BLACK BOX®
NETWORK SERVICES

PQ-6 PLUS (RO)

Receive-only printer interface for IBM® System 3X and AS/400
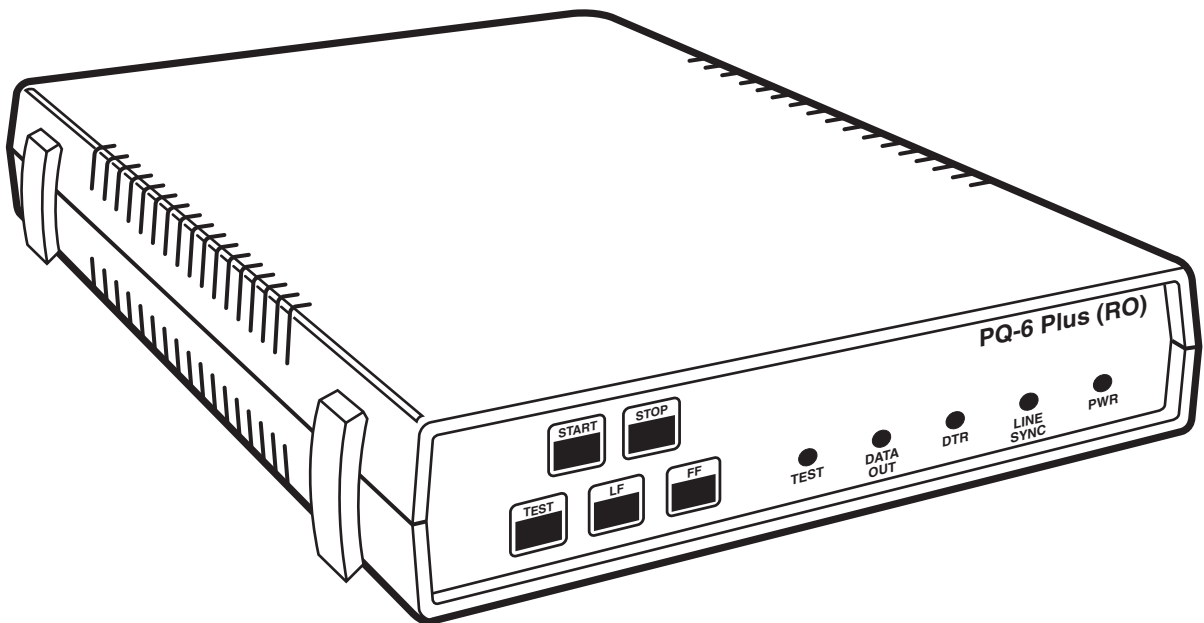
PQ-6 Plus (RO)

START STOP
TEST LF FF
TEST DATA OUT DTR LINE SYNC PWR

FEDERAL COMMUNICATIONS COMMISSION
AND
INDUSTRY CANADA
RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

INSTRUCCIONES DE SEGURIDAD (Normas Oficiales Mexicanas Electrical Safety Statement)

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:

    A: El cable de poder o el contacto ha sido dañado; u

    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o

    C: El aparato ha sido expuesto a la lluvia; o

    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o

    E: El aparato ha sido tirado o su cubierta ha sido dañada.

TRADEMARKS

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CONTENTS

1. Specifications

Controls—PCA35A-R3, PCA35AE-R2: Reset, Start, Stop, LF, FF, Test

Speed—Serial port, 50 bps to 19.2 kbps

Interface—IBM twinaxial; RS-232/V.24 DCE asynchronous or Centronics type parallel

Connectors—(1) DB15 male with twinax V, (1) DB25 female

Indicators—(5) LEDs: DTR, Line Sync, Power, Test, Data Out

Temperature—Operating: 40 to 100 °F (5 to 42 °C);
    Storage: -40 to 140 °F (-40 to 60 °C)

Humidity—0 to 95% noncondensing

MTBF—50,000 hours

Power—PCA35A-R2: 115-VAC, 60-Hz wallmount transformer (part number PS035A);
    PCA35AE-R2: 230-VAC, 50-Hz (part number PS034E)

Size—PCA35A-R3, PCA35AE-R2: 2.1"H x 8.8"W x 11.5"D (5.3 x 22.4 x 29.2 cm)

Weight—PCA35A-R3, PCA35AE-R2: 4 lb. (1.9 kg)

2. Introduction

2.1 Application

The PQ-6 PLUS (RO) is a "receive-only" microprocessor-based printer interface for the IBM System/34, System/36, and System/38 computers. It allows a printer with an RS-232 or Centronics compatible port to interface with IBM twinaxial cable via a male DB15 and twinax "pigtail" cable. Device address and serial or parallel output are switch selectable, and the baud rate is selectable in 16 settings from 50 to 19,200 bps. XON/XOFF and DTR are supported by the PQ-6 PLUS (RO) for buffer control. Data format is 7 bits, space parity, 1 stop or 8 data bits, no parity, 1 stop bit.

2.2 Description

Data and commands are received from the twinax cable serially (1-MHz clock) by the proprietary front-end processor of the PQ-6 PLUS (RO). Those commands and data addressed to the PQ-6 PLUS (RO) as determined by the device address selection switches, are passed to the Z-80A microprocessor for further processing. The Z-80A CPU converts EBCDIC to ASCII and makes the protocol conversions it needs to change the high-speed synchronous twinax input into an asynchronous RS-232 ASCII output or Centronics compatible output. You may bypass the EBCDIC to ASCII controller to the printer using the PQ-6 PLUS (RO) command-passthrough feature (see **Section 4.3**).

