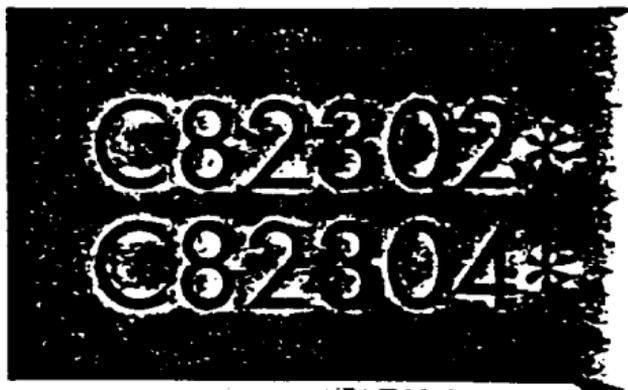


EPSON

32KB
Serial Interface



INTRODUCTION

The Serial Interface C82302* / C82304* is an interface board that allows asynchronous serial data communication between a host computer and an Epson printer.

This board features:

- a 32K byte buffer that frees up your computer for other uses while your printer continues to print.
- two self-test functions that can help solve interface problems.
- signal levels that can be set at either RS232C or 20 mA Current Loop.
- handshaking protocol using X-on/X-off or DTR flag control.
- selectable data word structure. This allows you to choose parity (Odd, Even, or None) and word bit settings (either 7 or 8 bit).
- selection of baud rate settings from 75 to 19,200 BPS. (Data transmission speed is limited to 1,200 BPS when the signal level is set to 20 mA Current Loop.)

This optional interface board is intended for use with the following Epson printers:

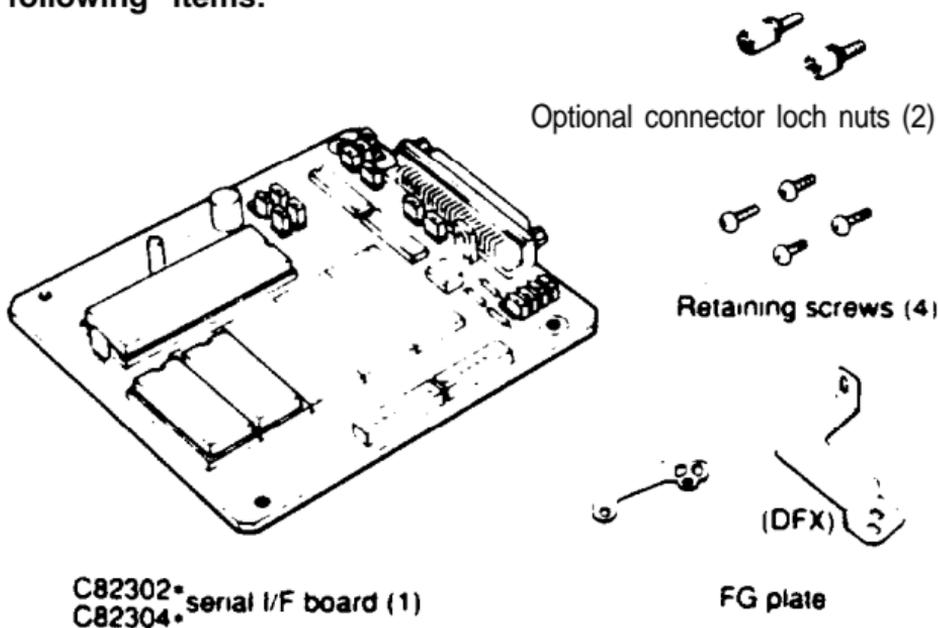
FX, FX+, JX, LX, RX, RX+, HI-80 IX-800, EX-800/1000, LQ-series (except for LQ-1500), SQ-series (except for SQ-2000)

About this guide

This guide is designed to give you detailed information on how to install your C82302* / C82304* serial interface board in a variety of Epson printers. Installation procedures vary slightly depending upon the printer model that you have.

Also included, are instructions on how to adjust the settings of the C82302*/C82304* interface board, as well as a general description of serial data communication.

