

-1 When a dialog is displayed and the user selects Cancel.
0 If shutdown fails
1 If shutdown is successful

Description

Use ShutDown to shutdown RC+ and optionally shutdown or reboot Windows from your program.
You can force a shutdown by using the Forced parameter.

Note

If you shutdown with the Forced parameter while tasks are running, you could lose data.
Be sure to save data before shutdown.

ShutDown Function Example

If ShutDown(SHUTDOWN_EPSONRC) = 1 Then
    Print "Shutdown: OK"
Else
    Print "Shutdown: NG"
EndIf
Send a signal to tasks executing WaitSig.

**Syntax**

```
Signal signalNumber
```

**Parameters**

| signalNumber | Signal number to transmit. Range is 0 ~ 63. |

**Description**

Signal can be used to synchronize multi-task execution.

Previous signals issued before WaitSig is executed are ignored.

**See Also**

WaitSig

**Signal Statement Example**

```
Function Main
  Xgt 2, SubTask
  Call InitSys
  Signal 1

Fend

Function SubTask
  WaitSig 1

Fend
```
Sin Function

Returns the sine of a numeric expression.

Syntax

Sin(radians)

Parameters

radians Real expression in Radians.

Return Values

Numeric value representing the sine of the numeric expression radians.

Description

Sin returns the sine of the numeric expression. The numeric expression (radians) must be in radian units. The value returned by the Sin function will range from -1 to 1.

To convert from radians to degrees, use the RadToDeg function.

See Also

Abs, Atan, Atan2, Cos, Int, Mod, Not, Sgn, Sqr, Str$, Tan, Val

Sin Function Example

The following example shows a simple program which uses Sin.

Function sintest
  Real x
  Print "Please enter a value in radians:"
  Input x
  Print "Sin of ", x, " is ", Sin(x)
Fend
SingularityAngle Statement

Sets the singularity neighborhood angle necessary for the singularity avoiding function.

Syntax
SingularityAngle {Angle}

Parameter
Angle Specify the Joint #5 angle (real number equals to or greater than 0.1. Unit: deg) by a formula or a value for determining the wrist singularity neighborhood of the vertical 6-axis robot.

Result
Current SingularityAngle value will be displayed if the parameter is omitted.

Description
This command is enabled only when the singularity avoiding function is being used. Default is 10 deg. This command can be used to adjust the start position of the singularity avoidance. If the value smaller than the default is specified, avoidance motion starts at the point closer to the singularity. Usually, it is not necessary to change the parameter. This may be useful to reduce errors which occur when passing the singularity.

If SingularityAngle parameter is changed, the current setting is effective until the next controller startup.

See Also
AvoidSingularit, SingualrityAngle Function, SingularitySpeed

SingularityAngle Statement Example
SingularityAngle 7.0 *Sets the singularity neighborhood angle at 7 degrees
SingularityAngle Function

Returns the SingularityAngle setting value.

Syntax

SingularityAngle

Return value

Returns the singularity neighborhood angle (Unit: deg).

See Also

AvoidSingularity, SingularityAngle, SingularitySpeed, SingularitySpeed Function

SingularityAngle Function Example

Real currSingularityAngle
currSingularityAngle = SingularityAngle
SingularityDist Statement

Sets the singularity neighborhood distance necessary for the singularity avoiding function.

Syntax

SingularityDist {distance}

Parameter

distance

Specify the distance between the point P and Joint #1 rotation axis (real number equals to or larger than 0. Unit: mm ) by a formula or a value for determining the shoulder singularity neighborhood or the vertical 6-axis robot.

Result

Current SingularityDist value will be displayed if the parameter is omitted.

Description

This command is enabled only when the singularity avoiding function is being used. Default is 30 mm. This command can be used to adjust the start position of the singularity avoidance. If the value smaller than the default is specified, avoidance motion starts at the point closer to the singularity. Usually, it is not necessary to change the parameter. This may be useful to reduce errors which occur when passing the singularity.

If SingularityDist parameter is changed, the current setting is effective until the next controller startup.

See Also

AvoidSingularity, SingularityAngle, SingualrityAngle Function, SingularityDist Function, SingularitySpeed, SingularitySpeed Function

SingularityDist Statement Example

SingularityDist 10.0 'Sets the singularity neighborhood distance at 10 mm
SingularityDist Function

Returns the SingularityDist setting value.

**Syntax**

SingularityDist

**Return value**

Returns the singularity neighborhood distance (Unit: mm).

**See Also**

SingularityDist, AvoidSingularity, SingularityAngle, SingularityAngle Function, SingularitySpeed, SingularitySpeed Function

**SingularityDist Function Example**

```
Real currSingularityDist
currSingularityDist = SingularityDist
```
SingularitySpeed Statement

Sets the singularity neighborhood angular velocity necessary for the singularity avoiding function.

Syntax

SingularitySpeed (Angular velocity)

Parameter

Angular velocity

Specify the percentage of the Joint #4 angular velocity with respect to the maximum angular velocity (real number equals to or greater than 0.1. Unit: %) by a formula or a value for determining the wrist singularity neighborhood of the vertical 6-axis robot.

Result

Current SingularitySpeed value will be displayed if the parameter is omitted.

Description

This command is enabled only when the singularity avoiding function is being used.

Default is 10 %. This command can be used to adjust the start position of the singularity avoidance. If the value smaller than the default is specified, avoidance motion starts at the point closer to the singularity. Usually, it is not necessary to change the parameter. This may be useful to reduce errors which occur when passing the singularity.

If SingularitySpeed parameter is changed, the current setting is effective until the next controller startup.

See Also

AvoidSingularity Function, SingularityAngle, SingularitySpeed

SingularitySpeed Example

SingularitySpeed 30.0 'Sets the singularity neighborhood angular velocity at 30 %
SingularitySpeed Function

Returns the SingularitySpeed setting value.

**Syntax**

SingularitySpeed

**Return Value**

Returns the singularity neighborhood angular velocity (Unit: %).

**See Also**

SingularitySpeed, SingularityAngle, AvoidSingularity

**SingularitySpeed Function Example**

```plaintext
Real currSingularitySpeed
currSingularitySpeed = SingularitySpeed
```
SLock Statement

Restores servo power from servo free condition for the specified servo axis.

Syntax

```
SLock  jointNumber [ , jointNumber,... ]
```

Parameters

- **jointNumber**
  - The servo joint number (1 ~ 9).
  - The additional S axis is 8 and T axis is 9.

Description

- **SLock** restores servo power to the specified servo joint, which was de-energized by the SFree instruction for the direct teaching or part installation.

  - If the joint number is omitted, all joints are engaged.
  - Engaging the 3rd joint (Z) causes the brake to release.
  - To engage all axes, Motor On may be used instead of **SLock**.
  - Executing **SLock** while in Motor Off state will cause an error.

  - SLock initializes the robot control parameter.
  - See Motor On for the details.

See Also

- Brake, LimZ, Reset, SFree

SLock Example

This is a simple example on the usage of the SLock instruction. The Motion with SFree controller preference must be enabled for this example to work.

```
Function test
  .
  .
  .
  SFree 1, 2 ' Release the excitation of J1 and J2,
  ' and control the Z and U joints for part installation.
  Go P1
  SLock 1, 2 ' Restore the excitation of J1 and J2.
  .
  .
Fend
```
SoftCP Statement

Specifies the SoftCP motion mode.

**Syntax**

\[ \text{SoftCP \{ \text{On | Off} \} } \]

**Parameters**

- **On**: Used to enable SoftCP motion mode.
- **Off**: Used to disable SoftCP motion mode.

**Description**

SoftCP motion mode controls the vibration caused by CP motion with high acceleration/deceleration. Normal CP motion focuses on path-tracking and uniform-motion which increases the vibration when acceleration/deceleration is high. To reduce the vibration, acceleration/deceleration needs to be reduced with the SpeedS and AccelS commands. However, some applications don’t necessarily require the high performance of path-tracking and uniform-motion but need CP motion with less vibration when acceleration/deceleration is high. SoftCP motion mode dampens the path-tracking and uniform-motion performance more than in the normal CP motion mode and reduces the vibration in CP motion with high acceleration/deceleration.

SoftCP motion mode applies to the following CP motion commands:

- Move, BMove, TMove, Arc, Arc3, CVMove, Jump3CP

If the vibration doesn’t matter in the normal CP motion or the performances of path-tracking and uniform-motion are required, don’t apply SoftCP motion mode.

SoftCP will be set to Off in the following cases:

- Controller startup
- Reset
- All task stop
- Switching the Auto / Programming operation mode
- Motor On
- SFree, SLock

**See Also**

- SoftCP Function

**SoftCP Statement Example**

```
SoftCP On
Move P1
Move P2
SoftCP Off
```
SoftCP Function

Returns the status of SoftCP motion mode.

Syntax

```
SoftCP
```

Return Values

0 = SoftCP motion mode off, 1 = SoftCP motion mode on.

See Also

SoftCP Statement

SoftCP Function Example

```
If SoftCP = Off Then
    Print "SoftCP is off"
EndIf
```
Space$ Function

Returns a string of space characters.

Syntax

Space$(count)

Parameters

count The number of spaces to put in the return string.

Return Values

Returns a string of count space characters.

Description

Space$ returns a string of count space characters as specified by the user. Space$ can return up to 255 characters (the maximum number of characters allowed in a string variable).

The Space$ instruction is normally used to insert spaces before, after, or between other strings of characters.

See Also

Asc, Chr$, InStr, Left$, Len, LSet$, Mid$, Right$, RSet$, Str$, Val

Space$ Function Example

> Print "XYZ" + Space$(1) + "ABC"
XYZ ABC

> Print Space$(3) + "ABC"
ABC >
Speed Statement

Specifies or displays the arm speed for the point to point motion instructions Go, Jump and Pulse.

Syntax

(1) Speed \texttt{percent}, [\texttt{departSpeed}], [\texttt{approSpeed}]

(2) Speed

Parameters
\begin{itemize}
  \item \texttt{percent} \hspace{1cm} \text{Integer expression between 1-100 representing the arm speed as a percentage of the maximum speed.}
  \item \texttt{departSpeed} \hspace{1cm} \text{Integer expression between 1-100 representing the depart motion speed for the Jump instruction. Available only with Jump command.}
  \item \texttt{approSpeed} \hspace{1cm} \text{Integer expression between 1-100 representing the approach motion speed for the Jump instruction. Available only with Jump command.}
\end{itemize}

Return Values

Displays current Speed value when used without parameters.

Description

Speed specifies the arm speed for all point to point motion instructions. This includes motion caused by the Go, Jump and Pulse robot motion instructions. The speed is specified as a percentage of maximum speed with the range of acceptable values between 1-100. (1 represents 1\% of the maximum speed and 100 represents 100\% of maximum speed). Speed 100 represents the maximum speed possible.

Depart and approach speed values apply only to the Jump instruction. If omitted, each defaults to the percent value.

The speed value initializes to its default value when any one of the following is performed:

Controller Startup  
Motor On  
SFree, SLock, Brake  
Reset, Reset Error  
Stop button or QuitAll stops tasks

In Low Power Mode, the effective speed setting is lower than the default value. If a higher speed is specified directly (from the command window) or in a program, the speed is set to the default value. In High Power Mode, the motion speed setting is the value specified with Speed.

If higher speed motion is required, set high power mode using Power High and close the safety door. If the safety door is open, the Speed settings will be changed to their default value.

If Speed is executed when the robot is in low power mode, the following message is displayed. The following example shows that the robot will move at the default speed (5) because it is in Low Power Mode even though the speed setting value by Speed is 80.

\begin{verbatim}
> speed 80
> speed
Low Power Mode
  80
  80     80
>
\end{verbatim}
See Also
Accel, Go, Jump, Power, Pass, Pulse, SpeedS

Speed Statement Example

Speed can be used from the command window or in a program. Shown below are simple examples of both methods.

```plaintext
Function speedtst
    Integer slow, fast, i
    slow = 10
    fast = 100
    For i = 1 To 10
        Speed slow
        Go P0
        Go P1
        Speed fast
        Go P0
        Go P1
    Next i
End
```

From the command window the user can also set Speed values.

```plaintext
> Speed 100,100,50   'Z joint downward speed set to 50
> Speed 50
> Speed
    Low Power State: Speed is limited to 5
    50
    50
    50
> 
```
Speed Function

Returns one of the three speed settings.

Syntax

```
Speed[paramNumber]
```

Parameters

- `paramNumber`: Integer expression which evaluates to one of the values shown below. When omitted, 1 will be taken as the specified number.
  1: PTP motion speed
  2: Jump depart speed
  3: Jump approach speed

Return Values

Integer value from 1 to 100.

See Also

- Speed Statement

Speed Function Example

```
Integer savSpeed

savSpeed = Speed(1)
Speed 50
Go pick
Speed savSpeed
Fend
```
Sets or displays the tool rotation speed for CP motion when ROT is used.

Syntax

(1) SpeedR  rotSpeed
(2) SpeedR

Parameters

rotSpeed  Real expression in degrees / second.
Valid entries range of the parameters: 0.1 to 1000

Return Values

When parameters are omitted, the current SpeedR setting is displayed.

Description

SpeedR  is effective when the ROT modifier is used in the Move, Arc, Arc3, BMove, TMove, and Jump3CP motion commands.

The SpeedR value initializes to the default value (low speed) when any one of the following conditions occurs:

- Controller Startup
- Motor On
- SFree, SLock, Brake
- Reset, Reset Error
- Stop button or QuitAll stops tasks

See Also

AccelR, Arc, Arc3, BMove, Jump3CP, Power, SpeedR Function, TMove

SpeedR Statement Example

```plaintext
SpeedR  200
```
SpeedR Function

Returns tool rotation speed value.

Syntax

SpeedR

Return Values

Real value in degrees / second

See Also

AccelR Statement, SpeedR Statement

SpeedR Function Example

Real currSpeedR

currSpeedR = SpeedR
SpeedS Statement

Specifies or displays the arm speed for use with the continuous path motion instructions such as Move, Arc, Arc3, Jump3, and Jump3CP.

Syntax

(1) SpeedS speed, [departSpeed], [approSpeed]
(2) SpeedS

Parameters

- **speed**: Real expression representing the CP motion speed in units of mm/sec.
- **departSpeed**: Optional. Real expression representing the Jump3 depart speed in units of mm/sec.
- **approSpeed**: Optional. Real expression representing the Jump3 approach speed in units of mm/sec.

Valid entries range of the parameters: 1 to 2000

Return Values

Displays current SpeedS value when used without parameters.

Description

SpeedS specifies the tool center point speed for use with all the continuous path motion instructions. This includes motion caused by the Move and Arc instructions.

SpeedS is specified in mm/Sec which represents a Tool Center Point velocity for the robot arm. The default value varies from robot to robot. See the robot manual for the default SpeedS values for your robot model. This is the initial SpeedS value set up automatically by the controller each time main power is turned on.

The SpeedS value initializes to its default value when any one of the following is performed:

- Controller Startup
- Motor On
- SFree, SLock, Brake
- Reset, Reset Error
- Stop button or QuitAll stops tasks

In Low Power Mode, the effective SpeedS setting is lower than the default value. If a higher speed is specified directly (from the command window) or in a program, the speed is set to the default value. In High Power Mode, the motion SpeedS setting is the value of SpeedS.

If higher speed motion is required, set high power mode using Power High and close the safety door. If the safety door is open, the SpeedS settings will be changed to their default value.

See Also

- AccelS, Arc, Jump3, Move, Speed
**SpeedS Example**

*SpeedS can be used from the command window or in a program.* Shown below are simple examples of both methods.

```plaintext
Function speedtst
    Integer slow, fast, i
    slow = 50
    fast = 500
    For i = 1 To 10
      SpeedS slow
      Go P0
      Move P1
      SpeedS fast
      Go P0
      Move P1
    Next i
Fend
```

From the command window the user can also set *SpeedS* values.

```plaintext
> speeds 1000
> speeds 500
> speed 30   ' set point to point speed
> go p0      ' point to point move
> speeds 100  ' set straight line speed in mm/Sec
> move P1    ' move in straight line
```
SpeedS Function

Returns the current SpeedS setting.

Syntax

\[ \text{SpeedS } [\text{paramNumber}] \]

Parameters

\[ \text{paramNumber} \] Optional. Integer expression specifying which SpeedS value to return.

1: CP speed
2: Jump3 depart speed
3: Jump3 approach speed

Return Values

Real number, in mm/sec

See Also

SpeedS Statement

SpeedS Example

```plaintext
Real savSpeeds
savSpeeds = SpeedS
Print "Jump3 depart speed = ", SpeedS(2)
```
Sqr Function

Computes the non-negative square root value of the operand.

Syntax

\[ \text{Sqr(Operand) } \]

Parameters

\[ \text{Operand} \quad \text{A real expression.} \]

Return Values

\[ \text{Square root value.} \]

Description

The Sqr function returns the non-negative square root value of the operand.

Potential Errors

\[ \text{Negative operand} \]

If the operand is or has a negative numeric value, an error will occur.

See Also

Abs, And, Atan, Atan2, Cos, Int, Mod, Not, Or, Sgn, Sin, Str$, Tan, Val, Xor

Sqr Function Example

This is a simple Command window example on the usage of the Sqr function.

```plaintext
> print sqr(2)
1.414214
>
```

The following example shows a simple program which uses \text{sqr}.

```plaintext
Function sqrtest
Real x
Print "Please enter a numeric value:"
Input x
Print "The Square Root of ", x, " is ", Sqr(x)
Fend
```
ST Function

Returns the coordinate value of the specified additional axis in the point data.

Syntax

\[ \text{ST} \ ( \ sValue \ \text{As Real}, \ tValue \ \text{As Real} ) \]

Parameter

- \( sValue \): Real value that specifies the S axis coordinate value
- \( tValue \): Real value that specifies the T axis coordinate value

Return Values

Coordinate values of the specified additional axis in the point data.

Description

This function is used when you are using the additional ST axes. When using this function like \( \text{Go ST}(10, 20) \), the additional axis will move to the specified coordinate but the manipulator will not move. If you want to move the manipulator as well, use like \( \text{Go XY}(60, 30, -50, 45) \ : \text{ST}(10, 20) \).

For the details of the additional axis, refer to \textit{EPSON RC+ Users Guide: 19. Additional Axis}.

See Also

- XY Function

ST Function Example

\[ \text{P10 = ST}(10, 20) \]
StartMain Statement

StartMain Statement

Executes the main function from a background task. This command is for the experienced user and you need to understand the command specification before use.

Syntax

StartMain mainFuncname

Parameters

mainFuncname Main function name you want to execute (main ~ main63)

Description

To execute StartMain, you need to set the [Enable advanced task commands] preference in the Setup | System Configuration | Controller | Preferences page.

If a task is executed using the Xqt statement from a background task, the executed task becomes a background task. With StartMain, you can execute the main function as a non-background task from a background task.

If you have already executed the main function or execute StartMain from a non-background task, an error occurs.

CAUTION

- When executing StartMain command from a program, you must understand the command specification and confirm that the system has the proper conditions for this command. Improper use such as continuous execution of a command within a loop may deteriorate the system safety.

See Also

Xqt

StartMain Example

Function bgmain

; If Sw(StartMainSwitch) = On And Sw(ErrSwitch) = Off Then
  StartMain main
EndIf
;
Fend
Stat Function

Returns the execution status information of the controller.

Syntax
Stat(address)

Parameters
address Defines which status bits to check.

Return Values
Returns a 4 byte value that presents the status of the controller. Refer to table below.

Description
The Stat instruction returns information as shown in the table below:

<table>
<thead>
<tr>
<th>Address</th>
<th>Bit</th>
<th>Controller Status Indicated When Bit is On</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0-15</td>
<td>&amp;H1 to &amp;H8000 Task (1~16) is being executed (Xqt) or in Halt State</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>&amp;H10000 Task(s) is being executed</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>&amp;H20000 Pause condition</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>&amp;H40000 Error Condition</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>&amp;H80000 Teach mode</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>&amp;H100000 Emergency Stop Condition</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>&amp;H200000 Low Power Mode (Power Low)</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>&amp;H400000 Safe Guard input is Closed</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>&amp;H800000 Enable Switch is Open</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>&amp;H1000000 Undefined</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>&amp;H2000000 Undefined</td>
</tr>
<tr>
<td></td>
<td>26-31</td>
<td>Undefined</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>&amp;H1 Log of Stop above target position upon satisfaction of condition in Jump...Sense statement. (This log is erased when another Jump statement is executed).</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>&amp;H2 Log of stop at intermediate travel position upon satisfaction of condition in Go/Jump/Move...Till statement. (This log is erased when another Go/Jump/Move...Till statement is executed</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>&amp;H4 Undefined</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>&amp;H8 Log of stop at intermediate travel position upon satisfaction of condition in Trap statement</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>&amp;H10 Motor On mode</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>&amp;H20 Current position is home position</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>&amp;H40 Low power state</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>&amp;H80 Undefined</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>&amp;H100 4&quot; Joint motor is on</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>&amp;H200 3&quot; Joint motor is on</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>&amp;H400 2&quot; Joint motor is on</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>&amp;H800 1&quot; Joint motor is on</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>&amp;H1000 6&quot; Joint motor is on</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>&amp;H2000 5&quot; Joint motor is on</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>&amp;H4000 Axis T motor is on</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>&amp;H8000 Axis S motor is on</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>&amp;H10000 7&quot; Joint motor is on</td>
</tr>
<tr>
<td></td>
<td>17-31</td>
<td>Undefined</td>
</tr>
<tr>
<td>2</td>
<td>0-15</td>
<td>&amp;H1 to &amp;H8000 Task (17~32) is being executed (Xqt) or in Halt State</td>
</tr>
</tbody>
</table>
Stat Function

See Also
EStopOn Function, TillOn Function, PauseOn Function, SafetyOn Function

Stat Example

Function StatDemo

rbt1 sts = RShift((Stat(0) And &H070000), 16)
Select TRUE
    Case (rbt1 sts And &H01) = 1
        Print "Tasks are running"
    Case (rbt1 sts And &H02) = 2
        Print "Pause Output is ON"
    Case (rbt1 sts And &H04) = 4
        Print "Error Output is ON"
Send
Fend
Str$ Function

Converts a numeric value to a string and returns it.

Syntax

Str$(number)

Parameters

number Integer or real expression.

Return Values

Returns a string representation of the numeric value.

Description

Str$ converts a number to a string. Any positive or negative number is valid.

See Also

Abs, Asc, Chr$, InStr, Int, Left$, Len, Mid$, Mod, Right$, Sgn, Space$, Val

Str$ Function Example

The example shown below shows a program which converts several different numbers to strings and then prints them to the screen.

Function strtest
    Integer intvar
    Real realvar
    intvar = -32767
    Print "intvar = ", Str$(intvar)
    realvar = 567.9987
    Print "realvar = ", Str$(realvar)
Fend

Some other example results from the Str$ instruction from the command window.

> Print Str$(99999999999999)
  1.000000E+14

> Print Str$(25.999)
  25.999
String Statement

Declares variables of type String. (Character-string variables)

Syntax

```
String varName$ [(subscripts)] [ , varName$ [(subscripts)]]...
```

Parameters

- **varName$**: Variable name which the user wants to declare as type String.
- **subscripts**: Optional. Dimensions of an array variable; up to 3 dimensions may be declared. The subscripts syntax is as follows:(ubound1, [ubound2], [ubound3]) ubound1, ubound2, ubound3 each specify the maximum upper bound for the associated dimension.
The elements in each dimension of an array are numbered from 0 and the available number of array elements is the upper bound value + 1. When specifying the upper bound value, make sure the number of total elements is within the range shown below:

<table>
<thead>
<tr>
<th>Type</th>
<th>Maximum Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local variable</td>
<td>2000</td>
</tr>
<tr>
<td>Global Preserve variable</td>
<td>4000</td>
</tr>
<tr>
<td>Global variable and module</td>
<td>100000</td>
</tr>
</tbody>
</table>

Description

The **String** statement is used to declare variables of type String. String variables can contain up to 255 characters. Local variables should be declared at the top of a function. Global and module variables must be declared outside of functions.

String Operators

The following operators can be used to manipulate string variables:

- **+**: Merges character strings together. Can be used in the assignment statements for string variables or in the Print instruction.
  
  **Example**: name$ = fname$ + " " + lname$

- **=`**: Compares character strings. True is returned only when the two strings are exactly equal, including case.
  
  **Example**: If temp1$ = "A" Then GoSub test

- **<>**: Compares character strings. True is returned when one or more characters in the two strings are different.
  
  **Example**: If temp1$ <> "A" Then GoSub test

Notes

**Variable Names Must Include "$" Character:**

Variables of type String must have the character "$" as the last character in the variable name.

See Also

Boolean, Byte, Double, Global, Integer, Long, Real
String Example

```
String password$
String A$(10)         ' Single dimension array of string
String B$(10, 10)     ' Two dimension array of string
String C$(5, 5, 5)    ' Three dimension array of string

Print "Enter password:"
Input password$
If UCase$(password$) = "EPSON" Then
    Call RunMaintenance
Else
    Print "Password invalid!"
EndIf
```
Sw Function

Returns or displays the selected input port status. (i.e. Discrete User I/O)

Syntax

\texttt{Sw(bitNumber)}

Parameters

\texttt{bitNumber}  Integer expression representing I/O input bits.

Return Values

Returns a 1 when the specified input is On and a 0 when the specified input is Off.

Description

\texttt{Sw} provides a status check for hardware inputs. \texttt{Sw} is most commonly used to check the status of one of the inputs which could be connected to a feeder, conveyor, gripper solenoid, or a host of other devices which works via discrete I/O. Obviously the input checked with the \texttt{Sw} instruction has 2 states (1 or 0). These indicate whether the device is On or Off.

See Also

In, InBCD, MemOn, MemOff, MemSw, Off, On, OpBCD, Oport, Out, Wait

Sw Function Example

The example shown below simply checks the discrete input #5 and branches accordingly. On is used instead of 1 for more clarity.

```plaintext
Function main
    Integer i, feed5Ready
    feed5Ready = \texttt{Sw}(5)
    ' Check if feeder is ready
    If feed5Ready = \texttt{On} Then
        Call mkpart1
    Else
        Print "Feeder #5 is not ready. Please reset and"
        Print "then restart program"
    EndIf
End
```

Other simple examples are as follows from the command window:

```
> print \texttt{sw}(5)
1
>
```
SyncLock Statement

Synchronizes tasks using a mutual exclusion lock.

Syntax

SyncLock syncID [, timeOut]

Parameters

- **syncID**: Integer expression representing signal number to receive. Range is from 0 to 63.
- **timeOut**: Optional. Real expression representing the maximum time to wait for lock. Valid range is 0-2147483 seconds in 0.01 second intervals.

Description

Use **SyncLock** to lock use of a common resource so that only one task at a time can use it. When the task is finished with the resource, it must call **SyncUnlock** to release the lock so other tasks can use it.

A task can only unlock a syncID that it previously locked.

A task must execute **SyncUnlock** to release the lock.

If the task is finished, then the lock it previously locked will release.

When **SyncLock** is second consecutive used to a same signal number, an error occurs.

If the **timeOut** parameter is used, then the **Tw** function must be used to check if the lock was successful.

Notes

In EPSON RC+6.0, the lock is automatically released when the task is finished while it is not in EPSON RC+5.0.

See Also

- Signal, SyncLock, Tw, Wait, WaitPos
SyncLock Example
The following example uses SyncLock and SyncUnlock to allow only one task at a time to write a message to a communication port.

```plaintext
Function Main
    Xqt Func1
    Xqt Func2
Fend

Function Func1
    Long count
    Do
        Wait .5
        count = count + 1
        LogMsg "Msg from Func1, " + Str$(count)
    Loop
Fend

Function Func2
    Long count
    Do
        Wait .5
        count = count + 1
        LogMsg "Msg from Func2, " + Str$(count)
    Loop
Fend

Function LogMsg(msg$ As String)
    SyncLock 1
    OpenCom #1
    Print #1, msg$
    CloseCom #1
    SyncUnlock 1
Fend
```

The following example uses SyncLock with optional time out. Tw is used to check if the lock was successful. By using a timeout, you can execute other code periodically while waiting to lock a resource.

```plaintext
Function MySyncLock(syncID As Integer)
    Do
        SyncLock syncID, .5
        If Tw = 0 Then
            Exit Function
        EndIf
        If Sw(1) = On Then
            Off 1
        EndIf
    Loop
Fend
```
SyncUnlock Statement

Unlocks a sync ID that was previously locked with SyncLock.

Syntax

```
SyncUnlock syncID
```

Parameters

- `syncID` is an integer expression representing signal number to receive. Range is from 0 ~ 63.

Description

Use `SyncUnlock` to unlock a sync ID previously locked with SyncLock.

A task can only unlock a syncID that it previously locked.

See Also

- Signal, SyncLock, Wait, WaitPos

SyncUnlock Example

```
Function Main
    Xqt task
    Xqt task
    Xqt task
    Xqt task
    Fend

Function task
    Do
    SyncLock 1
    Print "resource 1 is locked by task", MyTask
    Wait .5
    SyncUnlock 1
    Loop
    Fend
```
SyncRobots Statement

Start the reserved robot motion.

Syntax

\[\text{SyncRobots} \ robotNumber \ [, \ robotNumber] \ [,...] \]
\[\text{SyncRobots All}\]

Parameters

- \(\text{robotNumber}\) Integer expression that specifies a robot number you want to start the motion.
- \(\text{All}\) All robots whose motion is reserved

Description

\text{SyncRobots} is used to start the robot motion reserved with the SYNC parameter of each motion command. The robots specified by the \text{SyncRobots} start to move in the same timing. This is more useful than synchronizing the normal multi-task programs by waiting for the I/O signal event because there is no effect of switching tasks. It can synchronize the robot motion start more precisely.

If a robot number is specified whose motion is not reserved, an error occurs.

See Also

\text{SyncRobots function}

SyncRobots Example

The example below uses the SYNC parameter of a motion command and SyncRobots to start the motions of two robots simultaneously.

\begin{verbatim}
Function Main
  Xqt Func1
  Xqt Func2
  Do
    Wait 0.1
    If (SyncRobots And &H03) = &H03 Then
      Exit Do
    EndIf
  Loop
  SyncRobots 1,2
End

Function Func1
  Robot 1
  Motor On
  Go P1 SYNC
End

Function Func2
  Robot 2
  Motor On
  Go P1 SYNC
End
\end{verbatim}
SyncRobots Function

Returns the status of a robot whose motion is reserved.

Syntax

SyncRobots

Return Values

Returns the robot motion in a bit, and if not reserved, 0 is returned.

bit 0: robotNumber 1
bit 1: robotNumber 2

Description

SyncRobots function checks the motion reservation status of the SYNC parameter of the robot motion commands. The status the SyncRobots checks are displayed in the bit status corresponding to the robot number. Each bit shows either the robot motion is reserved (1) or not (2). You can start the robot motion reserved using the SyncRobots statement.

See Also

SyncRobots

SyncRobots function Example

The example below uses the SYNC parameter of a motion command and SyncRobots to start the motions of two robots simultaneously.

```plaintext
Function Main
  Xqt Func1
  Xqt Func2
  Do
    Wait 0.1
    If (SyncRobots And &H03) = &H03 Then
      Exit Do
    EndIf
  Loop
  SyncRobots 1,2
Fend

Function Func1
  Robot 1
  Motor On
  Go P1 SYNC
Fend

Function Func2
  Robot 2
  Motor On
  Go P1 SYNC
Fend
```
SysConfig Command

Displays system configuration parameter.

Syntax

SysConfig

Return Values

Returns system configuration parameter.

Description

Display current configured value for system control data. When the robot and controller is received from the factory or after changing the configuration, it is a good idea to save this data. This can be done with Backup Controller from the Tools | Controller dialog.

The following data will be displayed. (The following data is for reference only since data will vary from controller to controller.)

```
' Version:
  Firmware 1, 0, 0, 0

' Options:
  External Control Point
  VB Guide

' HOUR: 414.634

' Controller:
  ' Serial #: 0001

' ROBOT 1:
  ' Name: Mnp01
  ' Model: PS3-AS10
  ' Serial #: 0001
  ' Motor On Time: 32.738
    ' Motor 1: Enabled, Power = 400
    ' Motor 2: Enabled, Power = 400
    ' Motor 3: Enabled, Power = 200
    ' Motor 4: Enabled, Power = 50
    ' Motor 5: Enabled, Power = 50
    ' Motor 6: Enabled, Power = 50

ARCH 0, 30, 30
ARCH 1, 40, 40
ARCH 2, 50, 50
ARCH 3, 60, 60
ARCH 4, 70, 70
ARCH 5, 80, 80
ARCH 6, 90, 90
ARMSET 0, 0, 0, 0, 0, 0
HOPS 0, 0, 0, 0, 0, 0
HORDR 63, 0, 0, 0, 0, 0
RANGE -7427414, 7427414, -8738134, 2621440, -3145728, 8301227, -
5534152, 5534152, -3640889, 3640889, -6553600, 6553600
BASE 0, 0, 0, 0, 0, 0
WEIGHT 2, 0
INERTIA 0.1, 0
XYLIM 0, 0, 0, 0, 0, 0
```
SysConfig Command

' Extended I/O Boards:
'   1: Installed
'   2: Installed
'   3: None installed
'   4: None installed

' Fieldbus I/O Slave Board:
'   Installed
'   Type: PROFIBUS

' Fieldbus I/O Master Board:
'   None installed

' RS232C Boards:
'   1: Installed
'   2: None installed

' PG Boards:
'   1: None installed
'   2: None installed
'   3: None installed
'   4: None installed

SysConfig Example

> SysConfig
SysErr Function

Returns the latest error status or warning status.

Syntax

```
SysErr [(infoNo)]
```

Parameters

- `infoNo` Optional. Integer number representing the error code or warning code to get.
  - 0: Error code (When the parameter is omitted, 0 is automatically selected.)
  - 1: Warning code

Return Values

An integer representing the error code or warning code of the controller.

Description

`SysErr` is used only for NoEmgAbort task (special task using NoEmgAbort at Xqt) and background tasks.
Error codes or warning codes of controller are the error codes or warning codes displayed on the LCD.
When there are no errors or warnings, the return value will be 0.

See Also

ErrMsg$, ErrorOn, Xqt

SysErr Function Example

The following example shows a program that monitors the controller error and switches the I/O On/Off according to the error number when error occurs.

Notes

Forced Flag

This program example uses Forced flag for On/Off command.
Be sure that the I/O outputs change during error, or at Emergency Stop or Safety Door Open when designing the system.

After Error Occurrence

As this program, finish the task promptly after completing the error handling.

```
Function main

  Xqt ErrorMonitor, NoEmgAbort
    :
    Fend

Function ErrorMonitor

  Wait ErrorOn
  If 4000 < SysErr Then
    Print "Motion Error = ", SysErr
    Off 10, Forced
    On 12, Forced
  Else
    Print "Other Error = ", SysErr
    Off 11, Forced
    On 13, Forced
  EndIf

  Fend
```

Tab$ Function

Returns a string containing the specified number of tabs characters.

Syntax

```
Tab$(number)
```

Parameters

- **number**: Integer expression representing the number of tabs.

Return Values

String containing tab characters.

Description

The `Tab$` function returns a string containing the specified number of tabs.

See Also

- `Left$`, `Mid$`, `Right$`, `Space$`

Tab$ Function Example

```plaintext
Print "X", Tab$(1), "Y"
Print
For i = 1 To 10
    Print x(i), Tab$(1), y(i)
Next i
```
Tan Function

Returns the tangent of a numeric expression.

Syntax
Tan(radians)

Parameters
radians Real expression given in radians.

Return Values
Real number containing the tangent of the parameter radians.

Description
Tan returns the Tangent of the numeric expression. The numeric expression (radians) may be any numeric value as long as it is expressed in radian units.

To convert from radians to degrees, use the RadToDeg function.

See Also
Abs, Atan, Atan2, Cos, Int, Mod, Not, Sgn, Sin, Sqr, Str$, Val

Tan Function Example

Function tantest
    Real num
    Print "Enter number in radians to calculate tangent for:"
    Input num
    Print "The tangent of ", num, " is ", Tan(num)
Fend

The examples shown below show some typical results using the Tan instruction from the Command window.

> print tan(0)
0.00
> print tan(45)
1.6197751905439
>
TargetOK Function

TargetOK Function

Returns a status indicating whether or not the PTP (Point to Point) motion from the current position to a target position is possible.

Syntax

TargetOK(targetPos)

Parameters

$targetPos$ Point expression for the target position.

Return Values

True if it is possible to move to the target position from the current position, otherwise False.

Description

Use TargetOK to verify that a target position and orientation can be reached before actually moving to it. The motion trajectory to the target point is not considered.

See Also

CurPos, FindPos, InPos, WaitPos

TargetOK Function Example

If TargetOK(P1) Then
  Go P1
EndIf

If TargetOK(P10 /L /F) Then
  Go P10 /L /F
EndIf
TaskDone Function

Returns the completion status of a task.

Syntax

TaskDone (taskIdentifier)

Parameters

- **taskIdentifier**: Task name or integer expression representing the task number. Task name is a function name used in an Xqt statement or a function started from the Run window or Operator window.

  Task number range is:
  - Normal tasks: 1 ~ 32
  - Background task: 65 ~ 80
  - Trap tasks: 257 ~ 267

Return Values

- True if the task has been completed, False if not.

Description

Use TaskDone to determine if a task has completed.

See Also

TaskState, TaskWait

TaskDone Function Example

```plaintext
Xqt 2, conveyor
Do
  .
  .
Loop Until TaskDone(conveyor)
```
TaskInfo Function

Returns status information for a task.

Syntax

TaskInfo( taskIdentifier, index)

Parameters

- **taskIdentifier**: Task name or integer expression representing the task number.
  - A task name is the function name used in an Xqt statement or a function started from the Run window or Operator window.
  - Specifying a task number:
    - Normal tasks: 1 ~ 32
    - Background tasks: 65 ~ 80
    - Trap tasks: 257 ~ 267

- **index**: Integer expression that represents the index of the information to retrieve.

Return Values

- An integer containing the specified information.

Description

<table>
<thead>
<tr>
<th>Index</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Task number</td>
</tr>
<tr>
<td>1</td>
<td>0 – Normal task, NoPause task, or NoEmgAbort task 1 – Background task</td>
</tr>
</tbody>
</table>
| 2     | Task type  
  | 0 - Normal task  
  | 1 - NoPause task  
  | 2 - NoEmgAbort task  
  | 3 - Trap task  
  | 4 - Background task |
| 3     | 1 - Specified task is not executing.  
  | 1 - Specified task is executing.  
  | 2 - Specified task is waiting for an event.  
  | 3 - Specified task is paused or halted  
  | 4 - Specified task is in quick pause state  
  | 5 - Specified task is in error state |
| 4     | Timeout has occurred during wait for event (same as TW) |
| 5     | Event wait time (milliseconds). |
| 6     | Current robot number selected by the task |
| 7     | Current robot number being used by the task |

See Also

- CtrlInfo, RobotInfo, TaskInfo

TaskInfo Function Example

```plaintext
If (TaskInfo(1, 3) <> 0 Then
  Print "Task 1 is running"
Else
  Print "Task 1 is not running"
EndIf
```
TaskInfo$ Function

Returns text information for a task.

**Syntax**

\[
\text{TaskInfo$}( \text{taskIdentifier, index})
\]

**Parameters**

- **taskIdentifier**: Task name or integer expression representing the task number. A task name is the function name used in an Xqt statement or a function started from the Run window or Operator window.
  - Specifying a task number:
    - Normal tasks: 1 ~ 32
    - Background tasks: 65 ~ 80
    - Trap tasks: 257 ~ 267
- **index**: Integer expression that represents the index of the information to retrieve.