Input data from the controlling host consists of data and command sequences normally interpreted by an IBM 5256, 5224, and 5225 printer. In addition to printable characters and carriage-control characters (such as new line, carriage return, and line feed), the controlling host can send command sequences to control output format. These commands include page width, page length, characters-per-inch, and horizontal and vertical carriage-positioning sequences. The PQ-6 PLUS (RO) interprets these command sequences and outputs ASCII characters to perform the appropriate function. For example, when a form length command is received, the value is stored internally in the PQ-6 PLUS (RO); when it receives a request for a form feed or for an absolute move to line one of the next page, the PQ-6 PLUS (RO) will cause the paper in the attached printer to eject a form of the previously specified form length. Since some commands issued to IBM printers cannot be easily implemented on RS-232 ASCII printers, these commands are interpreted by the PQ-6 PLUS (RO) and discarded. For example, a command to set the lines per inch to seventy-two is accepted by the PQ-6 PLUS (RO), but no corresponding ASCII sequence is output, since the PQ-6 PLUS (RO) cannot know in advance whether the attached printer can accommodate such a command and how to implement it.

As shipped from the factory, the PQ-6 PLUS (RO) is configured to emulate an IBM 5256 printer. If the PQ-6 PLUS (RO) is to emulate the 5224 or 5225 printer, you need to set the appropriate switch on the printed circuit board (see **Section 4.5**).

Serial transmission speed is switch-selectable via printed-circuit-board switches, up to 19,200 bps. Output data is asynchronous with one start bit, seven data bits, space parity, and one stop bit.

The PQ-6 PLUS (RO) supports both software flow control via XON/XOFF characters and hardware flow control via the DTR RS-232 input lead. The PQ-6 PLUS (RO) will suspend printing whenever the DTR signal drops and will resume printing when DTR is asserted. Similarly, when it receives an XOFF character (hex 13), the PQ-6 PLUS (RO) suspends printing; when it receives an XON (hex 11), it will resume printing. Both methods are always enabled. No configuration is required.

The Centronics parallel interface is a 25-pin, parallel byte interface. It has eight lines that carry their respective binary bits in parallel. The transmission of these data bits is controlled by the computer-supplied STROBE pulse. Handshaking (flow control) is achieved by asserting or deasserting either the ACKNLG or BUSY signal from the printer.

Twinaxial

PQ-6 PLUS (RO)

Serial EBCDIC data and commands (1 MHz bit rate)

ASCII data serial or parallel

Printer

S/3X, AS/400 or remote controller
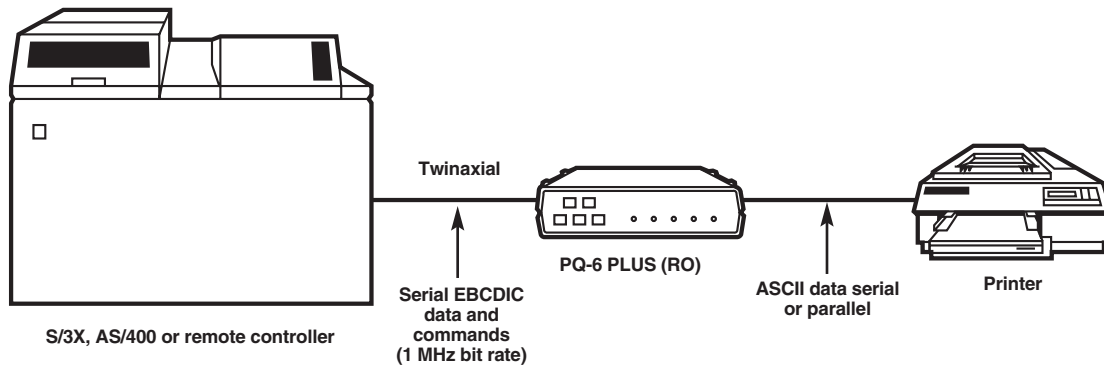
Figure 2-1. Typical Application.

3. Installation

The installation procedure is divided into three sections:

- **Section 3.1, Initial Setup**, explains how to position the PQ-6 (RO) after unpacking it, plug in the power supply, and run off-line tests.

- **Section 3.2, System Configuration and Connection**, covers the considerations for setting up the PQ-6 PLUS (RO). Items covered include setting the device address and all corresponding physical connections.

- **Section 3.3, Placing the PQ-6 PLUS (RO) into Operation**, details online testing procedures that you should implement after completely installing the unit. This section also contains recovery procedures that you can use if the PQ-6 PLUS (RO) malfunctions.

3.1 Initial Setup

3.1.1 INSTALLING A SUPPORTED PRINTER

CAUTION

Connecting a device to the DB25 connector without properly configuring the P3 jumper inside the box may cause damage to the PQ-6 PLUS (RO) and/or the attached device.

DB25 Female

DB15 Male

Reset

Power

Serial

Parallel

+5 **Ground**

EPROM

SW2

1 2 3 4 5 6 7 8

SW1

1 2 3 4 5 6 7 8

ON

Test **Data Out** **DTR** **Line Sync** **Power**

Figure 3-1. Board Layout.