The C82302*/C82304* option package contains the following items:



Note

When attaching the interface cable to the interface, you may find that the screws of your interface cable do not fit into the connector lock nuts. If this happens you will need to replace the connector lock nuts with the optional ones provided in this package.

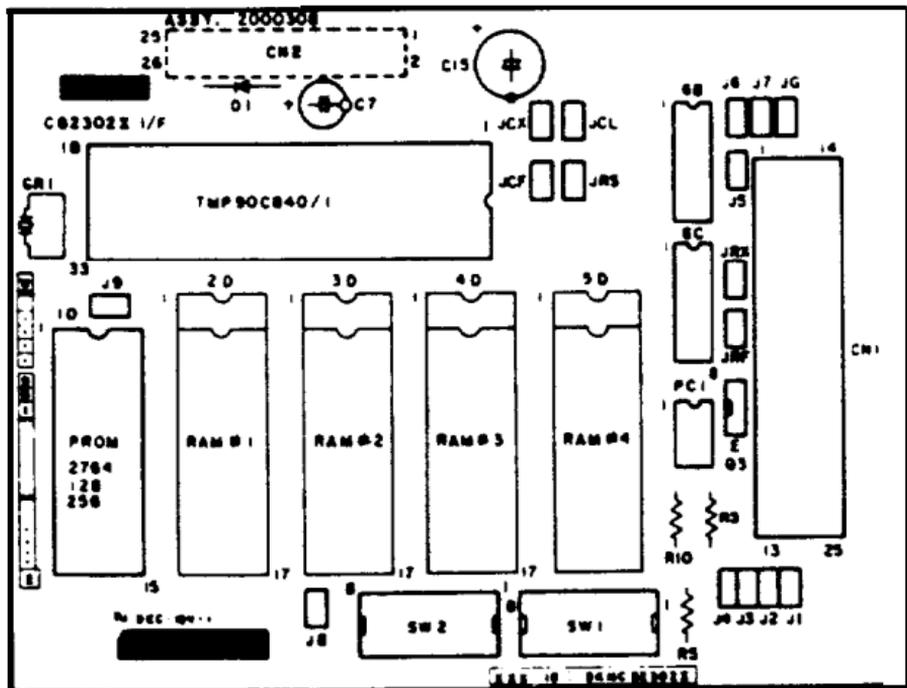
SETTING THE CONDITIONS

The C82302*/C82304* interface board has two sets of DIP (Dual In-line Package) switches, and 16 jumpers. These switch& and jumpers are used for selecting various interface operations.

Board layout

The figure below shows the layout of the C82302*/C82304* board, and the locations of the DIP switches and jumpers.

Figure 2. Board layout

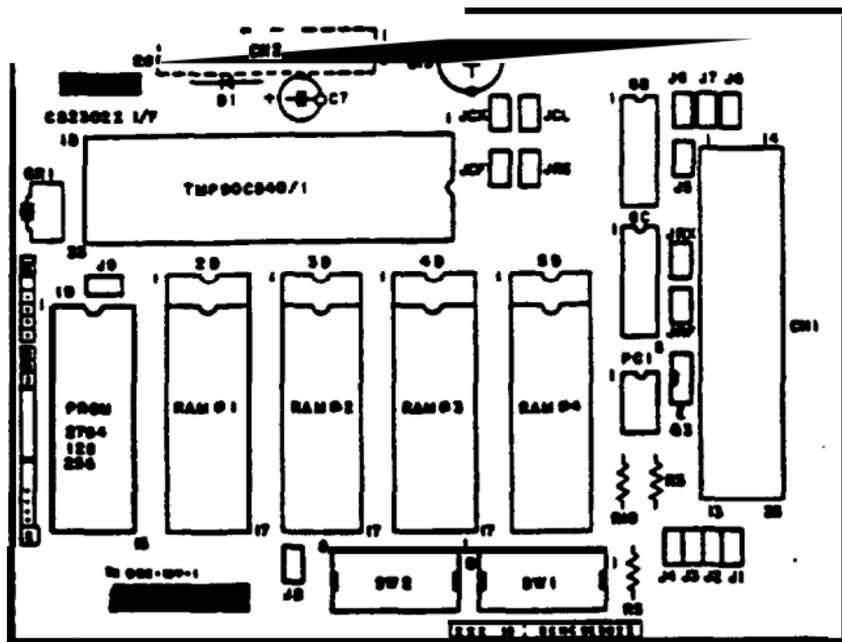


The c82302*/c82304* interface board has two sets of DIP (Dual in-line Package) switches, and 16 jumpers. These switches and jumpers are used for selecting various interface operations.