**Return Values**

A string containing the specified information.

**Description**

The following table shows the information that can be retrieved using TaskInfo$:

<table>
<thead>
<tr>
<th>Index</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Task name</td>
</tr>
<tr>
<td>1</td>
<td>Start date / time</td>
</tr>
<tr>
<td>2</td>
<td>Name of function currently executing</td>
</tr>
<tr>
<td>3</td>
<td>Line number in the program file that contains the function</td>
</tr>
</tbody>
</table>

**See Also**

CtrlInfo, RobotInfo, TaskInfo

**TaskInfo$ Function Example**

```
Print "Task 1 started: "TaskInfo$(1, 1)
```
TaskState Function

Returns the current state of a task.

Syntax

\[
\text{TaskState}( \text{taskIdentifier} )
\]

Parameters

\text{taskIdentifier} \quad \text{Task name or integer expression representing the task number.}

A task name is the function name used in an Xqt statement or a function started from the Run window or Operator window.

Specifying a task number:

- Normal tasks : 1 ~ 32
- Background tasks : 65 ~ 80
- Trap tasks : 257 ~ 267

Return Values

0: Task not running
1: Task is running
2: Task is waiting for an event
3: Task has been halted
4: Task has been paused in QuickPause
5: Task in error condition

Description

Use TaskState to get status for a given task. You can specify task number or task name.

See Also

TaskDone, TaskWait

TaskState Function Example

\[
\text{If TaskState(conveyor) = 0 Then}
\text{Xqt 2, conveyor}
\text{EndIf}
\]
TaskWait Statement

Waits to for a task to terminate.

Syntax

TaskWait (taskIdentifier)

Parameters

  taskIdentifier

  Task name or integer expression representing the task number. Task name is a function name used in an Xqt statement or a function started from the Run window or Operator window.

  Task number range is:

  Normal tasks: 1 ~ 32
  Background task: 65 ~ 80
  Trap tasks: 257 ~ 267

See Also

  TaskDone, TaskState

TaskWait Statement Example

  Xqt 2, conveyor
  TaskWait conveyor
TC Statement

Returns the torque control mode setting and current mode.

Syntax
(1) TC { On | Off }
(2) TC

Parameters
On | Off
On : Torque control mode ON
Off : Torque control mode OFF

Return Values
When the parameter are omitted, turns the current torque control mode.

Description
TC On/Off set the torque control mode available/unavailable.
The torque control mode sets the motor output limit to generate the constant force. This is used in pressing a hand to an object at constant force or making the close contact and coordinate moving of hand with an object.
Before setting the torque control available, configure the limits of torque control and speed control in TCLim and TCSpeed.
Under the torque control, the robot moves as positioning to the target while an operation command is executed. When the robot contact an object and motor output is at the torque control limit, the robot stops its operation and keeps the constant torque.

In any of the following cases, the torque mode turns unavailable.

Controller Startup
Motor On
SFree, SLock, Brake
Reset, Reset Error
Stop button or QuitAll stops tasks

See Also
TCLim, TCSpeed

TC Example

Speed 5
Go ApproachPoint

*T Set the Z axis torque limit to 20 %
TCLim -1, -1, 20, -1
*T Set the speed in torque control to 5 %
TcSpeed 5

TC On
Go ContactPoint
Wait 3
Go ApproachPoint
TC Off
TCLim Statement

Specifies the torque limit of each joint for the torque control mode.

Syntax

```
TCLim [j1Torque limit, j2Torque limit, j3Torque limit, j4Torque limit, j5Torque limit, j6Torque limit, j7Torque limit, j8Torque limit, j9Torque limit]
```

Parameters

- **j1Torque limit**: Specifies the proportion to the maximum momentary torque (1 to 100 / unit: %) using an expression or numeric value. 
  -1: Disable the torque limit and turns the mode to normal position control.

- **j2Torque limit**: Specifies the proportion to the maximum momentary torque (1 to 100 / unit: %) using an expression or numeric value. 
  -1: Disable the torque limit and turns the mode to normal position control.

- **j3Torque limit**: Specifies the proportion to the maximum momentary torque (1 to 100 / unit: %) using an expression or numeric value. 
  -1: Disable the torque limit and turns the mode to normal position control.

- **j4Torque limit**: Specifies the proportion to the maximum momentary torque (1 to 100 / unit: %) using an expression or numeric value. 
  -1: Disable the torque limit and turns the mode to normal position control.

- **j5Torque limit**: Option. Specifies the proportion to the maximum momentary torque (1 to 100 / unit: %) using an expression or numeric value. 
  -1: Disable the torque limit and turns the mode to normal position control.

- **j6Torque limit**: Option. Specifies the proportion to the maximum momentary torque (1 to 100 / unit: %) using an expression or numeric value. 
  -1: Disable the torque limit and turns the mode to normal position control.

- **j7Torque limit**: Option. Specifies the proportion to the maximum momentary torque (1 to 100 / unit: %) using an expression or numeric value. 
  -1: Disable the torque limit and turns the mode to normal position control.

- **j8Torque limit**: Option. Specifies the proportion to the S axis maximum momentary torque (1 to 100 / unit: %) using an expression or numeric value. 
  -1: Disable the torque limit and turns the mode to normal position control.

- **j9Torque limit**: Option. Specifies the proportion to the T axis maximum momentary torque (1 to 100 / unit: %) using an expression or numeric value. 
  -1: Disable the torque limit and turns the mode to normal position control.

Return values

When the parameters are omitted, returns the current torque limit.
Description
Setting to the torque limit becomes available at TC On.

When the limit value is too low, the robot doesn’t work and operation command stops before the robot reaches the target position.

In any of the following cases, TCLim set value is initialized.

- Controller Startup
- Motor On
- SFree, SLock, Brake
- Reset, Reset Error
- Stop button or QuitAll stops tasks

See Also
TC, TCLim Function, TCSpeed

TCLim Example

Speed 5
Go ApproachPoint

'Set the Z axis torque limit to 20 %
TCLim -1, -1, 20, -1
'Set the speed in torque control to 5 %
TcSpeed 5

TC On
Go ContactPoint
Wait 3
Go ApproachPoint
TC Off
TCLim Function

Returns the torque limit of specified joint.

Syntax

TCLim (jointNumber)

Parameters

jointNumber Specifies the joint number to retrieve the torque limit from using an expression or numeric value.
The additional S axis is 8 and T axis is 9.

Return values

Returns the integer number representing the current torque limit (1 - 100). -1 means the torque limit is invalid.

See Also

TC, TCLim, TCSpeed

TCLim Fuction Example

Print "Current Z axis torque limit: ", TCLim(3)
TCPSpeed Function

Returns the calculated current tool center point (TCP) speed.

Syntax
TCPSpeed

Return Values
Real value containing the calculated current tool center point speed in mm/second.

Description
Use TCPSpeed to get the calculated current speed of the tool center point in mm/second when executing a CP (Continuous Path) motion command. CP motion commands include Move, TMove, Arc, Arc3, CVMove, and Jump3CP. This is not the actual tool center point speed. It is the speed that the system has calculated for the tool center point at the time the function is called.

The motor compliance lag is excluded from the calculation.
If the robot is executing a PTP (Point to Point) motion command, this function returns 0.

Even if you are using the additional axis, only the robot travel distance is returned. For example, it doesn’t include the travel speed of additional axis while you use the additional axis as running axis.

See Also
AccelS, CurPos, InPos, SpeedS

TCPSpeed Function Example

```
Function MoveTest
  AccelS 4000, 4000
  SpeedS 200
  Xqt ShowTCPSpeed
  Do
    Move P1
    Move P2
  Loop
Fend

Function ShowTCPSpeed
  Do
    Print "Current TCP speed is: ", TCPSpeed
    Wait .1
  Loop
Fend
```
TCSpeed Statement

Specifies the speed limit in the torque control.

Syntax

TCSpeed [speed]

Parameters

speed Specifies the proportion to the maximum speed (1 - 100 / unit: %) using an expression or numeric value.

Description

Under the torque control, the speed is limited to the TCSpeed setting despite of the speed settings of such as Speed command.

Error occurs if the speed goes over the limit in the torque control.

In any of the following cases, TCSpeed set value is initialized to 100%.

- Controller Startup
- Motor On
- SFree, SLock, Brake
- Reset, Reset Error
- Stop button or QuitAll stops tasks

See Also

TC, TCLim, TCSpeed Function

TCSpeed Example

```
Speed 5
Go ApproachPoint

* Set the Z axis torque limit to 20 %
TCLim -1, -1, 20, -1
* Set the speed under the torque control to 5 %
TcsSpeed 5

TC On
Go ContactPoint
Wait 3
Go ApproachPoint
TC Off
```
TCSpeed Function

Returns the speed limit in the torque control.

Syntax

TCSpeed

Return values

Returns the integer number (1 - 100) representing the current speed limit.

See Also

TC, TCSpeed, TCLim

TCSpeed Example

```plaintext
Integer var
var = TCSpeed
```
TeachOn Function

Returns the Teach mode status.

Syntax

TeachOn

Return Values

True if it is in the Teach mode, False if not.

Description

TeachOn function is only used in the background task.

See Also

ErrorOn, EstopOn, SafetyOn, Xqt

TeachOn function Example

The following example monitors the controller as it starts in Teach mode, and turns On/Off the I/O.

Function BGMain

Do

    Wait 0.1
    If TeachOn = True Then
        On teachBit
    Else
        Off teachBit
    EndIf
    If SafetyOn = True Then
        On safetyBit
    Else
        Off safetyBit
    EndIf
    If PauseOn = True Then
        On PauseBit
    Else
        Off PauseBit
    EndIf

Loop

Fend
TGo Statement

Executes Point to Point relative motion, in the current tool coordinate system.

Syntax

TGo destination [CP] [searchExpr] [!...!] [SYNC]

Parameters

destination
The target destination of the motion using a point expression.

CP
Optional. Specifies continuous path motion.

searchExpr
Optional. A Till or Find expression.

Till | Find
Till Sw(expr) = {On | Off}
Find Sw(expr) = {On | Off}

!...!
Optional. Parallel Processing statements can be added to execute I/O and other commands during motion.

SYNC
Reserves a motion command. The robot will not move until SyncRobots is executed.

Description

Executes point to point relative motion in the current tool coordinate system.

Arm orientation attributes specified in the destination point expression are ignored. The manipulator keeps the current arm orientation attributes. However, for a 6-Axis manipulator, the arm orientation attributes are automatically changed in such a way that joint travel distance is as small as possible.

The Till modifier is used to complete TGo by decelerating and stopping the robot at an intermediate travel position if the current Till condition is satisfied.

The Find modifier is used to store a point in FindPos when the Find condition becomes true during motion.

When Till is used and the Till condition is satisfied, the manipulator halts immediately and the motion command is finished. If the Till condition is not satisfied, the manipulator moves to the destination point.

When Find is used and the Find condition is satisfied, the current position is stored. Please refer to Find for details.

When parallel processing is used, other processing can be executed in parallel with the motion command.

The CP parameter causes acceleration of the next motion command to start when the deceleration starts for the current motion command. In this case the robot will not stop at the destination coordinate and will continue to move to the next point.

See Also

Accel, CP, Find, !...! Parallel Processing, Point Assignment, Speed, Till, TMove, Tool
TGo Statement

TGo Example

> TGo XY(100, 0, 0, 0)  'Move 100mm in X direction (in the tool coordinate system)
Function TGoTest

    Speed 50
    Accel 50, 50
    Power High

    Tool 0
    P1 = XY(300, 300, -20, 0)
    P2 = XY(300, 300, -20, 0) /L

    Go P1
    Print Here
    TGo XY(0, 0, -30, 0)
    Print Here

    Go P2
    Print Here
    TGo XY(0, 0, -30, 0)
    Print Here

Fend

[Output]
X: 300.000 Y: 300.000 Z: -20.000 U: 0.000 V: 0.000 W: 0.000 /R /0
X: 300.000 Y: 300.000 Z: -50.000 U: 0.000 V: 0.000 W: 0.000 /R /0
X: 300.000 Y: 300.000 Z: -20.000 U: 0.000 V: 0.000 W: 0.000 /L /0
X: 300.000 Y: 300.000 Z: -50.000 U: 0.000 V: 0.000 W: 0.000 /L /0
Till Statement

Specifies and displays event condition that, if satisfied, completes the motion command (Jump, Go, Move, etc.) in progress by decelerating and stopping the robot at an intermediate position.

Syntax
Till [ eventcondition ]

Parameters

Input status specified as a trigger

[Event] comparative operator ( =, <=, >=, <, <=) [Integer expression]

The following functions and variables can be used in the Event:
Functions : Sw, In, InW, Oport, Out, OutW, MemSw, MemIn, MemInW, Ctr, GetRobotInsideBox, GetRobotInsidePlane, Force
Variables : Byte, Integer, Long global preserve variable, Global variable, module variable

In addition, using the following operators you can specify multiple event conditions.
Operator : And, Or, Xor
Example : Till Sw(5) = On
Till Sw(5) = On And Sw(6) = Off

Description
The Till statement can be used by itself or as a search expression in a motion command statement.

The Till condition must include at least one of the functions above. When variables are included, their values are computed when setting the Till condition. No use of variable is recommended. Otherwise, the condition may be an unintended condition. Multiple Till statements are permitted. The most recent Till condition remains current until superseded.

When parameters are omitted, the current Till definition is displayed.

Notes
Till Setting at Main Power On
At power on, the Till condition is initialized to Till Sw(0) = On.

Use of Stat or TillOn to Verify Till
After executing a motion command which uses the Till qualifier there may be cases where you want to verify whether or not the Till condition was satisfied. This can be done through using the Stat function or the TillOn function.

To use a variables in the event condition expression
- Available variables are Integer type (Byte, Integer, Long)
- Array variables are not available
- Local variables are not available
- If a variable value cannot satisfy the event condition for more than 0.01 second, the system cannot retrieve the change in variables.
- Up to 64 can wait for variables in one system (including the ones used in the event condition expressions such as Wait). If it is over 64, an error occurs during the project build.
- If you specify Byref to a waiting variable on any function call, an error occurs.
- When a variable is included in the right side member of the event condition expression, the value is calculated when starting the motion command. We recommend not using variables in an integer expression to avoid making unintended conditions.

See Also
Find, Go, In, InW, Jump, MemIn, MemSw, Move, Stat, Sw, TillOn

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Till Example

Shown below are some sample lines from programs using the Till instruction

```
Till Sw(1) = Off           ' Specifies Till condition (Input bit 1 off)
Go P1 Till                  ' Stop if previous line condition is satisfied
Till Sw(1) = On And Sw($1) = On ' Specify new Till condition
Move P2 Till                ' Stop if previous line condition satisfied
Move P5 Till Sw(10) = On    ' Stop if condition on this line is satisfied
```
TillOn Function

Returns the current Till status.

Syntax

TillOn

Return Values

True if the Till condition occurred in the previous motion command using Till.

Description

TillOn returns True if Till condition occurred.

TillOn is equivalent to ((Stat(1) And 2) <> 0).

See Also

EStopOn, SafetyOn, Sense, Stat, Till

TillOn Function Example

Go P0 Till Sw(1) = On
If TillOn Then
    Print "Till condition occurred during move to P0"
EndIf
Time Statement

Displays the current time.

Syntax

Time

Description

Displays the current time in 24 hour format.

See Also

Date, Time$

Time Example

Example from the command window:

> Time
10:15:32
Time Function

Returns the controller accumulated operating time.

Syntax

```
Time(unitSelect)
```

Parameters

- `unitSelect` An integer number ranging from 0-2. This integer specifies which unit of time the controller returns:
  - 0: hours
  - 1: minutes
  - 2: seconds

Description

Returns the controller accumulated operating time as an integer.

See Also

- Hour

Time Function Example

Shown below are a few examples from the command window:

```plaintext
Function main
    Integer h, m, s
    h = Time(0)  ' Store the time in hours
    m = Time(1)  ' Store the time in minutes
    s = Time(2)  ' Store the time in seconds
    Print "This controller has been used:"
    Print h, "hours, ",
    Print m, "minutes, ",
    Print s, "seconds"
Fend
```
Time$ Function

Returns the current system time.

Syntax

Time$

Return Values

A string containing the current time in 24 hour format \textit{hh:mm:ss}.

See Also

Date, Date$, Time

Time$ Example

\texttt{Print "The current time is: ", Time$}
**TLClr Statement**

Clears (undefines) a tool coordinate system.

**Syntax**

```
TLClr toolNumber
```

**Parameters**

- `toolNumber`: Integer expression representing which of the 3 tools to clear (undefine). (Tool 0 is the default tool and cannot be cleared.)

**See Also**

- Arm, ArmClr, ArmSet, ECPSet, Local, LocalClr, Tool, TLSet

**TLClr Example**

```
TLClr 1
```
TLDef Function

Returns tool definition status.

Syntax

TLDef (toolNumber)

Parameters

toolNumber Integer expression representing which tool to return status for.

Return Values

True if the specified tool has been defined, otherwise False.

See Also

Arm, ArmClr, ArmSet, ECPSet, Local, LocalClr, Tool, TLClr, TLSet

TLDef Example

Function DisplayToolDef(toolNum As Integer)

    If TLDef(toolNum) = False Then
        Print "Tool ", toolNum, " is not defined"
    Else
        Print "Tool ", toolNum, ": ",
        Print TlSet(toolNum)
    EndIf
EndFunction
TLSet Statement

Defines or displays a tool coordinate system.

Syntax

(1) TLSet toolNum, toolDefPoint
(2) TLSet toolNum
(3) TLSet

Parameters

- toolNum
  Integer number from 1-15 representing which of 15 tools to define. (Tool 0 is the default tool and cannot be modified.)

- toolDefPoint
  Pnumber or P(expr) or point label or point expression.

Return Values

When parameters are omitted, displays all TLSet Definition.
When only the tool number is specified, displays specified TLSet Definition.

Description

Defines the tool coordinate systems Tool 1, Tool 2 or Tool 3 by specifying tool coordinate system origin and rotation angle in relation to the Tool 0 coordinate system (Hand coordinate system).

TLSet 1, XY(50, 100, -20, 30)

TLSet 2, P10 +X(20)

In this case, the coordinate values of P10 are referenced and 20 is added to the X value. Arm attribute and local coordinate system numbers are ignored.

TLSET 1, XY(100, 60, -20, 30)

Rotation angle (c shown in the next figure)
Position for Z axis
Position for Y axis (b shown in the next figure)
Position for X axis (a shown in the next figure)
Tool coordinate system number
**TLSet for 6-Axis robots**

The origin of Tool 0 is the flange side of the sixth joint. When all joints are at the 0 degree position, the Tool 0 coordinate system’s X axis is aligned with the robot coordinate system’s Z axis, the Y axis is aligned with the robot coordinate system’s X axis, and the Z axis is perpendicular to the flange face, and is aligned with the robot coordinate system’s Y axis, as shown in the figure below:
Tool 0 coordinate systems are defined for ceiling and wall mounted robots as shown in the figures below.

Notes

TLSet values are maintained
The TLSet values are preserved. Use TLClr to clear a tool definition.

See Also
Tool, Arm, ArmSet, TLClr

TLSet Example
The example shown below shows a good test which can be done from the command window to help understand the difference between moving when a tool is defined and when no tool is defined.

```
> TLSet 1, XY(100, 0, 0, 0)  'Define tool coordinate system for Tool 1 (plus 100 mm in x direction from hand coordinate system)
> Tool 1                    'Selects Tool 1 as defined by TLSet
> TGo P1                    'Positions the Tool 1 tip position at P1
> Tool 0                    'Tells robot to use no tool for future motion
> Go P1                     'Positions the center of the U-Joint at P1
```
TLSet Function

Returns a point containing the tool definition for the specified tool.

Syntax

\[
\text{TLSet}(\text{toolNumber})
\]

Parameters

\[
\text{toolNumber} \quad \text{Integer expression representing the number of the tool to retrieve.}
\]

Return Values

A point containing the tool definition.

See Also

TLSet Statement

TLSet Function Example

\[
P1 = \text{TLSet}(1)
\]
TMOut Statement

Specifies the number of seconds to wait for the condition specified with the Wait instruction to come true before issuing a timeout error.

Syntax

```plaintext
TMOut seconds
```

Parameters

- `seconds` Real expression representing the number of seconds until a timeout occurs. Valid range is 0-2147483 seconds in 1 second intervals.

Description

`TMOut` sets the amount of time to wait (when using the Wait instruction) until a timeout error is issued. If a timeout of 0 seconds is specified, then the timeout is effectively turned off. In this case the Wait instruction waits indefinitely for the specified condition to be satisfied.

The default initial value for `TMOut` is 0.

See Also

- In, MemSw, OnErr, Sw, TW, Wait

TMOut Example

```plaintext
TMOut 5
Wait MemSw(0) = On
```
TMove Statement

Executes linear interpolation relative motion, in the current tool coordinate system

Syntax

```
TMove destination [ROT] [CP] [ searchExpr ] [ !...! ] [SYNC]
```

Parameters

- **destination**: The target destination of the motion using a point expression.
- **ROT**: Optional. :Decides the speed/acceleration/deceleration in favor of tool rotation.
- **CP**: Optional. Specifies continuous path motion.
- **searchExpr**: Optional. A Till or Find expression.
  - **Till**: `Till Sw(expr) = {On | Off}`
  - **Find**: `Find Sw(expr) = {On | Off}`
- **!...!**: Optional. Parallel Processing statements can be added to execute I/O and other commands during motion.
- **SYNC**: Reserves a motion command. The robot will not move until SyncRobots is executed.

Description

Executes linear interpolated relative motion in the current tool coordinate system.

Arm orientation attributes specified in the destination point expression are ignored. The manipulator keeps the current arm orientation attributes. However, for a 6-Axis manipulator, the arm orientation attributes are automatically changed in such a way that joint travel distance is as small as possible.

TMove uses the SpeedS speed value and AccelS acceleration and deceleration values. Refer to Using TMove with CP below on the relation between the speed/acceleration and the acceleration/deceleration. If, however, the ROT modifier parameter is used, TMove uses the SpeedR speed value and AccelR acceleration and deceleration values. In this case SpeedS speed value and AccelS acceleration and deceleration value have no effect.

Usually, when the move distance is 0 and only the tool orientation is changed, an error will occur. However, by using the ROT parameter and giving priority to the acceleration and the deceleration of the tool rotation, it is possible to move without an error. When there is not an orientational change with the ROT modifier parameter and movement distance is not 0, an error will occur.

Also, when the tool rotation is large as compared to move distance, and when the rotation speed exceeds the specified speed of the manipulator, an error will occur. In this case, please reduce the speed or append the ROT modifier parameter to give priority to the rotational speed/acceleration/deceleration.

The Till modifier is used to complete TMove by decelerating and stopping the robot at an intermediate travel position if the current Till condition is satisfied.

The Find modifier is used to store a point in FindPos when the Find condition becomes true during motion.

When Till is used and the Till condition is satisfied, the manipulator halts immediately and the motion command is finished. If the Till condition is not satisfied, the manipulator moves to the destination point.

When Find is used and the Find condition is satisfied, the current position is stored. Please refer to Find for details.
When parallel processing is used, other processing can be executed in parallel with the motion command.

Notes
Using TMove with CP
The CP parameter causes the arm to move to destination without decelerating or stopping at the point defined by destination. This is done to allow the user to string a series of motion instructions together to cause the arm to move along a continuous path while maintaining a specified speed throughout all the motion. The TMove instruction without CP always causes the arm to decelerate to a stop prior to reaching the point destination.

See Also
AccelS, CP, Find, !....! Parallel Processing, Point Assignment, SpeedS, TGo, Till, Tool

TMove Example

> TMove XY(100, 0, 0, 0) 'Move 100mm in the X direction (in the tool coordinate system)
Function TMoveTest

    Speed 50
    Accel 50, 50
    SpeedS 100
    AccelS 1000, 1000
    Power High

    Tool 0
    P1 = XY(300, 300, -20, 0)
    P2 = XY(300, 300, -20, 0) /L

    Go P1
    Print Here
    TMove XY(0, 0, -30, 0)
    Print Here

    Go P2
    Print Here
    TMove XY(0, 0, -30, 0)
    Print Here

Fend

[Output]
X:  300.000 Y:  300.000 Z:  -20.000 U:    0.000 V:    0.000 W:    0.000 /R /0
X:  300.000 Y:  300.000 Z:  -50.000 U:    0.000 V:    0.000 W:    0.000 /R /0
X:  300.000 Y:  300.000 Z:  -20.000 U:    0.000 V:    0.000 W:    0.000 /L /0
X:  300.000 Y:  300.000 Z:  -50.000 U:    0.000 V:    0.000 W:    0.000 /L /0
Tmr Function

Timer function which returns the amount of time in seconds which has elapsed since the timer was started.

Syntax

\[ \text{Tmr}(\text{timerNumber}) \]

Parameters

- \( \text{timerNumber} \) Integer expression representing which of the 64 timers to check the time of. (0 ~ 63)

Return Values

Elapsed time for the specified timer as a real number in seconds. Timer range is from 0 - approx. 1.7E+31. Timer resolution is 0.001 seconds.

Description

Returns elapsed time in seconds since the timer specified was started.

Timers are reset with TmReset.

Real overhead

TmReset 0
overHead = Tmr(0)

See Also

TmReset

Tmr Function Example

\[ \begin{align*}
\text{TmReset 0} & \quad ' \text{Reset Timer 0} \\
\text{For } i = 1 \text{ To 10} & \quad ' \text{Perform operation 10 times} \\
\text{GoSub Cycle} & \\
\text{Next} & \\
\text{Print } \text{Tmr}(0) / 10 & \quad ' \text{Calculate and display cycle time}
\end{align*} \]
TmReset Statement

Resets the timers used by the Tmr function.

Syntax

TmReset timerNumber

Parameters

timerNumber  Integer expression from 0 - 63 specifies which of the 64 timers to reset.

Description

 Resets and starts the timer specified by timerNumber.

Use the Tmr function to retrieve the elapsed time for a specific timer.

See Also

Tmr

TmReset Example

```
TmReset 0          ' Reset Timer 0
For i = 1 To 10    ' Perform operation 10 times
    GoSub CYL
Next
Print Tmr(0)/10    ' Calculate and display cycle time
```
Toff Statement

Turns off execution line display on the LCD.

Syntax
Toff

Description
Execution line will not be displayed on the LCD.

See Also
Ton

Toff Example

Function main
   Ton MyTask
   ...
   Toff
   Fend
### Ton Statement

Specifies a task which shows a execution line on the LCD.

#### Syntax

```
Ton taskIdentifier
Ton
```

#### Parameters

- `taskIdentifier`: Task name or integer expression representing the task number. Task name is a function name used in an Xqt statement or a function started from the Run window or Operator window.

  Task number range is:
  - Normal tasks: 1 ~ 32

#### Description

- Execution line of task 1 is displayed in initial status.
- **Ton** statement displays the specified task execution line on the LCD.
- When `taskIdentifier` is omitted, the task execution line with **Ton** statement execution is displayed on the LCD.

#### See Also

- **Toff**

#### Ton Example

```
Function main
    Ton MyTask
    ...
    Toff
Fend
```
Tool Statement

Selects or displays the current tool.

Syntax
(1) Tool toolNumber
(2) Tool

Parameters
toolNumber Optional. Integer expression from 0-15 representing which of 16 tool definitions to use with subsequent motion instructions.

Return Values
Displays current Tool when used without parameters.

Description
Tool selects the tool specified by the tool number (toolNum). When the tool number is 0, no tool is selected and all motions are done with respect to the center of the end effector joint. However, when Tool entry 1, 2, or 3 is selected motion is done with respect to the end of the tool as defined with the tool definition.

Note
Power Off and Its Effect on the Tool Selection
Turning main power off does not change the tool coordinate system selection.

See Also
TGo, TLSet, Tmove

Tool Statement Example
The example shown below shows a good test which can be done from the command window to help understand the difference between moving when a tool is defined and when no tool is defined.

>tlset 1, 100, 0, 0, 0  'Define tool coordinate system for
  'Tool 1 (plus 100 mm in x direction
  'from hand coordinate system)
>tool 1                   'Selects Tool 1 as defined by TLSet
>tgo p1                   'Positions the Tool 1 tip position at P1
>tool 0                   'Tells robot to use no tool for future motion
>go p1                    'Positions the center of the U-Joint at P1
Tool Function

Returns the current tool number.

**Syntax**

```plaintext
Tool
```

**Return Values**

Integer containing the current tool number.

**See Also**

Tool Statement

**Tool Function Example**

```plaintext
Integer savTool

savTool = Tool
Tool 2
Go P1
Tool savTool
```
Trap Statement (User defined trigger)

Defines interrupts and what should happen when they occur. With the Trap statement, you can jump to labels or call functions when the event occurs.

Trap statement has 2 types as below:
- 4 Traps that interrupts by the user defined input status
- 7 Traps that interrupts by the system status

Trap with user defined trigger is explained here.

Syntax

 Trap trapNumber, ioCondition GoTo label
 Trap trapNumber, ioCondition Call funcname
 Trap trapNumber, ioCondition Xqt funcname
 Trap trapNumber

Parameters

 trapNumber Integer number from 1-4 representing which of 4 Trap numbers to use. (SPEL supports up to 4 active Trap interrupts at the same time.)
 ioCondition Input status specified as a trigger [Event] comparative operator ( =, <>, >=, >, <, <=) [Integer expression]

The following functions and variables can be used in the Event:
Functions: Sw, In, InW, Oport, Out, OutW, MemSw, MemIn, MemInW, Ctr, GetRobotInsideBox, GetRobotInsidePlane
Variables: Byte, Integer, Long global preserve variable, Global variable, module variable

In addition, using the following operators you can specify multiple event conditions.
Operator : And, Or, Xor
Example : Trap 1, Sw(5) = On Call TrapFunc
          Trap 1, Sw(5) = On And Sw(6) = Off Call TrapFunc

label The label where program execution is to be transferred when Trap condition is satisfied.

funcName The function that is executed when Call or Xqt when the Trap condition is satisfied.
The function with argument cannot be specified.

Description

A Trap executes interrupt processing which is specified by GoTo, Call, or Xqt when the specified condition is satisfied.

The Trap condition must include at least one of the functions above.

When variables are included in the Trap condition, their values are computed when setting the Trap condition. No use of variable is recommended. Otherwise, the condition may be an unintended condition.

Once the interrupt process is executed, its Trap setting is cleared. If the same interrupt process is necessary, the Trap instruction must execute it again.

To cancel a Trap setting simply execute the Trap instruction with only the trapNumber parameter. e.g. "Trap 3" cancels Trap #3.
When the Function that executed Trap GoTo ends (or exit), the Trap Goto will be canceled automatically.
When the declared task ends, Trap Call will be canceled.
Trap Xqt will be canceled when all tasks have stopped.
If GoTo is specified
The command being executed will be processed as described below, then control branches to the
specified label.
- Any arm motion will pause immediately
- Waiting status by the Wait or Input commands will discontinue
- All other commands will complete execution before control branches

If Call is specified
After executing the same process as GoTo described above, then control branches to the specified
line number or label.
Once the function ends, program execution returns to the next statement after the statement where
program interruption occurred. Call statements cannot be used in the Trap processing function.
When an error occurs in the trap process function, error handling with OnErr will be invalid and an
error will occur.

If Xqt is specified
Program control executes the specified function as an interrupt processing task. In this case, the task
which executes the Trap command will not wait for the Trap function to finish and will continue to
execute.
You cannot execute a task with an Xqt statement from an interrupt processing task.

Notes

For EPSON RC+4.x user
The Trap Call function of EPSON RC+ 4.x or before is replaced with Trap Xqt in EPSON RC+ 6.0.
The Trap GoSub function of EPSON RC+ 4.x or before is removed in EPSON RC+ 6.0. Instead, use
Trap Call.

To use a variables in the event condition expression
- Available variables are Integer type (Byte, Integer, Long)
- Array variables are not available
- Local variables are not available
- If a variable value cannot satisfy the event condition for more than 0.01 second, the system cannot
  retrieve the change in variables.
- Up to 64 can wait for variables in one system (including the ones used in the event condition
  expressions such as Wait). If it is over 64, an error occurs during the project build.
- If you specify Byref to a waiting variable on any function call, an error occurs.
- When a variable is included in the right side member of the event condition expression, the value
  is calculated when setting the Trap condition. We recommend not using variables in an integer
  expression to avoid making unintended conditions.

See Also
Call, GoTo, Xqt
Trap Example

<Example 1> Error process defined by User
Sw(0) Input is regarded as an error input defined by user.

Function Main
        Trap 1, Sw(0) = On GoTo EHandle ' Defines Trap
        .
        .
    EHandle:
        On 31 'Signal tower lights
        OpenCom #1
        Print #1, "Error is issued"
        CloseCom #1
    Fend

<Example 2> Usage like multi-tasking

Function Main
        Trap 2, MemSw(0) = On Or MemSw(1) = On Call Feeder
        .
        .
    Fend

Function Feeder
    Select TRUE
    Case MemSw(0) = On
        MemOff 0
        On 2
    Case MemSw(1) = On
        MemOff 1
        On 3
    Send
        ' Re-arm the trap for next cycle
        Trap 2, MemSw(0) = On Or MemSw(1) = On Call Feeder
    Fend

<Example 3> Using global variable as event condition

Global Integer gi

Function main
        Trap 1, gi = 5 GoTo THandle
        Xqt sub
        Wait 100
        Exit Function
        THandle:
        Print "IN Trap ", gi
        Fend

Function sub
        For gi = 0 To 10
            Print gi
            Wait 0.5
        Next
    Fend
Trap (System status trigger)

Defines interrupts and what should happen when they occur. With the Trap statement, you can jump to labels or call functions when the event occurs.

Trap statement has 2 types as below:
- 4 Traps that interrupts by the user defined input status
- 7 Traps that interrupts by the system status

Trap with system status triggers is explained here.

Syntax

```
Trap {Emergency | Error | Pause | SGOpen | SGClose | Abort | Finish } Xqt funcname
Trap {Emergency | Error | Pause | SGOpen | SGClose | Abort | Finish }
```

Parameters

- **Emergency**: In the emergency stop status, executes the specified function.
- **Error**: In the error status, executes the specified function.
- **Pause**: In the pause status, executes the specified function.
- **SGOpen**: When safeguard is open, executes the specified function.
- **SGClose**: When safeguard is closed, executes the specified function.
- **Abort**: All tasks except the background tasks stops (such as when a statement corresponding to the Abort All is executed or Pause buton is pressed) by the user or system, executes the specified function.
- **Finish**: All tasks except the background tasks are completed, executes the specified function. It cannot be executed in the condition which executes the Trap Abort.
- **funcname**: Function of interrupt processing task for which Xqt is executed when the system status is completed. Functions with argument cannot be specified.

**Note**

Trap *** Call function of EPSON RC+4.x or before is replaced to Trap *** Xqt in EPSON RC+ 6.0.

**Description**

When the system status completes, the specified interrupt processing task is executed.

Even if you execute a interrupt processing task, the Trap settings cannot be cleared.

To clear the Trap setting, omit the funcname and execute the Trap statement.

**Example**: Trap Emergency clears Trap Emergency

After all normal tasks are completed and the controller is in the Ready status, all Trap settings are cleared.

You cannot execute more tasks using the Xqt from an interrupt processing.

**CAUTION**

- **Forced flag**: You can turn On/Off the I/O outputs even in the Emergency Stop status, Safeguard Open status, Teach mode, or error status by specifying the Forced flag to the I/O output statement such as On and Off statements.
- **DO NOT** connect the external devices which can move machines such as actuators with the I/O outputs which specifies the Forced flag. It is extremely dangerous and it can lead the external devices to move in the Emergency Stop status, Safeguard Open status, Teach mode, or error status.
- **I/O outputs** which specifies the Forced flag is supposed to be connected with the external device such as LED as the status display which cannot move machines.
If Emergency is specified
When the Emergency Stop is activated, the specified function is executed in the NoEmgAbort task attribute.
The commands executable from the interrupt processing tasks can execute the NoEmgAbort task.
When the interrupt processing of Emergency Stop is completed, finish the task promptly.
Otherwise, the controller cannot be in the Ready status. You cannot reset the Emergency Stop automatically by executing the Reset command from the interrupt processing task.
When the task executes I/O On/Off from the interrupt processing task, uncheck the Outputs off during emergency stop check box in the Controller | Preferences page. If this check box is checked, the execution order of turn Off by the controller and turn On using the task are not guaranteed.

If Error is specified
When the Emergency Stop is activated, the specified function is executed in the NoEmgAbort task attribute.
The commands executable from the interrupt processing tasks can execute the NoEmgAbort task.
When the interrupt processing of Emergency Stop is completed, finish the task promptly.
Otherwise, the controller cannot be in the Ready status.

If Pause is specified
When the Pause is activated, the specified function is executed in the NoEmgAbort task attribute.

If SGOpen is specified
When the Safeguard is open, the specified function is executed in the NoEmgAbort task attribute.

If SGClose is specified
When the safeguard is closed and latched, the specified function is executed in the NoEmgAbort task attribute.
If you execute the Cont statement from the interrupt processing tasks, an error occurs.

If Abort is specified
All tasks except background tasks stop (such as when a statement corresponding to the Abort All is executed or Pause button is pressed) by the user or system, executes the specified function in the NoPause attribute.
When the interrupt processing of Pause is completed, finish the task promptly. Otherwise, the controller cannot be in the Ready status. Although a task executed with the Trap Abort has an error, the Trap Error processing task is not executed.
If the Shutdown or Restart statements are aborted, processing tasks of neither the Trap Abort or Trap Finish is executed.

If Finish is specified
All tasks except the background tasks stops (such as when a statement corresponding to the Abort All is executed or Pause button is pressed) by the user or system, executes the specified function in the NoPause attribution. It cannot be executed in the condition which executes the Trap Abort processing task.
When the shutdown and interrupt processing are completed, finish the tasks promptly. Otherwise, the controller cannot be in the Ready status.

See Also
Era, Erl, Err, Ert, ErrMsg$, OnErr, Reset, Restart, Xqt

Trap Example
Function main :  
  Trap Error Xqt suberr :  
  Fend  
Function suberr  
  Print "Error =", Err  
  On ErrorSwitch  
  Fend
Trim$ Function

Returns a string equal to specified string without leading or trailing spaces.

Syntax

\[ \text{Trim}(\text{string}) \]

Parameters

`string` String expression.

Return Values

Specified string with leading and trailing spaces removed.

See Also

LTrim$, RTrim$

Trim$ Function Example

\[
\begin{align*}
\text{str$} &= " \text{data} \" \\
\text{str$} &= \text{Trim}$(\text{str$}) \quad \text{str$} = "\text{data}" \\
\end{align*}
\]
TW Function

Returns the status of the Wait, WaitNet, and WaitSig commands.

Syntax
TW

Return Values
Returns False if Wait condition is satisfied within the time interval.
Returns True if the time interval has elapsed.

Description
The Timer Wait function TW returns the status of the preceding Wait condition with time interval with a False (Wait condition was satisfied) or a True (time interval has elapsed).

See Also
TMOOut, Wait

TW Function Example

Wait Sw(0) = On, 5   ' Wait up to 5 seconds for input bit 0 On
If TW = True Then
   Print “Time Up”   ' Display “Time UP” after 5 seconds
EndIf
Type Statement

Displays the contents of the specified file.

Syntax
Type fileName

Parameters
fileName The path and name of the file to display.
If path is omitted, the file in the current directory is specified.
See ChDisk for the details.