Installing an RS-232 Printer

Connect the 6-pin connector from the power supply to the 6-pin connector on the back of the PQ-6 PLUS (RO). Remove the top cover of the PQ-6 PLUS (RO). Do not plug it into the AC outlet at this time. Locate switch SW1 to set the baud rate and port configuration. Select the serial transmission speed (baud rate) for the PQ-6 PLUS (RO) output port using the four switches labeled Rate 4, Rate 3, Rate 2, and Rate 1 on the printed circuit board according to **Table 3-1**.
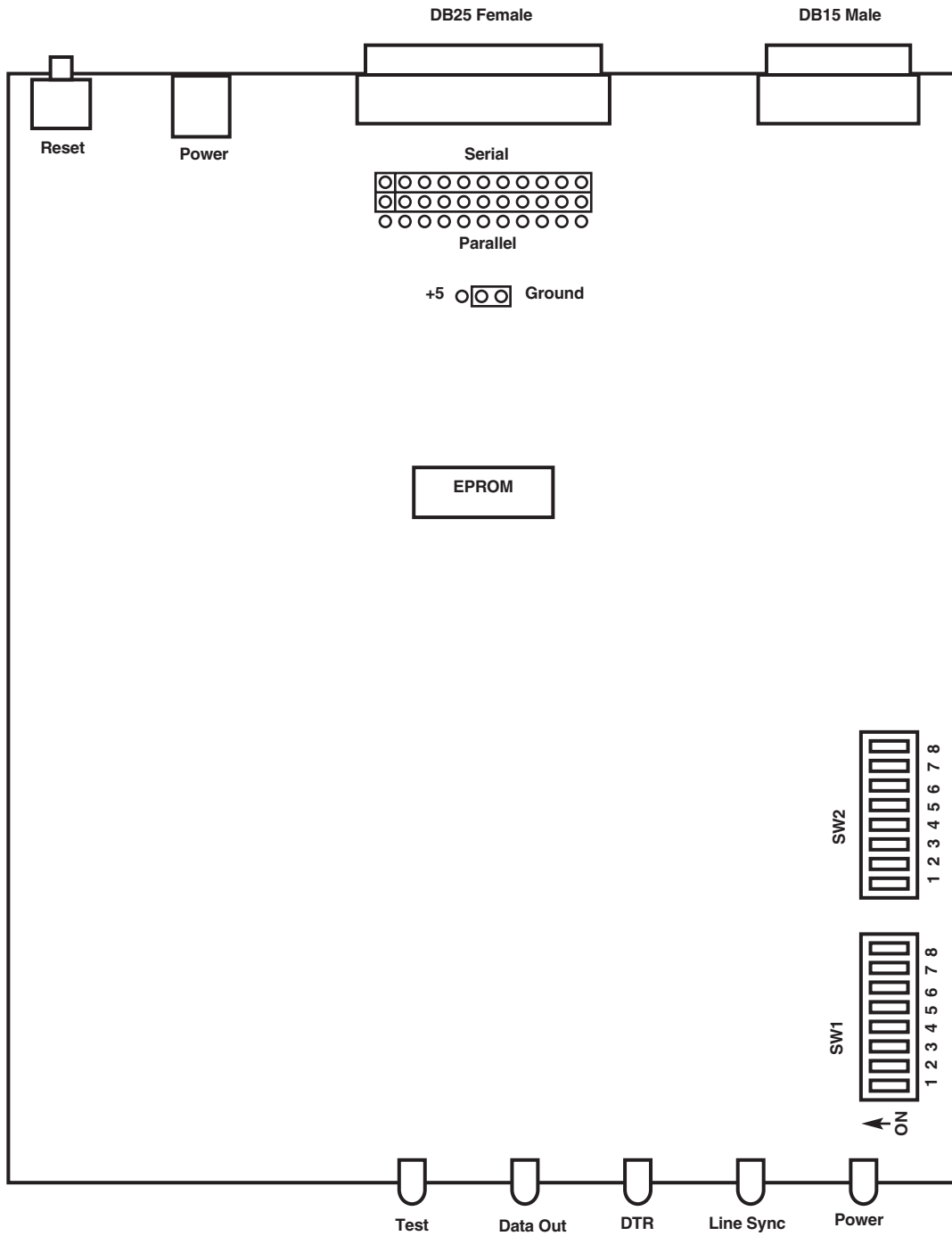
Table 3-1. Baud Rate.

Switch				Baud Rate
S5	**S6**	**S7**	**S8**	
OFF	OFF	OFF	OFF	50
OFF	OFF	OFF	ON	75
OFF	OFF	ON	OFF	110
OFF	OFF	ON	ON	134.5
OFF	ON	OFF	OFF	150
OFF	ON	OFF	ON	300
OFF	ON	ON	OFF	600
OFF	ON	ON	ON	1200
ON	OFF	OFF	OFF	1800
ON	OFF	OFF	ON	2000
ON	OFF	ON	OFF	2400
ON	OFF	ON	ON	3600
ON	ON	OFF	OFF	4800
ON	ON	OFF	ON	7200
ON	ON	ON	OFF	9600
ON	ON	ON	ON	19200

0=OFF
1=ON

Select the port configuration for RS-232 serial operation by setting Opt 3 to the "ON" position.

Place the large internal jumper strip on P3 (P2 on boards with revision levels below C) in the "B-C" position to select RS-232 output. Make sure that the cable to the PQ-6 PLUS (RO) is wired for DCE and contains wires for pins 1, 2, 3, 7, and 20, connecting at the PQ-6 PLUS (RO) with a male DB25 connector. The signals are shown in **Table 3-2**.

Table 3-2. Signals on the DCE cable.