Board layout

The figure below shows the layout of the (C82302*/C82304* board, and the locations of the DIP switches and jumpers.

Figure 1. Board layout



Before you install the C82302*/C82304* interface, you may need to adjust some of the settings. When making DIP switch setting changes, it is best to use a pointed device, such as a ball-point pen or small screwdriver.

Caution

All changes of DIP switch and jumper settings show are made with the printer power turned off. the printer checks and recognizes new settings only at the time the power is turned on

About DIP switches

The two sets of DIP switches on the C82302*/C82304* are labelled SW1 and SW2. Each set contains a number of individual toggle type switches that can be set either on or off. The individual switches are referred to by set (SW1 or SW2) and number. Therefore, the switch in set SW1 marked by the small number 3 is called DIP switch 1-3

DIP switch 1(Interface operations)

The table below contains information on switch functions, and the factory setting *of each* switch. *The* switches on DIP switch 1 allow you to change interface functions.

Table 1- DIP switch 1

SW pin No.	Function	ON	OFF	Factory setting
1-1	Word length selection	7 bits	8 bits	OFF
1-2	Parity check enable/disable selection	Enable	Disable	OFF
1-3	Even/odd parity selection	Even	Odd	OFF
1-4	Flag (DTR) positive/negative polarity selection	Negative (Note 2)	Positive (Note 1)	OFF
1-5	Baud rate selection	See Table 3.		OFF
1-6				OFF
1-7				OFF
1-8				OFF

Note

1. Positive:

Data Entry Enabled DTR ON (+3V to +27v)

Data Entry Disabled DTR OFF (-3V to -27V)

2. Negative:

Data Entry Enabled DTR OFF (-3V to -27W)

Data Entry Disabled DTR ON (+3V to +27v)

Data word structure

The data word structure is also operator selectable through DIP switch settings (see Table 1). The word structure for serial data is:

1 start bit + 7 or 8 data bits (selectable) + 1 Even or Odd parity bit (optional) + 1 or more stop bits

The table below shows the possible word *structure* Combinations.

Table 2. Word structure

Start Bit	Data Bit	Parity Bit	Stop Bit
1	7	No parity	1 or more
1	7	Odd parity	1 or more
1	7	Even parity	1 or more
1	8	No parity	1 or more
1	8	Odd parity	1 or more
1	8	Even parity	1 or more

Baud rate selection

In serial data communication, data is transmitted in the form of bits. These data bits go out one at a time along a single path, and in a specified order. The BPS (Bits Per Second) rate, or speed at which these bits are transmitted, can be selected using a combination of DIP switch settings.

Note

In the current loop mode, normal data transfer operation cannot be guaranteed at a baud rate setting exceeding 1,200 bps

the printer buffer is enabled. The buffer is a memory which can temporarily store data from a computer.

Table 3. Band rate selection

Baud rate (BPS)	DIP Switch 1			
	SW1-5	SW1-6	SW1-7	SW1-8
75	ON	ON	ON	ON
110	ON	ON	ON	OFF
134.5	ON	ON	OFF	ON
150	ON	ON	OFF	OFF
200	ON	OFF	ON	ON
300	ON	OFF	ON	OFF
600	ON	OFF	OFF	ON
1,200	ON	OFF	OFF	OFF
1,800	OFF	ON	ON	ON
2,400	OFF	ON	ON	OFF
4,800	OFF	ON	OFF	ON
9,600	OFF	ON	OFF	OFF
19,200	OFF	OFF	ON	ON

Note

Switch combinations other than those shown above will be taken as a setting for **19,200 BPS**.

1,200 BPS

Dip switch 2 (interface operations)

The table below contains information on switch functions, and the factory setting of each switch. The switches on DIP switch 2 allow you to change interface functions and select the self test modes.