Description
Type causes the specified file's contents to be displayed. Since only ASCII files can be displayed, be sure to specify only ASCII files. The purpose of Type is to display the contents of files, not to edit files.

See Also
Dir

Type Example
Example from the command window

> type test.dat
MyData Line 1
MyData Line 2
MyData Line 3
>
UBound Function

Returns the largest available subscript for the indicated dimension of an array.

Syntax

`UBound(arrayName [, dimension])`

Parameters

- `arrayName` Name of the array variable; follows standard variable naming conventions.
- `dimension` Optional. Integer expression indicating which dimension's upper bound is returned. Use 1 for the first dimension, 2 for the second, and 3 for the third. If `dimension` is omitted, 1 is assumed.

See Also

Redim

UBound Function Example

```plaintext
Integer i, a(10)
For i = 0 To UBound(a)
    a(i) = i
Next
```
UCase$ Function

Returns a string that has been converted to uppercase.

Syntax

\[
\text{UCase$ \ (string)}
\]

Parameters

\[
\text{string} \quad \text{String expression.}
\]

Return Values

The converted uppercase string.

See Also

LCase$, LTrim$, Trim$, RTrim$

UCase$ Example

\[
\text{str$} = "Data"
\text{str$} = \text{UCase$(str$) \quad \text{str$} = "DATA"
\]
UOpen Statement

Opens a file for read / write access.

Syntax

```plaintext
UOpen fileName As #fileNumber
.
.
Close #fileNumber
```

Parameters

- `fileName` String expression that specifies path and file name.
  If path is omitted, the file in the current directory is specified
  See ChDisk for the details.
- `fileNumber` Integer expression representing values from 30 ~ 63.

Description

Opens the specified file by the specified file number. This statement is used for writing and loading data in the specified file.

Note

Do not use a network path, otherwise an error occurs.

If the specified file does not exist on disk, the file will be created and the data will be written into it.
If the specified file already exists on disk, the data will be written and read starting from the beginning of the existing data.

The read/write position (pointer) of the file can be changed using the Seek command. When switching between read and write access, you must use Seek to reposition the file pointer.

`fileNumber` identifies the file while it is open and cannot be used to refer to a different file until the current file is closed. `fileNumber` is used by other file operations such as Print#, Read, Write, Seek, and Close.

`Close` closes the file and releases the file number.

It is recommended that you use the FreeFile function to obtain the file number so that more than one task are not using the same number.

See Also

Close, Print #, Input#, AOpen, BOpen, ROpen, WOpen, FreeFile, Seek

UOpen Statement Example

```plaintext
Integer fileNum, i, j

fileNum = FreeFile
UOpen "TEST.DAT" As #fileNum
For i = 0 To 100
   Print #fileNum, i
Next i
Close #fileNum

fileNum = FreeFile
UOpen "TEST.DAT" As #fileNum
Seek #fileNum, 10
Input #fileNum, j
Print "data = ", j
Close #fileNum
```
Val Function

Converts a character string that consists of numbers into their numerical value and returns that value.

Syntax
Val(string)

Parameters
string    String expression which contains only numeric characters. The string may also contain a prefix: &H (hexadecimal), &O (octal), or &B (binary).

Return Values
Returns an integer or floating point result depending upon the input string. If the input string has a decimal point character than the number is converted into a floating point number. Otherwise the return value is an integer.

Description
Val converts a character string of numbers into a numeric value. The result may be an integer or floating point number. If the string passed to the Val instruction contains a decimal point then the return value will be a floating point number. Otherwise it will be an integer.

See Also
Abs, Asc, Chr$, Int, Left$, Len, Mid$, Mod, Right$, Sgn, Space$, Str$

Val Example
The example shown below shows a program which converts several different strings to numbers and then prints them to the screen.

```pseudo
Function ValDemo
    String realstr$, intstr$
    Real realsqr, realvar
    Integer intsqr, intvar

    realstr$ = "2.5"
    realvar = Val(realstr$)
    realsqr = realvar * realvar
    Print "The value of ", realstr$, " squared is: ", realsqr

    intstr$ = "25"
    intvar = Val(intstr$)
    intsqr = intvar * intvar
    Print "The value of ", intstr$, " squared is: ", intsqr
Fend
```

Here's another example from Command window.

```pseudo
> Print Val("25.999")
25.999
> 
```
VxCalib Statement

Note: This command is only for use with external vision systems and cannot be used with Vision Guide.

Creates calibration data for an external vision system.

Syntax
(1) VxCalib CalNo
(2) VxCalib CalNo, CamOrient, P(pixel_st : pixel_ed), P(robot_st : robot_ed), [TwoRefPoints]
(3) VxCalib CalNo, CamOrient, P(pixel_st : pixel_ed), P(robot_st : robot_ed), P(ref0), [P(ref180)]

Parameters
CalNo Integer expression that specifies the calibration data number. The range is from 0 to 15; up to 16 calibrations may be defined.
CamOrient Integer expression that specifies the camera mounting direction using the following values:
1 to 3: Available only for syntax (2).
4 to 7: Available only for syntax (3).
1: Standalone
2: Fixed downward
3: Fixed upward
4: Mobile on Joint #2
5: Mobile on Joint #4
6: Mobile on Joint #5
7: Mobile on Joint #6
P(pixel_st : pixel_ed) Specifies the Pixel coordinates (X, Y only) using the continuous point data.
P(robot_st : robot_ed) Specifies the robot coordinates using the continuous point data.
The robot coordinates must be set as TOOL: 0, ARM: 0.
TwoRefPoints Available for syntax (2).
True, when using two measuring points. False, when using one measuring point.
Specifying two measuring points makes the calibration more accurate.
Optional.
Default: False
P(ref0) Available for syntax (3).
Specifies the robot coordinates of the reference point using the point data.
P(ref180) Available for syntax (3).
Specifies the robot coordinates of the second reference point using the point data.
Specifying two reference points makes the calibration more accurate.
Optional.

Description
The VxCalib command calculates the vision calibration data for the specified calibration number using the specified camera orientation, pixel coordinates, robot coordinates, and reference points (Mobile camera only) given by the parameter.

When you specify only CalNo, the point data and other settings you defined are displayed (only from the Command Window).

The following figure shows the coordinates system of the pixel coordinates. (Units: pixel)
For the pixel coordinates and robot coordinates, set the top left position of the window as Point 1 and set the bottom right position as Point 9 according to the order in the table below. It is classified into the four categories by the parameter CamOrient and TwoRefPoints.

1) CamOrient = 1 to 3 (Standalone, Fixed Downward, Fixed Upward), TwoRefPoints = False

<table>
<thead>
<tr>
<th>Data order</th>
<th>Position</th>
<th>Pixel coordinates</th>
<th>Robot coordinates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Top left</td>
<td>Detection coordinates 1</td>
<td>Measuring point coordinates 1</td>
</tr>
<tr>
<td>2</td>
<td>Top center</td>
<td>Detection coordinates 2</td>
<td>Measuring point coordinates 2</td>
</tr>
<tr>
<td>3</td>
<td>Top right</td>
<td>Detection coordinates 3</td>
<td>Measuring point coordinates 3</td>
</tr>
<tr>
<td>4</td>
<td>Center right</td>
<td>Detection coordinates 4</td>
<td>Measuring point coordinates 4</td>
</tr>
<tr>
<td>5</td>
<td>Center</td>
<td>Detection coordinates 5</td>
<td>Measuring point coordinates 5</td>
</tr>
<tr>
<td>6</td>
<td>Center left</td>
<td>Detection coordinates 6</td>
<td>Measuring point coordinates 6</td>
</tr>
<tr>
<td>7</td>
<td>Bottom left</td>
<td>Detection coordinates 7</td>
<td>Measuring point coordinates 7</td>
</tr>
<tr>
<td>8</td>
<td>Bottom center</td>
<td>Detection coordinates 8</td>
<td>Measuring point coordinates 8</td>
</tr>
<tr>
<td>9</td>
<td>Bottom right</td>
<td>Detection coordinates 9</td>
<td>Measuring point coordinates 9</td>
</tr>
</tbody>
</table>

2) CamOrient = 2 (Fixed Downward), TwoRefPoints = True
Note: When the tool is exactly defined, TwoRefPoints is not necessary and should be set to False.

By setting TwoRefPoints to True, two measuring points are used for each calibration position, which makes the calibration more accurate. 18 robot points with U axis: 0 degree / 180 degrees are required. After setting 1 to 9 measuring points coordinates, turn the U axis by 180 degrees and set the measuring point coordinates 10 to 18 where the hand (such as the rod) is positioned at the calibration target position.

<table>
<thead>
<tr>
<th>Data order</th>
<th>Position</th>
<th>Pixel coordinates</th>
<th>Robot coordinates</th>
<th>U axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Top left</td>
<td>Detection coordinates 1</td>
<td>Measuring point coordinates 1</td>
<td>0 degree</td>
</tr>
<tr>
<td>2</td>
<td>Top center</td>
<td>Detection coordinates 2</td>
<td>Measuring point coordinates 2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Top right</td>
<td>Detection coordinates 3</td>
<td>Measuring point coordinates 3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Center right</td>
<td>Detection coordinates 4</td>
<td>Measuring point coordinates 4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Center</td>
<td>Detection coordinates 5</td>
<td>Measuring point coordinates 5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Center left</td>
<td>Detection coordinates 6</td>
<td>Measuring point coordinates 6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Bottom left</td>
<td>Detection coordinates 7</td>
<td>Measuring point coordinates 7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Bottom center</td>
<td>Detection coordinates 8</td>
<td>Measuring point coordinates 8</td>
<td>180 degrees</td>
</tr>
<tr>
<td>9</td>
<td>Bottom right</td>
<td>Detection coordinates 9</td>
<td>Measuring point coordinates 9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Top left</td>
<td>- - -</td>
<td>Measuring point coordinates10</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Top center</td>
<td>- - -</td>
<td>Measuring point coordinates11</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Top right</td>
<td>- - -</td>
<td>Measuring point coordinates12</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Center right</td>
<td>- - -</td>
<td>Measuring point coordinates13</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Center</td>
<td>- - -</td>
<td>Measuring point coordinates14</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Center left</td>
<td>- - -</td>
<td>Measuring point coordinates15</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Bottom left</td>
<td>- - -</td>
<td>Measuring point coordinates16</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Bottom center</td>
<td>- - -</td>
<td>Measuring point coordinates17</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Bottom right</td>
<td>- - -</td>
<td>Measuring point coordinates18</td>
<td></td>
</tr>
</tbody>
</table>
VxCalib Statement

3) CamOrient = 3 (Fixed Upward), TwoRefPoints = True
Note: When the tool is exactly defined, TwoRefPoints is not necessary and should be set to False.

By setting TwoRefPoints to True, two detection points are used, which makes the calibration more accurate. For only the pixel coordinates, 18 points of U axis: 0 degree / 180 degrees are required. After setting 1 to 9 detection coordinates at the each measuring point coordinates at 0 degrees, set the detection coordinates for points 10 to 18 at 180 degrees.

<table>
<thead>
<tr>
<th>Data order</th>
<th>Position</th>
<th>Pixel coordinates</th>
<th>Robot coordinates</th>
<th>U axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Top left</td>
<td>Detection coordinates 1</td>
<td>Measuring point coordinates 1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Top center</td>
<td>Detection coordinates 2</td>
<td>Measuring point coordinates 2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Top right</td>
<td>Detection coordinates 3</td>
<td>Measuring point coordinates 3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Center right</td>
<td>Detection coordinates 4</td>
<td>Measuring point coordinates 4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Center</td>
<td>Detection coordinates 5</td>
<td>Measuring point coordinates 5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Center left</td>
<td>Detection coordinates 6</td>
<td>Measuring point coordinates 6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Bottom left</td>
<td>Detection coordinates 7</td>
<td>Measuring point coordinates 7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Bottom center</td>
<td>Detection coordinates 8</td>
<td>Measuring point coordinates 8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Bottom right</td>
<td>Detection coordinates 9</td>
<td>Measuring point coordinates 9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Top left</td>
<td>Detection coordinates 10</td>
<td>- - -</td>
<td>0 degree</td>
</tr>
<tr>
<td>11</td>
<td>Top center</td>
<td>Detection coordinates 11</td>
<td>- - -</td>
<td>0 degree</td>
</tr>
<tr>
<td>12</td>
<td>Top right</td>
<td>Detection coordinates 12</td>
<td>- - -</td>
<td>0 degree</td>
</tr>
<tr>
<td>13</td>
<td>Center right</td>
<td>Detection coordinates 13</td>
<td>- - -</td>
<td>0 degree</td>
</tr>
<tr>
<td>14</td>
<td>Center</td>
<td>Detection coordinates 14</td>
<td>- - -</td>
<td>0 degree</td>
</tr>
<tr>
<td>15</td>
<td>Center left</td>
<td>Detection coordinates 15</td>
<td>- - -</td>
<td>0 degree</td>
</tr>
<tr>
<td>16</td>
<td>Bottom left</td>
<td>Detection coordinates 16</td>
<td>- - -</td>
<td>0 degree</td>
</tr>
<tr>
<td>17</td>
<td>Bottom center</td>
<td>Detection coordinates 17</td>
<td>- - -</td>
<td>0 degree</td>
</tr>
<tr>
<td>18</td>
<td>Bottom right</td>
<td>Detection coordinates 18</td>
<td>- - -</td>
<td>0 degree</td>
</tr>
</tbody>
</table>

4) CamOrient = 4 to 7

<table>
<thead>
<tr>
<th>Data order</th>
<th>Position</th>
<th>Pixel coordinates</th>
<th>Robot coordinates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Top left</td>
<td>Detection coordinates 1</td>
<td>Measuring point coordinates 1</td>
</tr>
<tr>
<td>2</td>
<td>Top center</td>
<td>Detection coordinates 2</td>
<td>Measuring point coordinates 2</td>
</tr>
<tr>
<td>3</td>
<td>Top right</td>
<td>Detection coordinates 3</td>
<td>Measuring point coordinates 3</td>
</tr>
<tr>
<td>4</td>
<td>Center right</td>
<td>Detection coordinates 4</td>
<td>Measuring point coordinates 4</td>
</tr>
<tr>
<td>5</td>
<td>Center</td>
<td>Detection coordinates 5</td>
<td>Measuring point coordinates 5</td>
</tr>
<tr>
<td>6</td>
<td>Center left</td>
<td>Detection coordinates 6</td>
<td>Measuring point coordinates 6</td>
</tr>
<tr>
<td>7</td>
<td>Bottom left</td>
<td>Detection coordinates 7</td>
<td>Measuring point coordinates 7</td>
</tr>
<tr>
<td>8</td>
<td>Bottom center</td>
<td>Detection coordinates 8</td>
<td>Measuring point coordinates 8</td>
</tr>
<tr>
<td>9</td>
<td>Bottom right</td>
<td>Detection coordinates 9</td>
<td>Measuring point coordinates 9</td>
</tr>
</tbody>
</table>

Notes
In addition to the tables above, specify the robot coordinates of the reference points. Using the two reference points makes the calibration more accurate. In this case, it needs two points of U axis: 0 degree / 180 degrees.
After setting the first reference points coordinates, turn the U axis by 180 degrees and set the second reference points coordinates where the hand (such as the rod) is positioned at the calibration target position. When the tool is exactly defined, the two reference points are not necessary.

See Also
VxTrans Function, VxCallInfo Function, VxCalDelete, VxCalSave, VxCalLoad
VxCalib Statement Example

Function MobileJ2

Integer i
Double d(8)

Robot 1
LoadPoints "MobileJ2.pts"

VxCalib 0, 4, P(21:29), P(1:9), P(0)

If (VxCalInfo(0, 1) = True) Then
  For i = 0 To 7
    d(i) = VxCalInfo(0, i + 2)
  Next i
  Print "Calibration result:"
  Print d(0), d(1), d(2), d(3), d(4), d(5), d(6), d(7)

  P52 = VxTrans(0, P51, P50)
  Print "Coordinates conversion result:"
  Print P52
  SavePoints "MobileJ2.pts"
  VxCalSave "MobileJ2.caa"
Else
  Print "Calibration failed"
EndIf

Fend
VxCalDelete Statement

Note: This command is only for use with external vision systems and cannot be used with Vision Guide.

Deletes the calibration data for an external vision system calibration.

Syntax

VxCalDelete CalNo

Parameters

CalNo Integer expression that specifies the calibration data number. The range is from 0 to 15; up to 16 calibrations may be defined.

Description

Deletes the calibration data defined by the specified calibration number.

See Also

VxCalib, VxTrans Function, VxCalInfo Function, VxCalSave, VxCalLoad

VxCalDelete Statement Example

VxCalDelete "MobileJ2.caa"
VxCalLoad Statement

Note: This command is only for use with external vision systems and cannot be used with Vision Guide.

Loads the calibration data for an external vision system calibration from a file.

Syntax
VxCalLoad FileName

Parameters
FileName    Specifies the file name from which the calibration data is loaded using a string expression.
The file extension is .CAA. If omitted, .CAA is automatically added.
For extensions other than .CAA, they are automatically changed to .CAA.

Description
Loads the calibration data from the specified file in the current project.

See Also
VxCalib, VxTrans Function, VxCalInfo Function, VxCalDelete, VxCalSave

VxCalLoad Statement Example

VxCalLoad "MobileJ2.caa"
VxCalInfo Function

Note: This command is only for use with external vision systems and cannot be used with Vision Guide.

Returns the calibration completion status and the calibration data.

Syntax

\[ \text{VxCalInfo}(\text{CalNo}, \text{CalData}) \]

Parameters

- \text{CalNo} \quad \text{Integer expression that specifies the calibration data number. The range is from 0 to 15; up to 16 calibrations may be defined.}
- \text{CalData} \quad \text{Specifies the calibration data type to acquire using the integer values in the table below.}

<table>
<thead>
<tr>
<th>CalData</th>
<th>Calibration Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CalComplete</td>
</tr>
<tr>
<td>2</td>
<td>X Avg Error [mm]</td>
</tr>
<tr>
<td>3</td>
<td>X Max error [mm]</td>
</tr>
<tr>
<td>4</td>
<td>X mm per pixel [mm]</td>
</tr>
<tr>
<td>5</td>
<td>X tilt</td>
</tr>
<tr>
<td>6</td>
<td>Y Avg error [mm]</td>
</tr>
<tr>
<td>7</td>
<td>Y Max error [mm]</td>
</tr>
<tr>
<td>8</td>
<td>Y mm per pixel [mm]</td>
</tr>
<tr>
<td>9</td>
<td>Y tilt</td>
</tr>
</tbody>
</table>

Return Value

Returns the specified calibration data. For \text{CalData} = 1, the data type is Boolean. For all other data, the data type is Double.

Description

You can check which calibration has defined calibration data. Also, you can retrieve the calibration data values.

See Also

- VxCalib, VxTrans Function, VxCalDelete, VxCalSave, VxCalLoad

VxCalInfo Function Example

Print VxCalInfo(0, 1)
VxCalSave Statement

Note: This command is only for use with external vision systems and cannot be used with Vision Guide.

Saves the calibration data for an external vision system calibration to a file.

Syntax

VxCalSave FileName

Parameters

FileName

Specifies the file name from which the calibration data is loaded using a string expression.
The extension is .CAA. If omitted, .CAA is automatically added.
For extensions other than .CAA, they are automatically changed to .CAA.

Description

Saves the calibration data with the specified file name. The file is saved in the current project. If the file name is already existed, the calibration data is overwritten.

See Also

VxCalib, VxTrans Function, VxCallInfo Function, VxCalDelete, VxCalLoad

VxCalSave Statement Example

VxCalSave "MobileJ2.caa"
VxTrans Function

Note: This command is only for use with external vision systems and cannot be used with Vision Guide.

Converts pixel coordinates to robot coordinates and returns the converted point data.

Syntax
VxTrans (CalNo, P(pixel) [, P(camRobot)]) As Point

Parameters
- **CalNo**: Integer expression that specifies the calibration data number. The range is from 0 to 15; up to 16 calibrations may be defined.
- **P(pixel)**: Specifies the vision pixel coordinates (X,Y,U only) using point data.
- **P(camRobot)**: Optional. For a mobile camera, this is the position where the robot was located when the image was acquired. If not specified, then the current robot position is used. The point should be in BASE: 0, TOOL: 0, ARM: 0.

Return Value
Returns the calculated robot coordinates using the point data.

Description
This command converts pixel coordinates to robot coordinates using the calibration data of the specified calibration number.

When using a mobile camera, specify **P(camRobot)** if the robot has been moved from the position where the image was acquired. Ensure that **P(camRobot)** is in BASE: 0, TOOL: 0, ARM: 0. The Joint #4 and Joint #6 angles of the set robot coordinates are used for the calculation.

See Also
VxCalib, VxCalInfo Function, VxCalDelete, VxCalSave, VxCalLoad

VxTrans Statement Example

```
P52 = VxTrans(0, P51, P50)
```
Wait Statement

Causes the program to Wait for a specified amount of time or until the specified input condition (using MemSw or Sw) is met. (Oport may also be used in the place of Sw to check hardware outputs.) Also waits for the values of global variables to change.

Syntax

(1) Wait time
(2) Wait inputcondition
(3) Wait inputcondition, time

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>time</td>
<td>Real expression between 0 and 2,147,483 which represents the amount of time to wait when using the Wait instruction to wait based on time. Time is specified in seconds. The smallest increment is .01 seconds.</td>
</tr>
</tbody>
</table>
| inputcondition | The following syntax can be used to specify the inputcondition:
  [Event] Comparative operator ( =, <>, >=, >, <, <= ) [Integer expression] |

Description

(1) Wait with Time Interval
When used as a timer, the Wait instruction causes the program to pause for the amount of time specified and then continues program execution.

(2) Wait for Event Conditions without Time Interval
When used as a conditional Wait interlock, the Wait instruction causes the program to wait until specified conditions are satisfied. If after TMOOut time interval has elapsed and the Wait conditions have not yet been satisfied, an error occurs. The user can check multiple conditions with a single Wait instruction by using the And, Mask, Or, or Xor instructions. (Please review the example section for Wait.)

(3) Wait with Event Condition and Time Interval
Specifies Wait condition and time interval. After either Wait condition is satisfied, or the time interval has elapsed, program control transfers to the next command. Use Tw to verify if the Wait condition was satisfied or if the time interval elapsed.

Notes

Specifying a Timeout for Use with Wait
When the Wait instruction is used without a time interval, a timeout can be specified which sets a time limit to wait for the specified condition. This timeout is set through using the TMOOut instruction. Please refer to this instruction for more information. (The default setting for TMOOut is 0 which means no timeout.)

Waiting for variable with Wait
- Available variables are Integer type (Byte, Integer, Long)
- Array variables are not available
- Local variables are not available
Wait Statement

- If variables value cannot satisfy the event condition for more than 0.01 second, the change in variables may not be retrieved.
- Up to 64 can wait for variables in one system (including ones used in the event condition expressions such as Till). If it is over 64, an error occurs during the project build.
- If you specify Byref to a waiting variable on any function call, an error occurs.
- When a variable is included in the right side member of the event condition expression, the value is calculated when setting the Trap condition. We recommend not using variables in an integer expression to avoid making unintended conditions.

When Using PC COM port (1001,1002)
- You cannot use Lof Function for Wait instruction.

See Also
AtHome, Cnv_QueLen, Ctr, ErrorOn, EstopOn, GetRobotInsideBox, GetRobotInsidePlane, In, InW, LatchState, LOF, Mask, MCaCalComplete, MemIn, MemInW, MemSw, Motor, Oport, Out, OutW, SaftyOn, Sw, TeachOn, TMOut, WindowsStatus, Tw

Wait Example
The example shown below shows 2 tasks each with the ability to initiate motion instructions. However, a locking mechanism is used between the 2 tasks to ensure that each task gains control of the robot motion instructions only after the other task is finished using them. This allows 2 tasks to each execute motion statements as required and in an orderly predictable fashion. MemSw is used in combination with the Wait instruction to wait until the memory I/O #1 is the proper value before it is safe to move again.

```plaintext
Function main
Integer I
MemOff 1
Xqt !2, task2
For i = 1 to 100
    Wait MemSw(1) = Off
    Go P(i)
    Next i
Fend

Function task2
Integer i
For i = 101 to 200
    Wait MemSw(1) = On
    Go P(i)
    MemOff 1
Next i
Fend

' Wait until input 0 turns on
Wait Sw(0) = On

' Wait 60.5 secs and then continue execution
Wait 60.5

' Wait until input 0 is off and input 1 is on
Wait Sw(0) = Off And Sw(1) = On

' Wait until memory bit 0 is on or memory bit 1 is on
Wait MemSw(0) = On Or MemSw(1) = On

' Wait one second, then turn output 1 on
Wait 1; On 1

' Wait for the lower 3 bits of input port 0 to equal 1
```

Wait In(0) Mask 7 = 1

' Wait until the global Integer type variable giCounter is over 10
   Wait giCounter > 10

' Wait ten seconds, until the global Long type variable glCheck is 30000
   Wait glCheck = 30000, 10
WaitNet Statement

Wait for TCP/IP port connection to be established.

Syntax

\texttt{WaitNet \#portNumber [ , timeOut]}

Parameters

\begin{itemize}
\item \texttt{portNumber} Integer expression for TCP/IP port number to connect. Range is 201 - 216
\item \texttt{timeOut} Optional. Maximum time to wait for connection. Valid range is 0-2147483 seconds in 0.01 second intervals.
\end{itemize}

See Also

OpenNet, CloseNet

WaitNet Statement Example

For this example, two controllers have their TCP/IP settings configured as follows:

Controller #1:
Port: \#201
Host Name: 192.168.0.2
TCP/IP Port: 1000

\begin{verbatim}
Function tcpip
  OpenNet \#201 As Server
  WaitNet \#201
  Print \#201, "Data from host 1"
Fend
\end{verbatim}

Controller #2:
Port: \#201
Host Name: 192.168.0.1
TCP/IP Port: 1000

\begin{verbatim}
Function tcpip
  String data$="
  OpenNet \#201 As Client
  WaitNet \#201
  Input \#201, data$
  Print "received ", data$, " from host 1"
Fend
\end{verbatim}
WaitPos Statement

Waits for robot to decelerate and stop at position before executing the next statement while path motion is active.

Syntax
WaitPos

Description
Normally, when path motion is active (CP On or CP parameter specified), the motion command starts the next statement as deceleration starts. Use the WaitPos command right before the motion to complete the deceleration motion and go on to the next motion.

See Also
Wait, WaitSig, CP

WaitPos Statement Example

```
Off 1
CP On
Move P1
Move P2
WaitPos ' wait for robot to decelerate
On 1
CP Off
```
WaitSig Statement

Waits for a signal from another task.

Syntax

\[
\text{WaitSig} \ signalNumber [, \ timeOut]
\]

Parameters

- \(signalNumber\)  Integer expression representing signal number to receive. Range is from 0 ~ 63.
- \(timeOut\) Optional. Real expression representing the maximum time to wait. Valid range is 0-2147483 seconds in 0.01 second intervals.

Description

Use \text{WaitSig} to wait for a signal from another task. The signal will only be received after \text{WaitSig} has started. Previous signals are ignored.

See Also

Wait, WaitPos, Signal

WaitSig Example

```
Function Main
  Xqt SubTask
  Wait 1
  Signal 1
  .
  .
Fend

Function SubTask
  \text{WaitSig} 1
  Print "signal received"
  .
Fend
```
Weight Statement

Specifies or displays the inertia of the robot arm.

Syntax

```
Weight payloadWeight [, distance | S | T ]
Weight
```

Parameters

- `payloadWeight` The weight of the end effector to be carried in Kg unit.
- `distance` The distance from the rotational center of the second arm to the center of the gravity of the end effector in mm unit. Valid only for SCARA robots (including RS series).
- `S` Load weight against the additional S axis in kg to 2 decimal places
- `T` Load weight against the additional T axis in kg to 2 decimal places

Return Values

Displays the current `Weight` settings when parameters are omitted.

Description

Specifies parameters for calculating Point to Point motion maximum acceleration. The `Weight` instruction specifies the weight of the end effector and the parts to be carried.

The Arm length (`distance`) specification is necessary only for SCARA robots (including RS series). It is the distance from the second arm rotation joint centerline to the hand/work piece combined center of gravity.

If the robot has the additional axis, the loads on the additional axis must be set with the S, T parameters.

If the equivalent value work piece weight calculated from specified parameters exceeds the maximum allowable payload, an error occurs.

Potential Errors

**Weight Exceeds Maximum**

When the equivalent load weight calculated from the value entered exceeds the maximum load weight, an error will occur.

**Potential Damage to the Manipulator Arm**

Take note that specifying a `Weight` hand weight significantly less than the actual work piece weight can result in excessive acceleration and deceleration. These, in turn, may cause severe damage to the manipulator.

Note

**Weight Values Are Not Changed by Turning Main Power Off**

The `Weight` values are not changed by turning power off.

See Also

Accel, Inertia
**Weight Statement**

**Weight Statement Example**

This Weight instruction on the Command window displays the current setting.

```plaintext
> weight
2.000, 200.000
>
Sets the hand weight (3 kg) with the Weight statement
Weight 3.0

Sets the load weight on the additional S axis (3 kg) with the Weight statement
Weight 30.0, S
```
Weight Function

Returns a Weight parameter.

Syntax

\[ \text{Weight(} \text{paramNumber}\,\text{)} \]

Parameters

\[ \text{paramNumber} \]

Integer expression containing one of the values below:

1: Payload weight
2: Arm length
3: Load on the additional S axis
4: Load on the additional T axis

Return Values

Real number containing the parameter value.

See Also

Inertia, Weight Statement

Weight Function Example

Print "The current Weight parameters are: ", \text{Weight(1)}
Where Statement

Displays current robot position data.

Syntax
Where [localNumber]

Parameters
localNumber Optional. Specifies the local coordinate system number. Local 0 is default.

See Also
Joint, PList, Pulse

Where Statement Example

The display type can be different depending on the robot type and existence of additional axes.
The following example is for Scara robot without the additional axis.

>where
  WORLD: X: 350.000 mm  Y: 0.000 mm  Z: 0.000 mm  U: 0.000 deg  V: 0.000 deg  W: 0.000 deg
  JOINT:  1:  0.000 deg  2:  0.000 deg  3:  0.000 mm  4:  0.000 deg
  PULSE:  1:     0 pls  2:     0 pls  3:     0 pls  4:     0 pls
>local 1, 100,100,0,0
>where 1
  WORLD: X: 250.000 mm  Y:-100.000 mm  Z: 0.000 mm  U: 0.000 deg  V: 0.000 deg  W: 0.000 deg
  JOINT:  1:  0.000 deg  2:  0.000 deg  3:  0.000 mm  4:  0.000 deg
  PULSE:  1:     0 pls  2:     0 pls  3:     0 pls  4:     0 pls
WindowsStatus Function

Returns the Windows startup status.

Syntax

WindowsStatus

Return Values

Integer value representing the current Windows startup status. The Windows startup status is returned in a bit image and shows the following status.

<table>
<thead>
<tr>
<th>Function name</th>
<th>System reservation</th>
<th>RC+ enabled</th>
<th>PC enabled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit number</td>
<td>15 ~ 2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Details of available functions</td>
<td>Vision Guide (Frame grabber type)</td>
<td>VB Guide</td>
<td>Fieldbus master</td>
</tr>
</tbody>
</table>

Description

This function is used to check the controller startup status when the controller configuration is set to “Independent mode”. When the controller configuration is set to “Cooperative mode”, programs cannot be started until both RC+ function and PC function turn available.

WindowsStatus function Example

```c
Print "The current PC Booting up Status is: ", WindowsStatus
```
WOpen Statement

Opens a file for writing.

Syntax

WOpen fileName As #fileNumber

Close #fileNumber

Parameters

fileName A string expression containing the path and file name.
If path is omitted, the file in the current directory is specified.
See ChDisk for the details.

fileNumber Integer expression that specifies 30 ~ 63

Description

Opens the specified file using the specified fileNumber. This statement is used to open and write data to the specified file. (To append data refer to the AOpen explanation.)

If the specified filename does not exist on the disks current directory, WOpen creates the file and writes to it. If the specified filename exists, WOpen erases all of the data in the file and writes to it.

Note

Do not use a network path, otherwise an error occurs.

File write buffering

File writing is buffered. The buffered data can be written with Flush statement. Also, when closing a file with Close statement, the buffered data can be written.

fileNumber identifies the file while it is open and cannot be used to refer to a different file until the current file is closed. fileNumber is used by other file operations such as Print#, Write, Seek, and Close.

Close closes the file and releases the file number.

It is recommended that you use the FreeFile function to obtain the file number so that more than one task are not using the same number.

See Also

AOpen, BOpen, Close, Print#, ROpen, UOpen, FreeFile

WOpen Example

Integer fileNum, i, j

fileNum = FreeFile
WOpen "TEST.DAT" As #fileNum
For i = 0 To 100
    Print #fileNum, i
Next i
Close #fileNum

fileNum = FreeFile
ROpen "TEST.DAT" As #fileNum
For i = 0 to 100
    Input #fileNum, j
    Print "data = ", j
Next i
Close #fileNum
Wrist Statement

Sets the wrist orientation of a point.

Syntax

(1) \texttt{Wrist point, [Flip | NoFlip]}
(2) \texttt{Wrist}

Parameters

\begin{itemize}
  \item \texttt{point} \quad \text{Pnumber or P(expr) or point label.}
  \item \texttt{Flip | NoFlip} \quad \text{Representing wrist orientation.}
\end{itemize}

Return Values

When both parameters are omitted, the wrist orientation is displayed for the current robot position.
If \texttt{Flip | NoFlip} is omitted, the wrist orientation for the specified point is displayed.

See Also

Elbow, Hand, J4Flag, J6Flag, Wrist Function

Wrist Statement Example

\begin{verbatim}
Wrist P0, Flip
Wrist P(mypoint), NoFlip

P1 = 320.000, 400.000, 350.000, 140.000, 0.000, 150.000

Wrist P1, NoFlip
Go P1

Wrist P1, Flip
Go P1
\end{verbatim}
Wrist Function

Returns the wrist orientation of a point.

Syntax

Wrist [(point)]

Parameters

point Optional. Pnumber or P(expr) or point label or point expression. If point is omitted, then
the wrist orientation of the current robot position is returned.

Return Values

1 NoFlip (/NF)
2 Flip (/F)

See Also

Elbow, Hand, J4Flag, J6Flag, Wrist Statement

Wrist Function Example

Print Wrist(pick)
Print Wrist(P1)
Print Wrist
Print Wrist(P1 + P2)
Write Statement

Writes characters to a file or communication port without end of line terminator.

Syntax
  Write #portNumber, string

Parameters
  portNumber  ID number that specifies the file or communications port
  File number can be specified in ROpen, WOpen, AOpen statements.
  Communication port number can be specified in OpenCom (RS-232C) or
  OpenNet (TCP/IP) statements.
  string      String expression that will be written to the file.

Description
  Write is different from Print in that it does not add an end of line terminator.

Note
  File write buffering
  File writing is buffered. The buffered data can be written with Flush statement. Also, when closing a
  file with Close statement, the buffered data can be written.

See Also
  Print, Read

Write Example

  OpenCom #1
  For i = 1 to 10
    Write #1, data$(i)
  Next i
  CloseCom #1
WriteBin Statement

Writes binary data to a file or communications port.

Syntax

\[
\text{WriteBin} \ #\text{portNumber}, \text{ data} \\
\text{WriteBin} \ #\text{portNumber}, \text{ array()}, \text{ count}
\]

Parameters

- **portNumber**: ID number that specifies the file or communications port. File number can be specified in BOpen statements. Communication port number can be specified in OpenCom (RS-232C) or OpenNet (TCP/IP) statements.

- **data**: Integer expression containing the data to be written.

- **array()**: Name of a byte, integer, or long array variable that contains the data bytes to be written. Specify a one dimension array variable.

- **count**: Specifies the number of bytes to be written and must be less than or equal to the number of array elements.

See Also

ReadBin, Write

WriteBin Statement Example

```
Integer i, data(100)

OpenCom #1
For i = 0 To 100
    WriteBin #1, i
Next I
WriteBin #1, data(), 100
CloseCom #1
```
Xor Operator

Performs the bitwise Xor operation (exclusive OR) on two expressions.

Syntax

\[ \text{result} = \text{expr1} \text{ Xor } \text{expr2} \]

Parameters

- \text{expr1, expr2} \quad A numeric value, or a variable name.
- \text{result} \quad An integer.

Description

The \textit{Xor} operator performs the bitwise \textit{Xor} operation on the values of the operands. Each bit of the result is the \textit{Xored} value of the corresponding bits of the two operands.

<table>
<thead>
<tr>
<th>If bit in expr1 is</th>
<th>And bit in expr2 is</th>
<th>The result is</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

See Also

And, LShift, Not, Or, Rshift

Xor Operator Example

```
>print 2 Xor 6
4
>
```
Xqt Statement

Initiates execution of a task from within another task.

Syntax

\[ \text{Xqt} \left[ \text{taskNumber}, \right. \left. \text{funcName} \left[ \left( \text{argList} \right) \right] \left( \text{Normal} \ | \ \text{NoPause} \ | \ \text{NoEmgAbort} \right) \right] \]

Parameters

- **taskNumber**: Optional. The task number for the task to be executed. The range of the task number is 1 to 32. For background tasks, specifies integer value from 65 ~ 80.
- **funcName**: The name of the function to be executed.
- **argList**: Optional. List of arguments that are passed to the function procedure when it is called. Multiple arguments are separated by commas.
- **taskType**: Optional. Usually omitted. For background tasks, specifying a task type means nothing.
- **Normal**: Executes a normal task.
- **NoPause**: Executes a task that does not pause at Pause statement or Pause input signal occurrence or Safety Door Open.
- **NoEmgAbort**: Executes a task that continues processing at Emergency Stop or error occurrence.

Description

Xqt starts the specified function and returns immediately.

Normally, the taskNumber parameter is not required. When taskNumber is omitted, SPEL* automatically assigns a task number to the function, so you don't have to keep track of which task numbers are in use.

Notes

**Task Type**

Specify NoPause or NoEmgAbort as a task type to execute a task that monitors the whole controller. However, always use these special tasks based on the understanding of the task motion using SPEL* or restriction of special tasks.

For details of special tasks, refer to the section Special Tasks in the EPSON RC+ 5.0 User's Guide.

**Background task**

When executing Xqt in a background task, the generated task is also the background task. To execute the main function from a background task, use the StartMain statement.

The details of the background task are explained in the EPSON RC+ 6.0 Users Guide manual: 6.20 Special Task.

**Unavailable Commands in NoEmgAbort Task and background task**

The following commands cannot be executed in NoEmgAbort task and background task.