Pin	Signal Name	Source
1	Chassis Ground	—
2	Receive Data	Printer
3	Transmit Data	PQ-6 PLUS (RO)
7	Signal Ground	—
20	Data Terminal Ready	Printer

Place the supported printer close to the PQ-6 PLUS (RO). Connect the printer RS-232 cable to the DB25 connector on the back panel of the PQ-6 PLUS (RO). Proceed to **Section 3.2.3**.

Installing a Centronics compatible printer

Connect the 6-pin connector from the power supply to the 6-pin connector on the back of the PQ-6 PLUS (RO). Do not plug it into the AC outlet at this time.

Place the large jumper strip at P3, in the "A-B" position for parallel output.

The Centronics DB25 pinout is a standard DB25 to Centronics cable (Black Box part number EYN600) that connects the PC to the printer. This cable's pinning is shown in **Table 3-3**.

Table 3-3. Centronics to RS-232 Cable Wiring.

Pin No.	Signal	Source	Description
1	Strobe	PQ-6 PLUS (RO)	Data strobe pulse to printer.
2	Data 1	PQ-6 PLUS (RO)	
3	Data 2	PQ-6 PLUS (RO)	8 bits of parallel data.
4	Data 3	PQ-6 PLUS (RO)	
5	Data 4	PQ-6 PLUS (RO)	
6	Data 5	PQ-6 PLUS (RO)	
7	Data 6	PQ-6 PLUS (RO)	
8	Data 7	PQ-6 PLUS (RO)	
9	Data 8	PQ-6 PLUS (RO)	
10	Acknlg	Printer	Indicates data received and ready to accept other data.
11	Busy	Printer	Indicates printer cannot receive data.
12	Paper End	Printer	Indicates out of paper.
13	Select	Printer	Indicates printer is selected and ready to receive data.
14	Auto Feed	PQ-6 PLUS (RO)	When this signal is low (Jumper J1), the paper is automatically fed one line after printing. This signal does not apply to all printers.
15	Fault	Printer	Indicates a printer fault condition such as out of paper.
16	Input	PQ-6 PLUS (RO)	Clears the printer buffer and initializes the logic.
18, 19, 23, 25	Ground	PQ-6 PLUS (RO)	Logic ground.

Connect the Centronics printer cable to the DB25 connector at the back of the PQ-6 PLUS (RO). Locate SW1 and set switch option 3 (position 2) to the "OFF" position.

3.1.2 POWER AND GROUNDING OF PQ-6 PLUS (RO)

Plug the power supply into a suitably grounded AC receptacle.

3.1.3 OFF-LINE TEST OF PQ-6 PLUS (RO) AND PRINTER

Initial Power On Test

Once both the printer and the PQ-6 PLUS (RO) are plugged into the AC line, turn the printer power switch "ON" and put it into an "on-line" condition. Make sure the connection between the printer and the PQ-6 PLUS (RO) is complete. Run the following test to check the power and connections for both devices.

Table 3-4. Initial Test.

Initial Test	Device Response	Corrective Action
Plug the PQ-6 (RO) PLUS power supply into the AC line.	Power and DTR indicators.	Proper response. No corrective action is necessary.
	No response on power or DTR indicators.	Power supply not plugged into back connector of the PQ-6 (RO), or no AC line power, or PQ-6 (RO) power supply is defective.
	DTR indicator blinking.	If configured for serial: The attached serial device is not providing Data Terminal Ready (DTR) on Pin 20 of the PQ-6's DB25 connector. If configured for parallel: The attached parallel printer is not providing the select signal on Pin 13 of the PQ-6's DB25 connector. Check that the printer is "ON," on-line, and the cable is connected and configured properly.

Self-Test

After running the power test successfully, you can run the self-test to check the PQ-6 PLUS (RO) program memory (ROM) and buffer memory (RAM). You can perform the self-test via two different methods: internal DIP switches or the front-panel test button. Either way, the printer will print the software revision level, address selected, and printer emulated. The self-test will also send a printed barber-pole test pattern to the printer. The amount of data in the barber pole is different between the two types of self-tests. The self-test procedures and device response are shown in **Table 3-5**. **Figure 3-1** illustrates a sample of a self-test printout.

Table 3-5. Self-Test Procedures and Device Responses.

Preliminary Condition	Initial Test	Device Response	Corrective Action
Both PQ-6 PLUS (RO) and printer are "ON" and the "Power ON" test has been conducted successfully.	Two methods of performing the self-test: via switches or via the front-panel test button Switch method: Set SW2-4 ON, SW2-5 ON, then press and release the reset button on the rear of the unit. Front-panel method: Press the front-panel test button. When performing either method of self-test, the front-panel LEDs will flash once, then the Data Out LED will flash rapidly (depending on the baud rate if serial) while data is being sent to the attached printer.	1. Printed verification occurs as described above.	1. Proper response. No corrective action necessary.
		2. No response from printer or random or garbage characters are printed.	2. Check that the printer is on-line and the cable is configured properly. Incorrect baud rate, parity, or stop bits if using serial interface.
		3. Printed verification has blank line between printed lines.	3. Locate Jumper (J1) on PC board and position jumper from the +5V pin to the center pin.