Table 4. DIP switch 2

SW pin No.	Function	ON	OFF	Factory setting
2-1	I/F board enable/disable	Enable	Disable	ON
2-2	Buffer operation enable/disable	Enable	Disable	ON
2-3	Flag reset timing 1	See Table 5.		OFF
2-4	Flag reset timing 0			OFF
2-5	DSR/DCD Signal enable/disable	Enable	Disable	OFF
2-6	X-OFF transmit timing	16 bytes	512 bytes	OFF
2-7	Self-test enable/disable	Enable	Disable	OFF
2-8	Self-test selection	Line monitor	Loopback	OFF

Note

This interface board operates when DIP switch 2-1 is turned on. By turning this switch off, the parallel interface of the printer can be used even with the serial interface board installed. You should, however, remove any unused interface cable to prevent the possibility of radio frequency interference.

Buffer full recovery timing

When the available space for bytes in the print buffer drops to 512 or 16 bytes, data entry is disabled. As the printer prints the data in the buffer, the vacant area for bytes increases. when this vacant area reaches one of **the four values listed in the table below, data communication is resumed**. These settings are selectable by using the DIP switches.

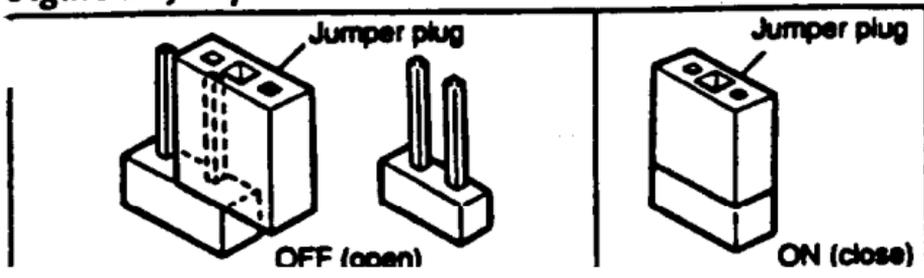
Table 5. Buffer full recovery timing

Vacant area for bytes in the print buffer	DIP Switch 2	
	SW2-3	SW2-4
768	OFF	OFF
1024	OFF	ON
2048	ON	OFF
4096	ON	ON

Jumpers

The jumper is a small terminal used for connecting or disconnecting a circuit. The jumper is on when the jumper plug covers both wires of the terminal. Jumper settings can be changed by either attaching or removing the rectangular jumper plug. If the jumper is to be turned off, connect it to just one of the two terminal pins as shown in the figure below. By doing this, you can avoid losing the unused jumper plug.

Figure 2. Jumpers



Jumper settings

The tables below give you information about the interface conditions that can be selected using jumpers. In all cases, ON denotes the connection of the jumper (covering both terminals), while OFF denotes the disconnection of the jumper.

Table 6. Jumper settings

Jumper	Function				Factory Setting
J1	ON: Pulls up "TTY-TXD" to +12V via 470 ohms resistor. (See Note 1.)				OFF
J2	ON: Connects "TTY-RXD Return" to Signal Ground. (See Note 1.)				OFF
J3	ON: Connects "TTY-TXD Return" to Signal Ground. (See Note 1.)				OFF
J4	ON: Pulls up "TTY-RXD" to +12V via 470 ohms resistor. (See Note 1.)				OFF
J5	ON: Pulls up "DSR" to +12V.				ON
J6	ON: Pulls up "DCD" to +12V.				OFF
J7	ON: Pulls up "CTS" to +12V				ON
J8	Fixed (See Note 2)				—
J9	Fixed (See Note 2)				—
JG	ON: Connects Protective Ground to Signal Ground				OFF
JRX	ON: Sends X-on/X-off when RS-232C level is selected. OFF: Does not send X-on/X-off when RS-232C level is selected.				ON
JRF	ON: DTR signal is fixed SPACE. OFF: DTR control is used for handshaking.				OFF
JCX	ON	X-ON/X-OFF signal is used for handshaking on Current Loop mode (See Note 3.)	OFF	DTR control is used for handshaking on Current Loop mode (See Note 3.)	OFF
JCF	OFF		ON		ON
JCL	ON: Receives data in Current Loop mode. (See Note 4.)				OFF
JRS	ON: Receives data in RS-232C mode. (See Note 4.)				ON

1. If the host computer is not equipped with a power supply for the Current loop interface, these jumpers must be connected to perform communication via the Current loop interface
2. Either J8 or J9 jumper is connected at the factory, and you should not change this setting
3. Either JCX or JCF jumper must be connected.
4. Either JCL or JRS jumper must be connected.