<table>
<thead>
<tr>
<th>Command</th>
<th>Command</th>
<th>Command</th>
<th>Command</th>
<th>Command</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Accel</td>
<td>F</td>
<td>Find</td>
<td>Q</td>
<td>QP</td>
</tr>
<tr>
<td>AccelR</td>
<td>AccelS</td>
<td>G</td>
<td>Go</td>
<td>QPDecelS</td>
<td>V</td>
</tr>
<tr>
<td>Arc</td>
<td>Arc3</td>
<td>H</td>
<td>Home</td>
<td>QPDecelR</td>
<td>VCal</td>
</tr>
<tr>
<td>Arch</td>
<td>Arm</td>
<td>HomeClr</td>
<td>R</td>
<td>VCals</td>
<td></td>
</tr>
<tr>
<td>ArmSet</td>
<td>ArmClr</td>
<td>HomeSet</td>
<td>Range</td>
<td>VCreateCalibration</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Base</td>
<td>I</td>
<td>Inertia</td>
<td>Reset</td>
<td></td>
</tr>
<tr>
<td>BArm</td>
<td>BGo</td>
<td>J</td>
<td>JRanger</td>
<td>*1</td>
<td></td>
</tr>
<tr>
<td>BMove</td>
<td>Box</td>
<td>J</td>
<td>Jump</td>
<td>VCals</td>
<td></td>
</tr>
<tr>
<td>BMove</td>
<td>BGo</td>
<td>J</td>
<td>Jump</td>
<td>VCreateObject</td>
<td></td>
</tr>
<tr>
<td>BMove</td>
<td>Box</td>
<td>J</td>
<td>Jump3CP</td>
<td>VCreateSequence</td>
<td></td>
</tr>
<tr>
<td>BMove</td>
<td>Box</td>
<td>J</td>
<td>JRange</td>
<td>VCreateSeuence</td>
<td></td>
</tr>
<tr>
<td>BMove</td>
<td>Box</td>
<td>J</td>
<td>JRange</td>
<td>VGet</td>
<td></td>
</tr>
<tr>
<td>BMove</td>
<td>Box</td>
<td>J</td>
<td>JRange</td>
<td>VLoad</td>
<td></td>
</tr>
<tr>
<td>BMove</td>
<td>Box</td>
<td>J</td>
<td>JRange</td>
<td>VLoadModel</td>
<td></td>
</tr>
<tr>
<td>BMove</td>
<td>Box</td>
<td>J</td>
<td>JRange</td>
<td>VRun</td>
<td></td>
</tr>
</tbody>
</table>
BoxClr  L  LimZ  SyncRobots  VSave
Brake  T  TC  VGo  VSaveModel
CnV_AbstractTrack  Local  TC  VSet
CnV_Fine  LocalClr  TGo  VSaveImage
CnV_QueueAdd  M  MCal  VSet
CnV_QueueMove  Motor  TSet  VShowModel
CnV_QueueReject  Move  TCL  VStatsReset
CnV_QueueUserData  T  TMove  VStatsResetAll
CnV_Trigger  O  OLAccel  Tool  VStatsSave
CP  Pass  Trap  VStatsShow
Curve  P  UC_Scan  VTeach
CVMove  Plane  VTrain
CVPTE  W  WaitPos
E  PlaneClr  Weight
ECP  Power  X  Xqt *3
ECPSet  PTPBoost

*1 Reset Error can be executed
*2 Executable from the Trap Error processing task
*3 Executable from the background tasks

See Also
Function/Fend, Halt, Resume, Quit, Startmain, Trap

Xqt Example

Function main
  Xqt flash ' Start flash function as task 2
  Xqt Cycle(5) ' Start Cycle function as task 3
  Do
    Wait 3 ' Execute task 2 for 3 seconds
    Halt flash ' Suspend the task
  Wait 3
  Resume flash ' Resume the task
  Loop
  Fend

Function Cycle(count As Integer)
  Integer i
  For i = 1 To count
    Jump pick
    On vac
    Wait .2
    Jump place
    Off vac
    Wait .2
  Next i
  Fend

Function flash
  Do
    On 1
    Wait 0.2
    Off 1
    Wait 0.2
  Loop
  Fend
XY Function

Returns a point from individual coordinates that can be used in a point expression.

Syntax

\[ XY(x, y, z, u, [v, w]) \]

Parameters

- **x**: Real expression representing the X coordinate.
- **y**: Real expression representing the Y coordinate.
- **z**: Real expression representing the Z coordinate.
- **u**: Real expression representing the U coordinate.
- **v**: Optional for 6-Axis robots. Real expression representing the V coordinate.
- **w**: Optional for 6-Axis robots. Real expression representing the W coordinate.

Return Values

A point constructed from the specified coordinates.

Description

When you don’t use the additional ST axis, there are nothing in particular to be care of.
You can move the manipulator to the specified coordinate with XY function like below:

\[ \text{Go } XY(60, 30, -50, 45) \]

When you use the additional ST axis, you need to be careful.
XY function returns the only robot point data, not including the additional axis.
If you use XY function lick this: Go XY(60,30,-50,45), the manipulator will move to the specified coordinate but the additional axis will not move. If you want to move the additional axis as well, specify like this: Go XY(60,30,-50,45) : ST(10,20).
For the details of additional axis, refer to EPSON RC+ Users Guide: 19. Additional Axis.

See Also

JA, Point Expression, ST Function

XY Function Example

\[ P10 = XY(60, 30, -50, 45) + P20 \]
XYLim Statement

Sets or displays the permissible XY motion range limits for the robot.

Syntax

```
XYLim minX, maxX, minY, maxY, [minZ], [maxZ]
```

Parameters

- **minX**: The minimum X coordinate position to which the manipulator may travel. (The manipulator may not move to a position with the X Coordinate less than minX.)
- **maxX**: The maximum X coordinate position to which the manipulator may travel. (The manipulator may not move to a position with the X Coordinate greater than maxX.)
- **minY**: The minimum Y coordinate position to which the manipulator may travel. (The manipulator may not move to a position with the Y Coordinate less than minY.)
- **maxY**: The maximum Y coordinate position to which the manipulator may travel. (The manipulator may not move to a position with the Y Coordinate greater than maxY.)
- **minZ**: Optional. The minimum Z coordinate position to which the manipulator may travel. (The manipulator may not move to a position with the Z Coordinate less than minZ.)
- **maxZ**: Optional. The maximum Z coordinate position to which the manipulator may travel. (The manipulator may not move to a position with the Z Coordinate greater than maxZ.)

Return Values

Displays current XYLim values when used without parameters

Description

XYLim is used to define XY motion range limits. Many robot systems allow users to define joint limits but the SPEL+ language allows both joint limits and motion limits to be defined. In effect this allows users to create a work envelope for their application. (Keep in mind that joint range limits are also definable with SPEL.)

The motion range established with XYLim values applies to motion command target positions only, and not to motion paths from starting position to target position. Therefore, the arm may move outside the XYLim range during motion. (i.e. The XYLim range does not affect Pulse.)

Notes

Turning Off Motion Range Checking

There are many applications which don't require Motion Range limit checking and for that reason there is a simple method to turn this limit checking off. To turn motion range limit checking off, define the Motion Range Limit values for minX, maxX, minY, and maxY to be 0. For example XYLim 0, 0, 0, 0.

Default Motion Range Limit Values

The default values for the XYLim instruction are "0, 0, 0, 0". (Motion Range Limit Checking is turned off.)

Tip

Point & Click Setup for XYLim

EPSON RC+ 6.0 has a point and click dialog box for defining the motion range limits. The simplest method to set the XYLim values is by using the XYZ Limits page on the Robot Manager.
XYLim Statement

See Also
Range

XYLim Statement Example
This simple example from the command window sets and then displays the current XYLim setting:

```>
> xlim -200, 300, 0, 500
```

```>
> XYLim
-200.000, 300.000, 0.000, 500.000
```
XYLim Function

Returns point data for either upper or lower limit of XYLim region.

Syntax

XYLim(limit)

Parameters

limit

Integer expression that specifies which limit to return.

1: Lower limit.
2: Upper limit.

Return Values

Point containing the specified limit coordinates.

See Also

XYLim Statement

XYLim Function Example

P1 = XYLim(1)
P2 = XYLim(2)
XYLimClr Statement

Clears the XYLim definition.

Syntax

XYLimClr

See Also

XYLim, XYLimDef

XYLimClr Function Example

This example uses the XYLimClr function in a program:

```prolog
Function ClearXYLim
    If XYLimDef = True Then
        XYLimClr
    EndIf
EndFunction
```
XYLimDef Function

Returns whether XYLim has been defined or not.

Syntax

XYLimDef

Return Values

True if XYLim has been defined, otherwise False.

See Also

XYLim, XYLimClr

XYLimDef Function Example

This example uses the XYLimDef function in a program:

```plaintext
Function ClearXYLim
    If XYLimDef = True Then
        XYLimClr
    EndIf
EndFend
```
## SPEL+ Error Messages

To help with any SPEL+ error, place the cursor on the error message in the run or command windows and press the F1 key.

<table>
<thead>
<tr>
<th>No.</th>
<th>Message</th>
<th>Remedy</th>
<th>Note 1</th>
<th>Note 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Controller control program started.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Termination due to low voltage of the power supply.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Controller control program has completed.</td>
<td>Stores this log when the controller is rebooted from EPSON RC+ or TP1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Preserve variables save area has been cleaned.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Function Main started.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Function Main started. Later same logs are skipped.</td>
<td>Skip the log &quot;Function Main started.&quot; to prevent system history space run out.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Serial number has been saved.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>System backup has been executed.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>System restore has been executed.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Robot parameters have been initialized.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Offset pulse value between the encoder origin and the home sensor (HOFS) is changed.</td>
<td>-</td>
<td>Value after change</td>
<td>Value before change</td>
</tr>
<tr>
<td>17</td>
<td>Message saving mode activated.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Conversion of Robot Parameter file has been executed.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>DU firmware has been installed.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Enable setting in Teach mode has been saved.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Enable setting in Teach mode has been changed.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>Device connected to Controller.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>101</td>
<td>Console device has changed.</td>
<td>-</td>
<td></td>
<td>21: PC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22: Remote</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26: Remote</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ethernet</td>
</tr>
<tr>
<td>102</td>
<td>Display device has changed.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>103</td>
<td>Working mode has changed.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>Cooperative mode has changed.</td>
<td>-</td>
<td>0: Independent</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1: Cooperative</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>Controller firmware has been installed.</td>
<td>-</td>
<td></td>
<td>1: Setup</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2: Initialize</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3: Upgrade</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4: Recover</td>
</tr>
<tr>
<td>111</td>
<td>IP address has been restored.</td>
<td>May store this log when the controller firmware is installed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>RC+ connected to the Controller.</td>
<td>-</td>
<td></td>
<td>1: Ethernet</td>
</tr>
<tr>
<td>121</td>
<td>TP connected to the Controller.</td>
<td>-</td>
<td></td>
<td>2: USB</td>
</tr>
<tr>
<td>122</td>
<td>OP connected to the Controller.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>123</td>
<td>RC+ disconnected from the Controller.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>124</td>
<td>TP disconnected from the Controller.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>126</td>
<td>Working mode changed to AUTO.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127</td>
<td>Working mode changed to Program.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>128</td>
<td>Working mode changed to Teach.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>129</td>
<td>Remote Ethernet connected to the Controller</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>Remote Ethernet disconnected to the Controller</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>501</td>
<td>Trace history is active.</td>
<td>Effects system performance if trace history is active.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>502</td>
<td>Memory has been initialized.</td>
<td>When this error occurs, the value of the Global Preserve variable will be initialized.</td>
<td>Replace the CPU board battery.</td>
<td>Replace the CPU board.</td>
</tr>
<tr>
<td>503</td>
<td>Found Hard disk error. You should replace the hard disk ASAP.</td>
<td>This is a warning of the hard disk failure. Replace the hard disk as soon as possible.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>504</td>
<td>An Error occurred on a Background Task</td>
<td>Make sure there are no problems in the system and continue the operation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>511</td>
<td>Battery voltage of the CPU board backup is lower than the allowed voltage. Replace the CPU board battery.</td>
<td>Replace the CPU board battery immediately. Keep the power to the controller ON as far as possible until you replace the battery.</td>
<td>100 times of current value</td>
<td>100 times of boundary value</td>
</tr>
<tr>
<td>512</td>
<td>5V input voltage for the CPU board is lower than the allowed voltage.</td>
<td>If normal voltage is not generated by a 5V power supply alone, replace the power supply.</td>
<td>100 times of current value</td>
<td>100 times of boundary value</td>
</tr>
<tr>
<td>513</td>
<td>24 V input voltage for the motor brake, encoder and fan is lower than the specified voltage.</td>
<td>If normal voltage is not generated by a 24V power supply alone, replace the power supply.</td>
<td>100 times of current value</td>
<td>100 times of boundary value</td>
</tr>
<tr>
<td>514</td>
<td>Internal temperature of the Controller is higher than the allowed temperature.</td>
<td>Stop the controller as soon as possible and check whether the ambient temperature of the controller is not high. Check whether the filter is not clogged up.</td>
<td>100 times of current value</td>
<td>100 times of boundary value</td>
</tr>
<tr>
<td>515</td>
<td>Rotating speed of the controller fan is below the allowed speed. (FAN1)</td>
<td>Check whether the filter is not clogged up. If the warning is not cleared after the controller is rebooted, replace the fan.</td>
<td>Current value</td>
<td>Boundary value</td>
</tr>
<tr>
<td>516</td>
<td>Rotating speed of the controller fan is below the allowed speed. (FAN2)</td>
<td>Check whether the filter is not clogged up. If the warning is not cleared after the controller is rebooted, replace the fan.</td>
<td>Current value</td>
<td>Boundary value</td>
</tr>
<tr>
<td>517</td>
<td>Internal temperature of the Controller is higher than the allowed temperature.</td>
<td>Stop the controller as soon as possible and check whether the ambient temperature of the controller is not high. Check whether the filter is not clogged up.</td>
<td>100 times of current value</td>
<td>100 times of boundary value</td>
</tr>
<tr>
<td>521</td>
<td>DU1 3.3V input voltage for the board is lower than the allowed voltage.</td>
<td>If normal voltage is not generated by 3.3V of Drive Unit 1 power supply alone, replace the power supply.</td>
<td>100 times of current value</td>
<td>100 times of boundary value</td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>522</td>
<td>DU1 5V input voltage for the board is lower than the allowed voltage. 0523:</td>
<td>If normal voltage is not generated by 5V of Drive Unit 1 power supply alone, replace the power supply.</td>
<td>100 times of current value</td>
<td>100 times of boundary value</td>
</tr>
<tr>
<td>523</td>
<td>DU1 24V input voltage for the motor brake, encoder and fan is lower than the specified voltage.</td>
<td>If normal voltage is not generated by 24V of Drive Unit 1 power supply alone, replace the power supply.</td>
<td>100 times of current value</td>
<td>100 times of boundary value</td>
</tr>
<tr>
<td>524</td>
<td>DU1 Internal temperature of the Controller is higher than the allowed temperature.</td>
<td>Stop Drive Unit 1 as soon as possible and check whether the ambient temperature of Drive Unit 1 is not high. Check whether the filter is not clogged up.</td>
<td>100 times of current value</td>
<td>100 times of boundary value</td>
</tr>
<tr>
<td>525</td>
<td>DU1 Rotating speed of the controller fan is below the allowed speed. (FAN1)</td>
<td>Check whether the filter of Drive Unit 1 is not clogged up. If the warning is not cleared after the controller is rebooted, replace the fan.</td>
<td>Current value</td>
<td>Boundary value</td>
</tr>
<tr>
<td>526</td>
<td>DU1 Rotating speed of the controller fan is below the allowed speed. (FAN2)</td>
<td>Check whether the filter of Drive Unit 1 is not clogged up. If the warning is not cleared after the controller is rebooted, replace the fan.</td>
<td>Current value</td>
<td>Boundary value</td>
</tr>
<tr>
<td>531</td>
<td>DU2 3.3V input voltage for the board is lower than the allowed voltage.</td>
<td>If normal voltage is not generated by 3.3V of Drive Unit 2 power supply alone, replace the power supply.</td>
<td>100 times of current value</td>
<td>100 times of boundary value</td>
</tr>
<tr>
<td>532</td>
<td>DU2 5V input voltage for the board is lower than the allowed voltage.</td>
<td>If normal voltage is not generated by 5V of Drive Unit 2 power supply alone, replace the power supply.</td>
<td>100 times of current value</td>
<td>100 times of boundary value</td>
</tr>
<tr>
<td>533</td>
<td>DU2 24V input voltage for the motor brake, encoder and fan is lower than the specified voltage.</td>
<td>If normal voltage is not generated by 24V of Drive Unit 2 power supply alone, replace the power supply.</td>
<td>100 times of current value</td>
<td>100 times of boundary value</td>
</tr>
<tr>
<td>534</td>
<td>DU2 Internal temperature of the Controller is higher than the allowed temperature.</td>
<td>Stop Drive Unit 2 as soon as possible and check whether the ambient temperature of Drive Unit 2 is not high. Check whether the filter is not clogged up.</td>
<td>100 times of current value</td>
<td>100 times of boundary value</td>
</tr>
<tr>
<td>535</td>
<td>DU2 Rotating speed of the controller fan is below the allowed speed. (FAN1)</td>
<td>Check whether the filter of Drive Unit 2 is not clogged up. If the warning is not cleared after the controller is rebooted, replace the fan.</td>
<td>Current value</td>
<td>Boundary value</td>
</tr>
<tr>
<td>536</td>
<td>DU2 Rotating speed of the controller fan is below the allowed speed. (FAN2)</td>
<td>Check whether the filter of Drive Unit 2 is not clogged up. If the warning is not cleared after the controller is rebooted, replace the fan.</td>
<td>Current value</td>
<td>Boundary value</td>
</tr>
<tr>
<td>597</td>
<td>The PTP motion to avoid the singularity point has completed.</td>
<td>PTP motion for the singularity avoidance was completed. Clicking the same jog button will operate the robot in the normal jog motion.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>599</td>
<td>Jogging attempted near singularity point.</td>
<td>The robot could not jog in the CP motion (default). Clicking the same jog button will operate the robot in the PTO motion.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>700</td>
<td>Motor driver type does not match the current robot model. Check the robot model. Replace the motor driver.</td>
<td>Check the robot model.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>736</td>
<td>Encoder has been reset. Reboot the controller.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>737</td>
<td>Low voltage from the encoder battery. Replace the battery with the controller ON.</td>
<td>Replace the battery for the robot with the controller ON.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>752</td>
<td>Servo alarm D.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1001</td>
<td>Operation Failure. Command parameter is invalid.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1002</td>
<td>Requested data cannot be accessed. The data is not set up or the range is invalid.</td>
<td>Check whether the target I/O, variables, and tasks exist.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1003</td>
<td>The password is invalid</td>
<td>Enter the correct password.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1004</td>
<td>Cannot execute with unsupported version.</td>
<td>Use the correct version file.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1005</td>
<td>Cannot execute with invalid serial number.</td>
<td>Use the backup data for the same controller to restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1006</td>
<td>Cannot execute with invalid Robot model.</td>
<td>Use the backup data for the same controller to restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1007</td>
<td>Cannot execute with invalid Controller.</td>
<td>Use the supported installer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1011</td>
<td>Remote setup error. Cannot assign a bit number which does not exist to a remote I/O signal. Check the fieldbus slave size.</td>
<td>Check the fieldbus slave size.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1012</td>
<td>Remote setup error. Cannot assign a bit number which does not exist to a remote I/O signal. Check the fieldbus master size.</td>
<td>Check the fieldbus master size.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1013</td>
<td>Fieldbus slave failure. Cannot change the size because it currently includes a remote I/O signal.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1014</td>
<td>Fieldbus master failure. Cannot change the size because it currently includes a remote I/O signal.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1020</td>
<td>Cannot execute in recovery mode.</td>
<td>Boot the controller as normal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1021</td>
<td>Cannot execute due to controller initialization failure.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1022</td>
<td>Cannot execute without the project being open.</td>
<td>Open a project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1023</td>
<td>Cannot execute while the project is open.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1024</td>
<td>Cannot activate from remote.</td>
<td>Enable the remote input.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1025</td>
<td>Execution in Teach mode is prohibited.</td>
<td>Change to the AUTO mode.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1026</td>
<td>Cannot execute in Teach mode except from TP.</td>
<td>Change to the AUTO mode.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>------</td>
<td>------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>1027</td>
<td>Cannot execute in Auto mode.</td>
<td>Change to the Program mode.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1028</td>
<td>Cannot execute in Auto mode except from the main console.</td>
<td>Change to the Program mode.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1030</td>
<td>Does not allow Operation mode to be changed.</td>
<td>Change to the Auto mode with a console in the Program mode.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1031</td>
<td>Cannot execute while tasks are executing.</td>
<td>Stop the task and then execute.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1032</td>
<td>Cannot execute while the maximum number of tasks are executing.</td>
<td>Stop the task and then execute.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1033</td>
<td>Cannot execute during asynchronous motion command.</td>
<td>Execute after the motion ends.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1034</td>
<td>Asynchronous command stopped during operation.</td>
<td>The asynchronous command already stopped when the controller received a stop command.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1035</td>
<td>Cannot execute in Remote enable except from the Remote.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>1036</td>
<td>Cannot execute in OP enable except from the OP.</td>
<td>-</td>
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<tr>
<td>1037</td>
<td>Cannot execute when Remote Ethernet enabled except from the remote Ethernet device.</td>
<td>-</td>
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</tr>
<tr>
<td>1039</td>
<td>Execution is prohibited.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1041</td>
<td>Cannot execute during Emergency Stop status.</td>
<td>Cancel the Emergency Stop status.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1042</td>
<td>Cannot execute while the safeguard is open.</td>
<td>Close the safeguard.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1043</td>
<td>Cannot execute during error condition.</td>
<td>Cancel the error condition.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1044</td>
<td>Cannot execute when the remote pause input is ON.</td>
<td>Change the remote pause input to OFF.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1045</td>
<td>Input waiting condition is the only available condition to input.</td>
<td>The controller received an input while it was not in the Input waiting condition.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1046</td>
<td>Cannot execute during file transfer.</td>
<td>Execute after the file transmission.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1047</td>
<td>Cannot cancel the command executed from other devices.</td>
<td>Cancel the motion command from the device the command was issued from.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1048</td>
<td>Cannot execute after after low voltage was detected.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>1049</td>
<td>Other devices are in program mode.</td>
<td>-</td>
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<tr>
<td>1050</td>
<td>Password is too long.</td>
<td>-</td>
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</tr>
<tr>
<td>1051</td>
<td>Export Controller Status failed.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1052</td>
<td>Export Controller Status busy.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>1100</td>
<td>File failure. Cannot access the file.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>1102</td>
<td>File failure. Read and write failure of the registry</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>1103</td>
<td>File is not found.</td>
<td>Check whether the file exists.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1104</td>
<td>Project file was not found.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1105</td>
<td>Object file was not found.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1106</td>
<td>Point files were not found.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1107</td>
<td>The program is using a feature that is not supported by the current controller firmware version.</td>
<td>-</td>
<td></td>
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<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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</tr>
<tr>
<td>1108</td>
<td>One or more source files are updated. Please build the project.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1109</td>
<td>Not enough storage capacity.</td>
<td>Increase free space of the USB memory.</td>
<td></td>
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</tr>
<tr>
<td>1110</td>
<td>File is not found.</td>
<td>-</td>
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<tr>
<td>1111</td>
<td>Conveyor file was not found.</td>
<td>-</td>
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<tr>
<td>1120</td>
<td>File failure. Setting file is corrupt.</td>
<td>Restore the controller configuration.</td>
<td></td>
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</tr>
<tr>
<td>1121</td>
<td>File failure. Project file is corrupt.</td>
<td>Rebuild the project.</td>
<td></td>
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</tr>
<tr>
<td>1122</td>
<td>File failure. Point file is corrupt.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1123</td>
<td>File failure. I/O label file is corrupt.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
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<tr>
<td>1124</td>
<td>File failure. User error file is corrupt.</td>
<td>Rebuild the project.</td>
<td></td>
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</tr>
<tr>
<td>1125</td>
<td>File failure. Error message file is corrupt.</td>
<td>-</td>
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<tr>
<td>1126</td>
<td>File failure. Software option information is corrupt.</td>
<td>-</td>
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<tr>
<td>1127</td>
<td>File failure. Vision file is corrupt.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1128</td>
<td>File failure. Backup information file is corrupt.</td>
<td>-</td>
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<tr>
<td>1130</td>
<td>Error message failure. No item is found in the error history.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>1131</td>
<td>Cannot access the USB memory.</td>
<td>Insert the USB memory properly. When this error still occurs after the USB memory is inserted properly, the memory may be unrecognizable to controller. Insert another memory to check the operation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1132</td>
<td>File failure. Failed to copy the file.</td>
<td>-</td>
<td></td>
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<tr>
<td>1133</td>
<td>File failure. Failed to delete the file.</td>
<td>-</td>
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<tr>
<td>1134</td>
<td>File failure. GUI Builder file is corrupt.</td>
<td>-</td>
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<tr>
<td>1140</td>
<td>File failure. Failed to open the object file.</td>
<td>-</td>
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<tr>
<td>1141</td>
<td>File failure. Failed to open the project file.</td>
<td>-</td>
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<tr>
<td>1142</td>
<td>File failure. Failed to read the project file.</td>
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<tr>
<td>1143</td>
<td>File failure. Failed to open the condition save file.</td>
<td>-</td>
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<tr>
<td>1144</td>
<td>File failure. Failed to write the condition save file.</td>
<td>-</td>
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<tr>
<td>1145</td>
<td>File failure. Failed to open the conveyor file.</td>
<td>-</td>
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<tr>
<td>1146</td>
<td>File failure. Failed to read the conveyor file.</td>
<td>-</td>
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<tr>
<td>1150</td>
<td>File failure. Error history is invalid.</td>
<td>-</td>
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<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
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<tr>
<td>1151</td>
<td>File failure. Failed to map the error history.</td>
<td>-</td>
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<tr>
<td>1152</td>
<td>File failure. Failed to open the error history file.</td>
<td>-</td>
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<tr>
<td>1153</td>
<td>File failure. Failed to write the error history file.</td>
<td>-</td>
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<tr>
<td>1155</td>
<td>File failure. Failed to open the settings file.</td>
<td>Restore the controller configuration.</td>
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<tr>
<td>1156</td>
<td>File failure. Failed to save the settings file.</td>
<td>Restore the controller configuration.</td>
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</tr>
<tr>
<td>1157</td>
<td>File failure. Failed to read the settings file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1158</td>
<td>File failure. Failed to write the settings file.</td>
<td>Restore the controller configuration.</td>
<td></td>
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<tr>
<td>1160</td>
<td>MCD failure. Failed to open the MCD file.</td>
<td>Restore the controller configuration.</td>
<td></td>
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<tr>
<td>1161</td>
<td>MCD failure. Failed to read the MCD file.</td>
<td>Restore the controller configuration.</td>
<td></td>
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<tr>
<td>1162</td>
<td>MCD failure. Failed to write the MCD file.</td>
<td>Restore the controller configuration.</td>
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<tr>
<td>1163</td>
<td>MCD failure. Failed to save the MCD file.</td>
<td>Restore the controller configuration.</td>
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<tr>
<td>1165</td>
<td>MPD failure. Failed to open the MPD file.</td>
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<tr>
<td>1166</td>
<td>MPD failure. Failed to read the MPD file.</td>
<td>-</td>
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<tr>
<td>1167</td>
<td>MPD failure. Failed to write the MPD file.</td>
<td>-</td>
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<tr>
<td>1168</td>
<td>MPD failure. Failed to save the MPD file.</td>
<td>-</td>
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<tr>
<td>1170</td>
<td>MPL failure. Failed to open the MPL file.</td>
<td>Reinstall the firmware.</td>
<td></td>
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</tr>
<tr>
<td>1171</td>
<td>MPL failure. Failed to read the MPL file.</td>
<td>Update the firmware.</td>
<td></td>
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<tr>
<td>1172</td>
<td>MPL failure. Failed to write the MPL file.</td>
<td>-</td>
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<tr>
<td>1173</td>
<td>MPL failure. Failed to save the MPL file.</td>
<td>-</td>
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<tr>
<td>1175</td>
<td>MAL failure. Failed to open the MAL file.</td>
<td>-</td>
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<tr>
<td>1176</td>
<td>MAL failure. Failed to read the MAL file.</td>
<td>-</td>
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<tr>
<td>1177</td>
<td>MAL failure. Failed to write the MAL file.</td>
<td>-</td>
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<tr>
<td>1178</td>
<td>MAL failure. Failed to save the MAL file.</td>
<td>-</td>
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<tr>
<td>1180</td>
<td>MTR failure. Failed to create the MTR file.</td>
<td>-</td>
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<tr>
<td>1181</td>
<td>PRM failure. Failed to replace the PRM file.</td>
<td>-</td>
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<tr>
<td>1185</td>
<td>File failure. Failed to open the backup information file.</td>
<td>-</td>
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<tr>
<td>1186</td>
<td>File failure. Failed to read the backup information file.</td>
<td>-</td>
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<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
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<tr>
<td>1187</td>
<td>File failure. Failed to write the backup information file.</td>
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<tr>
<td>1188</td>
<td>File failure. Failed to save the backup information file.</td>
<td>-</td>
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</tr>
<tr>
<td>1189</td>
<td>The backup data was created by an old version.</td>
<td>Cannot restore the controller configuration in the specified procedure for using old backup data. Check the backup data.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1190</td>
<td>The backup data was created by a newer version.</td>
<td>-</td>
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</tr>
<tr>
<td>1191</td>
<td>There is no project in the backup data.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>1192</td>
<td>Cannot execute with invalid robot number.</td>
<td>Check the Backup data is same as current robot number.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1193</td>
<td>Cannot execute with invalid robot information.</td>
<td>Check the Backup data is same as current robot number.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1200</td>
<td>Compile failure. Check the compile message.</td>
<td>This error occurs during compilation from TP. Correct where the error occurred.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1201</td>
<td>Link failure. Check the link message.</td>
<td>This error occurs during compilation from TP. Correct where the error occurred.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1500</td>
<td>Communication error.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1501</td>
<td>Command did not complete in time.</td>
<td>Execute the command again after a while. Check the connection between the EPSON RC+6.0 and controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1502</td>
<td>Communication disconnection between RC+ and Controller. Re-establish communication.</td>
<td>Check the connection between the EPSON RC+6.0 and controller.</td>
<td>1: Communication timeout 2: USB cable disconnection 3: USB reception failure 4: USB communication shutdown</td>
<td></td>
</tr>
<tr>
<td>1503</td>
<td>Disconnection while executing a task.</td>
<td>-</td>
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</tr>
<tr>
<td>1504</td>
<td>Communication disconnection between Remote Ethernet and Controller. Re-establish communication.</td>
<td>-</td>
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<tr>
<td>1510</td>
<td>Out of IP Address range.</td>
<td>-</td>
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<tr>
<td>1521</td>
<td>Vision communication. Initialization failed.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1522</td>
<td>Vision communication. Termination failed.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>1523</td>
<td>Vision communication. Socket handle acquisition failed.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1524</td>
<td>Vision communication. Communication failed.</td>
<td>Check the connection between the camera and controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1526</td>
<td>Vision communication. Sending failed.</td>
<td>Check the connection between the camera and controller.</td>
<td></td>
<td></td>
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<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
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<tr>
<td>1527</td>
<td>Vision communication. Failed to read from the server.</td>
<td>Check the connection between the camera and controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1528</td>
<td>Vision communication. Option setting failed.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>1529</td>
<td>Vision communication. Initialization process not completed.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1530</td>
<td>Vision communication. Communication error.</td>
<td>Check the connection between the camera and controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1531</td>
<td>Vision communication. Sockets are all used.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1532</td>
<td>Vision communication. Sending time-out.</td>
<td>Check the connection between the camera and controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1533</td>
<td>Vision communication. Receiving time-out.</td>
<td>Check the connection between the camera and controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1534</td>
<td>Vision communication. Communication error.</td>
<td>Check the connection between the camera and controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1550</td>
<td>Communication failure. Ethernet initialization error.</td>
<td>-</td>
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<tr>
<td>1551</td>
<td>Communication failure. USB initialization error.</td>
<td>-</td>
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<tr>
<td>1552</td>
<td>Communication failure. Controller internal communication error.</td>
<td>-</td>
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</tr>
<tr>
<td>1553</td>
<td>Communication failure. Invalid data is detected.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>1555</td>
<td>Ethernet transmission error.</td>
<td>Check the connection between the EPSON RC+6.0 and controller.</td>
<td></td>
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</tr>
<tr>
<td>1556</td>
<td>Ethernet reception error.</td>
<td>Check the connection between the EPSON RC+6.0 and controller.</td>
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<td></td>
<td></td>
<td>If the router is used between the PC and controller, confirm that the DHCP function is disabled.</td>
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</tr>
<tr>
<td>1557</td>
<td>USB transmission error.</td>
<td>Check the connection between the EPSON RC+6.0 and controller.</td>
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</tr>
<tr>
<td>1558</td>
<td>USB reception error.</td>
<td>Check the connection between the EPSON RC+6.0 and controller.</td>
<td></td>
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</tr>
<tr>
<td>1580</td>
<td>Parser communication failure. Communication error.</td>
<td>-</td>
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<tr>
<td>1581</td>
<td>Parser communication failure. Time-out occurred during communication.</td>
<td>-</td>
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</tr>
<tr>
<td>1582</td>
<td>Parser communication failure. Transmission error.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>1583</td>
<td>Parser communication failure. Initialization error.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1584</td>
<td>Parser communication failure. Connection error.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1585</td>
<td>Parser communication failure. Invalid parameter</td>
<td>-</td>
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</tr>
<tr>
<td>1586</td>
<td>Parser communication failure. Busy</td>
<td>-</td>
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<tr>
<td>No.</td>
<td>Message</td>
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<td>Note 1</td>
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<tr>
<td>1587</td>
<td>Parser communication failure. Received an invalid data</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1700</td>
<td>Initialization failure. Failed to initialize TP.</td>
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<td>Initialization failure. Failed to initialize TP.</td>
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<td>1702</td>
<td>Initialization failure. Failed to initialize TP.</td>
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<td>1703</td>
<td>File failure. Failed to read the screen data file.</td>
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<td>1704</td>
<td>Failed to read the setting file.</td>
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<td>1705</td>
<td>Failed to open the TP port.</td>
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<td>1706</td>
<td>Failed to read the key table for TP.</td>
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<td>1707</td>
<td>Failed to change the language.</td>
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<tr>
<td>1710</td>
<td>Failed to make the screen.</td>
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<tr>
<td>1800</td>
<td>The controller is already connected to a RC+.</td>
<td>Only one RC+ can be connected to the controller.</td>
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<tr>
<td>1802</td>
<td>The command was attempted without being connected to a controller.</td>
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<tr>
<td>1803</td>
<td>Failed to read or write the file on the PC.</td>
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<tr>
<td>1804</td>
<td>Initialization failure. Failed to allocate memory on the PC.</td>
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<td>1805</td>
<td>Connection failure. Check the controller startup and connection of the communication cable.</td>
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<td>1806</td>
<td>Timeout during connection via Ethernet.</td>
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<td>1807</td>
<td>Timeout during connection via USB.</td>
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<td>1808</td>
<td>USB driver is not installed.</td>
<td>Failed to install EPSON RC+ 6.0. Install EPSON RC+ 6.0 again.</td>
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<td>1809</td>
<td>Initialization failure. Failed to initialize PC daemon.</td>
<td>Reboot the System</td>
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<td>1810</td>
<td>PC daemon error. Uncommon error.</td>
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<td>1901</td>
<td>Unsupported. Unsupported command was attempted.</td>
<td>Update the firmware.</td>
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<td>1902</td>
<td>Unsupported. Unsupported parameter was specified.</td>
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<td>1903</td>
<td>System error.</td>
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<td>2000</td>
<td>Unsupported. Unsupported command was attempted.</td>
<td>Rebuild the project.</td>
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<td>2001</td>
<td>Unsupported. Unsupported motion command was attempted.</td>
<td>Rebuild the project.</td>
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<td>2003</td>
<td>Unsupported. Unsupported Function argument was specified.</td>
<td>Rebuild the project.</td>
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<td>2004</td>
<td>Unsupported. Unsupported Function return value was specified.</td>
<td>Rebuild the project.</td>
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<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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<td>-----</td>
<td>-------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
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<tr>
<td>2005</td>
<td>Unsupported. Unspecified condition was specified.</td>
<td>Rebuild the project.</td>
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<tr>
<td>2006</td>
<td>Unsupported. Unsupported I/O command was specified.</td>
<td>Rebuild the project.</td>
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<tr>
<td>2007</td>
<td>Unsupported condition was specified.</td>
<td>Cannot jog in the CP motion (default).</td>
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<td>2008</td>
<td>Unsupported. Unknown error number.</td>
<td>Clicking the same jog button will operate the robot in the PTP motion.</td>
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<td>2010</td>
<td>Object file error. Build the project. Out of internal code range.</td>
<td>Rebuild the project.</td>
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<tr>
<td>2011</td>
<td>Object file error. Build the project. Function argument error.</td>
<td>Rebuild the project.</td>
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<td>2012</td>
<td>Object file error. Build the project. Command argument error.</td>
<td>Rebuild the project.</td>
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<tr>
<td>2013</td>
<td>Object file error. Build the project. Cannot process the code.</td>
<td>Rebuild the project.</td>
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<tr>
<td>2014</td>
<td>Object file error. Build the project. Cannot process the variable type code.</td>
<td>Rebuild the project.</td>
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<td>2015</td>
<td>Object file error. Build the project. Cannot process the string type code.</td>
<td>Rebuild the project.</td>
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<tr>
<td>2016</td>
<td>Object file error. Build the project. Cannot process the variable category code.</td>
<td>Rebuild the project.</td>
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<td>2017</td>
<td>Object file error. Build the project. Cannot process because of improper code.</td>
<td>Rebuild the project.</td>
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<tr>
<td>2018</td>
<td>Object file error. Build the project. Failed to calculate the variable size.</td>
<td>Rebuild the project.</td>
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<tr>
<td>2019</td>
<td>Object file error. Cannot process the variable wait. Build the project.</td>
<td>Rebuild the project.</td>
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<tr>
<td>2020</td>
<td>Stack table number exceeded. Function call or local variable is out of range.</td>
<td>Check whether no function is called infinitely. Reduce the Call function depth.</td>
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<tr>
<td>2021</td>
<td>Stack area size exceeded. Stack error. Function call or local variable is out of range.</td>
<td>If using many local variables, especially String type, replace them to global variables.</td>
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<tr>
<td>2022</td>
<td>Stack failure. Required data not found on the stack.</td>
<td>Rebuild the project.</td>
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<tr>
<td>2023</td>
<td>Stack failure. Unexpected tag found on the stack.</td>
<td>Rebuild the project.</td>
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<tr>
<td>2024</td>
<td>Stack area size exceeded. Local variable is out of range.</td>
<td>Change the size of the Local variable.</td>
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<tr>
<td>2031</td>
<td>System failure. Robot number is beyond the maximum count.</td>
<td>Restore the controller configuration.</td>
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</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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<td>------</td>
<td>-------------------------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
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<tr>
<td>2032</td>
<td>System failure.</td>
<td>Rebuild the project.</td>
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<tr>
<td></td>
<td>Task number compliance error.</td>
<td></td>
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<tr>
<td>2033</td>
<td>System failure.</td>
<td>Remedy the errors occurring frequently.</td>
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<tr>
<td></td>
<td>Too many errors.</td>
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<tr>
<td>2040</td>
<td>Thread failure.</td>
<td>Reboot the controller.</td>
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<td></td>
<td>Failed to create the thread.</td>
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<td>2041</td>
<td>Thread failure.</td>
<td>Reboot the controller.</td>
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<td>Thread creation timeout.</td>
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<td>2042</td>
<td>Thread failure.</td>
<td>Reboot the controller.</td>
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<td></td>
<td>Thread termination timeout.</td>
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<td>2043</td>
<td>Thread failure.</td>
<td>Reboot the controller.</td>
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<tr>
<td></td>
<td>Thread termination timeout.</td>
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<td>2044</td>
<td>Thread failure.</td>
<td>Reboot the controller.</td>
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<td></td>
<td>Daemon process timeout.</td>
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<td>2045</td>
<td>Thread failure.</td>
<td>Reboot the controller.</td>
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<td></td>
<td>Task continuance wait timeout.</td>
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<td>2046</td>
<td>Thread failure.</td>
<td>Reboot the controller.</td>
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<td></td>
<td>Task stop wait timeout.</td>
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<td>2047</td>
<td>Thread failure.</td>
<td>Reboot the controller.</td>
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<td></td>
<td>Task startup wait timeout.</td>
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<td>2050</td>
<td>Object file operation failure.</td>
<td>Rebuild the project.</td>
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<tr>
<td></td>
<td>Object file size is beyond the allowable size.</td>
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<td>2051</td>
<td>Object file operation failure.</td>
<td>Reboot the controller.</td>
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<tr>
<td></td>
<td>Cannot delete the object file during execution.</td>
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<td>2052</td>
<td>Object file operation failure.</td>
<td>Reboot the controller.</td>
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<tr>
<td></td>
<td>Cannot allocate the memory for the object file.</td>
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<tr>
<td>2053</td>
<td>Object file update.</td>
<td>Perform the same processing after a while. Rebuild the project.</td>
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<tr>
<td></td>
<td>Updating the object file.</td>
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<td>2054</td>
<td>Object file operation failure.</td>
<td>Synchronize the files of the project. Rebuild the project.</td>
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<tr>
<td></td>
<td>Synchronize the project. Function ID failure.</td>
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<tr>
<td>2055</td>
<td>Object file operation failure.</td>
<td>Synchronize the files of the project. Rebuild the project.</td>
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<td></td>
<td>Synchronize the project. Local variable ID failure.</td>
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<td>2056</td>
<td>Object file operation failure.</td>
<td>Synchronize the files of the project. Rebuild the project.</td>
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<td></td>
<td>Synchronize the project. Global variable ID failure.</td>
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<tr>
<td>2057</td>
<td>Object file operation failure.</td>
<td>Synchronize the files of the project. Rebuild the project.</td>
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<tr>
<td></td>
<td>Synchronize the project. Global Preserve variable ID failure.</td>
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<tr>
<td>2058</td>
<td>Object file operation failure.</td>
<td>Synchronize the files of the project. Rebuild the project.</td>
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<tr>
<td></td>
<td>Failed to calculate the variable size.</td>
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<tr>
<td>2059</td>
<td>Exceed the global variable area.</td>
<td>Reduce the number of Global variables to be used.</td>
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<tr>
<td></td>
<td>Cannot assign the Global variable area.</td>
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<tr>
<td>2070</td>
<td>SRAM failure.</td>
<td>Replace the CPU board.</td>
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<tr>
<td></td>
<td>SRAM is not mapped.</td>
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<tr>
<td>2071</td>
<td>SRAM failure.</td>
<td>Perform the same processing after a while. Rebuild the project.</td>
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<tr>
<td></td>
<td>Cannot delete when Global Preserve variable is in use.</td>
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</table>
## SPEL+ Error Messages