After the self-test is successfully performed, set SW2 position 5 to "OFF" and press the reset switch.

```
PQ6.PLUS
REV1.41 SOFTWARE
RAM OK
ROM OK

DEVICE ADDRESS 0
Printer = 5256
```

```
    .<(+|& !$*);^-/,%>? -:#@'="abcdefghi jklmnopqr    -stuvwxyz    {ABCDEFGHI    }JKLMNOPQ
     <(+|& !$*);^-/,%>? -:#@'="abcdefghi jklmnopqr    -stuvwxyz    {ABCDEFGHI    }JKLMNOPQ
   .<(+|& !$*);^-/ ,%>? -:#@'="abcdefghi jklmnopqr    -stuvwxyz    {ABCDEFGHI    }JKLMNOPQ
    <(+|& !$*);^-/ ,%>? -:#@'="abcdefghi jklmnopqr    -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
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       !$*);^-/ ,%>? -:#@'="abcdefghi jklmnopqr    -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
       !$*);^-/ ,%>? -:#@'="abcdefghi jklmnopqr     -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
       !$*);^-/ ,%>? -:#@'="abcdefghi jklmnopqr      -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
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      !$*);^-/ ,%>? -:#@'="abcdefghi jklmnopqr      -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
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       >? -:#@'="abcdefghi jklmnopqr         -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
        -:#@'="abcdefghi jklmnopqr          -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
        -:#@'="abcdefghi jklmnopqr          -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
       -:#@'="abcdefghi jklmnopqr          -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
      -:#@'="abcdefghi jklmnopqr           -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
      -:#@'="abcdefghijklmnopqr           -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
     -:#@'="abcdefghijklmnopqr            -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
    -:#@'="abcdefghijklmnopqr            -stuvwxyz    {ABCDEFGHI    }JKLMNOPQ
    :#@'="abcdefghijklmnopqr            -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
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    ="  abcdefghijklmnopqr             -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
       abcdefghijklmnopqr             -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
       bcdefghijklmnopqr              -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
        defghijklmnopqr              -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
         fghijklmnopqr              -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
          hijklmnopqr              -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
          jklmnopqr               -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
          jklmnopqr               -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
          jklmnopqr               -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
          jklmnopqr               -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
          klmnopqr                -stuvwxyz    {ABCDEFGHI    }JKLMNOPQR
```

Figure 3-1. Sample Self-Test Printout.

3.2 System Configuration and Connection

At this point, the PQ-6 PLUS (RO)'s serial or parallel port has been tested off-line and verified to be in working condition. However, before attaching to the host system, you must consider the overall system layout to establish the relative device positioning, port selection, cabling, device addressing, and unit identification.

3.2.1 PQ-6 PLUS (RO) ADDRESS SELECTION

Determine the correct device address number for the PQ-6 to use by contacting the person responsible for assigning workstation and device addresses.

Locate the printer-options/address-selection DIP switches by removing the top half of the enclosure. The switches are labeled SW2: ADR4 (POS 6), ADR2 (POS 7), and ADR1 (POS 8).

Set the three switches on the right of the DIP switch to arrive at the proper twinax address. When the switch is OFF, it represents a zero. Conversely, when the switch is ON, it represents a one. The three switches are labeled ADR 4, 2, and 1, representing a binary value. Therefore, any address, zero to six, can be represented by an appropriate on-off configuration of the switches. Examples are given in **Table 3-6**.

Table 3-6. Printer Options/Address Selection DIP Switch.

Decimal	SW6 ADR4	Device Address SW7 ADR2	SW 8 ADR1	
0	OFF	OFF	OFF	
1	OFF	OFF	ON	
2	OFF	ON	OFF	
3	OFF	ON	ON	
4	ON	OFF	OFF	
5	ON	OFF	ON	
6	ON	ON	OFF	
7	ON	ON	ON	(ON=ILLEGAL)

3.2.2 SYSTEM CONFIGURATION REQUEST

Physically, the PQ-6 PLUS (RO) is now properly addressed and cabled to the host system or remote controller. However, before the System 3X or AS/400 system will recognize the PQ-6 PLUS (RO), you must: 1) make sure the PQ-6 PLUS (RO) is emulating the proper system device and 2) perform a system configuration (unless the PQ-6 PLUS (RO) is replacing an existing printer or you have auto-config enabled).

As shipped from the factory, the PQ-6 PLUS (RO) is configured to emulate an IBM 5256 printer. On the inside of the PQ-6 PLUS (RO) are two DIP switches labeled ID1 and ID2 SW2, positions 1 and 2. They select the IBM printer to be emulated (5256, 5224, or 5225). **Table 3-7** gives the proper settings for selecting the desired printer type.

Table 3-7. Settings for Printer Type.

ID2 SW2-1	ID1 SW2-2	Printer Type
OFF	OFF	5256
OFF	ON	5224
ON	OFF	5225
ON	ON	UNUSED

You must configure the system at a console to inform the operating system of the new device port, address, and unit ID assignments.

NOTE

You don't have to configure the system if a previously existing 5256, 5224, or 5225 printer was replaced by the PQ-6 PLUS (RO) or if you have auto-config enabled on the AS/400. If the PQ-6 PLUS (RO) is replacing an existing device, printer ID and device addressing must remain as established for the removed device.

3.2.3 PRINTER CODES FOR PITCH AND DENSITY

The printer control ode feature in the PQ-6 PLUS (RO) allows the host to control the horizontal pitch (10 and 15 CPI) and vertical pitch (6 and 8 LPI) for certain attached ASCII printers. You can find the list of printers on **page 20**.

3.3 Placing the PQ-6 in Operation

When notified that the system operator has completed the system configuration, you can power on the PQ-6 PLUS (RO) (and all other cabled-through devices) using the following procedure:

A. Plug the power supply into the AC line.

B. Place the AC power switch on the attached printer in the "ON" position and place the printer into "on-line" mode. The DTR indicator should light.

C. The LINE SYNC indicator should light as soon as communications with the host are established. The PQ-6 PLUS (RO) should now be exercised online to verify the operational readiness. Simply execute a print comand.