Jumper settings for RS-232C and current loop

Refer to the table below for information on the four available handshaking protocol selections.

Table 7. Protocol selection in RS-232C mode

JRS		ON			
JCL		OFF			
JRX		ON	ON	OFF	OFF
JRF		ON	OFF	ON	OFF
RS-232C level	X-ON/X-OFF control	○	○	×	×
	DTR control	×	○	×	○

Table 8. Protocol selection in Current Loop mode

JCL		OFF			
JCL		ON			
JCX		ON	ON	OFF	OFF
JCF		ON	OFF	ON	OFF
Current Loop	X-ON/X-OFF control	prohibited	○	×	×
	DTR control	prohibited	×	○	×

○: Protocol possible
 ×: Protocol impossible

This section gives a brief description of serial data communication conditions and handshaking protocols supported by the C82302*/C82304* interface board.

serial data communications

The C82302*/C82304 interface allows you to select either RS-232C or 20 mA Current Loop signal level data communication but never both at the same time

This interface board also provides for either DTR (Data Terminal Ready) or X-on/X-off handshaking protocol.

About data entry

To accommodate data entry, the C82302*/C82304* interface board is equipped with a buffer that temporarily stores data before transferring it to the printer. When this buffer becomes full, any additional transmitted data cannot be accepted and is discarded. To prevent such data loss, special handshaking protocols are provided regulate the flow of data transmission. **The two protocols available on the C82302*/C82304* interface board are DTR and X-on/X-off.**

To enable the data entry to the buffer, DSR and DCD must be held at the positive EIA level (SPACE) or DIP switch 2-5 must be off. When DIP switch 2-5 is on and either DSR or DCD is set to the negative EIA level (MARK), all receiving data will be ignored by the C82302*/C82304* interface board.

Note

When a parity error (if parity check is enabled) or an overrun error is detected in the receiving data, an asterisk (*) is printed instead of the receiving data. If a flaming error occurs, the receiving data is ignored.

Handshaking protocol

X-on/X-off Protocol

X-on/X-off protocol is a system in which the printer transmits a code to the computer to indicate that it cannot accept more data, and a second code when it is once again ready. This protocol can be performed under either RS232C or 20 mA Current Loop signal levels.

The C82302*/C82304* interface board sends an X-on <11>H code when it is ready to receive data, and an X-off <13>H when it is busy. The X-On/X-off *Signals* may be transmitted from the TXD terminal at **RS-232C signal levels, or through the TTY-TXD terminal at 20 mA Current Loop levels.**

Note

X-on/X-off protocol cannot be performed when the buffer operation is disabled. But the DTR flag protocol is still possible.

After the X-on flag has been set, data can be accepted up to the maximum capacity of the buffer.

Transmit timing of X-off signal

The X-off signal is transmitted when the vacant area for bytes in the buffer drops to 512 or 16 bytes (selectable with DIP switch 2-6).