<table>
<thead>
<tr>
<th>No.</th>
<th>Message</th>
<th>Remedy</th>
<th>Note 1</th>
<th>Note 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2072</td>
<td>Exceed the backup variable area. Cannot assign the Global Preserve area.</td>
<td>Reduce the number of Global Preserve variables to be used.</td>
<td>Maximum size</td>
<td>The size you attempted to use</td>
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<td>2073</td>
<td>SRAM failure. Failed to clear the Global Preserve variable area.</td>
<td>Rebuild the project.</td>
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<td>2074</td>
<td>SRAM failure. Failed to clean up the Global Preserve variable save area.</td>
<td>Reboot the controller.</td>
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<tr>
<td>2100</td>
<td>Initialization failure. Failed to open the initialization file.</td>
<td>Restore the controller configuration.</td>
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<tr>
<td>2101</td>
<td>Initialization failure. Duplicated initialization.</td>
<td>Reboot the controller.</td>
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<tr>
<td>2102</td>
<td>Initialization failure. Failed to initialize MNG.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
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<tr>
<td>2103</td>
<td>Initialization failure. Failed to create an event.</td>
<td>Reboot the controller.</td>
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<td>2104</td>
<td>Initialization failure. Failed to setup a priority.</td>
<td>Reboot the controller.</td>
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<td>2105</td>
<td>Initialization failure. Failed to setup the stack size.</td>
<td>Reboot the controller.</td>
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<tr>
<td>2106</td>
<td>Initialization failure. Failed to setup an interrupt process.</td>
<td>Reboot the controller.</td>
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<tr>
<td>2107</td>
<td>Initialization failure. Failed to start an interrupt process.</td>
<td>Reboot the controller.</td>
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<tr>
<td>2108</td>
<td>Initialization failure. Failed to stop an interrupt process.</td>
<td>Reboot the controller.</td>
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<tr>
<td>2109</td>
<td>Initialization failure. Failed to terminate MNG.</td>
<td>Reboot the controller.</td>
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<tr>
<td>2110</td>
<td>Initialization failure. Failed to allocate memory.</td>
<td>Reboot the controller.</td>
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<tr>
<td>2111</td>
<td>Initialization failure. Failed to initialize motion.</td>
<td>Restore the controller configuration.</td>
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<td>2112</td>
<td>Initialization failure. Failed to terminate motion.</td>
<td>Reboot the controller.</td>
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<tr>
<td>2113</td>
<td>Initialization failure. Failed to map SRAM.</td>
<td>Replace the CPU board.</td>
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<td>2114</td>
<td>Initialization failure. Failed to register SRAM.</td>
<td>Replace the CPU board.</td>
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<tr>
<td>2115</td>
<td>Initialization failure. Fieldbus board is beyond the maximum count.</td>
<td>Check the number of fieldbus boards.</td>
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<td>2116</td>
<td>Initialization failure. Failed to initialize fieldbus.</td>
<td>Reboot the controller. Check the fieldbus board. Replace the fieldbus board.</td>
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<tr>
<td>2117</td>
<td>Initialization failure. Failed to terminate fieldbus.</td>
<td>Reboot the controller.</td>
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<tr>
<td>2118</td>
<td>Initialization failure. Failed to open motion.</td>
<td>Restore the controller configuration.</td>
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<tr>
<td>2119</td>
<td>Initialization failure. Failed to initialize conveyor tracking.</td>
<td>Make sure the settings of conveyor and encoder are correct.</td>
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<td>2120</td>
<td>Initialization failure. Failed to allocate the system area.</td>
<td>Reboot the controller.</td>
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<td>2121</td>
<td>Initialization failure. Failed to allocate the object file area.</td>
<td>Reboot the controller.</td>
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<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
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<td>2122</td>
<td>Initialization failure.Failed to allocate the robot area.</td>
<td>Reboot the controller.</td>
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<td>2123</td>
<td>Initialization failure. Failed to create event.</td>
<td>Reboot the controller.</td>
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<td>2130</td>
<td>MCD failure. Failed to open the MCD file.</td>
<td>Restore the controller</td>
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<tr>
<td>2131</td>
<td>MCD failure. Failed to map the MCD file.</td>
<td>Restore the controller</td>
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<tr>
<td>2132</td>
<td>PRM failure. PRM file cannot be found.</td>
<td>Restore the controller</td>
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<tr>
<td>2133</td>
<td>PRM failure. Failed to map the PRM file.</td>
<td>Restore the controller</td>
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<tr>
<td>2134</td>
<td>PRM failure. PRM file contents error.</td>
<td>Restore the controller</td>
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<tr>
<td>2135</td>
<td>PRM failure. Failed to convert the PRM file.</td>
<td>Reboot the controller</td>
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<td>PRM failure. Failed to convert the PRM file.</td>
<td>Reboot the controller</td>
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<td>PRM failure. Failed to convert the PRM file.</td>
<td>Reboot the controller</td>
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<td>2140</td>
<td>DU Init Error. Cannot use drive units.</td>
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<td>2141</td>
<td>DU Init Error. Failed to initialize drive units.</td>
<td>Check the connection with drive units.</td>
<td></td>
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<tr>
<td>2142</td>
<td>DU Init Error. Failed to initialize drive units.</td>
<td>Check the connection with drive units.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2143</td>
<td>DU Init Error. Timeout during initialization of drive units.</td>
<td>Check the connection with drive units.</td>
<td></td>
<td></td>
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<tr>
<td>2144</td>
<td>DU Init Error. No data to download to drive units.</td>
<td>Reboot the control unit and drive units.</td>
<td></td>
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<tr>
<td>2145</td>
<td>DU Init Error. Failed to start communication with drive units.</td>
<td>Reboot the control unit and drive units.</td>
<td></td>
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<tr>
<td>2146</td>
<td>DU Init Error. Timeout when starting communication with drive units.</td>
<td>Reboot the control unit and drive units.</td>
<td></td>
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<tr>
<td>2147</td>
<td>DU Init Error. Failed to update the drive units software.</td>
<td>Review the software update setting. Check the connection with the Drive Unit.</td>
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<tr>
<td>2148</td>
<td>DU Init Error. Failed to update the drive units software.</td>
<td>Check the file name.</td>
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<tr>
<td>2149</td>
<td>DU Init Error. Failed to update the drive units software.</td>
<td>Check the Drive Unit power and connection. Reboot the Controller.</td>
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<tr>
<td>2150</td>
<td>Operation failure. Task number cannot be found.</td>
<td>Reboot the Controller.</td>
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<td>2151</td>
<td>Operation failure. Executing the task.</td>
<td>Reboot the Controller.</td>
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<td>2152</td>
<td>Operation failure. Object code size failure.</td>
<td>Reboot the Controller.</td>
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<td>2154</td>
<td>Operation failure. Executing jog.</td>
<td>Reboot the Controller.</td>
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<tr>
<td>No.</td>
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<td>2155</td>
<td>Operation failure. Cannot execute the jog function.</td>
<td>Reboot the Controller.</td>
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<tr>
<td>2156</td>
<td>Operation failure. Jog data is not configured.</td>
<td>Reboot the Controller.</td>
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<tr>
<td>2157</td>
<td>Operation failure. Failed to change the jog parameter.</td>
<td>Reboot the Controller.</td>
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<tr>
<td>2158</td>
<td>Operation failure. Failed to allocate the area for the break point.</td>
<td>Reboot the Controller.</td>
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<tr>
<td>2159</td>
<td>Operation failure. Break point number is beyond the allowable setup count.</td>
<td>Reduce the break points.</td>
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<tr>
<td>2160</td>
<td>Operation failure. Failed to allocate the function ID.</td>
<td>Reboot the Controller.</td>
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<tr>
<td>2161</td>
<td>Operation failure. Failed to allocate the local variable address.</td>
<td>Reboot the Controller.</td>
<td></td>
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<tr>
<td>2162</td>
<td>Operation failure. Not enough buffer to store the local variable.</td>
<td>Review the size of the Local variable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2163</td>
<td>Operation failure. Value change is available only when the task is halted.</td>
<td>Halt the task by the break point.</td>
<td></td>
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<tr>
<td>2164</td>
<td>Operation failure. Failed to allocate the global variable address.</td>
<td>Review the size of the global variable.</td>
<td></td>
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<tr>
<td>2165</td>
<td>Operation failure. Not enough buffer to store the global variable.</td>
<td>Review the size of the global variable.</td>
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<tr>
<td>2166</td>
<td>Operation failure. Failed to obtain the Global Preserve variable address.</td>
<td>Review the size of the global preserve variable.</td>
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<tr>
<td>2167</td>
<td>Operation failure. Not enough buffer to store the Global Preserve variable.</td>
<td>Review the size of the global preserve variable.</td>
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<tr>
<td>2168</td>
<td>Operation failure. SRAM is not mapped.</td>
<td>Reboot the Controller.</td>
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<tr>
<td>2169</td>
<td>Operation failure. Cannot clear the Global Preserve variable when loading the object file.</td>
<td>Reboot the Controller.</td>
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<tr>
<td>2170</td>
<td>Operation failure. Not enough buffer to store the string.</td>
<td>Check the size of the string variable.</td>
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<tr>
<td>2171</td>
<td>Operation failure. Cannot start the task after low voltage was detected.</td>
<td>Check the controller power. Reboot the Controller.</td>
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<tr>
<td>2172</td>
<td>Operation failure. Duplicated remote I/O configuration.</td>
<td>Reboot the Controller.</td>
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<tr>
<td>2173</td>
<td>Remote setup error. Cannot assign non-existing input number to remote function.</td>
<td>Check the I/O input number.</td>
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<tr>
<td>2174</td>
<td>Remote setup error. Cannot assign non-existing output number to remote function.</td>
<td>Check the I/O output number.</td>
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<tr>
<td>2175</td>
<td>Operation failure. Remote function is not configured.</td>
<td>Reboot the Controller.</td>
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<tr>
<td>2176</td>
<td>Operation failure. Event wait error.</td>
<td>Reboot the Controller.</td>
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<td>No.</td>
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<tr>
<td>2179</td>
<td>Remote setup error. Cannot assign same input number to some remote functions.</td>
<td>Check the remote setting.</td>
<td></td>
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<tr>
<td>2180</td>
<td>Remote setup error. Cannot assign same output number to some remote functions.</td>
<td>Check the remote setting.</td>
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<tr>
<td>2190</td>
<td>Cannot calculate because it was queue data.</td>
<td>Check the program.</td>
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<tr>
<td>2191</td>
<td>Cannot execute AbortMotion because robot is not running from a task.</td>
<td>If you don’t operate the robot from a program, you cannot use AbortMotion.</td>
<td></td>
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<tr>
<td>2192</td>
<td>Cannot execute AbortMotion because robot task is already finished.</td>
<td>Task is completed. Review the program.</td>
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<tr>
<td>2193</td>
<td>Cannot execute Recover without motion because AbortMotion was not executed.</td>
<td>Execute AbortMotion in advance to execute Recover WithoutMove.</td>
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<td>2194</td>
<td>Conveyor setting error.</td>
<td>Make sure the settings of conveyor and encoder are correct.</td>
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</tr>
<tr>
<td>2195</td>
<td>Conveyor setting error.</td>
<td>Make sure the settings of conveyor and encoder are correct.</td>
<td></td>
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</tr>
<tr>
<td>2196</td>
<td>Conveyor number is out of range.</td>
<td>Make sure the settings of conveyor and encoder are correct.</td>
<td></td>
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<tr>
<td>2197</td>
<td>Command parameter prohibited for conveyor tracking motion was used.</td>
<td>Delete LJM.</td>
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<tr>
<td>2200</td>
<td>Robot in use. Cannot execute the motion command when other tasks are using the robot.</td>
<td>The motion command for the robot cannot be simultaneously executed from more than one task. Review the program.</td>
<td></td>
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<tr>
<td>2201</td>
<td>Robot does not exist.</td>
<td>Check whether the robot setting is performed properly. Restore the controller configuration.</td>
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<tr>
<td>2202</td>
<td>Motion control module status failure. Unknown error was returned.</td>
<td>Rebuild the project.</td>
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</tr>
<tr>
<td>2203</td>
<td>Cannot clear local number ' 0 '.</td>
<td>The Local number 0 cannot be cleared. Review the program.</td>
<td>The Arm number you attempted to clear</td>
<td></td>
</tr>
<tr>
<td>2204</td>
<td>Cannot clear an arm while in use.</td>
<td>The Arm cannot be cleared while it is in use. Check whether the Arm is not used.</td>
<td></td>
<td></td>
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<tr>
<td>2205</td>
<td>Cannot clear arm number ' 0 '.</td>
<td>The Arm number 0 cannot be cleared. Review the program.</td>
<td>The Tool number you attempted to clear</td>
<td></td>
</tr>
<tr>
<td>2206</td>
<td>Cannot clear a tool while in use.</td>
<td>The Tool cannot be cleared while it is in use. Check whether the Tool is not used.</td>
<td></td>
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</tr>
<tr>
<td>2207</td>
<td>Cannot clear tool number ' 0 '.</td>
<td>The Tool number 0 cannot be cleared. Review the program.</td>
<td>The Tool number you attempted to clear</td>
<td></td>
</tr>
<tr>
<td>2208</td>
<td>Cannot clear ECP ' 0 '.</td>
<td>The ECP number 0 cannot be cleared. Review the program.</td>
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## SPEL+ Error Messages

