EPSON RC+ Robot Maintenance
Six Axis Robot

Day 1

1. Introduction
   - 1.1 Documentation
   - 1.2 Model Identification
   - 1.3 Safety Overview
     - 1.3.1 Emergency Stop
     - 1.3.2 Safeguard
     - 1.3.3 Lock Out / Tag Out
     - 1.3.4 Teach / Auto
   - 1.4 Power Requirements
   - 1.5 Robot Joint Identification
   - 1.6 Work Envelope (Range)
   - 1.7 Brake Release Module
   - 1.8 Robot Coordinate System
   - 1.9 Robot / Controller Cable Connections
   - 1.10 Power On / Off
   - 1.11 LEDs
   - 1.12 EPSON RC+
   - 1.13 Communications

2. Epson RC+ Programming & Control Environment
   - 2.1 Logging On
     - 2.1.1 Start Mode Identification
     - 2.1.2 Changing Start Mode
   - 2.2 Data Backup
     - 2.2.1 Trigger (controller status to USB media)
     - 2.2.2 Project Copy
     - 2.2.3 Project Restore
     - 2.2.4 View Status
     - 2.2.5 System Restore
     - 2.2.6 Firmware Versions
   - 2.3 Command Mode >
     - 2.3.1 Motor On/Off
     - 2.3.2 Brake Off/On
     - 2.3.3 Pulse Motion Command
       - 2.3.3.1 Monument / Master Recovery Position
     - 2.3.4 Basic Point Expressions
       - 2.3.4.1 P(number) = P(here) (Stores current position into memory)
       - 2.3.4.2 X,Y,Z,U,V,W
       - 2.3.4.3 Plist
       - 2.3.4.4 Point Files
       - 2.3.4.5 On / Off (Output toggle command)
       - 2.3.4.6 SW (Print Input bit status)
   - 2.4 Jog And Teach
     - 2.4.1 Jogging Robot
       - 2.4.1.1 World
       - 2.4.1.2 Joint
       - 2.4.1.3 Tool
   - 2.5 Teaching Points
     - 2.5.1 Using PC
     - 2.5.2 Using Teach Pendant
     - 2.5.3 Direct Point Data Entry
     - 2.5.4 Point File Table

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3. Batteries
   - 3.1. Robot Encoder
     - 3.1.1. Robot Battery Replacement Procedure
   - 3.2. CPU
     - 3.2.1. CPU Battery Replacement Procedure
4. Input and Output Commands
   - 4.1. On / Off (Output toggle command)
   - 4.2. SW (Print Input bit status)
   - 4.3. IO Monitor

Day 2

1. Motor / Harmonic Drive / Belt replacement Exercises
   - 1.1 Safety Overview
   - 1.2 Tool Lists
   - 1.3 Monument Position
   - 1.4 Safety
   - 1.5 Positioning Robot for Maintenance Procedure

2. Joints 1, 2, 4
   - 2.1. Motor
   - 2.2. Reduction Gear Unit
   - 2.3. Timing Belt
   - 2.4. Electromagnetic Brake (C3)
   - 2.5. Calibrate Joint

3. Joint 5 and 6
   - 3.1. Motor
   - 3.2. Timing Belt
   - 3.3. Reduction Gear Units (PS*)
   - 3.4. Electromagnetic Brake (C3)
   - 3.5. Calibration

4. Replacing the Joint 5 & 6 Unit (C3 only)
   - 4.1. Partial Cable Harness Removal
   - 4.2. Calibration

Day 3

A. Lab 1
   - a. Objective: Basic motion Commands, motion between two points using discussed Techniques. Teaching points.
   - b. Review Lab - discussion

B. EPSON RC+ Controller
   - a. 7 segment LED
   - b. Connections
   - c. Power Requirements
   - d. Backplane
   - e. CPU Boards

f. USB / Ethernet Communications
g. PNP / NPN IO diagrams

C. Controller Partial Disassembly
   a. Switching Power Supply
   b. Drive Power circuit
   c. Motor Power Circuit
   d. Main Board
   e. Motor Driver Module
   f. Cooling Fans
   g. Filters
   h. Review of Emergency Stop Circuit
   i. Digital IO
   j. Error Codes
   k. Safe Guard Input
   l. Questions

SPARE PARTS / TROUBLE SHOOTING

1. Troubleshooting and Overview
   1.1. Discussion
   1.2. (4) labs covering actual problem solving
2. Course Review / Question and answer
3. Preventative Maintenance Review (Greasing HD)
4. Spares