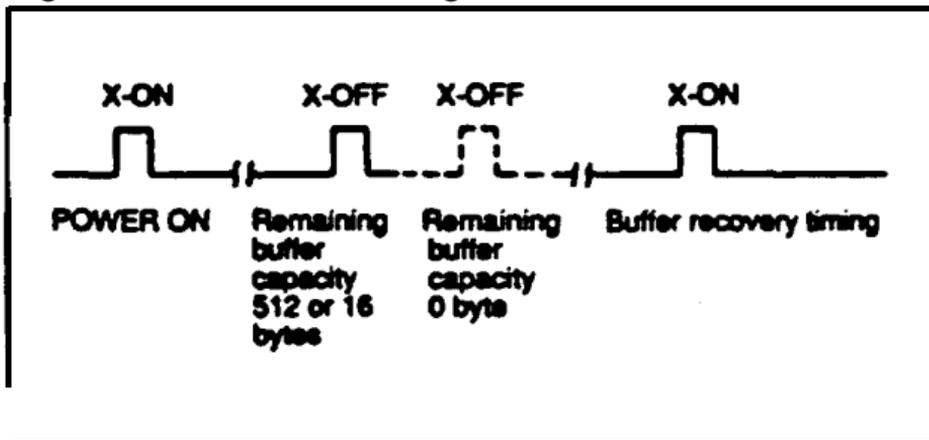
Data transfer after X-off signal

Data can be sent to the printer even after the X-Off signal is transmitted as long as sufficient room for data remains in the buffer. However, if the transmitted data exceeds the vacant area in the buffer, it will be discarded. X-off character will be transmitted again when the remaining buffer capacity is actually 0 bytes. At the same time, BS code <08>H and "/" character <2F>H will be sent to the printer.

Transmit timing of X-on signal

The X-on signal is transmitted when the power is first turned on, or when the vacant area in the buffer is greater than the preset value of the buffer recovery timing. Refer to Table 5. for buffer recovery timing information

Figure 3. X-on/x-off timing



DTR protocol

This interface board also provides for DTR handshaking protocol using either RS-232C or Current Loop signal levels

Under this system, when the printer is turned on the DTR enters the SPACE state, meaning that data entry is enabled. When the rate of data reception is greater than that of printing, the buffer gradually fills up. once the vacant area for transmitted bytes drops to 512 or 1 bytes, the DTR sets the status flag to prohibit further data entry. This flag is output through the DTR (pin No. 20) under RS-232C signal levels, and through the TTY-TXD (pin No. 17) under Current Loop levels.

printer continues to print. When the vacant area for bytes reaches the preset recovery value (see Table 5), the flag is reset and data entry is again enabled.

Note

Reverse Channel (pin No. 11) and DTR (pin No. 20) are internally connected on the interface board and must have identical signal levels.

When buffer operation is disabled

Under this condition, the flag is output from the DTR (pin No. 20) in the case of RS-232C, and from the TTY-TXD (pin No. 17) in the case of Current Loop.

During buffer disabled operation only a single byte of data can be handled at a time. Once the interface transfers a byte of data to the printer, the status flag will be set. After this data is printed, the flag will reset, and data entry will be enabled again.

Printer status error

The flag will be set immediately regardless of the remaining buffer capacity if the printer reaches a state of error. The error signal (pin No. 1 of CN2) will then be low.

Two self test modes can be selected by DIP switches 2-7 and 2-8. To select a self test mode, first turn off the power to the printer and then change the DIP switch setting. When the power is turned back on, the new settings *automatiully* come into effect. To exit from the self test, turn off the power and reset the DIP switches.

Table 9. Self modes

SW2-7	SW2-8	Mode
ON	OFF	Loopback
ON	ON	Line monitor

Loopback

When the power is turned on after connecting pins No. 2 (TXD) and No. 3 (RXD) on the interface connector, the interface board first checks the RAM conditions. After checking the RAM, data in the range of <30>H to <39>H and LF<0A>H are sent to the printer 8 times and printed. The interface must be set at the RS-232C signal level before this self test can be performed. (Connection of jumper JRS selects RS-232C levels.)

Note

It takes some time to check the RAM before test printing.

Line monitor

Under this test, data on the RS-232C line or Current Loop line are printed in hexadecimal code. The only difference between normal operation and this mode, is that all data is converted into hexadecimal form.