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<td>2209</td>
<td>Cannot clear an ECP while in use.</td>
<td>The ECP cannot be cleared while it is in use. Check whether the ECP is not used.</td>
<td>The ECP number you attempted to clear</td>
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<tr>
<td>2210</td>
<td>Cannot specify ’ 0 ’ as the local number.</td>
<td>The command processing the Local cannot process the Local number 0. Review the program.</td>
<td>The specified Local number</td>
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<tr>
<td>2216</td>
<td>Box number is out of range.</td>
<td>Available Box numbers are from 1 to 15. Review the program.</td>
<td>The specified Local number</td>
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<tr>
<td>2217</td>
<td>Box number is not defined.</td>
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<tr>
<td>2218</td>
<td>Plane number is out of range.</td>
<td>Available Box numbers are from 1 to 15. Review the program.</td>
<td>The specified Local number</td>
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<tr>
<td>2219</td>
<td>Plane number is not defined.</td>
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<tr>
<td>2220</td>
<td>PRM failure. No PRM file data is found.</td>
<td>Reboot the controller. Restore the controller configuration.</td>
<td>The specified Arm number</td>
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<tr>
<td>2221</td>
<td>PRM failure. Failed to flash the PRM file.</td>
<td>Reboot the controller. Restore the controller configuration.</td>
<td>The specified Arm number</td>
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<tr>
<td>2222</td>
<td>Local number is not defined.</td>
<td>Check the Local setting. Review the program.</td>
<td>The specified Local number</td>
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<tr>
<td>2223</td>
<td>Local number is out of range.</td>
<td>Available Local number is from 1 to 15. Review the program.</td>
<td>The specified Local number</td>
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<tr>
<td>2224</td>
<td>Unsupported. MCOFS is not defined.</td>
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<td>2225</td>
<td>CalPls is not defined.</td>
<td>Check the CalPls setting.</td>
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<tr>
<td>2226</td>
<td>Arm number is out of range.</td>
<td>Available Arm number is from 0 to 3. Depending on commands, the Arm number 0 is not available. Review the program.</td>
<td>The specified Arm number</td>
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<tr>
<td>2227</td>
<td>Arm number is not defined.</td>
<td>Check the Arm setting. Review the program.</td>
<td>The specified Arm number</td>
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<tr>
<td>2228</td>
<td>Pulse for the home position is not defined.</td>
<td>Check the HomeSet setting.</td>
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<tr>
<td>2229</td>
<td>Tool number is out of range.</td>
<td>Available Tool number is from 0 to 3. Depending on commands, the Tool number 0 is not available. Review the program.</td>
<td>The specified Tool number</td>
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<tr>
<td>2230</td>
<td>Tool number is not defined.</td>
<td>Check the Tool setting. Review the program.</td>
<td>The specified Tool number</td>
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<tr>
<td>2231</td>
<td>ECP number is out of range.</td>
<td>Available Tool number is from 0 to 15. Depending on commands, the Tool number 0 is not available. Review the program.</td>
<td>The specified ECP number</td>
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<tr>
<td>2232</td>
<td>ECP number is not defined.</td>
<td>Check the ECP setting. Review the program.</td>
<td>The specified ECP number</td>
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<tr>
<td>2233</td>
<td>Axis to reset the encoder was not specified.</td>
<td>Be sure to specify the axis for encoder reset.</td>
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<tr>
<td>2234</td>
<td>Cannot reset the encoder with motor in the on state.</td>
<td>Turn the motor power OFF before reset.</td>
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<tr>
<td>2235</td>
<td>XYLIM is not defined.</td>
<td>Check the XYLIM setting. Review the program.</td>
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<tr>
<td>2236</td>
<td>PRM failure. Failed to set up the PRM file contents to the motion control status module.</td>
<td>Reboot the controller. Restore the controller configuration.</td>
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<tr>
<td>2240</td>
<td>Array subscript is out of user defined range. Cannot access or update beyond array bounds.</td>
<td>Check the array subscript. Review the program.</td>
<td>The dimensions exceeding the definition</td>
<td>The specified subscript</td>
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<tr>
<td>2241</td>
<td>Dimensions of array do not match the declaration.</td>
<td>Check the array's dimensions. Review the program.</td>
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<tr>
<td>2242</td>
<td>Zero '0' was used as a divisor.</td>
<td>Review the program.</td>
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<tr>
<td>2243</td>
<td>Variable overflow. Specified variable was beyond the maximum allowed value.</td>
<td>Check the variable type and calculation result. Review the program.</td>
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<tr>
<td>2244</td>
<td>Variable underflow. Specified variable was below the minimum allowed value.</td>
<td>Check the variable type and calculation result. Review the program.</td>
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<tr>
<td>2245</td>
<td>Cannot execute this command with a floating point number.</td>
<td>This command cannot be executed for Real or Double type. Review the program.</td>
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<tr>
<td>2246</td>
<td>Cannot calculate the specified value using the Tan function.</td>
<td>Check the specified value. Review the program.</td>
<td>The specified value</td>
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<tr>
<td>2247</td>
<td>Specified array subscript is less than '0'.</td>
<td>Check the specified value. Review the program.</td>
<td>The specified value</td>
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<tr>
<td>2248</td>
<td>Array failure. Redim can only be executed for an array variable.</td>
<td>You attempted to redimension the variable that is not array. Rebuild the project.</td>
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<tr>
<td>2249</td>
<td>Array failure. Cannot specify Preserve for other than a single dimension array.</td>
<td>Other than a single dimension array was specified as Preserve for Redim. Rebuild the project.</td>
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<td>2250</td>
<td>Array failure. Failed to calculate the size of the variable area.</td>
<td>Rebuild the project.</td>
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<tr>
<td>2251</td>
<td>Cannot allocate enough memory for Redim statement.</td>
<td>Reduce the number of subscripts to be specified for Redim. Perform Redim modestly.</td>
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<tr>
<td>2252</td>
<td>Cannot allocate enough memory for ByRef.</td>
<td>Reduce the number of array's subscripts to be seen by ByRef.</td>
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<tr>
<td>2253</td>
<td>Cannot compare characters with values.</td>
<td>Check whether the string type and the numeric data type are not compared. Review the program.</td>
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<tr>
<td>2254</td>
<td>Specified data is beyond the array bounds. Cannot refer or update beyond the array bounds.</td>
<td>Check the number of array's subscripts and data. Review the program.</td>
<td>The number of array subscripts The number of data to be referred or updated</td>
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<tr>
<td>2255</td>
<td>Variable overflow or underflow. Specified variable is out of value range.</td>
<td>The value that exceeds the range of Double type is specified. Review the program.</td>
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<tr>
<td>2256</td>
<td>Specified array subscript is beyond the maximum allowed range.</td>
<td>Reduce the number of subscripts to be specified. For available subscripts, see the online help.</td>
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<tr>
<td>2260</td>
<td>Task number is out of the available range.</td>
<td>For available task number, see the online help. Review the program.</td>
<td>The specified task number</td>
<td></td>
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<tr>
<td>2261</td>
<td>Specified task number does not exist.</td>
<td>Review the program.</td>
<td>The specified task number</td>
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<tr>
<td>2262</td>
<td>Robot number is out of the available range.</td>
<td>The available Robot number is 1. Review the program.</td>
<td>The specified robot number</td>
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<tr>
<td>2263</td>
<td>Output number is out of the available range. The Port No. or the Device No. is out of the available range.</td>
<td>For available output number, see the online help. Review the program.</td>
<td>The specified output number</td>
<td></td>
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<tr>
<td>2264</td>
<td>Command argument is out of the available range. Check the validation. Added data 1: Passed value. Added data 2: argument order.</td>
<td>For available range of argument, see the online help. Review the program.</td>
<td>The Added value The Added value</td>
<td>What number argument?</td>
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<tr>
<td>2265</td>
<td>Joint number is out of the available range.</td>
<td>Available Joint number is from 1 to 6. Review the program.</td>
<td>The specified joint number</td>
<td></td>
</tr>
<tr>
<td>2266</td>
<td>Wait time is out of available range.</td>
<td>Available wait time is from 0 to 2147483. Review the program.</td>
<td>The specified wait time</td>
<td></td>
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<tr>
<td>2267</td>
<td>Timer number is out of available range.</td>
<td>Available timer number is from 0 to 15. Review the program.</td>
<td>The specified timer number</td>
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<tr>
<td>2268</td>
<td>Trap number is out of available range.</td>
<td>Available trap number is from 1 to 4. Review the program.</td>
<td>The specified trap number</td>
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<tr>
<td>2269</td>
<td>Language ID is out of available range.</td>
<td>For available language ID, see the online help. Review the program.</td>
<td>The specified language ID</td>
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<tr>
<td>2270</td>
<td>Specified D parameter value at the parallel process is out of available range.</td>
<td>Available D parameter value is from 0 to 100. Review the program.</td>
<td>The specified D parameter value</td>
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<td>2271</td>
<td>Arch number is out of available range.</td>
<td>Available arch number is from 0 to 7. Review the program.</td>
<td>The specified arch number</td>
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<tr>
<td>2272</td>
<td>Device No. is out of available range.</td>
<td>The specified number representing a control device or display device is out of available range. For available device number, see the online help. Review the program.</td>
<td>The specified device number</td>
<td></td>
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<tr>
<td>2273</td>
<td>Output data is out of available range.</td>
<td>Available output data value is from 0 to 255. Review the program.</td>
<td>Output data</td>
<td>What number byte data is out of range?</td>
</tr>
<tr>
<td>2274</td>
<td>Asin argument is out of available range.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2275</td>
<td>Acos argument is out of available range.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2276</td>
<td>Sqr argument is out of available range.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2277</td>
<td>Randomize argument is out of available range.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2278</td>
<td>Sin, Cos, Tan argument is out of available range.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2279</td>
<td>Timeout period set by the TMOut statement expired before the wait condition was completed in the WAIT statement.</td>
<td>Investigate the cause of timeout. Check whether the set timeout period is proper.</td>
<td>Timeout period</td>
<td></td>
</tr>
<tr>
<td>2280</td>
<td>Timeout period set by TMOOut statement expired or SyncLock statement expired.</td>
<td>Investigate the cause of timeout. Check whether the set timeout period is proper.</td>
<td>Signal number Timeout period</td>
<td></td>
</tr>
<tr>
<td>2281</td>
<td>Timeout period set by TMOut statement in WaitSig statement or SyncLock statement expired.</td>
<td>Investigate the cause of timeout. Check whether the set timeout period is proper.</td>
<td>Port number Timeout period</td>
<td></td>
</tr>
<tr>
<td>2282</td>
<td>Timeout. Timeout at display device setting.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2283</td>
<td>Cannot execute a motion command.</td>
<td>Cannot execute the motion command after using the user function in the motion command. Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2290</td>
<td>Cannot execute the OnErr command.</td>
<td>Cannot execute OnErr in the motion command when using user function in the motion command. Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>2292</td>
<td>Cannot execute an I/O command while the safeguard is open. Need Forced.</td>
<td>I/O command cannot be executed while the safeguard is open. Review the program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2293</td>
<td>Cannot execute an I/O command during emergency stop condition. Need Forced.</td>
<td>I/O command cannot be executed during emergency stop condition. Review the program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2294</td>
<td>Cannot execute an I/O command when an error has been detected. Need Forced.</td>
<td>I/O command cannot be executed while an error occurs. Review the program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2295</td>
<td>Cannot execute this command from a NoEmgAbort Task and Background Task.</td>
<td>For details on inexecutable commands, refer to the online help. Review the program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2296</td>
<td>One or more source files are updated. Please build the project.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2297</td>
<td>Cannot execute an I/O command in TEACH mode without the Forced parameter.</td>
<td>I/O command cannot be executed in TEACH mode. Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2298</td>
<td>Cannot execute this command in Trap SGClose process.</td>
<td>You cannot execute Cont and Recover statements with processing task of Trap SGClose.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2299</td>
<td>Cannot execute this command. Need the setting.</td>
<td>Enable the [enable the advance taskcontrol commands] from RC+ to execute the command</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2300</td>
<td>Robot in use. Cannot execute the motion command when other task is using the robot.</td>
<td>The motion command for the robot cannot be simultaneously executed from more than one task. Review the program.</td>
<td>Task number that is using the robot</td>
<td></td>
</tr>
<tr>
<td>2301</td>
<td>Cannot execute the motion command when the Enable Switch is OFF.</td>
<td>Execute the motion command with the enable switch gripped.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2302</td>
<td>Cannot execute a Call statement in a Trap Call process.</td>
<td>Another function cannot be called from the function called by Trap Call. Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2303</td>
<td>Cannot execute a Call statement in a parallel process.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2304</td>
<td>Cannot execute an Xqt statement in a parallel process.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2305</td>
<td>Cannot execute a Call statement from the command window.</td>
<td>Execute Call from the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2306</td>
<td>Cannot execute an Xqt statement from the task started by Trap Xqt.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2307</td>
<td>Cannot execute this command while tasks are executing.</td>
<td>Check whether all tasks are completed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2308</td>
<td>Cannot turn on the motor because of a critical error.</td>
<td>Find the previously occurring error in the error history and resolve its cause. Then, reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2309</td>
<td>Cannot execute a motion command while the safeguard is open.</td>
<td>Check the safeguard status.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2310</td>
<td>Cannot execute a motion command while waiting for continue.</td>
<td>Execute the Continue or Stop and then execute the motion command.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2311</td>
<td>Cannot execute a motion command during the continue process.</td>
<td>Wait until the Continue is complete and then execute the motion command.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2312</td>
<td>Cannot execute a task during emergency stop condition.</td>
<td>Check the emergency stop status.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2313</td>
<td>Cannot continue execution immediately after opening the safeguard.</td>
<td>Wait 1.5 seconds after the safeguard is open, and then execute the Continue.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2314</td>
<td>Cannot continue execution while the safeguard is open.</td>
<td>Check the safeguard status.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2315</td>
<td>Duplicate execution continue.</td>
<td>Wait until the Continue is completed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2316</td>
<td>Cannot continue execution after an error has been detected.</td>
<td>Check the error status.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2317</td>
<td>Cannot execute the task when an error has been detected.</td>
<td>Reset the error by Reset and then execute the task.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2318</td>
<td>Cannot execute a motion command when an error has been detected.</td>
<td>Execute the motion command after resetting the error by Reset</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2319</td>
<td>Cannot execute a I/O command during emergency stop condition.</td>
<td>Check the emergency stop status.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2320</td>
<td>Function failure. Argument type does not match.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2321</td>
<td>Function failure. Return value does not match to the function.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2322</td>
<td>Function failure. ByRef type does not match.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2323</td>
<td>Function failure. Failed to process the ByRef parameter.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2324</td>
<td>Function failure. Dimension of the ByRef parameter does not match.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2325</td>
<td>Function failure. Cannot use ByRef in an Xqt statement.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2326</td>
<td>Cannot execute a Dll Call statement from the command window.</td>
<td>Execute Dll Call from the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2327</td>
<td>Failed to execute a Dll Call.</td>
<td>Check the DLL. Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2328</td>
<td>Cannot execute the task before connect with RC+.</td>
<td>You need to connect with RC+ before executing the task.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2329</td>
<td>Cannot execute a Eval statement in a Trap Call process.</td>
<td>Check the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2330</td>
<td>Trap failure. Cannot use the argument in Trap Call or Xqt statement.</td>
<td>Check the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2331</td>
<td>Trap failure. Failed to process Trap Goto statement.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2332</td>
<td>Trap failure. Failed to process Trap Goto statement.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2333</td>
<td>Trap failure. Trap is already in process.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2334</td>
<td>Cannot execute a Eval statement in a Trap Finish and Trap Abort process.</td>
<td>Check the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2335</td>
<td>Cannot continue execution and Reset Error in TEACH mode.</td>
<td>Check the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>2336</td>
<td>Cannot use Here statement with a parallel process.</td>
<td>Go Here :Z(0) ! D10; MemOn(1) ! is not executable. Change the program to: P999 = Here; Go P999 Here :Z(0) ! D10; MemOn(1) !</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2340</td>
<td>Value allocated in InBCD function is an invalid BCD value.</td>
<td>Review the program.</td>
<td>Tens digit</td>
<td>Units digit</td>
</tr>
<tr>
<td>2341</td>
<td>Specified value in the OpBCD statement is an invalid BCD value.</td>
<td>Review the program.</td>
<td>The specified</td>
<td></td>
</tr>
<tr>
<td>2342</td>
<td>Cannot change the status for output bit configured as remote output.</td>
<td>Check the remote I/O setting.</td>
<td>I/O number</td>
<td>1: bit, 2: byte, 3: word</td>
</tr>
<tr>
<td>2343</td>
<td>Output time for asynchronous output commanded by On or Off statement is out of the available range.</td>
<td>Review the program.</td>
<td>The specified time</td>
<td></td>
</tr>
<tr>
<td>2344</td>
<td>I/O input/output bit number is out of available range or the board is not installed.</td>
<td>Review the program. Check whether the expansion I/O board and Fieldbus I/O board are correctly detected.</td>
<td>Bit number</td>
<td></td>
</tr>
<tr>
<td>2345</td>
<td>I/O input/output byte number is out of available range or the board is not installed.</td>
<td>Review the program. Check whether the expansion I/O board and Fieldbus I/O board are correctly detected.</td>
<td>Byte number</td>
<td></td>
</tr>
<tr>
<td>2346</td>
<td>I/O input/output word No. is out of available range or the board is not installed.</td>
<td>Review the program. Check whether the expansion I/O board and Fieldbus I/O board are correctly detected.</td>
<td>Word number</td>
<td></td>
</tr>
<tr>
<td>2347</td>
<td>Memory I/O bit number is out of available range.</td>
<td>Review the program.</td>
<td>Bit number</td>
<td></td>
</tr>
<tr>
<td>2348</td>
<td>Memory I/O byte number is out of available range.</td>
<td>Review the program.</td>
<td>Byte number</td>
<td></td>
</tr>
<tr>
<td>2349</td>
<td>Memory I/O word number is out of available range.</td>
<td>Review the program.</td>
<td>Word number</td>
<td></td>
</tr>
<tr>
<td>2350</td>
<td>Command allowed only when virtual I/O mode is active.</td>
<td>The command can be executed only for virtual I/O mode.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2360</td>
<td>File failure. Failed to open the configuration file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2361</td>
<td>File failure. Failed to close the configuration file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2362</td>
<td>File failure. Failed to open the key of the configuration file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2363</td>
<td>File failure. Failed to obtain the string from the configuration file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2364</td>
<td>File failure. Failed to write in the configuration file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2365</td>
<td>File failure. Failed to update the configuration file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2370</td>
<td>The string combination exceeds the maximum string length.</td>
<td>The maximum string length is 255. Review the program.</td>
<td>Combined string length</td>
<td></td>
</tr>
<tr>
<td>2371</td>
<td>String length is out of range.</td>
<td>The maximum string length is 255. Review the program.</td>
<td>The specified length</td>
<td></td>
</tr>
<tr>
<td>2372</td>
<td>Invalid character is specified after the ampersand in the Val function.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>--------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2373</td>
<td>Illegal string specified for the Val function.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2374</td>
<td>String Failure. Invalid character code in the string.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2380</td>
<td>Cannot use &quot; 0 &quot; for Step value in For...Next.</td>
<td>Check the Step value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2381</td>
<td>Relation between For...Next and GoSub is invalid. Going in or out of a For...Next using a Goto statement.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2382</td>
<td>Cannot execute Return while executing OnErr.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2383</td>
<td>Return was used without GoSub. Review the program.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2384</td>
<td>Case or Send was used without Select. Review the program.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2385</td>
<td>Cannot execute EResume while executing GoSub.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2386</td>
<td>EResume was used without OnErr. Review the program.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2400</td>
<td>Curve failure. Failed to open the Curve file.</td>
<td>Reboot the controller. Create a Curve file again.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2401</td>
<td>Curve failure. Failed to allocate the header data of the curve file.</td>
<td>Reboot the controller. Create a Curve file again.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2402</td>
<td>Curve failure. Failed to write the curve file.</td>
<td>Reboot the controller. Create a Curve file again.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2403</td>
<td>Curve failure. Failed to open the curve file.</td>
<td>Reboot the controller. Create a Curve file again.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2404</td>
<td>Curve failure. Failed to update the curve file.</td>
<td>Reboot the controller. Create a Curve file again.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2405</td>
<td>Curve failure. Failed to read the curve file.</td>
<td>Reboot the controller. Create a Curve file again.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2406</td>
<td>Curve failure. Curve file is corrupt.</td>
<td>Reboot the controller. Create a Curve file again.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2407</td>
<td>Curve failure. Specified a file other than the curve file.</td>
<td>Reboot the controller. Create a Curve file again.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2408</td>
<td>Curve failure. Version of the curve file is invalid.</td>
<td>Reboot the controller. Create a Curve file again.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2409</td>
<td>Curve failure. Robot number in the curve file is invalid.</td>
<td>Reboot the controller. Create a Curve file again.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2410</td>
<td>Curve failure. Cannot allocate enough memory for the CVMove statement.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2411</td>
<td>Specified point data in the Curve statement is beyond the maximum count.</td>
<td>The maximum number of points specified in the Curve statement is 200. Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2412</td>
<td>Specified number of output commands in the Curve statement is beyond the maximum count.</td>
<td>The maximum number of output commands specified in the Curve statement is 16. Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2413</td>
<td>Curve failure. Specified internal code is beyond the allowable size in Curve statement.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SPEL+ Error Messages
<table>
<thead>
<tr>
<th>No.</th>
<th>Message</th>
<th>Remedy</th>
<th>Note 1</th>
<th>Note 2</th>
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</thead>
<tbody>
<tr>
<td>2414</td>
<td>Specified continue point data P(\cdot) is beyond the maximum count.</td>
<td>The maximum number of points specified continuously is 200. Review the program.</td>
<td>Start point</td>
<td>End point</td>
</tr>
<tr>
<td>2415</td>
<td>Curve failure. Cannot create the curve file.</td>
<td>Reboot the controller. Create a Curve file again.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2416</td>
<td>Curve file does not exist.</td>
<td>Check whether the specified Curve file name is correct.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2417</td>
<td>Specified continue point data P(\cdot) is beyond the maximum count.</td>
<td>The maximum number of points specified continuously is 200. Review the program.</td>
<td>Start point</td>
<td>End point</td>
</tr>
<tr>
<td>2430</td>
<td>Error message failure. Error message file does not exist.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2431</td>
<td>Error message failure. Failed to obtain the header data of the error message file.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2432</td>
<td>Error message failure. Specified a file other than the error message file.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2433</td>
<td>Error message failure. Error message file is corrupted.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2434</td>
<td>Error message failure. Specified a file other than the error message file.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2435</td>
<td>Error message failure. Version of the error message file is invalid.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2440</td>
<td>File Error. File number is used.</td>
<td>Check the file number.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2441</td>
<td>File Error. Failed to open the file.</td>
<td>Make sure the file exists and you specified the file correctly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2442</td>
<td>File Error. The file is not open.</td>
<td>Open the file in advance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2443</td>
<td>File Error. The file number is being used by another task.</td>
<td>Check the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2444</td>
<td>File Error. Failed to close the file.</td>
<td>Check the file.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2445</td>
<td>File Error. File seek failed.</td>
<td>Review the program. Check the pointer setting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2446</td>
<td>File Error. All file numbers are being used.</td>
<td>Close unnecessary files.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2447</td>
<td>File Error. No read permission.</td>
<td>Use ROpen or UOpen that has read access to the file.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2448</td>
<td>File Error. No write permission.</td>
<td>Use WOpen or UOpen that has write access to the file.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2449</td>
<td>File Error. No binary permission.</td>
<td>Use BOpen that has binary access to the file.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2450</td>
<td>File Error. Failed to access the file.</td>
<td>Check the file.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2451</td>
<td>File Error. Failed to write the file.</td>
<td>Check the file.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2452</td>
<td>File Error. Failed to read the file.</td>
<td>Check the file.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2453</td>
<td>File Error. Cannot execute the command for current disk.</td>
<td>The specified command is not available in the current disk (ChDisk).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2454</td>
<td>File Error. Invalid disk.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2455</td>
<td>File Error. Invalid drive.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2456</td>
<td>File Error. Invalid folder.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>---------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>2460</td>
<td>Database Error. The database number is already being used.</td>
<td>Review the program. Specify the number of other database. Close the database.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2461</td>
<td>Database Error. The database is not open.</td>
<td>Review the program. Open the database.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2462</td>
<td>Database Error. The database number is being used by another task.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2470</td>
<td>Windows Communication Error. Invalid status.</td>
<td>Reboot the Controller. Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2471</td>
<td>Windows Communication Error. Invalid answer.</td>
<td>Reboot the Controller. Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2474</td>
<td>Windows Communication Error. No request.</td>
<td>Reboot the Controller. Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2475</td>
<td>Windows Communication Error. Data buffer overflow.</td>
<td>Reduce the data volume. Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2476</td>
<td>Windows Communication Error. Failed to wait for event.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2477</td>
<td>Windows Communication Error. Invalid folder.</td>
<td>Make sure the specified folder is correct.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2478</td>
<td>Windows Communication Error. Invalid error code.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2500</td>
<td>Specified event condition for Wait is beyond the maximum count.</td>
<td>The maximum number of event conditions is 8. Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2501</td>
<td>Specified bit number in the Ctr function was not setup with a CTRestat statement.</td>
<td>Review the program. The specified bit number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2502</td>
<td>Task number is beyond the maximum count to execute.</td>
<td>The available number of the tasks that can be executed simultaneously is 16. Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2503</td>
<td>Cannot execute Xqt when the specified task number is already executing</td>
<td>Review the program. The specified task number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2504</td>
<td>Task failure. Specified manipulator is already executing a parallel process.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2505</td>
<td>Not enough data for Input statement variable assignment.</td>
<td>Check the content of communication data. Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2506</td>
<td>Specified variable for the Input statement is beyond the maximum count.</td>
<td>For OP, only one variable can be specified. For other devices, up to 32 variables can be specified.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2507</td>
<td>All counters are in use and cannot setup a new counter with CTRestat.</td>
<td>The available number of the counters that can be set simultaneously is 16. Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2508</td>
<td>OnErr failure. Failed to process the OnErr statement.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2509</td>
<td>OnErr failure. Failed to process the OnErr statement.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>2510</td>
<td>Specified I/O label is not defined.</td>
<td>The specified I/O label is not registered. Check the I/O label file.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2511</td>
<td>SyncUnlock statement is used without executing a previous SyncLock statement. Review the program.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2512</td>
<td>SyncLock statement was already executed.</td>
<td>The SyncLock statement cannot be executed for the second time in a row. Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2513</td>
<td>Specified point label is not defined.</td>
<td>The specified point label is not registered. Check the point file.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2514</td>
<td>Failed to obtain the motor on time of the robot.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2515</td>
<td>Failed to configure the date or the time.</td>
<td>Check whether a date and time is set correctly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2516</td>
<td>Failed to obtain the debug data or to initialize.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2517</td>
<td>Failed to convert into date or time.</td>
<td>Check the time set on the controller. Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2518</td>
<td>Larger number was specified for the start point data than the end point data.</td>
<td>Specify a larger number for the end point data than that for the start point data.</td>
<td>Start point</td>
<td>End point</td>
</tr>
<tr>
<td>2519</td>
<td>Specified the format for FmtStr$ can not understand.</td>
<td>Check the format.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2520</td>
<td>File name is too long.</td>
<td>Check whether the specified point file name is correct. The maximum string length of the file name is 32.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2521</td>
<td>File path is too long.</td>
<td>Check whether the specified point file name is correct.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2522</td>
<td>File name is invalid.</td>
<td>Make sure you don’t use improper characters for file name.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2523</td>
<td>The continue process was already executed.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2524</td>
<td>Cannot execute Xqt when the specified trap number is already executing.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2525</td>
<td>Password is invalid.</td>
<td>Check whether a password is set correctly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2526</td>
<td>No wait terms.</td>
<td>Rebuild the project.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2527</td>
<td>Too many variables used for global variable wait.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2528</td>
<td>The variables cannot use global variable wait.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2529</td>
<td>Cannot use Byref if the variables used for global variable wait.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2530</td>
<td>Too many point files.</td>
<td>Check the point file.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2531</td>
<td>The point file is used by another robot.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2532</td>
<td>Cannot calculate the point position because there is undefined data.</td>
<td>Check the point data.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2533</td>
<td>Error on INP or OUTP.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2534</td>
<td>No main function to start on Restart statement.</td>
<td>Without executing main function, Restart is called.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
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</tr>
<tr>
<td>2541</td>
<td>Duplicate parameter.</td>
<td>Same robot number was specified. Check the parameter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2546</td>
<td>Cannot turn on the motor immediately after closing the safeguard.</td>
<td>Wait 1.5 seconds after the safeguard is open, and then execute the motor on.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2900</td>
<td>Failed to open as server to the Ethernet port.</td>
<td>Check whether the Ethernet port is set properly. Check whether the Ethernet cable is connected properly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2901</td>
<td>Failed to open as client to the Ethernet port.</td>
<td>Check whether the Ethernet port is set properly. Check whether the Ethernet cable is connected properly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2902</td>
<td>Failed to read from the Ethernet port.</td>
<td>Check whether the port of communication recipient is not close.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2904</td>
<td>Invalid IP Address was specified.</td>
<td>Review the IP address.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2905</td>
<td>Ethernet failure. No specification of Server/Client.</td>
<td>Review the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2906</td>
<td>Ethernet port was not configured.</td>
<td>Check whether the Ethernet port is set properly. Port number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2907</td>
<td>Ethernet port was already in use by another task.</td>
<td>A single port cannot be used by more than one task. Port number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2908</td>
<td>Cannot change the port parameters while the Ethernet port is open.</td>
<td>The port parameters cannot be changed while the port is open. Port number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2909</td>
<td>Ethernet port is not open.</td>
<td>To use the Ethernet port, execute the OpenNet statement. Port number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2910</td>
<td>Timeout reading from an Ethernet port.</td>
<td>Check the communication. Timeout value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2911</td>
<td>Failed to read from an Ethernet port.</td>
<td>Check the communication.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2912</td>
<td>Ethernet port was already open by another task.</td>
<td>A single port cannot be used by more than one task. Port number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2913</td>
<td>Failed to write to the Ethernet port.</td>
<td>Check whether the Ethernet port is set properly. Check whether the Ethernet cable is connected properly. Port number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2914</td>
<td>Ethernet port connection was not completed.</td>
<td>Check whether the port of communication recipient is open. Port number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2915</td>
<td>Data received from the Ethernet port is beyond the limit of one line.</td>
<td>The maximum length of a line is 255 bytes. The number of bytes in a received line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2920</td>
<td>RS-232C failure. RS-232C port process error.</td>
<td>Check whether the RS-232C board is correctly detected.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2922</td>
<td>Failed to read from the RS-232C port. Overrun error.</td>
<td>Slow down data transfer or reduce data size.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2926</td>
<td>The RS-232C port hardware is not installed.</td>
<td>Check whether the RS-232C board is correctly detected. Port number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2927</td>
<td>RS-232C port is already open by another task.</td>
<td>A single port cannot be used by more than one task. Port number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2928</td>
<td>Cannot change the port parameters while the RS-232C port is open.</td>
<td>The port parameters cannot be changed while the port is open. Port number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>2929</td>
<td>RS-232C port is not open.</td>
<td>To use the RS-232C port, execute the OpenCom statement.</td>
<td>Port number</td>
<td></td>
</tr>
<tr>
<td>2930</td>
<td>Timeout reading from the RS-232C port.</td>
<td>Check the communication.</td>
<td></td>
<td>Timeout value</td>
</tr>
<tr>
<td>2931</td>
<td>Failed to read from the RS-232C port.</td>
<td>Check the communication.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2932</td>
<td>RS-232C port is already open by another task.</td>
<td>A single port cannot be used by more than one task.</td>
<td>Port number</td>
<td></td>
</tr>
<tr>
<td>2933</td>
<td>Failed to write to the RS-232C port.</td>
<td>Check the communication.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2934</td>
<td>RS-232C port connection not completed.</td>
<td>Check the RS-232C port.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2935</td>
<td>Data received from the RS-232C port is beyond the limit of one line.</td>
<td>The maximum length of a line is 255 bytes.</td>
<td>The number of bytes in a received line</td>
<td></td>
</tr>
<tr>
<td>2950</td>
<td>Daemon failure. Failed to create the daemon thread.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2951</td>
<td>Daemon failure. Timeout while creating the daemon thread.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2952</td>
<td>TEACH/AUTO switching key input signal failure was detected.</td>
<td>Set the TP key switch to TEACH or AUTO properly. Check whether the TP is connected properly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2953</td>
<td>ENABLE key input signal failure was detected.</td>
<td>Check whether the TP is connected properly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2954</td>
<td>Relay weld was detected.</td>
<td>Overcurrent probably occurred due to short-circuit failure. Investigate the cause of the problem and take necessary measures and then replace the DPB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2955</td>
<td>Temperature of regeneration resistor was higher than the specified temperature.</td>
<td>Check whether the filter is not clogged up and the fan does not stop. If there is no problem on the filter and fan, replace the regenerative module.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2970</td>
<td>MNG failure. Area allocate error.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2971</td>
<td>MNG failure. Real time check error.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2972</td>
<td>MNG failure. Standard priority error.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2973</td>
<td>MNG failure. Boost priority error.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2974</td>
<td>MNG failure. Down priority error.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2975</td>
<td>MNG failure. Event wait error.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2976</td>
<td>MNG failure. Map close error.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2977</td>
<td>MNG failure. Area free error.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2978</td>
<td>MNG failure. AddIOMem error.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2979</td>
<td>MNG failure. AddInPort error.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2980</td>
<td>MNG failure. AddOutPort error.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2981</td>
<td>MNG failure. AddInMemPort error.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2982</td>
<td>MNG failure. AddOutMemPort error.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2983</td>
<td>MNG failure. IntervalOutBit error.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2984</td>
<td>MNG failure. CtrReset error.</td>
<td>Reboot the Controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td></td>
<td></td>
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<tr>
<td>-----</td>
<td>-------------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
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</tr>
<tr>
<td>2998</td>
<td>AbortMotion attempted when robot was not moving</td>
<td>See Help for AbortMotion.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2999</td>
<td>AbortMotion attempted when robot was moving</td>
<td>See Help for AbortMotion.</td>
<td></td>
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</tr>
<tr>
<td>3000</td>
<td>OBJ file size is large. TP1 may not be able to build this project.</td>
<td>-</td>
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</tr>
<tr>
<td>3001</td>
<td>The number of variable which is using Wait command are near the maximum allowed</td>
<td>-</td>
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</tr>
<tr>
<td>3002</td>
<td>DLL file cannot be found.</td>
<td>-</td>
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<tr>
<td>3003</td>
<td>DLL function cannot be found.</td>
<td>-</td>
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</tr>
<tr>
<td>3050</td>
<td>Main function is not defined.</td>
<td>Declare a Main function.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3051</td>
<td>Function does not exist.</td>
<td>Declare an unresolved function.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3052</td>
<td>Variable does not exist.</td>
<td>Declare an unresolved variable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3100</td>
<td>Syntax error</td>
<td>Correct the syntax error.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3101</td>
<td>Parameter count error.</td>
<td>The number of parameters is excess or deficiency. Correct the parameters.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3102</td>
<td>File name length is beyond the maximum allowed.</td>
<td>Shorten the file name.</td>
<td></td>
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</tr>
<tr>
<td>3103</td>
<td>Duplicate function definition.</td>
<td>Change the function name.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3104</td>
<td>Duplicate variable definition <code>'**'</code>.</td>
<td>Change the variable name.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3105</td>
<td>Global and Global Preserve variables cannot be defined inside a function block</td>
<td>Declare the Global and Global Preserve variables outside the function block.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3106</td>
<td>An undefined function was specified.</td>
<td>Specify a valid function name.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3107</td>
<td>Both While and Until for Do...Loop was specified.</td>
<td>The While/Until statement is specified for both Do statement and Loop statement. Delete either While/Until statement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3108</td>
<td>Specified line number or label <code>'**'</code> does not exist.</td>
<td>Set the line label.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3109</td>
<td>Overflow error</td>
<td>The direct numerical specification overflows. Reduces the numeric value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3110</td>
<td>An undefined variable was specified <code>'**'</code>.</td>
<td>There is an undefined variable. Declare the variable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3111</td>
<td>Specified variable is not an array variable.</td>
<td>Specify the array variable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3112</td>
<td>Cannot change the dimensions of the array variable.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3113</td>
<td>Specified elements of the array variable are beyond the maximum value. (Not in use)</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3114</td>
<td>Specified Next variable does not match the specified For variable.</td>
<td>Correct the variable name.</td>
<td></td>
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<tr>
<td>3115</td>
<td>Cannot use a point expression in the first argument.</td>
<td>Specify a single point for the point flag setting. Do not specify a point expression.</td>
<td></td>
<td></td>
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<tr>
<td>3116</td>
<td>Array number of dimensions does not match the declaration.</td>
<td>Check the number of array dimensions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3117</td>
<td>File cannot be found.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3118</td>
<td>Corresponding EndIf cannot be found.</td>
<td>The number of EndIf statements is not enough. Add the EndIf.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3119</td>
<td>Corresponding Loop cannot be found.</td>
<td>The number of Loop statements is not enough. Add the Loop.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>3120</td>
<td>Corresponding Next cannot be found.</td>
<td>The number of Next statements is not enough. Add the Next.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3121</td>
<td>Corresponding Send cannot be found.</td>
<td>The number of Send statements is not enough. Add the Send.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3122</td>
<td>Cannot specify the second parameter. (Not in use)</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3123</td>
<td>On/Off statements are beyond the maximum count.</td>
<td>An upper limit is set on the number of On/Off statements. Check the upper limit and correct the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3124</td>
<td>Point number is beyond the maximum count.</td>
<td>An upper limit is set on the available number of points. Check the upper limit and correct the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3125</td>
<td>Corresponding If cannot be found.</td>
<td>The number of EndIf statements is too many. Delete the unnecessary EndIf.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3126</td>
<td>Corresponding Do cannot be found.</td>
<td>The number of Loop statements is too many. Delete the unnecessary Loop.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3127</td>
<td>Corresponding Select cannot be found.</td>
<td>The number of Send statements is too many. Delete the unnecessary Send.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3128</td>
<td>Corresponding For cannot be found.</td>
<td>The number of Next statements is too many. Delete the unnecessary Next.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3129</td>
<td>** cannot be used as the first character of an identifier.</td>
<td>Change the first character of the identifier to an alphabetic character.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3130</td>
<td>Cannot specify Rot parameter.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3131</td>
<td>Cannot specify Ecp parameter.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3132</td>
<td>Cannot specify Arch parameter.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3133</td>
<td>Cannot specify LimZ parameter.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3134</td>
<td>Cannot specify Sense parameter.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3135</td>
<td>Invalid parameter is specified.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3136</td>
<td>Cannot use #include.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3137</td>
<td>Cannot specify the array variable subscript.</td>
<td>The array variable subscript cannot be specified.</td>
<td></td>
<td></td>
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<tr>
<td>3138</td>
<td>ByRef was not specified on Function declaration.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3139</td>
<td>Cannot execute the Xqt statement for a function that needs a ByRef parameter.</td>
<td>The Xqt statement cannot be executed for a function needing a ByRef parameter. Delete the ByRef parameter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3140</td>
<td>Cannot execute the Redim statement for a ByRef variable.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3141</td>
<td>OBJ file is corrupt.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3142</td>
<td>OBJ file size is beyond the available size after compiling.</td>
<td>The compilation result exceeds the limit value. Divide the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3143</td>
<td>Ident length is beyond the available size.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3144</td>
<td>** already used for a function name.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3145</td>
<td>** already used for a Global Preserve variable.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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<tr>
<td>------</td>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>3146</td>
<td>'***' already used for a Global variable.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3147</td>
<td>'***' already used for a Module variable.</td>
<td></td>
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<tr>
<td>3148</td>
<td>'***' already used for a Local variable.</td>
<td></td>
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<tr>
<td>3149</td>
<td>'***' already used for a I/O label.</td>
<td></td>
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</tr>
<tr>
<td>3150</td>
<td>'***' already used for a User Error label.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3151</td>
<td>Cannot use a function parameter.</td>
<td>Argument cannot be specified for the function that is executed by the Trap statement.</td>
<td></td>
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</tr>
<tr>
<td>3152</td>
<td>Over elements value.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3153</td>
<td>Parameter type mismatch.</td>
<td></td>
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<tr>
<td>3154</td>
<td>'***' is not Input Bit label.</td>
<td></td>
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<tr>
<td>3155</td>
<td>'***' is not Input Byte label.</td>
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<tr>
<td>3156</td>
<td>'***' is not Input Word label.</td>
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<tr>
<td>3157</td>
<td>'***' is not Output Bit label.</td>
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</tr>
<tr>
<td>3158</td>
<td>'***' is not Output Byte label.</td>
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</tr>
<tr>
<td>3159</td>
<td>'***' is not Output Word label.</td>
<td></td>
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</tr>
<tr>
<td>3160</td>
<td>'***' is not Memory Bit label.</td>
<td></td>
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<tr>
<td>3161</td>
<td>'***' is not Memory Byte label.</td>
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<tr>
<td>3162</td>
<td>'***' is not Memory Word label.</td>
<td></td>
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</tr>
<tr>
<td>3163</td>
<td>Too many function arguments.</td>
<td></td>
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<tr>
<td>3164</td>
<td>Cannot compare Boolean value.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3165</td>
<td>Cannot use Boolean value in the expression.</td>
<td></td>
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</tr>
<tr>
<td>3166</td>
<td>Cannot compare between Boolean and expression.</td>
<td></td>
<td></td>
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<tr>
<td>3167</td>
<td>Cannot store Boolean value to the numeric variable.</td>
<td></td>
<td></td>
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<tr>
<td>3168</td>
<td>Cannot store numeric value to the Boolean variable.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3169</td>
<td>Undefined I/O label was specified.</td>
<td></td>
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</tr>
<tr>
<td>3170</td>
<td>Invalid condition expression was specified.</td>
<td></td>
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</tr>
<tr>
<td>3171</td>
<td>Cannot compare between numeric value and string.</td>
<td></td>
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</tr>
<tr>
<td>3172</td>
<td>Cannot use keyword for the variable name.</td>
<td></td>
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</tr>
<tr>
<td>3173</td>
<td>'***' already used for a line label.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3174</td>
<td>Duplicate line number or label (**).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3175</td>
<td>Undefined Point label was specified.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3176</td>
<td>An undefined variable was specified.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3177</td>
<td>'***' already used for a Point label.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3178</td>
<td>Cannot use the result number.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3179</td>
<td>String literal is beyond the available length.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3180</td>
<td>Cannot change a calibration property value with the VSet command.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3181</td>
<td>Array variable should be used with ByRef.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3182</td>
<td>Subscription was not specified.</td>
<td></td>
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</tr>
<tr>
<td>3183</td>
<td>Parameter can not be omitted.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3184</td>
<td>RSRV parameter cannot use with tracking command.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3185</td>
<td>Cannot use Queue data.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------------------------</td>
<td>--------</td>
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</tr>
<tr>
<td>3186</td>
<td>Combination between Queue and Point data does not match.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3187</td>
<td>Invalid Point flag value was specified.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3188</td>
<td>Call command cannot be used in parallel processing.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3189</td>
<td>Local variables cannot be used with the Wait command.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3190</td>
<td>Array variables cannot be used with the Wait command.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3191</td>
<td>Real variables cannot be used with the Wait command.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3192</td>
<td>String variables cannot be used with the Wait command.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3193</td>
<td>Vision object name is missing.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3194</td>
<td>Cannot use Boolean value for the timeout value.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3195</td>
<td>(not used)</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3196</td>
<td>Fend is not there.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3197</td>
<td>Numeric variable name cannot use '$'.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3198</td>
<td>String variable should has '$'.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3199</td>
<td>Invalid object is specified.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3200</td>
<td>Value is missing.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3201</td>
<td>Expected ' ,' :</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3202</td>
<td>Expected ' ( '</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3203</td>
<td>Expected ' ) )'</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3204</td>
<td>Identifier is missing.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3205</td>
<td>Point is not specified.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3206</td>
<td>Event condition expression is missing.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3207</td>
<td>Formula is missing.</td>
<td>-</td>
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</tr>
<tr>
<td>3208</td>
<td>String formula is missing.</td>
<td>-</td>
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</tr>
<tr>
<td>3209</td>
<td>Point formula is missing.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3210</td>
<td>Line label was not specified.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3211</td>
<td>Variable was not specified.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3212</td>
<td>Corresponding Fend cannot be found.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3213</td>
<td>Expected ' : : '</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3214</td>
<td>True/False was not specified.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3215</td>
<td>On/Off was not specified.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3216</td>
<td>High/Low was not specified.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3217</td>
<td>Input bit label was not specified.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3218</td>
<td>Input byte label was not specified.</td>
<td>-</td>
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</tr>
<tr>
<td>3219</td>
<td>Input word label was not specified.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>3220</td>
<td>Output bit label was not specified.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3221</td>
<td>Output byte label was not specified.</td>
<td>-</td>
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<td>3222</td>
<td>Output word label was not specified.</td>
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<td>3223</td>
<td>Memory bit label was not specified.</td>
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<td>3224</td>
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<td>User error label was not specified.</td>
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<td>3227</td>
<td>Function name was not specified.</td>
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<td>3228</td>
<td>Variable type was not specified.</td>
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<tr>
<td>3229</td>
<td>Invalid Trap statement parameter. Use Goto, Call, or Xqt.</td>
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</tr>
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<td>3230</td>
<td>Expected For/Do/Function.</td>
<td>-</td>
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</tr>
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<td>3231</td>
<td>Above/Below was not specified.</td>
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<td>3232</td>
<td>Rightly/Leftly was not specified.</td>
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</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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<tr>
<td>-----</td>
<td>----------------------------------------------</td>
<td>-----------------</td>
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<tr>
<td>3233</td>
<td>NoFlip/Flip was specified.</td>
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<tr>
<td>3234</td>
<td>Port number was not specified.</td>
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<tr>
<td>3235</td>
<td>String type variable was not specified.</td>
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<td>3236</td>
<td>RS-232C port number was not specified.</td>
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</tr>
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<td>3237</td>
<td>Network communication port number was not specified.</td>
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<td>Communication speed was not specified.</td>
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<td>Data bit number was not specified.</td>
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<td>Terminator was not specified.</td>
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<td>3245</td>
<td>None was not specified.</td>
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<td>3246</td>
<td>Parameter ‘O’ or ‘C’ was not specified.</td>
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<td>3247</td>
<td>NumAxes parameter was not specified.</td>
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<td>3248</td>
<td>J4Flag value (0-1) was not specified.</td>
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<td>3249</td>
<td>J6Flag value (0-127) was not specified.</td>
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<td>Device ID was not specified.</td>
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<td>I/O type was not specified.</td>
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<td>ByRef was not specified.</td>
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<td>Variable type was not specified.</td>
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<tr>
<td>3257</td>
<td>Condition expression does not return Boolean value.</td>
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<td>3258</td>
<td>RS232C port number was not specified.</td>
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<td>3259</td>
<td>Network communication port number was not specified.</td>
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<td>Expected ‘’.</td>
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<td>3262</td>
<td>Vision Sequence Name was not specified.</td>
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<tr>
<td>3263</td>
<td>Vision Sequence Name or Calibration Name was not specified.</td>
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<tr>
<td>3264</td>
<td>Vision Property Name or Result Name was not specified.</td>
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<td>3265</td>
<td>Vision Property Name, Result Name or Object Name was not specified.</td>
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<td>Vision Calibration Property Name was not specified.</td>
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<td>Task type was not specified.</td>
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<td>3268</td>
<td>Form name was not specified.</td>
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<tr>
<td>3269</td>
<td>Property Name or Control Name was not specified.</td>
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<td>3270</td>
<td>Property Name was not specified.</td>
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<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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<td>-----</td>
<td>------------------------------------------------</td>
<td>---------------------------------------------</td>
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<td>3272</td>
<td>BorderStyle was not specified.</td>
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<td>DropDownListStyle was not specified.</td>
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<td>EventTaskType was not specified.</td>
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<td>FormBorderStyle was not specified.</td>
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<td>ScrollBars was not specified.</td>
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<td>SizeMode was not specified.</td>
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<td>3280</td>
<td>StartPosition was not specified.</td>
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<td>3283</td>
<td>TextAlign was not specified.</td>
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<td>WindowState was not specified.</td>
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<td>3285</td>
<td>J1FLAG was not specified.</td>
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<td>3286</td>
<td>J2FLAG was not specified.</td>
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<td>3287</td>
<td>robotID was not specified.</td>
<td>-</td>
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<tr>
<td>3288</td>
<td>robotID/All was not specified.</td>
<td>-</td>
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<tr>
<td>3289</td>
<td>areaID was not specified.</td>
<td>-</td>
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<td>3290</td>
<td>File number was not specified.</td>
<td>-</td>
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<td>3291</td>
<td>MemBlock ID was not specified.</td>
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<tr>
<td>3292</td>
<td>Database type was not specified.</td>
<td>-</td>
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<tr>
<td>3293</td>
<td>Disk type was not specified.</td>
<td>-</td>
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<td>3294</td>
<td>Variable type was not specified.</td>
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<td>3295</td>
<td>Conveyor area ID was not specified.</td>
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<tr>
<td>3296</td>
<td>Database file number was not specified.</td>
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<td>3297</td>
<td>Vision calibration name was not specified.</td>
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<td>3298</td>
<td>Vision object type ID was not specified.</td>
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<td>3299</td>
<td>Shutdown mode ID was not specified.</td>
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<tr>
<td>3300</td>
<td>External definition symbol was included. (Not in use)</td>
<td>-</td>
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<tr>
<td>3301</td>
<td>Version of linked OBJ file does not match.</td>
<td>Not all project files are complied in the same version. Perform the rebuild.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3302</td>
<td>Linked OBJ file does not match the compiled I/O label.</td>
<td>The project configuration has been changed. Perform the rebuild.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3303</td>
<td>Linked OBJ file does not match the compiled user error label.</td>
<td>The project configuration has been changed. Perform the rebuild.</td>
<td></td>
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<tr>
<td>3304</td>
<td>Linked OBJ file does not match the compiled compile option.</td>
<td>The project configuration has been changed. Perform the rebuild.</td>
<td></td>
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<td>3305</td>
<td>Linked OBJ file does not match the compiled link option.</td>
<td>The project configuration has been changed. Perform the rebuild.</td>
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<td>3306</td>
<td>Linked OBJ file does not match the compiled SPEL option.</td>
<td>The project configuration has been changed. Perform the rebuild.</td>
<td></td>
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<td>3307</td>
<td>Duplicate function.</td>
<td>The same function name is used for more than one file.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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<tr>
<td>------</td>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>3308</td>
<td>Duplicate global preserve variable.</td>
<td>The same global preserve variable name is used for more than one file.</td>
<td></td>
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</tr>
<tr>
<td>3309</td>
<td>Duplicate global variable.</td>
<td>The same global variable name is used for more than one file.</td>
<td></td>
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</tr>
<tr>
<td>3310</td>
<td>Duplicate module variable.</td>
<td>The same module variable name is used for more than one file.</td>
<td></td>
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</tr>
<tr>
<td>3311</td>
<td>File cannot be found.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3312</td>
<td>OBJ file is corrupt.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3313</td>
<td>The specified file name includes character(s) that cannot be used.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3314</td>
<td>Cannot open the file.</td>
<td>The file is used for other application. Quit the other application.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3315</td>
<td>'*' is already used for the function name.</td>
<td></td>
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</tr>
<tr>
<td>3316</td>
<td>'*' is already used for the global preserve variable.</td>
<td></td>
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</tr>
<tr>
<td>3317</td>
<td>'*' is already used for the global variable.</td>
<td></td>
<td></td>
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<tr>
<td>3318</td>
<td>'*' is already used for the module variable.</td>
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<td>3319</td>
<td>Dimension of the array variable does not match the declaration.</td>
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<tr>
<td>3320</td>
<td>Return value type of the function does not match the declaration.</td>
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<tr>
<td>3321</td>
<td>'*' is already used with function name.</td>
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<tr>
<td>3322</td>
<td>'*' is already used with Global Preserve name.</td>
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<tr>
<td>3323</td>
<td>'*' is already used with Global name.</td>
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<tr>
<td>3324</td>
<td>'*' is already used with Module name.</td>
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<tr>
<td>3325</td>
<td>'*' is already used with Local name.</td>
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<tr>
<td>3326</td>
<td>The number of parameters does not match the declaration.</td>
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<tr>
<td>3327</td>
<td>ByVal was not specified on Function declaration on parameter '**'.</td>
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</tr>
<tr>
<td>3328</td>
<td>ByVal was not specified on parameter '**'.</td>
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</tr>
<tr>
<td>3329</td>
<td>Parameter '**' type mismatch.</td>
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<tr>
<td>3330</td>
<td>Linked OBJ file does not match the compiled Vision Project.</td>
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<tr>
<td>3331</td>
<td>OBJ file size is beyond the available size after linking.</td>
<td>The OBJ file size exceeds the limit value. Reduce the program.</td>
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<tr>
<td>3332</td>
<td>Variable '%s' is redefined.</td>
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<tr>
<td>3333</td>
<td>Linked OBJ file does not match the compiled GUI Builder Project.</td>
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<tr>
<td>3334</td>
<td>The number of variable which is using Wait command are beyond the maximum allowed.</td>
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<tr>
<td>3335</td>
<td>Call cannot use in the parallel processing.</td>
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<tr>
<td>3336</td>
<td>Variable was redefined.</td>
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<td>3400</td>
<td>Dialog ID was not specified.</td>
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<td>3401</td>
<td>Main function name was not specified.</td>
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</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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<tr>
<td>-------</td>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
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<td>3402</td>
<td>Vision object name was not specified.</td>
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<td>3403</td>
<td>Recover mode ID was not specified.</td>
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<td>3404</td>
<td>Trap condition was not specified.</td>
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<td>3405</td>
<td>DialogResult was not specified.</td>
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<td>3406</td>
<td>MsgBox_Type was not specified.</td>
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<td>3407</td>
<td>Byte type array variable was not specified.</td>
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<td>3408</td>
<td>Single array variable was not specified.</td>
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<td>3409</td>
<td>Point list is not specified.</td>
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<td>3410</td>
<td>Code type is not specified.</td>
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<td>3411</td>
<td>Edge type is not specified.</td>
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<td>3412</td>
<td>ECC type is not specified.</td>
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<td>3413</td>
<td>ImageColor type is not specified.</td>
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<td>3414</td>
<td>Point type is not specified.</td>
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<td>3415</td>
<td>Reference type is not specified.</td>
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<td>3416</td>
<td>Edge type is not specified.</td>
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<td>3417</td>
<td>Port number is not specified.</td>
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</tr>
<tr>
<td>3418</td>
<td>Axis is not specified.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3419</td>
<td>CompareType is not specified.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3420</td>
<td>Integer or Short type array variable is only available.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3426</td>
<td>Singularity avoidance mode was not specified.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3432</td>
<td>Point is not specified. Or formula is missing.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3500</td>
<td>Duplicate macro in #define statement.</td>
<td>Another macro with the same name has been defined.</td>
<td>Change the macro name.</td>
<td></td>
</tr>
<tr>
<td>3501</td>
<td>Macro name was not specified.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3502</td>
<td>Include file name cannot be found.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3503</td>
<td>Specified include file is not in the project.</td>
<td>The include file that is not registered in the project configuration is specified. Add the include file to the project configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3504</td>
<td>Parameter of the macro function does not match to the declared.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3505</td>
<td>Macro has a circular reference.</td>
<td>The macro has a circular reference. Correct the circular reference.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3506</td>
<td>#define, #ifdef, ifndef, else, endif, undef and variable declaration statements are only valid in an include file.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3507</td>
<td>Over #ifdef or ifndef nesting level.</td>
<td>Reduce the nesting level to under the limited value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3508</td>
<td>Cannot find corresponding #ifdef or ifndef.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3509</td>
<td>No #endif found for #ifdef or ifndef.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3510</td>
<td>Cannot obtain the macro buffer.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3550</td>
<td>Parameter for the macro function was not specified.</td>
<td>The macro declared as a macro function is called without argument.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3600</td>
<td>Tracking motion command cannot use Sense parameter.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>---------</td>
<td>--------</td>
</tr>
<tr>
<td>3601</td>
<td>Parameter type is mismatch for the external function ' ** '</td>
<td>Check all statements where this function is called in this file.</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3602</td>
<td>The specified motion command cannot use LJM parameter.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3603</td>
<td>InReal function cannot be used with Wait statement.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3800</td>
<td>Compile process aborted.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3801</td>
<td>Link process aborted.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3802</td>
<td>Compile process aborted. Compile errors reached the maximum count.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3803</td>
<td>Link process aborted. Link errors reached the maximum count.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3804</td>
<td>Specified command cannot be executed from the Command window.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3805</td>
<td>Specified command can only be executed from the Command window.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3806</td>
<td>Specified function cannot be executed from the Command window.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3807</td>
<td>Specified command cannot be executed in the Gripper function.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3808</td>
<td>Specified syntax cannot be used in the current version.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3809</td>
<td>Module variables cannot be used in the command window.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3810</td>
<td>Too many point files.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3811</td>
<td>Too many registered points.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3850</td>
<td>File not found.</td>
<td></td>
<td>-</td>
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</tr>
<tr>
<td>3851</td>
<td>Point file not found.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3852</td>
<td>I/O label file not found.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3853</td>
<td>User error label file not found.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3900</td>
<td>Uncommon error. Cannot obtain the internal communication buffer.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3901</td>
<td>Buffer size is not enough.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3910</td>
<td>Undefined command was specified.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3911</td>
<td>Cannot enter the file name in the file name buffer.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3912</td>
<td>Cannot obtain the internal buffer.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3913</td>
<td>Cannot set priority.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3914</td>
<td>Invalid ICode.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3915</td>
<td>Invalid ICode.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3916</td>
<td>Invalid ICode.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3917</td>
<td>Invalid ICode.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3918</td>
<td>Invalid ICode.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3919</td>
<td>Invalid ICode.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3920</td>
<td>Invalid ICode.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3921</td>
<td>Invalid ICode.</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>4001</td>
<td>Arm reached the limit of motion range.</td>
<td>Check the point to move, current point, and Range setting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4002</td>
<td>Specified value is out of allowable range.</td>
<td>Review the setting parameters.</td>
<td></td>
<td>The parameter causing the error</td>
</tr>
<tr>
<td>4003</td>
<td>Motion device driver failure. Communication error within the motion control module.</td>
<td>Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
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<td>-----</td>
<td>-------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>4004</td>
<td>Motion device driver failure. Event waiting error within the motion control module.</td>
<td>Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4005</td>
<td>Current point position is above the specified LimZ value.</td>
<td>Lower the Z axis. Increase the specified LimZ value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4006</td>
<td>Target point position is above the specified LimZ value.</td>
<td>Lower the Z coordinate position of the target point. Increase the specified LimZ value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4007</td>
<td>Coordinates conversion error. The end/mid point is out of the motion area. Jogging to the out of the motion area.</td>
<td>Check whether the coordinate out of the motion range is not specified.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4008</td>
<td>Current point position or specified LimZ value is out of motion range.</td>
<td>Change the specified LimZ value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4009</td>
<td>Motion device driver failure. Timeout error within motion control module.</td>
<td>Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4010</td>
<td>Specified Local coordinate was not defined.</td>
<td>Define the Local coordinate system.</td>
<td>Local number</td>
<td></td>
</tr>
<tr>
<td>4011</td>
<td>Arm reached the limit of XY motion range specified by XYLim statement.</td>
<td>Check the area limited by the XYLim statement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4012</td>
<td>Upper limit value of Box is smaller than the lower limit value. Change the upper and lower limit values.</td>
<td>Set the upper limit value to be larger than the lower limit value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4013</td>
<td>Motion control module internal calculation error.</td>
<td>Execute MCAL. Make sure the MCOdr is set for the joint connected to the PG board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4014</td>
<td>MCAL was not completed.</td>
<td>Execute MCAL. Make sure the MCOdr is set for the joint connected to the PG board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4016</td>
<td>SFree statement was attempted for prohibited joint(s).</td>
<td>Due to robot mechanistic limitation, setting some joint(s) to servo free status is prohibited. Check the robot specifications.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4018</td>
<td>Communication error within the motion control module. Check sum error.</td>
<td>Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4021</td>
<td>Point positions used to define the Local are too close.</td>
<td>Set the distance between points more than 1μm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4022</td>
<td>Point coordinate data used to define the Local is invalid.</td>
<td>Match the coordinate data for the points to be specified.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4023</td>
<td>Cannot execute when the motor is in the off state.</td>
<td>Turn the motor power ON and then execute.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4024</td>
<td>Cannot complete the arm positioning using the current Fine specification.</td>
<td>Check whether the robot does not generate vibration or all parts and screws are secured firmly. Increase the Fine setting value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4025</td>
<td>Cannot execute a motion command during emergency stop condition.</td>
<td>Clear the emergency stop condition and execute the motion command.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4026</td>
<td>Communication error within the motion control module. Servo I/F failure.</td>
<td>Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4028</td>
<td>Communication error within the motion control module. Device driver status failure.</td>
<td>Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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</tr>
<tr>
<td>4030</td>
<td>Buffer for the average torque calculation has overflowed. Shorten the time interval from Atclr to Atrq.</td>
<td>Shorten the time interval from Atclr to Atrq less than about two minutes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4031</td>
<td>Cannot execute a motion command when the motor is in the off state.</td>
<td>Turn the motor power ON and then execute the motion command.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4032</td>
<td>Cannot execute a motion command when one or more joints are in SFree state.</td>
<td>Set all joints to the SLock state and execute the motion command.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4033</td>
<td>The specified command is not supported for the joints with Pulse Generator Board.</td>
<td>The specified command is not permitted for the joints with PG board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4034</td>
<td>Specified command is not supported for this manipulator model.</td>
<td>Use the Jump3 and Jump3CP statements.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4035</td>
<td>Only the tool orientation was attempted to be changed by the CP statement.</td>
<td>Set a move distance between points. Use the ROT modifier, SpeedR statement, and AccelR statement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4036</td>
<td>Rotation speed of tool orientation by the CP statement is too fast.</td>
<td>Decrease the setting values for the SpeedS and AccelS statements. Use the ROT modifier, SpeedR statement, and AccelR statement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4037</td>
<td>The point attribute of the current and target point positions differ for executing a CP control command.</td>
<td>Match the point attribute.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4038</td>
<td>Two point positions are too close to execute the Arc statement.</td>
<td>Set the distance between points more than 1μm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4039</td>
<td>Three point positions specified by the Arc statement are on a straight line.</td>
<td>Use the Move statement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4041</td>
<td>Motion command was attempted to the prohibited area at the backside of the robot.</td>
<td>Check the robot motion range.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4042</td>
<td>Motion device driver failure. Cannot detect the circular format interruption.</td>
<td>Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4043</td>
<td>Specified command is not supported for this manipulator model or this joint type.</td>
<td>Remove the unsupported command from the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4044</td>
<td>Curve failure. Specified curve form is not supported.</td>
<td>Create a Curve file again with the Curve statement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4045</td>
<td>Curve failure. Specified mode is not supported.</td>