MALFUNCTION RECOVERY PROCEDURES

Table 3-8 describes the recovery procedures you can use if the machine malfunctions.

Table 3-8. Recovery Procedures.

Indicator Condition	Probable Cause	Recovery Action

No indicator lights	Power supply not plugged into AC or into PQ-6.	Plug power supply cord into a suitable receptacle.
Line Sync light "OFF"	Printer improperly addressed.	Set correct address on SW2-6, 7, and 8; press RESET. Check twinax connections.
DTR Flashing	Attached printer OFF, in error condition, or switches and P2 jumper not in proper position.	Turn on attached printer or check for proper configuration.
Head moving printing	No ribbon. Defective ribbon.	Install new ribbon. Install new ribbon.
No printing in test mode.	Ribbon out. Paper out. Printer AC off. No DTR or select from printer.	Install new ribbon. Install forms. Turn on printer power. Check cables and printer power.
Test message printed incorrectly.	Incorrect PQ-6(RO) baud rate. Bad cable connection to printer.	Set correct baud rate via switches on the board. Disconnect power supply, check cable for complete insertion at both ends. Check for broken wires.

4. Operation

4.1 Operator Controls and Indicators

Use **Figure 4-1** to locate the controls, indicators, and connectors described in this section.
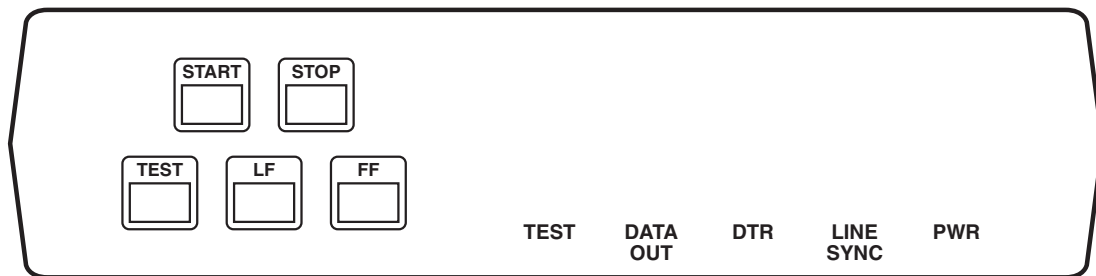
Figure 4-1. Front-Panel Controls and Indicators.

4.1.1 FUNCTION SWITCHES

- Test: Pressing this switch will cause the TEST light to blink and a test pattern to be printed. If the PQ-6 (RO) cannot detect the attached printer, the TEST light will blink repeatedly. You can clear this condition by readying the printer.

- Line Feed: Pressing the LINE FEED switch will cause the paper to advance one line for each key you press. The internal line counter will also be advanced. For continuous line feeds, hold this switch "ON."

- Form Feed: Pressing the FORM FEED switch will cause the paper to move to the top of the next form.

- Stop: Pressing the STOP switch stops printing on the PQ-6 PLUS (RO) Plus. It also presents "unit not available" status to the controller. The message "press start on printer Pn" will appear on the controlling console.

- Start: Pressing the START switch will present "unit available" status to the controller and clear the STOP message. Printing will resume on the PQ-6 Plus.

- Reset: Pressing the RESET switch (located on the rear panel) initializes all PQ-6 PLUS (RO) hardware.

4.1.2 INDICATOR LIGHTS

- Power: Indicates that AC power has been applied to the unit.

- Line Sync: Indicates that the PQ-6 is responding to host polls.

- DTR (Data Terminal Ready): This signal from the printer to the PQ-6 PLUS (RO) indicates that the printer is ready. This signal must be present for printing to proceed. You can enable flow control from the PQ-6 PLUS (RO) to the printer via XON/XOFF characters (Hex 11/Hex 13) or by dropping DTR when the printer is not able to accept more data. When used as a Centronics port, the DTR light indicates select from the printer.

- Data Out: Shows the data sent to the printer from the PQ-6 PLUS.

- Test: Blinks to indicates that internal tests are running. Blinks repeatedly if the select signal from the printer is not present.

NOTE
Initial setup of internal switch and jumper settings for baud rate, printer interface, etc., must have been done previously. See Section 3.1.

4.2 Setup Mode

You can configure the PQ-6's twinax address, printer emulated, ASCII printer type, page select and command pass-through by the front panel or the internal DIP switches.

NOTE
ASCII printer type is only selectable via the front panel.

To enable configuration via the front panel, set the internal DIP switch bank 2 position 4 to OFF. The factory-default setting for this switch position is ON.

To place the PQ-6 PLUS (RO) in setup mode, press and hold in the test switch while pressing and releasing the reset switch, then release the test switch. The PQ-6 PLUS (RO) will print the following menu on the attached printer:

PQ-6 PLUS REV. 1.41 SOFTWARE SETUP MODE

Press START to select switch settings
Press STOP to print switch settings
Press LF to do Printer Test
Press FF to return to twinax mode

Press FF to accept switch setting
Press STOP to toggle switch setting

DEVICE ADDRESS 0
DEVICE ADDRESS 7
DEVICE ADDRESS 6
DEVICE ADDRESS 5
DEVICE ADDRESS 4
DEVICE ADDRESS 3
DEVICE ADDRESS 2
DEVICE ADDRESS 1
DEVICE ADDRESS 0

Printer=5224

Printer=5225

Page Eject is Form Feeds

Page Eject is Line Feeds

Command Pass Thru is Disabled

Command Pass Thru is Enabled

Current printer attached is Generic 3400h
Current printer attached is IBM Proprinter
Current printer attached is Okidata 2410
Current printer attached is Okidata 83/84
Current printer attached is MX-80
Current printer attached is T.I. 810/820
Current printer attached is NEC SpWr 3500
Current printer attached is FX-80

Press FF to save configuration
Press STOP to cancel configuration

SELECTING SWITCH SETTINGS

This mode lets you change the initial switch settings using the front panel instead of removing the top cover of the PQ-6 PLUS.