SPECIFICATIONS

1. **Synchronizing** Method: Asynchronous
2. Baud Rate: **75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200**BPS
(selectable)
3. Word length:
 - Start bit: 1 bit
 - Data bit: 7 or 8 bits (**selectable**)
 - Parity bit: Odd, even or none (selectable)
 - Stop bit: 1 bit or more

Input signal polarity:

1) **With RS-232C:**

MARK = logic "1" (-3 to -27V)

SPACE = logic "0" (+3 to +27V)

2) **Current** loop:

MARK = logic "1" (Current ON)

SPACE = logic "0" (Current **OFF**)

5. Handshaking

Table 10. Handshaking

	RS-232C	Control Loop
Using DTR Protocol*	When the signal condition rtpinNo.11 and pin No. 20 is: MARK: Data entry is disabled. SPACE: Data entry is enabled.	When the impedance bawccnpinNo.17 and pin No. 24 is: LOW (MARK): Data entry is disabled. High (SPACE): Data entry is enabled.
Using X-ON/X-OFF signals	Data is transmitted fmpinNo.2 X-ON <11>H: Data entry is enabled. X-OFF <13>H: Data entry is disabled.	Data is transmitted by the change of the impedance between pin No. 17 and pin No. 24. X-ON <11>H: Data entry is enabled. X-OFF <13>H: Data entry is disabled.

1. DTR signal can be fixed SPACE by jumper JRF.
TXD signal can be fixed MARK by jumper JRX.
(No transmission of X-ON/X-OFF characters from TXD.)

Note

Operation is not **guaranteed** when using the current loop mode at **rates** over 1200 BPS.

1. I/F board connector : EIA standard 25-pin Cannon type.
2. For signal description and pin assignment, refer to the table below:

Table 11. Signal *Description* and Pin Assignment

Pin No.	Signal Name	Direction*	Description
1	Protective Ground	—	Chassis ground
2	Transmitted Data (TXD)	out	Transmitted serial data
3	Received Data (RXD)	In	Received serial data
4	Request to Send (RTS)	out	This signal is always at the positive EIA level.
5	Clear to Send (CTS)	In	No-operation
6	Data Set Ready (DSR)	In	This signal must be at the positive EIA level for the printer to receive data.
7	Signal Ground	In	Return path for data and control signals.
8	Data Carrier Detect (DCD)	In	This is the same signal as DSR at pin No.6. DCD and DSR can be held at "SPACE" internally. The signal polarity is factory-set to "SPACE".
11	Reverse Channel (= 2nd RTS)	Out	This signal is at the positive EIA level when the printer is ready to accept data entry and at the negative EIA level when the printer is not ready to accept data entry. Operator can invert the polarity of this signal by the DIP switch 1-4, or can fix the positive EIA level by the jumper JRF.
20	Data Terminal Ready (DTR)	Out	

Pin No.	Signal Name	Direction*	Description
17	TTY-TXD	Out	High impedance ("SPACE") between pin No. 17 and No. 24 or X-on signal sent across pin No. 17 and No. 24 indicates that the printer is ready to accept data; Low impedance ("MARK") or X-off signal being set indicates that the printer is busy. Operator can invert the polarity of this signal by the DIP switch 1-4.
24	TTY-TXD Return	—	
25	TTY-RXD	In	Input data of serial current loop.
23	TTY-RXD Return	—	

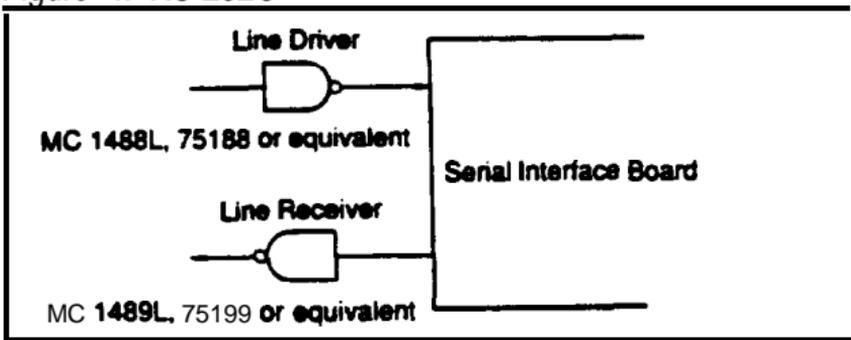
Note

- 1 The column heading "Direction" refers to the direction of signal flow as viewed from the printer.
 - 2 All signals except TTY-TXD and TTY-RXD comply with EIA RS-232C standard.
-