<td>Specify the Curve mode properly. Create a Curve file again with the Curve statement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4046</td>
<td>Curve failure. Specified coordinate number is out of the allowable range.</td>
<td>The number of the available coordinate axes is 2, 3, 4, and 6. Create a Curve file again with the Curve statement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4047</td>
<td>Curve failure. Point data was not specified.</td>
<td>Create a Curve file again with the Curve statement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4048</td>
<td>Curve failure. Parallel process was specified before the point designation.</td>
<td>Create a Curve file again with the Curve statement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4049</td>
<td>Curve failure. Number of parallel processes is out of the allowable range.</td>
<td>Create a Curve file again with the Curve statement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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</tr>
<tr>
<td>4050</td>
<td>Curve failure. Number of points is out of the allowable range.</td>
<td>The number of available point numbers differs according to the curve form. Check the number of points again.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4051</td>
<td>Curve failure. Local attribute and the point attribute of all specified points do not match.</td>
<td>Match the local and point flag for all the specified points.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4052</td>
<td>Curve failure. Not enough memory to format the curve file.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4053</td>
<td>Curve failure. Failed to format the curve file.</td>
<td>Review the point data. Check whether adjacent two points do not overlap on the specified point line.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4054</td>
<td>Curve failure. Curve file error</td>
<td>The Curve file is broken. Create a Curve file again with the Curve statement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4055</td>
<td>Curve failure. No distance for curve file movement.</td>
<td>Review the point data.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4056</td>
<td>Curve failure. Point positions for the Curve statement are too close.</td>
<td>Set the distance between two points adjacent to the specified point more than 0.001 mm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4058</td>
<td>Prohibited command while tracking was executed.</td>
<td>Remove the prohibited command from the program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4059</td>
<td>Executed encoder reset command while the motor is in the on state.</td>
<td>Turn the motor power OFF.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4060</td>
<td>Executed an invalid command while the motor is in the on state.</td>
<td>Turn the motor power OFF.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4061</td>
<td>Specified parameter is in use.</td>
<td>You attempted to clear the currently specified Arm and Tool. Select other Arm and Tool and execute.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4062</td>
<td>Orientation variation is over 360 degrees.</td>
<td>You attempted to rotate the joint #J6 more than 360 degrees with a CP motion command.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4063</td>
<td>Orientation variation of adjacent point is over 90 degrees.</td>
<td>On the specified point line by the Curve statement, set the orientation variation of U, V, and W coordinate values between two adjacent points to under 90 degrees.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4064</td>
<td>Cannot execute the orientation correction automatically.</td>
<td>On the specified point line, a curve cannot be created by automatic orientation correction. Change the specified point line so that the joint #J6 orientation variation decreases.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4065</td>
<td>Attempt to revolve J6 one rotation with the same orientation in CP statement.</td>
<td>You attempted to rotate the joint #J6 more than 360 degrees with a CP motion command. You attempted to revolve the joint 6 one rotation with the same as motion start orientation. Change the target point so that the joint #J6 revolves less than one rotation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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</tr>
<tr>
<td>4066</td>
<td>Motion command was attempted in the prohibited area depended on joint combination.</td>
<td>You attempted to move the joints to the robot's interference limited area.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4068</td>
<td>ROT modifier parameter was specified for the CP motion command without orientation rotation.</td>
<td>Delete the ROT from the CP motion command.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4069</td>
<td>Specified ECP without selecting ECP in CP statement.</td>
<td>Specify a valid ECP.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4070</td>
<td>Specified ECP number does not match the ECP number used in curve file creation.</td>
<td>Specify a valid ECP.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4071</td>
<td>Attempted motion command during electronic brake lock condition.</td>
<td>Release the electromagnetic brake.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4072</td>
<td>Initialization failure. Hardware monitor was not initialized.</td>
<td>Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4073</td>
<td>Orientation variation of adjacent point is over 90 degrees.</td>
<td>Any of U, V, or W changes 90 degrees or more. Change the point or the orientation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4074</td>
<td>Motor type does not match the current robot setting.</td>
<td>Check whether the specified robot model is connected.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4075</td>
<td>ECP Option is not active.</td>
<td>Enable the ECP option.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4076</td>
<td>Point positions used to define the Plane are too close.</td>
<td>Set the distance between points more than 1 μm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4077</td>
<td>Point coordinate data used to define the Plane is invalid.</td>
<td>Match the coordinate data for the points to be specified.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4078</td>
<td>Only the additional ST axis was attempted to be changed by the CP statement.</td>
<td>Use PTP motion commands in order to move the additional axis only.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4079</td>
<td>Speed of additional ST axis by the CP statement is too fast.</td>
<td>Reduce the set values of SpeedS and AccelS.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4080</td>
<td>Cannot execute when the Enable Switch is OFF.</td>
<td>Turn the Enable Switch ON and then execute.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4081</td>
<td>Error was detected during operation.</td>
<td>Check the PG board. Check the connection with the motor driver. Replace the PG board. Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4082</td>
<td>Pulse Generator Board error was detected during operation.</td>
<td>Check the PG board. Check the connection with the motor driver. Replace the PG board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4083</td>
<td>MCAL did not complete in time.</td>
<td>Set PG parameter so that MCAL can complete within 120 seconds.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4084</td>
<td>Limit Sensor error was detected during operation.</td>
<td>Check the limit sensor.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4085</td>
<td>Failed to change to specified location.</td>
<td>Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4086</td>
<td>Cannot execute because it is not dry run mode.</td>
<td>Change to the dry run mode and execute.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4087</td>
<td>Failed to format the playback file.</td>
<td>Check the amount of free space of the computer. Reboot the computer. Reinstall the RC+. Replace the computer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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<tr>
<td>4099</td>
<td>Servo error was detected during operation.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4100</td>
<td>Communication error in motion control module. Cannot calculate the current point or pulse.</td>
<td>Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4101</td>
<td>Communication error in the motion control module. Cannot calculate the current point or pulse.</td>
<td>Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4103</td>
<td>Initialization failure. Motion control module initialization error.</td>
<td>Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4104</td>
<td>Positioning timeout of the joint connected to the Pulse Generator Board.</td>
<td>Cannot receive the positioning completion signal (DEND) from the servo motor connected to PG board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4105</td>
<td>EMERGENCY connector connection failure.</td>
<td>-</td>
<td></td>
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<tr>
<td>4106</td>
<td>Drive unit failure.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>4150</td>
<td>Redundant input signal failure of the emergency stop.</td>
<td>The input status of the redundant emergency stop input continuously differs for more than two seconds. Check whether no disconnection, earth fault, or short-circuit of the emergency stop input signal exits. Then reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4151</td>
<td>Redundant input signal failure of the safeguard.</td>
<td>The input status of the redundant emergency stop input continuously differs for more than two seconds. Check whether no disconnection, earth fault, or short-circuit of the emergency stop input signal exits. Then reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4152</td>
<td>Relay welding error of the main circuit.</td>
<td>A relay welding error was detected due to power system over current. Replace the controller. Replace the robot.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4153</td>
<td>Redundant input signal failure of the enable switch.</td>
<td>The input status of the redundant enable signal differs continuously for more than two seconds. Check the TP connector connection. Replace the TP. Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4154</td>
<td>Temperature of regeneration resistor was higher than the specified temperature.</td>
<td>Robot's Duty is too high. Lengthen the waiting time or reduce the Accel value. If the error occurs although Duty was lowered, replace the DPB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4180</td>
<td>Manipulator initialization failure. Specified manipulator was not found.</td>
<td>-</td>
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<td></td>
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<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
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<tr>
<td>4181</td>
<td>Manipulator initialization failure. Specified manipulator was in use by another task.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4182</td>
<td>Manipulator initialization failure. Manipulator name is too long.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4183</td>
<td>Manipulator initialization failure. Manipulator data version error.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>4184</td>
<td>Manipulator initialization failure. Duplication of single axis joint is assigned.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4185</td>
<td>Manipulator initialization failure. Specified axis is in use by the other manipulator.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4186</td>
<td>Manipulator initialization failure. Necessary hardware resource is not defined.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4187</td>
<td>Manipulator initialization failure. Communication error with the module : VSRCMNPK.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>4188</td>
<td>Manipulator initialization failure. Joint angle interference matrix is invalid.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>4189</td>
<td>Manipulator initialization failure. Communication error with the module : VSRCMC.</td>
<td>-</td>
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</tr>
<tr>
<td>4191</td>
<td>Manipulator initialization failure. Physical-logical pulse transformation matrix is invalid.</td>
<td>-</td>
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</tr>
<tr>
<td>4192</td>
<td>Manipulator initialization failure. Communication error with the servo module.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4210</td>
<td>RAS circuit detected the servo system malfunction. Reboot the controller. Measure the noise. Replace the controller.</td>
<td>Reboot the controller, take the measure against noise, or replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4211</td>
<td>Servo CPU internal RAM failure. Reboot the controller. Measure the noise. Replace the DMB.</td>
<td>Reboot the controller, take the measure against noise, or replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4212</td>
<td>RAM for the main and servo CPU communication failure. Reboot the controller. Measure the noise. Replace the DMB.</td>
<td>Reboot the controller, take the measure against noise, or replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4213</td>
<td>Servo CPU internal RAM failure. Reboot the controller. Measure the noise. Replace the DMB.</td>
<td>Reboot the controller, take the measure against noise, or replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4214</td>
<td>Initialization communication of main CPU and servo CPU failure. Reboot the Controller. Measure the noise. Replace DMB.</td>
<td>Reboot the controller, take the measure against noise, or replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4215</td>
<td>Initialization communication of the main and servo CPU failure. Reboot the controller. Noise measure. Replace the DMB.</td>
<td>Reboot the controller, take the measure against noise, or replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4216</td>
<td>Communication of the main and servo CPU failure. Reboot the controller. Measure the noise. Replace the DMB.</td>
<td>Reboot the controller, take the measure against noise, or replace the DMB.</td>
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<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
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<tr>
<td>4217</td>
<td>Communication of the main and servo CPU failure. Reboot the controller. Measure the noise. Replace the DMB.</td>
<td>Reboot the controller, take the measure against noise, or replace the DMB.</td>
<td></td>
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</tr>
<tr>
<td>4218</td>
<td>Servo long time command overrun.</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>4219</td>
<td>Servo long time command check sum error.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4220</td>
<td>System watchdog timer detected the failure. Reboot the controller.</td>
<td>Reboot the controller, take the measure against noise, or replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4221</td>
<td>Drive unit check failure.</td>
<td>Reboot the controller, take the measure against noise, or replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4222</td>
<td>RAM failure of the servo CPU. Reboot the controller. Measure the noise. Replace the DMB.</td>
<td>Reboot the controller, take the measure against noise, or replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4223</td>
<td>Failure of duplicate circuit of the emergency stop or the safeguard.</td>
<td>Check the wiring of the emergency stop or the safeguard.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4224</td>
<td>Low voltage of the main circuit power supply is detected. Check the power supply voltage. Reboot the controller.</td>
<td>Check the power supply voltage, or reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4225</td>
<td>Control relay contact of the main circuit power supply is welded.</td>
<td>Replace the DPB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4230</td>
<td>Servo real time status failure. Check sum error.</td>
<td>A data checksum error was detected in the controller. Check the short-circuit and improper connection of the peripheral equipment wiring. (Emergency, D-I/O, and Expansion I/O connectors) Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4232</td>
<td>Servo real time status failure. Free running counter error with the servo.</td>
<td>A free running counter error was detected in the controller. Check the short-circuit and improper connection of the peripheral equipment wiring. (Emergency, D-I/O, and Expansion I/O connectors) Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4233</td>
<td>Servo real time status failure. Communication error with the servo CPU.</td>
<td>A communication error was detected in the controller. Check the short-circuit and improper connection of the peripheral equipment wiring. (Emergency, D-I/O, and Expansion I/O connectors) Replace the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4240</td>
<td>Irregular motion control interruption was detected. Interruption duplicate.</td>
<td>A interruption error was detected in the controller. Check the short-circuit and improper connection of the peripheral equipment wiring. (Emergency, D-I/O, and Expansion I/O connectors) Replace the controller.</td>
<td></td>
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</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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<tr>
<td>4241</td>
<td>Over speed during low power mode was detected.</td>
<td>The robot over speed was detected during low power mode. Check the robot mechanism. (Smoothness, backlash, non-smooth motion, loose belt tension, brake) Check whether the robot does not interfere with peripheral equipment. (Collision, contact) Replace the motor driver. Replace the motor. (Motor and encoder failure) Check the short-circuit and improper connection of the peripheral equipment wiring. (Emergency, D-I/O, and Expansion I/O connectors)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4242</td>
<td>Improper acceleration reference was generated.</td>
<td>You attempted to operate the robot with the acceleration reference exceeding the specified value. For a CP motion, decrease the AccelS value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4243</td>
<td>Improper speed reference is generated in the high power mode.</td>
<td>The robot over speed was detected during high power mode. Check the robot mechanism. (Smoothness, backlash, non-smooth motion, loose belt tension, brake) Check whether the robot does not interfere with peripheral equipment. (Collision, contact) Replace the motor driver. Replace the motor. (Motor and encoder failure) Check the short-circuit and improper connection of the peripheral equipment wiring. (Emergency, D-I/O, and Expansion I/O connectors)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4250</td>
<td>Arm reached the limit of motion range during the operation.</td>
<td>Check whether a CP motion trajectory is within the motion range.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4251</td>
<td>Arm reached the limit of XY motion range specified by XYLim during the operation.</td>
<td>Check the XYLim setting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4252</td>
<td>Coordinate conversion error occurred during the operation.</td>
<td>Check whether a CP motion trajectory is within the motion range.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4261</td>
<td>The Arm reached the limit of motion range in conveyor tracking.</td>
<td>Place the conveyor inside the motion range. Meanwhile, allow the tracking range for the deceleration when switching</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4262</td>
<td>The Arm reached the limit of XY motion range in conveyor tracking.</td>
<td></td>
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</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
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<tr>
<td>4263</td>
<td>The Arm reached the limit of pulse motion range in conveyor tracking.</td>
<td>from tracking motion to non-tracking. If error occurs during the shift from tracking motion, it may be prevented by increasing the accel speed to complete the tracking motion.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4267</td>
<td>Attempt to exceed the J4Flag attribute without indication.</td>
<td>You attempted to exceed the J4Flag attribute during motion without the J4Flag indication. Change the J4Flag for the target point.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4268</td>
<td>Attempt to exceed the J6Flag attribute without indication.</td>
<td>You attempted to exceed the J6Flag attribute during motion without the J6Flag indication. Change the J6Flag for the target point.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4269</td>
<td>Attempt to exceed the particular wrist orientation attribute without indication.</td>
<td>You attempted to exceed the particular wrist orientation attribute during motion without the Wrist indication. Change the Wrist attribute for the target point. Change the target point to avoid a particular wrist orientation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4270</td>
<td>Attempt to exceed the particular arm orientation attribute without indication.</td>
<td>You attempted to exceed the particular hand orientation attribute during motion without the Hand indication. Change the Hand attribute for the target point. Change the target point to avoid a particular hand orientation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4271</td>
<td>Attempt to exceed the particular elbow orientation attribute without indication.</td>
<td>You attempted to exceed the particular elbow orientation attribute during motion without the Elbow indication. Change the Elbow attribute for the target point. Change the target point to avoid a particular elbow orientation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4272</td>
<td>Specified point flag is invalid.</td>
<td>For a CP motion command, the arm form at the target point is different from the point flag specified with the target point. Change the point flag for the target point.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4273</td>
<td>J6Flag switched during the lift motion in conveyor tracking</td>
<td>Adjust the Tool orientation so that J6Flag will not switch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4274</td>
<td>Manipulator motion did not match to J6Flag of the target point</td>
<td>For a CP motion command, the manipulator reached to the target point with J6Flag which differs from the one specified for the target point. Change J6Flag for the target point.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
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<tr>
<td>4275</td>
<td>Manipulator motion did not match to J4Flag of the target point</td>
<td>For a CP motion command, the manipulator reached to the target point with J4Flag which differs from the one specified for the target point. Change J4Flag for the target point.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4276</td>
<td>Manipulator motion did not match to ArmFlag of the target point</td>
<td>For a CP motion command, the manipulator reached to the target point with ArmFlag which differs from the one specified for the target point. Change ArmFlag for the target point.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4277</td>
<td>Manipulator motion did not match to ElbowFlag of the target point</td>
<td>For a CP motion command, the manipulator reached to the target point with ElbowFlag which differs from the one specified for the target point. Change ElbowFlag for the target point.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4278</td>
<td>Manipulator motion did not match to WristFlag of the target point</td>
<td>For a CP motion command, the manipulator reached to the target point with WristFlag which differs from the one specified for the target point. Change WristFlag for the target point.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4291</td>
<td>Data sending failure in motion network.</td>
<td>Check the connection of the cable for Drive Unit.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4292</td>
<td>Data receiving failure in motion network.</td>
<td>Check the connection of the cable for Drive Unit.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4301</td>
<td>The Pulse Generating Board detected a limit signal.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4302</td>
<td>The Pulse Generating Board detected an alarm signal.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4401</td>
<td>The specified conveyor number is illegal.</td>
<td>Review the conveyor number.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4402</td>
<td>The specified queue is full.</td>
<td>The number of registration reached the upper limit (1000 pcs.) Delete the queue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4403</td>
<td>Continue operation cannot be done in tracking motion.</td>
<td>Tracking motion cannot be continued after aborted/paused?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4404</td>
<td>The specified queue data does not exist.</td>
<td>Review the queue number. Or, check whether the queue is registered.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4405</td>
<td>The conveyor is not correctly initialized.</td>
<td>-</td>
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</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
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<tr>
<td>4406</td>
<td>The specified queue data is outside the set area.</td>
<td>The queue outside of the range cannot be tracked. If the specified queue is above the upstream limit, change the program so that tracking does not start until the queue enters the area below the upper limit. If the specified queue is below the downstream limit, change the program to delete the queue data.</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>4407</td>
<td>The encoder is not correctly assigned.</td>
<td>Set the encoder.</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>4409</td>
<td>The parameter of the conveyor instruction is invalid.</td>
<td>Review the parameter.</td>
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<tr>
<td>4410</td>
<td>The conveyor coordinates conversion error occurs.</td>
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<tr>
<td>4411</td>
<td>Communication error within the Conveyor Modules.</td>
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<tr>
<td>4413</td>
<td>Conveyor tracking starting error.</td>
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<tr>
<td>4414</td>
<td>Conveyor tracking cannot start after motion with CP ON.</td>
<td>Start the conveyor tracking using CP OFF.</td>
<td>-</td>
<td></td>
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<tr>
<td>4415</td>
<td>The setting of Diagonal Upstream Limit or Diagonal Downstream Limit is not appropriate.</td>
<td>The diagonal downstream limit is above the upstream limit, or the diagonal upstream/downstream limit is horizontal to the conveyor direction. Review the setting of diagonal upstream/downstream limit.</td>
<td>-</td>
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<tr>
<td>5000</td>
<td>Servo control gate array failure. Check the DMB.</td>
<td>Check the short-circuit and improper connection of the peripheral equipment wiring. (Emergency and I/O connectors) Replace the DMB. Replace the additional axis unit.</td>
<td>-</td>
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<tr>
<td>5001</td>
<td>Disconnection of the parallel encoder signal. Check the signal cable connection or the robot internal wiring.</td>
<td>Check the M/C cable signal. Check the robot signal wiring. (Missing pin, disconnection, short-circuit) Replace the motor. Replace the DMB. Check the connector connection in the controller. (Loosening, connecting to the serial encoder terminal on the DMB) Check the model setting. Check the peripheral equipment wiring. (Emergency and I/O)</td>
<td>-</td>
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<tr>
<td>5002</td>
<td>Motor driver is not installed. Install the motor driver. Check the DMB or the motor driver.</td>
<td>Check whether the motor driver is mounted. Check the model setting and hardware setting. Replace the motor driver. Replace the DMB.</td>
<td>-</td>
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<tr>
<td>5003</td>
<td>Initialization communication failure of incremental encoder. Check the signal cable connection and the robot setting.</td>
<td>Check the model setting. Replace the motor. Replace the DMB.</td>
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<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
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<tr>
<td>5004</td>
<td>Initialization failure of absolute encoder. Check the signal cable connection or the robot setting.</td>
<td>Check the model setting. Replace the motor. Replace the DMB.</td>
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<tr>
<td>5005</td>
<td>Encoder division setting failure. Check the robot setting.</td>
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<tr>
<td>5006</td>
<td>Data failure during absolute encoder initialization. Check the signal cable connection, the controller, or the motor.</td>
<td>Replace the motor. Replace the DMB. Check the noise countermeasures.</td>
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<tr>
<td>5007</td>
<td>Absolute encoder multi-turn is beyond the maximum range. Reset the encoder.</td>
<td>Reset the encoder. Replace the motor.</td>
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<tr>
<td>5008</td>
<td>Position is out of the range. Reset the encoder.</td>
<td>Reset the encoder. Replace the DMB. Replace the motor.</td>
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</tr>
<tr>
<td>5009</td>
<td>No response from the serial encoder. Check the signal cable connection, the motor, the DMB, or the encoder IF board.</td>
<td>Check the model setting. (Improperly setting of the parallel encoder model) Check the signal cable connection. Replace the DMB and encoder IF board.</td>
<td></td>
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</tr>
<tr>
<td>5010</td>
<td>Serial encoder initialization failure. Reboot the controller. Check the motor, the DMB, or the encoder IF board.</td>
<td>Check the robot configuration. Check the signal cable connection. Replace the DMB and encoder IF board.</td>
<td></td>
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</tr>
<tr>
<td>5011</td>
<td>Serial encoder communication failure. Reboot the controller. Check the motor, the DMB, or the encoder IF board.</td>
<td>Check the robot configuration. Check the signal cable connection. Replace the DMB and encoder IF board.</td>
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<tr>
<td>5012</td>
<td>Servo CPU watchdog timer failure. Reboot the controller. Check the motor or the DMB.</td>
<td>Replace the DMB. Check the noise countermeasures.</td>
<td></td>
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</tr>
<tr>
<td>5013</td>
<td>Current control circuit WDT failure. Reboot the controller. Check the controller.</td>
<td>Check the power cable connection. Check the 15V power supply and cable connection. Replace the DMB. Check the noise countermeasures.</td>
<td></td>
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<tr>
<td>5015</td>
<td>Encoder is reset. Reboot the controller.</td>
<td>Reboot the controller.</td>
<td></td>
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<tr>
<td>5016</td>
<td>Power supply failure of the absolute encoder. Replace the battery. Check the robot internal wiring.</td>
<td>Reset the encoder. Check the signal cable connection.</td>
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<tr>
<td>5017</td>
<td>Backup data failure of the absolute encoder. Reset the encoder.</td>
<td>Reset the encoder. Check the signal cable connection.</td>
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<tr>
<td>5018</td>
<td>Absolute encoder battery alarm.</td>
<td>Replace the battery. Check the signal cable connection.</td>
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<tr>
<td>5019</td>
<td>Position failure of the absolute encoder. Reset the encoder. Replace the motor.</td>
<td>Reset the encoder. Replace the motor.</td>
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<td>No.</td>
<td>Message</td>
<td>Remedy</td>
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<tr>
<td>5020</td>
<td>Speed is too high at controller power ON. Stop the robot and reboot the controller.</td>
<td>Reboot the controller.</td>
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<tr>
<td>5021</td>
<td>Absolute encoder overheat.</td>
<td>Lower the motion duty. Wait until the temperature of the encoder decreases.</td>
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<tr>
<td>5032</td>
<td>Servo alarm A.</td>
<td>-</td>
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<tr>
<td>5040</td>
<td>Motor torque output failure in high power state. Check the power cable connection, the robot, the driver or the motor.</td>
<td>Specify the Weight/Inertia setting. Check the load. Check the robot. (Smoothness, backlash, non-smooth motion, loose belt tension, brake) Check the interference with the peripheral equipment. (Collision, contact) Check the model setting. Check the power cable connection. Check the robot power wiring. (Missing pin, disconnection, short-circuit) Check the power supply voltage. (Low power supply voltage) Replace the motor driver. Replace the DMB. Replace the motor.</td>
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<tr>
<td>5041</td>
<td>Motor torque output failure in low power state. Check the power cable connection, robot, brake, driver, or motor.</td>
<td>Check the robot. (Smoothness, backlash, non-smooth motion, loose belt tension, brake) Check the interference with the peripheral equipment. (Collision, contact) Check the model setting. Check the power cable connection. Check the robot power wiring. (Missing pin, disconnection, short-circuit) Check the power supply voltage. (Low power supply voltage) Replace the motor driver. Replace the DMB. Replace the motor.</td>
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<tr>
<td>5042</td>
<td>Position error overflow in high power state. Check the power cable connection, the robot, the driver and the motor.</td>
<td>Specify the Weight/Inertia setting. Check the load. Check the robot. (Smoothness, backlash, non-smooth motion, loose belt tension, brake) Check the interference with the peripheral equipment. (Collision, contact) Check the model setting. Check the power cable connection. Check the robot power wiring. (Missing pin, disconnection, short-circuit) Check the power supply voltage. (Low power supply voltage) Replace the motor driver. Replace the DMB. Replace the motor.</td>
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<tr>
<td>5043</td>
<td>Position error overflow in low power state. Check the power cable connection, robot, brake, driver, or motor.</td>
<td>Check the robot. (Smoothness, backlash, non-smooth motion, loose belt tension, brake) Check the interference with the peripheral equipment. (Collision, contact) Check the model setting. Check the power cable connection. Check the robot power wiring. (Missing pin, disconnection, short-circuit) Check the power supply voltage. (Low power supply voltage) Replace the motor driver. Replace the DMB. Replace the motor.</td>
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<tr>
<td>5044</td>
<td>Speed error overflow in high power state. Check the power cable connection, robot, brake, driver, or motor.</td>
<td>Specify the Weight/Inertia setting. Check the load. Check the robot. (Smoothness, backlash, non-smooth motion, loose belt tension, brake) Check the interference with the peripheral equipment. (Collision, contact) Check the model setting. Check the power cable connection. Check the robot power wiring. (Missing pin, disconnection, short-circuit) Check the power supply voltage. (Low power supply voltage) Replace the motor driver. Replace the DMB. Replace the motor.</td>
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<tr>
<td>5045</td>
<td>Speed error overflow in low power state. Check the power cable connection, robot, brake, drive, or motor.</td>
<td>Check the robot. (Smoothness, backlash, non-smooth motion, loose belt tension, brake)</td>
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<td>Check the interference with the peripheral equipment. (Collision, contact)</td>
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<td>Check the model setting.</td>
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<td>Check the power cable connection.</td>
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<td>Check the robot power wiring. (Missing pin, disconnection, short-circuit)</td>
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<td>Check the power supply voltage. (Low power supply voltage)</td>
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<td>Replace the motor driver.</td>
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<td>Replace the DMB.</td>
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<td>Replace the motor.</td>
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<tr>
<td>5046</td>
<td>Over speed in high power state. Reduce SpeedS. Check the signal cable connection, robot, brake, driver or motor.</td>
<td>Reduce SpeedS of the CP motion. Change the orientation of the CP motion.</td>
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<td>Specify the Weight/Inertia setting. Check the load.</td>
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<td>Check the robot. (Smoothness, backlash, non-smooth motion, loose belt tension, brake)</td>
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<td>Check the interference with the peripheral equipment. (Collision, contact)</td>
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<td>Check the model setting.</td>
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<td>Check the power cable connection.</td>
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<td>Check the robot power wiring. (Missing pin, disconnection, short-circuit)</td>
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<td>Check the power supply voltage. (Low power supply voltage)</td>
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<td>Replace the motor driver.</td>
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<td>Replace the DMB.</td>
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<td>Replace the motor.</td>
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<tr>
<td>5047</td>
<td>Over speed in low power state. Check the signal cable connection, robot, brake, driver, or motor.</td>
<td>Check the motion in high power state.</td>
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<td>Check the robot. (Smoothness, backlash, non-smooth motion, loose belt tension, brake)</td>
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<td>Check the interference with the peripheral equipment. (Collision, contact)</td>
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<td>Check the model setting.</td>
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<td>Check the power cable connection.</td>
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<td>Check the robot power wiring. (Missing pin, disconnection, short-circuit)</td>
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<td>Check the power supply voltage. (Low power supply voltage)</td>
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<td>Replace the motor driver.</td>
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<td>Replace the DMB.</td>
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<td>Replace the motor.</td>
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<tr>
<td>5048</td>
<td>Over voltage of the main power circuit. Check the main power voltage or the regeneration module.</td>
<td>Specify the Weight/Inertia setting. Check the load. Check the robot. (Smoothness, backlash, non-smooth motion, loose belt tension, brake) Check the interference with the peripheral equipment. (Collision, contact) Check the model setting. Check the power cable connection. Check the robot power wiring. (Missing pin, disconnection, short-circuit) Check the power supply voltage. (Low power supply voltage) Replace the motor driver. Replace the DMB. Replace the motor.</td>
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<tr>
<td>5049</td>
<td>Over current of the motor driver. Check the power cable connection or the robot internal wiring.</td>
<td>Check the short-circuit and earth fault of the power line. Replace the motor driver. Replace the DMB.</td>
<td></td>
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<tr>
<td>5050</td>
<td>Over speed during torque control. Check the work motion speed range.</td>
<td>Check the motion speed during torque control.</td>
<td></td>
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<tr>
<td>5051</td>
<td>15V PWM drive power supply failure. Reboot the controller. Replace the 15V power supply.</td>
<td>Check the 15V power supply and cable connection. Replace the motor driver. Replace the DMB.</td>
<td></td>
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<tr>
<td>5054</td>
<td>Overload of the motor. Decrease the motion duty and the Accel.</td>
<td>Lower the motion duty. Check the Weight/Inertia setting. Check the robot. (Backlash, large load, loose belt tension, brake)</td>
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<tr>
<td>5055</td>
<td>Overload of the motor. Decrease the operation duty and the Accel.</td>
<td>Lower the motion duty. Check the Weight/Inertia setting. Check the robot. (Backlash, large load, loose belt tension, brake)</td>
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<tr>
<td>5072</td>
<td>Servo alarm B.</td>
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<tr>
<td>5080</td>
<td>Motor is overloaded. Decrease the duty and the Accel.</td>
<td>Lower the motion duty. Check the Weight/Inertia setting. Check the robot. (Backlash, large load, loose belt tension, brake)</td>
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<tr>
<td>5098</td>
<td>High temperature of the encoder. Decrease the duty. Check the reduction gear unit of the robot.</td>
<td>Wait until the temperature of the encoder decreases. Lower the motion duty. Check the Weight/Inertia setting. Check the robot. (Backlash, large load, loose belt tension, brake)</td>
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<tr>
<td>5099</td>
<td>High temperature of the motor driver. Clean the controller fan filter. Check the ambient temperature. Decrease the duty.</td>
<td>Clean the cooling fan filter. Lower the motion duty. Check the Weight/Inertia setting. Lower the ambient temperature.</td>
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<tr>
<td>5112</td>
<td>Servo alarm C.</td>
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<td>Message</td>
<td>Remedy</td>
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<tr>
<td>6001</td>
<td>Calibration number is out of range.</td>
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<tr>
<td>6002</td>
<td>Calibration is not defined.</td>
<td>-</td>
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<tr>
<td>6003</td>
<td>Camera orientation is out of range.</td>
<td>-</td>
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<tr>
<td>6004</td>
<td>TwoRefPoints flag is out of range.</td>
<td>-</td>
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<tr>
<td>6005</td>
<td>Cannot calculate the point position because there is invalid data.</td>
<td>-</td>
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<tr>
<td>6006</td>
<td>Calibration failed. Cannot calculate because there is invalid data.</td>
<td>-</td>
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<tr>
<td>6007</td>
<td>Coordinate transformation failed. Cannot calculate because there is invalid data.</td>
<td>-</td>
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<tr>
<td>6008</td>
<td>Calibration file name is invalid.</td>
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<tr>
<td>6009</td>
<td>Calibration file is not found.</td>
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<tr>
<td>6010</td>
<td>Failed to read the calibration file.</td>
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<tr>
<td>6011</td>
<td>Failed to write the calibration file.</td>
<td>-</td>
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<tr>
<td>6012</td>
<td>9 pixel coordinate points should be specified.</td>
<td>-</td>
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<tr>
<td>6013</td>
<td>18 pixel coordinate points should be specified.</td>
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<tr>
<td>6014</td>
<td>9 robot coordinate points should be specified.</td>
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<tr>
<td>6015</td>
<td>18 robot coordinate points should be specified.</td>
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<tr>
<td>6016</td>
<td>9 robot coordinate points and 1 reference point should be specified.</td>
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<tr>
<td>6017</td>
<td>18 robot coordinate points and 1 reference point should be specified.</td>
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<tr>
<td>6018</td>
<td>9 robot coordinate points and 2 reference points should be specified.</td>
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</tr>
<tr>
<td>6019</td>
<td>18 robot coordinate points and 2 reference points should be specified.</td>
<td>-</td>
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<tr>
<td>7003</td>
<td>The specified robot cannot be found.</td>
<td>Reboot the controller.</td>
<td></td>
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<tr>
<td>7004</td>
<td>Duplicate allocation of the point data area.</td>
<td>Reboot the controller.</td>
<td></td>
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<tr>
<td>7005</td>
<td>Specified point number cannot be found.</td>
<td>Check the specified point number.</td>
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<tr>
<td>7006</td>
<td>Specified point number was not defined.</td>
<td>Check whether point data is registered in the specified point.</td>
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<tr>
<td>7007</td>
<td>Cannot allocate the memory area for the pallet definition.</td>
<td>Reboot the controller.</td>
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<tr>
<td>7008</td>
<td>Cannot free the memory area for the pallet definition.</td>
<td>Reboot the controller.</td>
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</tr>
<tr>
<td>7009</td>
<td>Specified pallet number cannot be found.</td>
<td>Check the pallet number.</td>
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<tr>
<td>7010</td>
<td>Specified pallet is not defined. Specify a defined pallet or define the pallet.</td>
<td>Check whether the specified pallet is defined by the Pallet statement.</td>
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<tr>
<td>7011</td>
<td>Specified division number is beyond the pallet division number definition.</td>
<td>Check the specified division number.</td>
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<tr>
<td>7012</td>
<td>Specified coordinate axis number does not exist.</td>
<td>Check the specified coordinate axis number.</td>
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<td>Check the specified arm orientation number.</td>
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<td>7017</td>
<td>Cannot allocate the required memory.</td>
<td>Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
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<td>7018</td>
<td>Specified point label cannot be found. Specify a valid point label.</td>
<td>Check the specified point label.</td>
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<td>7019</td>
<td>Parameter setup in the initialization file is invalid.</td>
<td>Reboot the controller. Initialize the controller firmware.</td>
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<td>7021</td>
<td>Duplicate point label. Specified label name is already registered. Change the label name.</td>
<td>Change the point label.</td>
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<td>7022</td>
<td>Specified local coordinate system is not defined. Specify a valid local coordinate system number.</td>
<td>Check the specified local number. Define the Local coordinate system.</td>
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<td>7023</td>
<td>Specified string is not in the correct format.</td>
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<tr>
<td>7024</td>
<td>Point data memory area for the specified robot is not allocated.</td>
<td>Rebuild the project.</td>
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<tr>
<td>7026</td>
<td>Cannot open the point file. Specify a valid point file name.</td>
<td>Check the point file name. Check whether the point file specified for the project exists.</td>
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<tr>
<td>7027</td>
<td>Cannot read the point data from the point file.</td>
<td>Create the point file again.</td>
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<tr>
<td>7028</td>
<td>Point area is allocated beyond the available point number.</td>
<td>There are too many points. Review the number of points.</td>
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<td>7029</td>
<td>Specified point file name is not correct. Specify a valid point file name.</td>
<td>Check the file extension.</td>
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<tr>
<td>7030</td>
<td>Specified point label is beyond the maximum length. Specify a valid point label.</td>
<td>Change the point label.</td>
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<tr>
<td>7031</td>
<td>Description for the specified point is beyond the maximum length. Specify a valid description.</td>
<td>Change the comment.</td>
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<tr>
<td>7032</td>
<td>Point file is corrupted. Check sum error.</td>
<td>Create the point file again.</td>
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<td>7033</td>
<td>Specified point file cannot be found. Specify a valid point file name.</td>
<td>Check the name of the specified point file.</td>
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<td>7034</td>
<td>Cannot save the point file.</td>
<td>Failed to save the point file (create a temporary file). Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
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<td>7035</td>
<td>Cannot save the point file.</td>
<td>Failed to save the point file (file open). Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
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<td>7036</td>
<td>Cannot save the point file.</td>
<td>Failed to save the point file (renew the file header). Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
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<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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<td>7037</td>
<td>Cannot save the point file.</td>
<td>Failed to save the point file (create the file name). Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
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<td>7038</td>
<td>Cannot save the point file.</td>
<td>Failed to save the point file (copy the file). Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
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<td>7039</td>
<td>Cannot save the point file.</td>
<td>Failed to save the point file (change the file name). Reboot the controller. Initialize the controller firmware. Replace the controller.</td>
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<td>7040</td>
<td>The point label is not correct. Specify a valid point point label.</td>
<td>The initial character of the point label name is improper. Correct the lable name.</td>
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<tr>
<td>7041</td>
<td>The point label is not correct. Specify a valid point point label.</td>
<td>Inadequate character is used. Correct the lable name.</td>
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<td>7042</td>
<td>The pallet cannot be defined.</td>
<td>Undefined flag for pallet data is mixed. Check the point data. Correct the point data.</td>
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<tr>
<td>7043</td>
<td>Invalid a point file version.</td>
<td>The point file version is different. Re-create the point file.</td>
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<tr>
<td>7101</td>
<td>Communication error occur during transform.</td>
<td>The fieldbus slave board is broken or the controller software is damaged. Restore the controller firmware. A communication data error was detected during communication. The communication cable has a problem. Check the communication cable and its related units.</td>
<td></td>
<td></td>
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<tr>
<td>7103</td>
<td>Timeout error occurs during transform.</td>
<td>The fieldbus slave board is broken or the controller software is damaged. Restore the controller firmware. The PLC is not running or not connected. Check the PLC, the communication cable, and peripherals. (If Code 1 is 22 when the CC-Link board is used.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 1 to 15 refer to specific steps or actions to take.
<table>
<thead>
<tr>
<th>No.</th>
<th>Message</th>
<th>Remedy</th>
<th>Note 1</th>
<th>Note 2</th>
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<tr>
<td>7200</td>
<td>Invalid argument.</td>
<td>Check the parameter.</td>
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<td>7201</td>
<td>The system error occurred.</td>
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<td>7202</td>
<td>There is not enough memory.</td>
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<td>7203</td>
<td>Access is denied.</td>
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<td>7210</td>
<td>Drive is not ready.</td>
<td>Set the device.</td>
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<td>7211</td>
<td>The specified path is invalid.</td>
<td>Make sure the specified path exists.</td>
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<tr>
<td>7212</td>
<td>The specified path is already existing.</td>
<td>If the specified directory or file already exists, you cannot execute.</td>
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<tr>
<td>7213</td>
<td>The file specified by path does not exist.</td>
<td>Make sure the specified file exists.</td>
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<td>7214</td>
<td>File size is too large.</td>
<td>Specify the file that is less than 2G bytes.</td>
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<tr>
<td>7215</td>
<td>The specified file is open.</td>
<td>The specified file number is already existing. Use another file number.</td>
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<td>7216</td>
<td>The open mode is illegal.</td>
<td>Make sure you opened in reading or writing mode.</td>
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<tr>
<td>7217</td>
<td>There is no read data.</td>
<td>Make sure there are data to read.</td>
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<tr>
<td>7230</td>
<td>The specified connection is open.</td>
<td>The specified file number is already existing. Use another file number.</td>
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<td>7231</td>
<td>A connection-level error occurred while opening the connection.</td>
<td>Check the access right of database.</td>
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<tr>
<td>7232</td>
<td>The connection is closed.</td>
<td>Use OpenDB and open the database.</td>
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<tr>
<td>7233</td>
<td>The data type not supported is included.</td>
<td>Convert the data into string or numeric value.</td>
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<td>7234</td>
<td>Data size is too large.</td>
<td>Too large data in a line. Specify the query so that necessary field are only retrieved.</td>
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<td>7235</td>
<td>The specified file type is not supported.</td>
<td>Check the type of Excel file.</td>
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<td>7236</td>
<td>There is no selected data.</td>
<td>Make sure the data you retrieved exists.</td>
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<td>7250</td>
<td>No bytes were available to read.</td>
<td>There are no retrieved data.</td>
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<td>7251</td>
<td>The port is in an invalid state.</td>
<td>Check the device setting for the specified port.</td>
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<td>7252</td>
<td>The specified port is open.</td>
<td>Check the port number to open.</td>
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<td>7253</td>
<td>The port is closed</td>
<td>Check the port number to close.</td>
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<td>7254</td>
<td>The specified port is not</td>
<td>Check the port number to open.</td>
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<td>7255</td>
<td>Timeout reading from the port.</td>
<td>Check the port timeout period and update to the appropriate setting.</td>
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<tr>
<td>7256</td>
<td>Timeout writing to the port.</td>
<td>Check the port timeout period and update to the appropriate setting.</td>
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<tr>
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<td>Note 1</td>
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<td>The checksum in project file is invalid.</td>
<td>Rebuild the project.</td>
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<td>Invalid function.</td>
<td>Check the function definition to call.</td>
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<td>Check the connection with the camera.</td>
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<td>Smart camera. Out of memory.</td>
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<td>Smart camera. Project does not exist.</td>
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<td>Smart camera. Project has not been set.</td>
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<td>Smart camera. Vision property or result not supported.</td>
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<td>Undefined vision sequence.</td>
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<td>Smart camera. Critical error.</td>
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<td>7508</td>
<td>Smart camera. Invalid command.</td>
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<td>Invalid vision property value.</td>
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<td>Vision model not trained.</td>
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<td>Vision model object not Self.</td>
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<td>Invalid vision result.</td>
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<td>No vision calibration.</td>
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<td>Incomplete vision calibration.</td>
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<td>Smart camera. Cannot connect with camera.</td>
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<td>Smart camera. Communication error.</td>
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<td>OCR font is invalid.</td>
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<td>The specified vision calibration already exists.</td>
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<td>The specified vision sequence already exists.</td>
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<td>The specified vision object already exists.</td>
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<td>Cannot load vision project.</td>
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<td>Cannot save vision project.</td>
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<td>Vision processor. Critical error.</td>
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<td>Image file not found.</td>
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<td>Camera does not exist.</td>
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<td>Acquisition failed.</td>
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<td>Vision object is not taught.</td>
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<td>GUI Builder. Cannot execute a GUI Builder statement from the command window.</td>
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<td>7602</td>
<td>GUI Builder. GSet parameter is too long.</td>
<td>Correct the parameter to the proper length.</td>
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<td>7603</td>
<td>GUI Builder. Too many parameters for GGet.</td>
<td>Check the number of parameters.</td>
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<td>7604</td>
<td>GUI Builder. Not enough data for GGet statement variable assignment.</td>
<td>Specify the variable.</td>
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<td>7610</td>
<td>GUI Builder. The event task cannot be executed. System in pause state and EventTaskType is Normal.</td>
<td>The system can be operated by changing EventTaskType to &quot;NoPause&quot;</td>
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<tr>
<td>7611</td>
<td>GUI Builder. The event task cannot be executed. Safeguard is open and EventTaskType is Normal.</td>
<td>The system can be operated by changing EventTaskType to &quot;NoEmgAbort&quot;</td>
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<tr>
<td>7612</td>
<td>GUI Builder. The event task cannot be executed. Estop is active and EventTaskType is not NoEmgAbort.</td>
<td>The system can be operated by changing EventTaskType to &quot;NoEmgAbort&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7613</td>
<td>GUI Builder. The event task cannot be executed. System in error state and EventTaskType is not NoEmgAbort.</td>
<td>The system can be operated by changing EventTaskType to &quot;NoEmgAbort&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7650</td>
<td>GUI Builder. Invalid property.</td>
<td>Specify the valid property.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7651</td>
<td>GUI Builder. Invalid form.</td>
<td>Specify the valid form.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7652</td>
<td>GUI Builder. Invalid control.</td>
<td>Specify the valid control.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7653</td>
<td>GUI Builder. The specified form is already open.</td>
<td>Modify the program to avoid double launch.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7654</td>
<td>GUI Builder. Event function does not exist.</td>
<td>Check the function name set for the event.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7655</td>
<td>GUI Builder. Item does not exist.</td>
<td>Specify the valid item.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7656</td>
<td>GUI Builder. Invalid property value.</td>
<td>Check the property value and specify the valid value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7700</td>
<td>Security. Invalid user.</td>
<td>Contact the administrator to register the user</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7701</td>
<td>Security. Invalid password.</td>
<td>Check the password.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7702</td>
<td>Security. Permission denied.</td>
<td>Contact the administrator to set authority.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7703</td>
<td>Security. Option not active.</td>
<td>Register the options.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7710</td>
<td>Source and destination cannot be the same.</td>
<td>Specify another destination.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7711</td>
<td>Point file name is used by another robot.</td>
<td>Check the point file name.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7712</td>
<td>Invalid axis specified.</td>
<td>Check whether the specified axis is valid. Check if the axis is specified correctly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7713</td>
<td>Option not enabled</td>
<td>Enable the option.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7714</td>
<td>File not found.</td>
<td>Specify the correct file name.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7715</td>
<td>Robot number is out of the available range.</td>
<td>Check the robot number.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7716</td>
<td>Robot does not exist.</td>
<td>Check whether the robot is registered.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7717</td>
<td>File Error. Invalid folder.</td>
<td>Check the folder name.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7800</td>
<td>Data cannot be changed, because it is not data of PG axis.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7801</td>
<td>Invalid joint number is selected.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7802</td>
<td>The type of robot is invalid.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------------------</td>
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</tr>
<tr>
<td>7803</td>
<td>The parameter is invalid.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7804</td>
<td>The number of robot is invalid.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7805</td>
<td>MCD failure. Failed to open the MCD file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7806</td>
<td>MCD failure. Failed to read the MCD file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7807</td>
<td>MCD failure. Failed to save the MCD file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7808</td>
<td>MCD failure. Failed to create the MCD file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7809</td>
<td>MCD failure. Failed to write the MCD file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7810</td>
<td>MPL failure. Failed to open the MPL file.</td>
<td>Reinstall the firmware.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7811</td>
<td>MPL failure. Failed to read the MPL file.</td>
<td>Update the firmware.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7812</td>
<td>MPL failure. Failed to write the MPL file.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7813</td>
<td>IFS failure. Failed to open the IFS file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7814</td>
<td>IFS failure. Failed to read the IFS file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7815</td>
<td>IFS failure. Failed to write the IFS file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7816</td>
<td>MTR failure. Failed to create the MTR file.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7817</td>
<td>MTR failure. Failed to open the MTR file.</td>
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<tr>
<td>7818</td>
<td>MTR failure. Failed to read the MTR file.</td>
<td></td>
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<tr>
<td>7819</td>
<td>MTR failure. Failed to write the MTR file.</td>
<td></td>
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<tr>
<td>7820</td>
<td>PRM failure. Failed to create the PRM file.</td>
<td>Restore the controller configuration.</td>
<td></td>
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<tr>
<td>7821</td>
<td>PRM failure. Failed to open the PRM file.</td>
<td>Restore the controller configuration.</td>
<td></td>
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<tr>
<td>7822</td>
<td>PRM failure. Failed to read the PRM file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7823</td>
<td>PRM failure. Failed to write the PRM file.</td>
<td>Restore the controller configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7824</td>
<td>File failure. Cannot access the file.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7825</td>
<td>The type of motor is invalid.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7826</td>
<td>Area allocate error.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7827</td>
<td>Fieldbus not installed.</td>
<td></td>
<td></td>
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<tr>
<td>7828</td>
<td>Fieldbus invalid parameter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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<td>------</td>
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<td>------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>7902</td>
<td>Fieldbus line defect</td>
<td>Check the connection of the communication cable for the fieldbus.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check whether the communication cable for the fieldbus is powered.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>(if the fieldbus requires power supply)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Check the connection of the fieldbus slave.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7903</td>
<td>Fieldbus device not configured</td>
<td>Check that the fieldbus master board is installed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reboot the computer where the fieldbus master board is installed.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Replace the fieldbus master board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7904</td>
<td>Fieldbus invalid board</td>
<td>Check that the fieldbus master board is installed.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Reboot the computer where the fieldbus master board is installed.</td>
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<tr>
<td></td>
<td></td>
<td>Replace the fieldbus master board.</td>
<td></td>
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</tr>
<tr>
<td>7905</td>
<td>Fieldbus connection denied</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7906</td>
<td>Fieldbus invalid device configuration</td>
<td>Check that the fieldbus master board is installed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reboot the computer where the fieldbus master board is installed.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Replace the fieldbus master board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7907</td>
<td>Fieldbus general error</td>
<td>Check that the fieldbus master board is installed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reboot the computer where the fieldbus master board is installed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replace the fieldbus master board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7908</td>
<td>Fieldbus configuration error</td>
<td>Check the fieldbus master setting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7909</td>
<td>Fieldbus slaves were not detected.</td>
<td>Register the slave to the fieldbus master by accompanying applicomIO Console application</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9001</td>
<td>Emergency stop circuit failure was detected. Disconnection or other failure was found in one of the redundant inputs.</td>
<td>Check whether no disconnection, earth fault, or short-circuit of the emergency stop input signal exits. Then reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9002</td>
<td>Safeguard circuit failure was detected. Disconnection or other failure was found in one of the redundant inputs.</td>
<td>Check whether no disconnection, earth fault, or short-circuit of the safeguard input signal exits. Then reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>9003</td>
<td>Initialization failure. Failed to initialize the firmware.</td>
<td>This is likely because of the controller hardware failure. Check the wiring is correct. If the error is not cleared after the controller is rebooted, contact us.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9004</td>
<td>Initialization failure. Failed to initialize the DU. Check the DU power and the connection.</td>
<td>The number of set Drive Unit(s) disagrees with the number of recognized Drive Unit(s). Check the wirings of power supply and between Control Unit and Drive Unit are correct. If the error is not cleared after the controller is rebooted, contact us.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9005</td>
<td>Initialization failure. Failed to initialize the DU. Check the connection.</td>
<td>This is likely because of the Drive Unit hardware failure. Check the wiring is correct. If the error is not cleared after the controller is rebooted, contact us.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9011</td>
<td>Battery voltage of the CPU board backup is lower than the specified voltage. Replace the CPU board battery.</td>
<td>Replace the battery for the CPU board immediately. Keep the controller ON as long as possible until the battery is replaced.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9012</td>
<td>5V input voltage for CPU board is lower than the specified voltage.</td>
<td>If normal voltage is not generated by 5V power supply alone, replace the power supply.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9013</td>
<td>24 V input voltage for the motor brake, encoder and fan is lower than the specified voltage.</td>
<td>If normal voltage is not generated by 24V power supply alone, replace the power supply.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9014</td>
<td>Internal temperature of the Controller is higher than the specified temperature.</td>
<td>Stop the controller as soon as possible and check whether the ambient temperature of the controller is not high. Check whether the filter is not clogged up.</td>
<td>Current value</td>
<td>Boundary value</td>
</tr>
<tr>
<td>9015</td>
<td>Rotating speed of the controller fan is below the allowed speed. (FAN1)</td>
<td>Check whether the filter is not clogged up. If the warning is not cleared after the controller is rebooted, replace the fan.</td>
<td>Current value</td>
<td>Boundary value</td>
</tr>
<tr>
<td>9016</td>
<td>Rotating speed of the controller fan is below the allowed speed. (FAN2)</td>
<td>Check whether the filter is not clogged up. If the warning is not cleared after the controller is rebooted, replace the fan.</td>
<td>Current value</td>
<td>Boundary value</td>
</tr>
<tr>
<td>9017</td>
<td>Internal temperature of the Controller is higher than the specified temperature.</td>
<td>Stop the controller as soon as possible and check whether the ambient temperature of the controller is not high. Check whether the filter is not clogged up.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9021</td>
<td>DU1 3.3V input voltage for the board is lower than the allowed voltage.</td>
<td>If normal voltage is not generated by 3.3V of Drive Unit 1 power supply alone, replace the power supply.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td></td>
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<td>------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
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</tr>
<tr>
<td>9022</td>
<td>DU1 5V input voltage for the board is lower than the allowed voltage.</td>
<td>If normal voltage is not generated by 5V of Drive Unit 1 power supply alone, replace the power supply.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9023</td>
<td>DU1 24 V input voltage for the motor brake, encoder and fan is lower than the specified voltage.</td>
<td>If normal voltage is not generated by 24V of Drive Unit 1 power supply alone, replace the power supply.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9024</td>
<td>DU1 Internal temperature of the Controller is higher than the allowed temperature.</td>
<td>Stop the Drive Unit 1 as soon as possible and check whether the ambient temperature of the controller is not high. Check whether the filter is not clogged up.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9025</td>
<td>DU1 Rotating speed of the controller fan is below the allowed speed. (FAN1)</td>
<td>Check whether the filter of the Drive Unit 1 is not clogged up. Replace the fan.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9026</td>
<td>DU1 Rotating speed of the controller fan is below the allowed speed. (FAN2)</td>
<td>Check whether the filter of the Drive Unit 1 is not clogged up. Replace the fan.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9031</td>
<td>DU2 3.3V input voltage for the board is lower than the allowed voltage.</td>
<td>If normal voltage is not generated by 3.3V of Drive Unit 2 power supply alone, replace the power supply.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9032</td>
<td>DU2 5V input voltage for the board is lower than the allowed voltage.</td>
<td>If normal voltage is not generated by 5V of Drive Unit 2 power supply alone, replace the power supply.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9033</td>
<td>DU2 24 V input voltage for the motor brake, encoder and fan is lower than the specified voltage.</td>
<td>If normal voltage is not generated by 24V of Drive Unit 2 power supply alone, replace the power supply.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9034</td>
<td>DU2 Internal temperature of the Controller is higher than the allowed temperature.</td>
<td>Stop the Drive Unit 2 as soon as possible and check whether the ambient temperature of the controller is not high. Check whether the filter is not clogged up.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9035</td>
<td>DU2 Rotating speed of the controller fan is below the allowed speed. (FAN1)</td>
<td>Check whether the filter of the Drive Unit 2 is not clogged up. Replace the fan.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9036</td>
<td>DU2 Rotating speed of the controller fan is below the allowed speed. (FAN2)</td>
<td>Check whether the filter of the Drive Unit 2 is not clogged up. Replace the fan.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9100</td>
<td>Initialization failure. Failed to allocate memory.</td>
<td>Reboot the controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9101</td>
<td>Message queue has become full.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9233</td>
<td>The Fieldbus I/O driver is in an abnormal state.</td>
<td>The module is broken or the controller software is damaged. Restore the controller firmware.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9234</td>
<td>Fieldbus I/O driver initialization failure.</td>
<td>The module is broken or the controller software is damaged. Restore the controller firmware.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9610</td>
<td>RAS circuit detected a servo system malfunction. Reboot the controller.</td>
<td>Check the noise countermeasures. Replace the DMB.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>No.</th>
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<th>Note 1</th>
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</tr>
</thead>
<tbody>
<tr>
<td>9611</td>
<td>Servo CPU internal RAM failure. Reboot the controller. Check for noise. Replace the DMB.</td>
<td>Check the noise countermeasures. Replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9612</td>
<td>RAM for the main and servo CPU communication failure. Reboot the controller. Check for noise. Replace the DMB.</td>
<td>Check the noise countermeasures. Replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9613</td>
<td>Servo CPU internal RAM failure. Reboot the controller. Check for noise. Replace the DMB.</td>
<td>Check the noise countermeasures. Replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9614</td>
<td>Initialization communication of main CPU and servo CPU failure. Reboot the controller. Check for noise. Replace DMB.</td>
<td>Check the noise countermeasures. Replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9615</td>
<td>Initialization communication of the main and servo CPU failure. Reboot the controller. Check for noise. Replace the DMB.</td>
<td>Check the noise countermeasures. Replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9616</td>
<td>Communication of the main and servo CPU failure. Reboot the controller. Check for noise. Replace the DMB.</td>
<td>Check the noise countermeasures. Replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9617</td>
<td>Communication of the main and servo CPU failure. Reboot the controller. Check for noise. Replace the DMB.</td>
<td>Check the noise countermeasures. Replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9618</td>
<td>Servo long time command overrun.</td>
<td>Check the noise countermeasures. Replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9619</td>
<td>Servo long time command check sum error.</td>
<td>Check the noise countermeasures. Replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9620</td>
<td>System watchdog timer detected a failure. Reboot the controller. Check for noise. Replace the DMB.</td>
<td>Check the noise countermeasures. Replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9621</td>
<td>Drive unit check failure.</td>
<td>Check the noise countermeasures. Replace the DMB.</td>
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<tr>
<td>9622</td>
<td>RAM failure of the servo CPU. Reboot the controller. Check for noise. Replace the DMB.</td>
<td>Check the noise countermeasures. Replace the DMB.</td>
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<tr>
<td>9623</td>
<td>Failure of the redundant circuitry for the emergency stop or the safeguard. Check the wiring.</td>
<td>Check the noise countermeasures. Replace the DMB.</td>
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<tr>
<td>9624</td>
<td>Low voltage of the main circuit power supply was detected. Check the power supply voltage. Reboot the controller.</td>
<td>Check the noise countermeasures. Replace the DMB.</td>
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<tr>
<td>9625</td>
<td>Control relay contact of the main circuit power supply is welded closed. Replace the DPB.</td>
<td>Replace the DMB.</td>
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<tr>
<td>9630</td>
<td>Servo real time status failure. Check sum error.</td>
<td>Reboot the controller.</td>
<td>Replace the DMB.</td>
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<tr>
<td>9632</td>
<td>Servo real time status failure. Servo free running counter error</td>
<td>Reboot the controller.</td>
<td>Replace the DMB.</td>
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<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
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<td>-------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
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<tr>
<td>9633</td>
<td>Servo real time status failure. Servo CPU communication error.</td>
<td>Reboot the controller. Replace the DMB. Check the noise countermeasures.</td>
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<tr>
<td>9640</td>
<td>Irregular motion control interruption was detected.</td>
<td>Reboot the controller. Replace the DMB. Check the noise countermeasures.</td>
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<tr>
<td>9691</td>
<td>Data sending failure in motion network.</td>
<td>Check the connection of the cable for Drive Unit.</td>
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<tr>
<td>9692</td>
<td>Data receiving failure in motion network.</td>
<td>Check the connection of the cable for Drive Unit.</td>
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<tr>
<td>9700</td>
<td>Servo control gate array failure. Check the DMB.</td>
<td>Check the short-circuit and improper connection of the peripheral equipment wiring. (Emergency and I/O connectors) Replace the DMB. Replace the additional axis unit.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9701</td>
<td>Disconnection of the parallel encoder signal. Check the signal cable connection or the robot internal wiring.</td>
<td>Check the M/C cable signal. Check the robot signal wiring. (Missing pin, disconnection, short-circuit) Replace the motor. (Encoder failure) Replace the DMB. (Detection circuit failure) Check the connector connection in the controller. (Loosening, connecting to the serial encoder terminal on the DMB) Check the model setting. (Improperly setting of the parallel encoder) Check the peripheral equipment wiring. (Emergency and I/O)</td>
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<tr>
<td>9702</td>
<td>Motor driver is not installed. Install the motor driver. Check the DMB or the motor driver.</td>
<td>Check whether the motor driver is mounted. Check the model setting and hardware setting. Replace the motor driver. Replace the DMB.</td>
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<tr>
<td>9703</td>
<td>Initialization communication failure of incremental encoder. Check the signal cable connection and the robot setting.</td>
<td>Check the model setting. Replace the motor. (Encoder failure) Replace the DMB.</td>
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<tr>
<td>9704</td>
<td>Initialization failure of absolute encoder. Check the signal cable connection or the robot setting.</td>
<td>Check the model setting. Replace the motor. (Encoder failure) Replace the DMB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9705</td>
<td>Encoder division setting failure. Check the robot setting.</td>
<td>Check the model setting.</td>
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<td></td>
</tr>
<tr>
<td>9706</td>
<td>Data failure at the absolute encoder initialization. Check the signal cable connection, the controller, or the motor.</td>
<td>Replace the motor. (Encoder failure) Replace the DMB. Check the noise countermeasures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>9707</td>
<td>Absolute encoder multi-turn is beyond the maximum range. Reset the encoder.</td>
<td>Reset the encoder. Replace the motor. (Encoder failure)</td>
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<tr>
<td>9708</td>
<td>Position is out of the range. Reset the encoder.</td>
<td>Reset the encoder. Replace the motor. (Encoder failure)</td>
<td></td>
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</tr>
<tr>
<td>9709</td>
<td>No response from the serial encoder. Check the signal cable connection, the motor, the DMB, or the encoder IF board.</td>
<td>Check the model setting. (Improperly setting of the parallel encoder model) Check the signal cable connection. Replace the DMB and encoder IF board.</td>
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<tr>
<td>9710</td>
<td>Serial encoder initialization failure. Reboot the controller. Check the motor, the DMB, or the encoder IF board.</td>
<td>Check the robot configuration. Check the signal cable. Replace the DMB and encoder IF board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9711</td>
<td>Serial encoder communication failure. Reboot the controller. Check the motor, the DMB, or the encoder IF board.</td>
<td>Check the robot configuration. Check the signal cable. Replace the DMB and encoder IF board.</td>
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<td></td>
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<tr>
<td>9712</td>
<td>Servo CPU watchdog timer failure. Reboot the controller. Check the motor or the DMB.</td>
<td>Replace the DMB. Check the noise countermeasures.</td>
<td></td>
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<tr>
<td>9713</td>
<td>Current control circuit WDT failure. Reboot the controller. Check the controller.</td>
<td>Check the power cable connection. Check the 15V power supply and cable connection. Replace the DMB. Check the noise countermeasures.</td>
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<tr>
<td>9715</td>
<td>Encoder is reset. Reboot the controller.</td>
<td>Reboot the controller.</td>
<td></td>
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<tr>
<td>9716</td>
<td>Power supply failure of the absolute encoder. Replace the battery to a new one. Check the robot internal wiring.</td>
<td>Reset the encoder. Check the signal cable connection.</td>
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<tr>
<td>9717</td>
<td>Backup data failure of the absolute encoder. Reset the encoder.</td>
<td>Reset the encoder. Check the signal cable connection.</td>
<td></td>
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<tr>
<td>9718</td>
<td>Absolute encoder battery alarm. Replace the battery. Check the signal cable connection.</td>
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<tr>
<td>9719</td>
<td>Position failure of the absolute encoder. Reset the encoder. Replace the motor.</td>
<td>Reset the encoder. Replace the motor. (Encoder failure)</td>
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<tr>
<td>9720</td>
<td>Speed is too high at controller power ON. Stop the robot and reboot the controller.</td>
<td>Reboot the controller.</td>
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<tr>
<td>9721</td>
<td>Absolute encoder over heat. Lower the motion duty. Wait until the temperature of the encoder decreases.</td>
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<tr>
<td>9732</td>
<td>Servo alarm A.</td>
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<tr>
<td>10000</td>
<td>Command aborted by user</td>
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<td>10001</td>
<td>Command timeout.</td>
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<td>10002</td>
<td>Bad point file line syntax</td>
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<td>10003</td>
<td>Project could not be built.</td>
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<tr>
<td>No.</td>
<td>Message</td>
<td>Remedy</td>
<td>Note 1</td>
<td>Note 2</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
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<tr>
<td>10004</td>
<td>Cannot initialize Spel class instance.</td>
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<tr>
<td>10005</td>
<td>Cannot initialize parser.</td>
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<tr>
<td>10006</td>
<td>Cannot initialize wbproxy.</td>
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<tr>
<td>10007</td>
<td>Project does not exist.</td>
<td>Check whether the project name and the path are correct.</td>
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<tr>
<td>10008</td>
<td>No project specified.</td>
<td>Specify the project.</td>
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<tr>
<td>10009</td>
<td>Cannot open file.</td>
<td>Check whether the project name and the path are correct.</td>
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<tr>
<td>10010</td>
<td>Cannot create file.</td>
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<tr>
<td>10011</td>
<td>File not found</td>
<td>Check whether the project name and the path are correct.</td>
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<tr>
<td>10012</td>
<td>Option not enabled</td>
<td>Close the robot manager and execute.</td>
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<tr>
<td>10013</td>
<td>Cannot execute LoadPoints with Robot Manager open.</td>
<td>Close the robot manager and execute.</td>
<td>-</td>
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<tr>
<td>10014</td>
<td>Project cannot be locked. It is being used by another session.</td>
<td>Terminate other applications.</td>
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<tr>
<td>10015</td>
<td>Project could not be synchronized.</td>
<td>-</td>
<td>-</td>
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<tr>
<td>10016</td>
<td>Drive not ready</td>
<td>Check whether the drive designation is correct.</td>
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<tr>
<td>10017</td>
<td>Invalid IP address</td>
<td>Check the IP address</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>10018</td>
<td>Invalid IP mask</td>
<td>Check the IP mask</td>
<td>-</td>
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</tr>
<tr>
<td>10019</td>
<td>Invalid IP gateway</td>
<td>Check the IP gateway</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>10020</td>
<td>IP address or gateway cannot be the subnet address.</td>
<td>Check the IP address</td>
<td>-</td>
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<tr>
<td>10021</td>
<td>IP address or gateway cannot be the broadcast address.</td>
<td>Check the IP address</td>
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<tr>
<td>10022</td>
<td>Invalid DNS address</td>
<td>Check the DNS</td>
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<tr>
<td>10023</td>
<td>Commands cannot be executed because the project build is not complete.</td>
<td>Execute after the project build is completed.</td>
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<tr>
<td>10024</td>
<td>Invalid task name</td>
<td>Check the task name</td>
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<tr>
<td>10100</td>
<td>Command already in cycle.</td>
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<tr>
<td>10101</td>
<td>Command aborted by user.</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>10501</td>
<td>Connection aborted.</td>
<td>-</td>
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<tr>
<td>10502</td>
<td>Cannot connect with the SPEL controller board.</td>
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<tr>
<td>10503</td>
<td>Controller firmware is not compatible with this version of RC+.</td>
<td>Check the connection number.</td>
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<tr>
<td>10600</td>
<td>Frame grabber driver not installed.</td>
<td>Install the driver</td>
<td>-</td>
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</table>
Overview

