Chapter 5: Communication Interface

Communication Overview

In order for a receipt to be printed, a program must be in place that translates the data from the host computer into a language that the printer can understand. This program must tell the printer exactly how to print each character. This chapter describes how to create such a program or modify an existing one.

Interface

In order for the printer to communicate with the host, a communication link must be set up. The printer supports the RS-232C Serial and IEEE 1284 Parallel interface.

The interfaces have a protocol associated with them that the host must understand and adhere to. Only when the interface parameters are matched and the proper protocol is used will the host and the printer be able to communicate.

For more information about	See this section
Protocol description	"RS-232C Interface"

Sending Commands

Once the communication link is established, commands can be sent to the printer. This section describes how to send commands to the printer using DOS and BASIC. This section does not take into account the necessary protocol, but is meant as a general introduction to how the printer functions.

Using DOS to Send Commands

One way of getting commands to the printer is to send them directly from DOS. For example, the command

```
COPY CON: COM1:
```

sets the computer up such that the hexadecimal code corresponding to any key that was pressed would be sent to the communication port COM1 when the COPY mode is exited. If the printer is connected to COM1, then the data will go to the printer.

Exit the COPY mode by typing

```
CTRL Z
```

and then pressing the ENTER key. Once the computer knows to direct data from any print command to the proper port, commands can be sent from any software program.

Using BASIC to Send Commands

In BASIC, printer commands are sent as a string of characters that are preceded by the LPRINT command. For example,

```
LPRINT CHR$(&H0A)
```

sends the hexadecimal number 0A to the printer, which causes the printer to print the contents of its print buffer. Previously sent commands tell the printer exactly how this data should appear on the paper. For example,

```
LPRINT CHR$(&H12); "ABC"; CHR$(&H0A)
```

sends the hexadecimal numbers 12 41 42 43 0A to the printer. This causes the printer to set itself to double wide mode (12), load the print buffer with "ABC" (41 42 43), and finally, print (0A). Again, the communication link that the BASIC program outputs to must be matched to that of the printer.

RS-232C Interface

The RS-232C interface uses either XON / XOFF (software) or DTR / DSR (hardware) protocol to control the flow of information between the computer and the printer. For XON / XOFF, a particular character is sent back and forth between the host and the printer to regulate the communication. For DTR / DSR, changes in the DTR / DSR signal on the RS-232C interface coordinate the information flow.

The RS-232C interface offers the standard settings that are selected through the Configuration Menu described on page 10 of the "Diagnostics and Configuration" chapter in the *A794 Service Guide*.

Print Speed and Timing

The fast speed of the printer requires the application to send data to the printer at least as fast as it is printed. The application must also allow receipt lines to be buffered ahead at the printer, so the printer will be able to print each line immediately after the preceding line, without stopping to wait for more data. Ideally, the application will send all the data for an entire receipt without pausing between characters or lines transmitted.

The table shows that with a pause of 50 milliseconds after each line, the transmit time equals or exceeds the print time, slowing down the printer, regardless of the baud rate.

50 Millisecond Pause after Each Line

Characters per Line	Lines per Receipt	Transmit Time (9600 Baud)	Transmit Time (19.2 K Baud)	Transmit Time (115.2 K Baud)	Process Time*
20	20	1.4 Sec.	1.2 Sec.	1.03 Sec.	0.5 Sec.
20	40	2.8 Sec.	2.4 Sec.	2.06 Sec.	1.0 Sec.
44	20	1.88 Sec.	1.44 Sec.	1.07 Sec.	0.5 Sec.
44	40	3.76 Sec.	2.88 Sec.	2.15 Sec.	1.0 Sec.

*Process Time is the time it would take the printer to process the data if all transmitted data were present. (It is not the time it takes to print the receipt.)

Example: 20 characters / line, with 20 lines = 0.5 seconds process time for the printer. It takes 1.2 seconds to send the data to the printer at 19.2K baud speed with a 50ms delay after each line. Thus the printer would have to wait 0.7 seconds longer to receive the data that it could process it if no delays existed and the transmission speed were faster.

The next table shows that with no delay between lines, the transmit time is much less than the process time, allowing the printer to print at full speed.

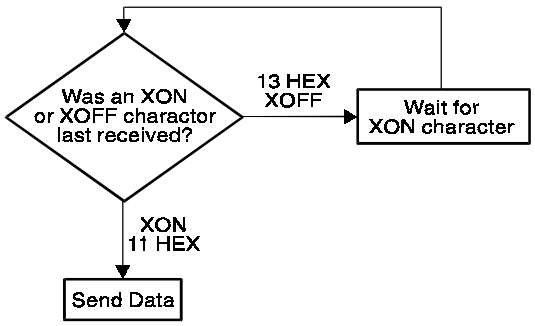
No Delay Between Lines

Char. per Line	Lines per Receipt	Transmit Time (9600 Baud)	Transmit Time (19.2 K Baud)	Transmit Time (115.2 K Baud)	Process Time
20	20	0.4 Sec.	0.2 Sec.	0.035 Sec.	0.5 Sec.
20	40	0.8 Sec.	0.4 Sec.	0.07 Sec.	1.0 Sec.
44	20	0.88 Sec.	0.44 Sec.	0.075 Sec.	0.5 Sec.
44	40	1.76 Sec.	0.88 Sec.	0.15 Sec.	1.0 Sec.

XON/XOFF Protocol

The XON / XOFF characters coordinate the information transfer between the printer and the host computer. The printer sends an XON character when it is ready to receive data and it sends an XOFF character when it cannot accept any more data. The software on the host computer must monitor the communication link as shown in the following flowchart in order to send data at the appropriate times.