Follow the instructions on the printed menu to select the different switch selections.

Upon exiting this mode, the switch selections will be stored in nonvolatile memory; the PQ-6 will retain them until you change them using the front panel. On the next power-up, the PQ-6 PLUS will be configured to the last stored setup. If no previous configuration was stored, the PQ-6 PLUS will default to the current switch settings on the PC board, and the printer type will be Generic 3400h.

When selecting printer type, the following data is used by the PQ-6 PLUS:

6 LPI
8 LPI
10 CPI
15 CPI

If you select a generic printer, the data used is located at 3400H and must be entered in the EPROM (see **Section 3.3.3**).

To cancel a print job sent from the host, press and hold the STOP button on the PQ-6 Plus (RO) front panel, and press the START button simultaneously. This sends a cancel request to the host, ending the print job.

4.3 Command Pass-Through

The command pass-through feature in the PQ-6 PLUS (RO) lets you (or a programmer) control an attached printer so that you can use special functions or features of the printer. It's required because the IBM System 3X operating software will not allow codes below Hex 40 to be transmitted on the twinax cable.

The method will transmit any 8-bit binary value from Hex 00 to Hex FF. The PQ-6 does not interpret or translate data when in command pass-through mode.

To enter command pass-through mode, send the two-character sequence ampersand percent (&%) as part of the normal printable data.

NOTE
Ampersand (&)=EBCDIC 50 Hex
Percent (%)=EBCDIC 6C Hex

After it enters command pass through mode, the PQ-6 PLUS (RO) takes characters from its internal print buffer and outputs a single 8-bit binary value for every two EBCDIC characters it receives. The two EBCDIC characters should embody the Hex representation of a legal 8-bit value.

Example: To send an ASCII escape character (1B Hex), send the two-character sequence ampersand percent as a terminating character pair.

NOTE
No gaps or spaces should occur between any characters during command pass through mode.

To send the sequence of ASCII characters "ABC (space) 1 2 3," the following command pass-through sequence would be sent:

```
EBCDIC - &  %  4  1  4  2  4  3  2  0  3  1  3  2  3  3  &  %
Hex     - 50 6C F4 F1 F4 F2 F4 F3 F2 F0 F3 F1 F3 F2 F3 F3 50 6C
```

4.4 Buffer Print Mode

A buffer print listing interprets the actions of a printer or similar device on the twinax cable. All the data that is received is listed as a hexadecimal printout. None of the formatting commands are executed; rather, they are printed to aid in the interpretation.

4.4.1 PRINTOUT FORMAT

The data transmitted on the twinax cable is sent in blocks. A block can be one byte to 256 bytes long. The PQ-6 does not interpret the poll requests and device commands (such as device status) in a buffer print listing, but prints all of the data received in each of the blocks, grouped in its block. Each byte that the PQ-6 receives is expanded into three characters. The first two characters are the hexadecimal representation of the data byte, and the third is the printable character that the byte would print if any. The three characters that are printed for the received byte are printed in a vertical line. The most significant nibble on the second line, and the printable character, if any, appear on the third line.

    Characters are printed in groups of three lines, each line containing up to 128 characters. Since each block of data can be up to 256 bytes, the blocks are printed in one or two groups of three lines. At the beginning of each block of data, a new group of three lines starts. Thus, the position of the data within each block can be readily seen.

    Take care here if you're using a printer that will print only 80 character lines. The groups of three lines are up to 128 characters long. If the printer used will only print 80 character lines, or has been set to print only 80 character lines, one of two things will occur depending on the printer. If the printer is set to not auto-new-line, the printer does an auto-new-line after reaching its line length, and the end of each line will be interlaced between each of the original lines. You can interpret this once you realize what is happening.

4.4.2 DATA INTERPRETATION

The data is received in IBM EBCDIC. The format commands, while almost exactly the same for all twinax systems, may be somewhat different. It is always best to consult the IBM manual for the particular system.

    Listed next is a representation of the buffer printout. This particular listing was copied from a printout for the beginning of the System 34 printer diagnostic. A few comments follow that will assist in its interpretation.

    EXAMPLE OF A BUFFER PRINT LISTING

```
0
C

2C002D02002D0802C082C042C040
B62CB2490AB1310B124B222B8201
 F  K    J a  A d B   H
CCCCCCCCCCDDDDDDDDDDEEEEEEEEE44444FFFFFFFFFF
1234567891234567892345678900000001123456789
ABCDEFGHIJKLMNOPQRSTUVWXYZ     0123456789
```

4.4.3 NOTES

The first block contains a single byte (a hex 0C). In EBCDIC, that's a formfeed. Note that it is not a printing character and the space under the 0C is blank. The next block of data contains 28 bytes. It starts with a 2B, which is a format command (similar to an ASCII escape sequence). The 2BC6 denotes set line density, 02 says 2 bytes after the 2BC6 are part of the command. The 0C designates 6 lines per inch. The C6 has an "F" under it. If it occurred not in a format command, it would be printable "F," but it does not print since it is part of a command.