This section contains information for customers using EPSON RC+ 6.0 with RC620 Controller that have already used EPSON RC+ 5.0 with RC170/RC180.

EPSON RC+ 6.0 and EPSON RC+ 5.0 differs in such as harware, adaptable manipulators, number of joint allowance, and software execution enviornment. Please read this section and understand the contents for the safety use of the Robot system.

EPSON RC+ 6.0 is an improved software that has compatibility with products before EPSON RC+ 6.0 and designed to innovate advanced software technologies. However, some parts do not have compatibility with EPSON RC+ 5.0 or have been deleted to specialize in the robot controller and for ease of use.

The following compatibility is indicated based on EPSON RC+ 5.0 compared to EPSON RC+ 6.0.
# General Differences

General differences of EPSON RC+ 5.0 and EPSON RC+ 6.0 are as follows.

<table>
<thead>
<tr>
<th>Item</th>
<th>EPSON RC+ 6.0</th>
<th>EPSON RC+ 5.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of task</td>
<td>Up to 32 tasks</td>
<td>Up to 16 tasks</td>
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<tr>
<td></td>
<td>(Background task: Up to 16 tasks)</td>
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<tr>
<td>Type of task</td>
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<td>Able to specify NoPouse task</td>
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<td></td>
<td>Able to specify NoEmgAbort task</td>
<td>Able to specify NoEmgAbort task</td>
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<tr>
<td></td>
<td>Able to specify Background task</td>
<td>Able to specify Background task</td>
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<tr>
<td>Special TRAP such as TRAP ERROR</td>
<td>Supported</td>
<td>Not supported</td>
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<tr>
<td>Task starts by TRAP number</td>
<td>Dedicated task number</td>
<td>Dedicated task number</td>
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<tr>
<td>Multi Manipulator</td>
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<td>Not supported</td>
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<tr>
<td>Robot number</td>
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<tr>
<td>Number of significant figure for Real type</td>
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<td>Number of significant figure for Double type</td>
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<td>Array elements number</td>
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<td>Local variable</td>
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<td>22:REMOTE</td>
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<td>24:TP</td>
<td>23:OP</td>
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<td>28:LCD</td>
<td>24:TP</td>
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<td>Control device</td>
<td>Remote I/O</td>
<td>Remote I/O</td>
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<td>PC</td>
<td>PC</td>
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<td>OP1 REMOTE Ethernet</td>
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<tr>
<td>Timer number range</td>
<td>0 to 63</td>
<td>0 to 15</td>
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<tr>
<td>Program capacity</td>
<td>8 MB</td>
<td>4 MB</td>
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<tr>
<td>Signal No range for SyncLock, SyncUnlock</td>
<td>0 to 63</td>
<td>0 to 15</td>
</tr>
<tr>
<td>Signal No range for WaitSig, Signal</td>
<td>0 to 63</td>
<td>0 to 5</td>
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<tr>
<td>Memory I/O port</td>
<td>1024</td>
<td>256</td>
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<tr>
<td>I/O port number</td>
<td>Common with EPSON RC+ 5.0</td>
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<tr>
<td>Port No of Ethernet</td>
<td>201 to 206</td>
<td>201 to 208</td>
</tr>
<tr>
<td>Remote I/O assignment</td>
<td>Default: --</td>
<td>Assigned as default</td>
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<tr>
<td>Port No of RS-232C communication</td>
<td>1 to 8, 1001, 1002</td>
<td>1 to 8</td>
</tr>
<tr>
<td>OpenCom execution of RS-232C communication port</td>
<td>Optional</td>
<td>Mandatory</td>
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<tr>
<td>Input/output to files</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>File number</td>
<td>30 to 63</td>
<td>Not supported</td>
</tr>
<tr>
<td>Access number for the database</td>
<td>501 to 508</td>
<td>Not supported</td>
</tr>
<tr>
<td>VisionGuide</td>
<td>Smart camera type</td>
<td>Smart camera type</td>
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<tr>
<td></td>
<td>Frame grubber type</td>
<td></td>
</tr>
<tr>
<td>Conveyor tracking</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>PG robot</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>OCR</td>
<td>Supported</td>
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## Precaution of EPSON RC+ 5.0 Compatibility

<table>
<thead>
<tr>
<th>Item</th>
<th>EPSON RC+ 6.0</th>
<th>EPSON RC+ 5.0</th>
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</thead>
<tbody>
<tr>
<td>Security</td>
<td>Supported</td>
<td>Not supported</td>
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<tr>
<td>VBGuide</td>
<td>Supported</td>
<td>VBGuide Lite is supported</td>
</tr>
<tr>
<td>Fieldbus I/O</td>
<td>Use normal I/O commands</td>
<td>Use normal I/O commands</td>
</tr>
<tr>
<td>Fieldbus master</td>
<td>Response is not guaranteed</td>
<td>Not supported</td>
</tr>
<tr>
<td>Fieldbus slave</td>
<td>Response is guaranteed</td>
<td>Response is guaranteed</td>
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<tr>
<td>GUI Builder</td>
<td>Supported</td>
<td>Not supported</td>
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<tr>
<td>Group in the project</td>
<td>Supported</td>
<td>Not supported</td>
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<tr>
<td>Error number</td>
<td>Common with EPSON RC+ 5.0</td>
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## Compatibility List of Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Compatibility</th>
<th>Note</th>
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<tr>
<td>Abs Function</td>
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<tr>
<td>Accl Statement</td>
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<td>Accel Function</td>
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<td>AccelMax Statement</td>
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<td>AccelR Statement</td>
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<td>AccelR Function</td>
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<td>AccelS Statement</td>
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<td>AccelS Function</td>
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<td>PNumber Function</td>
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### Precaution of EPSON RC+ 5.0 Compatibility

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<td>Added the display of default point file name</td>
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<td>RTrim$ Function</td>
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<td>Select...Send Statement</td>
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<td>Space$ Function</td>
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<td>Sqr Function</td>
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### Precaution of EPSON RC+ 5.0 Compatibility

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<td>TMOOut Statement</td>
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<td>TMove Statement</td>
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<td>Tw Function</td>
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<td>U UBound Function</td>
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<td>UCase$ Function</td>
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<td>V Val Function</td>
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<td>W Wait Statement</td>
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<td>WaitSig Statement</td>
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<td>Added the designation of S, T</td>
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<tr>
<td>Weight Function</td>
<td>+</td>
<td>Added the designation of S, T</td>
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<td>Wrist Function</td>
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<td>WriteBin Statement</td>
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<td>X Xor Operator</td>
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<td>Xqt Statement</td>
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<td>XY Function</td>
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*1: LJM parameter will be supported by Ver.6.1 (Controller firmware Ver.6.2.0.0) or greater.
### EPSON RC+ 6.2.0 List of New Commands

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<td>Cnv_OffsetAngle Function</td>
<td>LatchEnable</td>
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<tr>
<td>Force_Calibrate</td>
<td>LatchState Function</td>
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<tr>
<td>Force_GetForces</td>
<td>LatchPos Function</td>
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<td>Force_GetForce Function</td>
<td>MHour Function</td>
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<td>Force_Sensor</td>
<td>OpenCom Function</td>
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<td>Force_Sensor Function</td>
<td>OpenNet Function</td>
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<td>Force_SetTrigger</td>
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### EPSON RC+ 6.1.0 List of New Commands

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<td>AtHome Function</td>
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### EPSON RC+ 6.0.0 List of New Commands

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<td>J1Angle Statement</td>
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<tr>
<td>ChDisk Statement</td>
<td>J1Angle Function</td>
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<tr>
<td>CloseDB Statement</td>
<td>OpenDB Statement</td>
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<tr>
<td>CR Statement</td>
<td>PG_FastStop Statement</td>
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<tr>
<td>CR Function</td>
<td>PG_LSPEED Statement</td>
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<tr>
<td>CS Statement</td>
<td>PG_LSPEED Function</td>
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<td>CS Function</td>
<td>PG_Scan Statement</td>
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<td>CT Statement</td>
<td>PG_SlowStop Statement</td>
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<tr>
<td>CT Function</td>
<td>QPDECELR Statement</td>
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<tr>
<td>Flush Statement</td>
<td>QPDECELR Function</td>
</tr>
<tr>
<td>GetRobotInsideBox Function</td>
<td>QPDECELS Statement</td>
</tr>
<tr>
<td>GetRobotInsidePlane Function</td>
<td>QPDECELS Function</td>
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### Commands from EPSON RC+ Ver.4.* (Not supported in EPSON RC+ 5.0)

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<tr>
<td>Aopen Statement</td>
<td>Cnv_QueUserData Function</td>
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<tr>
<td>BOpen Statement</td>
<td>Hofs Function</td>
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<tr>
<td>Calib Statement</td>
<td>ImportPoints Statement</td>
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<tr>
<td>CalPIs Statement</td>
<td>InputBox Statement</td>
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<tr>
<td>ChDir Statement</td>
<td>LogIn Function</td>
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<tr>
<td>ChDrive Statement</td>
<td>MCalComplete Function</td>
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<tr>
<td>Close Statement</td>
<td>MCal Statement</td>
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<tr>
<td>Conv_AbortTrack Statement</td>
<td>MKDir Statement</td>
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<tr>
<td>Conv_Downstream Statement</td>
<td>Conv_Drive$ Function</td>
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<tr>
<td>Conv_File Statement</td>
<td>Declare Statement</td>
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<td>Conv_Number Function</td>
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<td>Eval Function</td>
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<td>FbusIO_GetDeviceStatus Function</td>
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<tr>
<td>Conv_QueueAdd Statement</td>
<td>FbusIO_SendMsg Statement</td>
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<td>Conv_QueueGet Function</td>
<td>FileDateTime$ Function</td>
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<td>Conv_QueueLen Function</td>
<td>FileExists Function</td>
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<td>Conv_QueueList Statement</td>
<td>FileLen Function</td>
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<td>Conv_QueueMove Statement</td>
<td>FolderExists Function</td>
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<td>Conv_QueueReject Function</td>
<td>GetCurrentUser$ Statement</td>
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<tr>
<td>Conv_QueueRemove Statement</td>
<td>Hofs Statement</td>
</tr>
<tr>
<td>Conv_QueueUserData Statement</td>
<td>Robot Statement</td>
</tr>
</tbody>
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EPSON RC+ 6.0 (Ver.6.2) SPEL+ Language Reference Rev.5
Precaution of EPSON RC+ Ver.4.* Compatibility

Overview

This section contains information for customers using EPSON RC+ 6.0 with RC620 Controller that have already used EPSON RC+ Ver.4.* with RC520 or RC420. EPSON RC+ 6.0 and EPSON RC+ Ver.4.* differs in such as hardware, adaptable manipulators, number of joint allowance, and software execution environment. Please read this section and understand the contents for the safety use of the Robot system.

EPSON RC+ 6.0 is an improved software that has compatibility with products before EPSON RC+ 6.0 and designed to innovate advanced software technologies. However, some parts do not have compatibility with EPSON RC+ Ver.4.* or have been deleted to specialize in the robot controller and for ease of use.

The following compatibility is indicated based on EPSON RC+ Ver.4.* compared to EPSON RC+ 6.0.
## General Differences

General differences of EPSON RC+ Ver.4.* and EPSON RC+ 6.0 are as follows.

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<th>Item</th>
<th>EPSON RC+ 6.0</th>
<th>EPSON RC+ Ver.4.*</th>
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</thead>
<tbody>
<tr>
<td>Number of task</td>
<td>Up to 32 tasks</td>
<td>Up to 32 tasks</td>
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<tr>
<td></td>
<td>(Background task : Up to 16 tasks)</td>
<td></td>
</tr>
<tr>
<td>Type of task</td>
<td>Able to specify NoPouse task</td>
<td>Able to specify NoPouse task</td>
</tr>
<tr>
<td></td>
<td>Able to specify NoEmgAbort task</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Able to specify Background task</td>
<td></td>
</tr>
<tr>
<td>Special TRAP such as TRAP ERROR</td>
<td>Supported</td>
<td>Supported</td>
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<tr>
<td>Task starts by TRAP number</td>
<td>Dedicated task number</td>
<td>Task number only using 1 to 32</td>
</tr>
<tr>
<td>Multi manipulator</td>
<td>Supported</td>
<td>Supported</td>
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<td>1 to 16</td>
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# Precaution of EPSON RC+ Ver.4.* Compatibility

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## Compatibility List of Commands

+ Function expansion / function changes have been made with upper compatibility.
− No changes.
! Pay attention. Function changes or syntax changes have been made.
!! Pay attention. Significant changes have been made.
× Deleted.

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<tr>
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## Precaution of EPSON RC+ Ver.4.* Compatibility

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