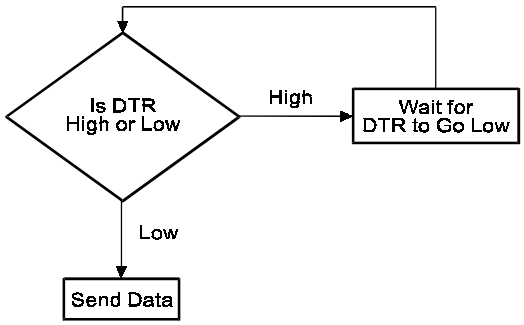
If XON / XOFF has been selected, the printer also toggles the DTR signal, as described in the next section, but it does not look at the DSR signal to transmit data.



XON character = hexadecimal 11.
XOFF character = hexadecimal 13.

DTR/DSR Protocol

The DTR signal is used to control data transmission to the printer. It is driven low when the printer is ready to receive data and driven high when it cannot accept any more data. Data is transmitted from the printer after it confirms that the DSR signal is low.



RS-232C Technical Specifications

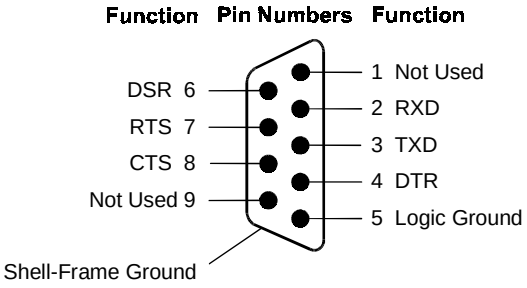
This section describes the pin settings for the connectors and the RS-232C interface parameters. The RS-232C parameters are selected through the configuration menu feature. The RS-232C parameters must match those of the host computer.

For more information about	See these sections or *documents*
Configuration menu feature	*A794 Owner's Guide*
RS-232C settings	"RS-232C Serial Interface Settings" in the *A794 Service Guide*

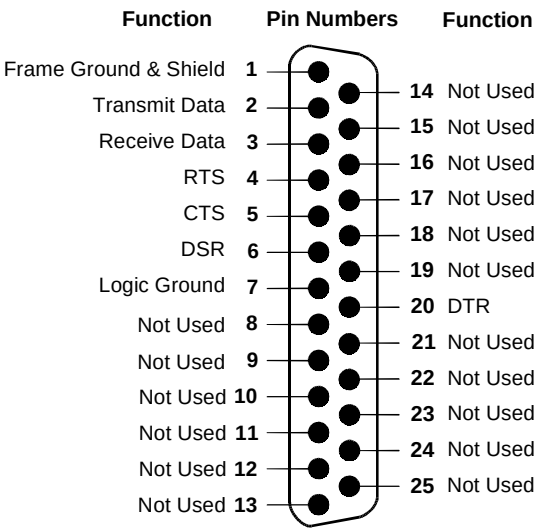
Communication Connectors

The following illustration shows the RS-232C communication connectors and pin assignments. The connectors are located at the rear of the printer, and are specified as male, DB9, 9-pin D-shell, and female DB25, 25-pin with RTS and CTS pins connected.

9-pin DB-9 Connector

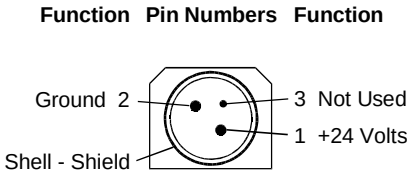


25-pin DB-25 Connector



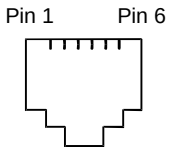
Power Connector

With RS-232C, the printer is always remotely powered. The following illustration shows the power cable connector and pin assignments. The power cable connector is a 3-pin mini DIN plug and is located at the rear of the printer.



Cash Drawer Connector

The following illustration shows the pinouts for the cash drawer connector.



The following table shows the pinouts for the cash drawer. The connector can support two cash drawers with a Y cable, and is located at the rear of the printer.

Pin Number	Cash Drawer Connector
1	Frame Ground
2	Drawer 1 Driver
3	Status Switch +
4	+24 VDC
5	Drawer 2 Driver
6	Status Switch -

RS-232C Settings

The printer supports the standard RS-232C settings:

Baud Rate	1200, 2400, 4800, 9600, 19.2 K, 38.4 K, 57.6 K, 115.2 K
Parity	Parity Enabled, Parity Disabled, Even Parity, Odd Parity
Flow Control Method	XON / XOFF, DTR / DSR
Data Reception Errors	Print "?" for Data Errors, Ignore Data Errors

Generally the printer is shipped with all the RS-232C parameters pre-set at the factory. If you need to change any of these settings, you can do so using the configuration menu feature.

This feature prints instructions on the receipt for changing the RS-232C settings (in addition to other settings).

For more information about	See this section
Changing the RS-232C settings through the configuration menu	"Diagnostics and Configuration" in the *A794 Service Guide*

Parallel Interface

The printer is also available with an IEEE-1284 parallel interface. The printer configuration must be set to the parallel interface using the printer's Configuration Menu described in the "Diagnostics and Configuration" section of the *A794 Service Guide.*

IEEE Bi-directional Parallel Connector

The following illustration shows the parallel communication connector and pin assignments. The connector is located at the rear of the printer, and is designated as an IEEE 1284-A receptacle, commonly known as a D-Subminiature 25 pin.