RECOMMENDED CIRCUIT CONNECTIONS

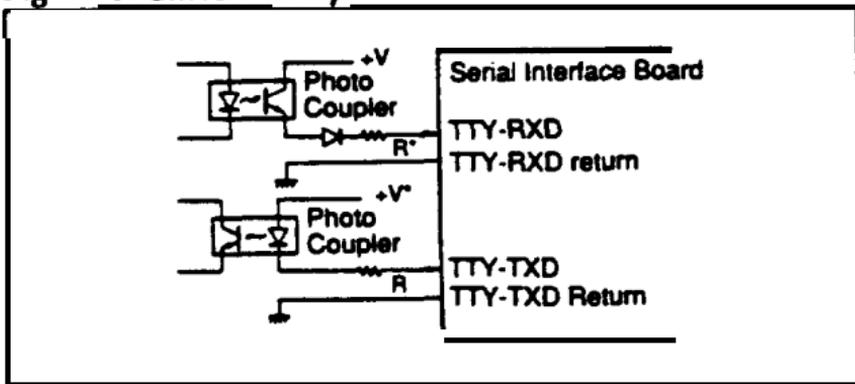
Recommended line driver and line receiver for RS-232C signal level settings., (As viewed from the host computer.)

Figure 4. RS-232C



Recommended line interface circuit for 20 mA Current Loop signal level settings. (As viewed from the host computer .)

Figure 5. Current Loop

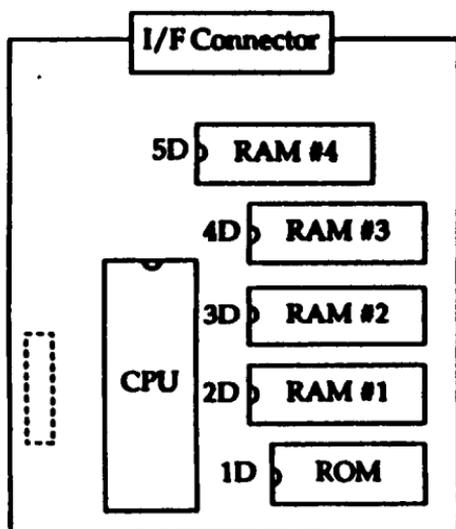


Note

The value of "R" should be selected so that the loop current is set between 10 and 20 mA. The "+V" should be 3v to 24v.

32KB C82302*/C82304* Serial Interface Memory Expansion

The 32KB C82302*/C82304* Serial Interface is designed to allow you to expand buffer size up to 512KB by installing one or more RAM chips. The figure below shows sockets available on the interface board for RAM chip installation.



The interface board is already equipped with one 256KB RAM chip in socket 2D.



CAUTION: Do not insert a RAM chip in socket 1D.

RAM Chip and Socket Combinations

To expand buffer size, use only the socket and RAM chip combinations shown in the table below. Combinations other than those shown below cause the board to lose data.

Buffer size	RAM #1 (2D)	RAM #2 (3D)	RAM #3 (4D)	RAM #4 (5D)
32K byte	256K	-	-	-
64K byte	256K	256K	-	-
96K byte	256K	256K	256K	-
128K byte	1M	-	-	-
256K byte	1M	1M	-	-
334K byte	1M	1M	1M	-
512K byte	1M	1M	1M	1M

Recommended RAM Chips

The tables below list recommended RAM chips. You may also substitute equivalent RAM chips. Check with your Epson® dealer if you need more information.

256K bit RAM

	Maker	Device Number
PS-RAM	Toshiba	TC51832P/PL-85/10/12
	Hitachi	HM65256BP/BLP-10/12
S-RAM	Toshiba	TC55256PL-10/12
	Hitachi	HM62256P/LP-8/10/12
	Seiko Epson	SRM20256C/LC-10/12
	NEC	μPD43256-10L

1M bit RAM

	Maker	Device Number
PS-RAM	Toshiba	TC518128AP/APL-80/10/12
	Hitachi	HM658128DP/LP-10/12



CAUTION: Do not mix PS-RAM and S-RAM chips together on the same interface board. The board must contain only one type of chip: S-RAM or PS-RAM.

IMPORTANT NOTICES:

- Disregard the note on page 8 of the use manual.
- The factory setting is 1200 BPS.