The 2B D2 04 29 00 0A is the format command to set the printer into 10 characters per inch.

The 2B D1 03 81 00 sets the printer into the international character set.

The 2B C1 is for setting the maximum print position. 02 again states that 2 bytes follow the 2BC1 command, and 84 is hex for 132. Thus, it sets the maximum print position to 132.

The 2B C2 sets the maximum number of print lines per page. 02 42 specifies two following bytes and sets it to 66 lines per page.

The 2B C8 states what the printer will do when it receives a character that is undefined. This sequence of 02 bytes sets the printer to print a hex 40 (which is a space), and the 01 indicates to continue without any error action.

The next block of data is actual EBCDIC printable data (the first data that the printer actually prints). This pattern is the alphabet and numbers.

4.5 Functions and Options

For easy setup, the new PQ-6 PLUS (RO) single-port device features slide-type DIP switches that you can access by removing the top cover.

Table 4-1. Option Switch SW1 Baud Rate Selection (0=OFF, 1=ON).

Switch Bank 1				Baud Rate
5	6	7	8	
OFF	OFF	OFF	OFF	50
OFF	OFF	OFF	ON	75
OFF	OFF	ON	OFF	110
OFF	OFF	ON	ON	134.5
OFF	ON	OFF	OFF	150
OFF	ON	OFF	ON	300
OFF	ON	ON	OFF	600
OFF	ON	ON	ON	1200
ON	OFF	OFF	OFF	1800
ON	OFF	OFF	ON	2000
ON	OFF	ON	OFF	2400
ON	OFF	ON	ON	3600
ON	ON	OFF	OFF	4800
ON	ON	OFF	ON	7200
ON	ON	ON	OFF	9600
ON	ON	ON	ON	19200

Option Select

1 (OPT4)	ON=Buffer print mode.
2 (OPT3)	ON=Serial OFF=Parallel
3 (OPT2)	ON=Enable Command Passthrough
	OFF=Disable Command Passthrough
4 (OPT1)	OFF=Use FF (Form Feed) character for page eject.
	ON=Use Multiple Line Feed for page eject.

Table 4-2. Option Switch SW2.

Switch Bank 2 Position	Function
1, 2	Printer type select (00=5256, 01=5224, 10=5225, 11=illegal)
3	Parallel Print option (OFF=PQ-6 responds to the busy and acknowledge signals from the printer. ON=PQ-6 responds to the busy signal only. This setting increases the data transfer rate to the printer.)
4	Configuration option (ON=DIP switch, OFF=Front panel)
5	Self-Test
6, 7, 8	Address select (0-6) 0=OFF, 1=ON

When the auto-feed jumper is installed in the ground position, the paper is automatically fed one line after printing. This signal does not apply to all printers.

Jumper (J1) applies either +5 or ground or pin 14 of the Centronics printer connector.

Appendix A: PQ-6 PLUS (RO) EBCDIC to ASCII Translation Table

HEX EBCDIC	HEX ASCII	DESCRIPTION
05	09	Horizontal Tab
0B	08	Backspace
0C	0C	Form Feed
00	00	Carriage Return
0F	20	|
15	0A	Line Feed
16	08	Backspace
25	0A	Line Feed
2F	07	Bel
40	20	Space
46	20	Carriage Return
47	20	Line Feed
48	20	Form Feed
49	20	Line Feed
4B	2E	.
4C	3C	<
4D	28	[
4E	2B	-
4F	7C	|
50	26	&
5A	21	
5B	24	$
5C	2A	*
5D	29	]
5E	3B	;
5F	5E	^
60	2D	-
61	2F	/
6A	7C	|
6B	2C	,
6C	25	%
6D	5F	_
6E	3E	>
6F	3F	?
79	60	
7A	3A	:
7B	23	=
7C	40	@

HEX EBCDIC	HEX ASCII	DESCRIPTION
7D	27	'
7E	3D	=
7F	22	"
81	61	a
82	62	b
83	63	c
84	64	d
85	65	e
86	66	f
87	67	g
88	68	h
89	69	i
91	6A	j
92	6B	k
93	6C	l
94	6D	m
95	6E	n
96	6F	o
97	70	p
98	71	q
99	72	r
A1	7E	
A2	73	s
A3	74	t
A4	75	u
A5	76	v
A6	77	w
A7	78	x
A8	79	y
A9	7A	z
C0	7B	[
C1	41	A
C2	42	B
C3	43	C
C4	44	D
C5	45	E
C6	46	F
C7	47	G
C8	48	H
C9	49	I
D0	7P	]
D1	4A	J
D2	4B	K
D3	4C	L
D4	4D	M
D5	4E	N

HEX EBCDIC	HEX ASCII	DESCRIPTION
D6	4F	O
D7	50	P
D8	51	Q
E9	52	R
E0	5C	
E2	53	S
E3	54	T
E4	55	U
E5	56	V
E6	57	W
E7	58	X
E8	59	Y
E9	5A	Z
F0	30	0
F1	31	1
F2	32	2
F3	33	3
F4	34	4
F5	35	5
F6	36	6
F7	37	7
F8	38	8
F9	39	9

NOTE
Any characters not shown are not used.

PQ-6 (RO) Board Layout.

Reset Power
DB25 Female DB15 Male
Serial
Parallel
+5 Ground
EPROM
SW2 1 2 3 4 5 6 7 8
SW1 1 2 3 4 5 6 7 8
ON
Test Data Out DTR Line Sync Power
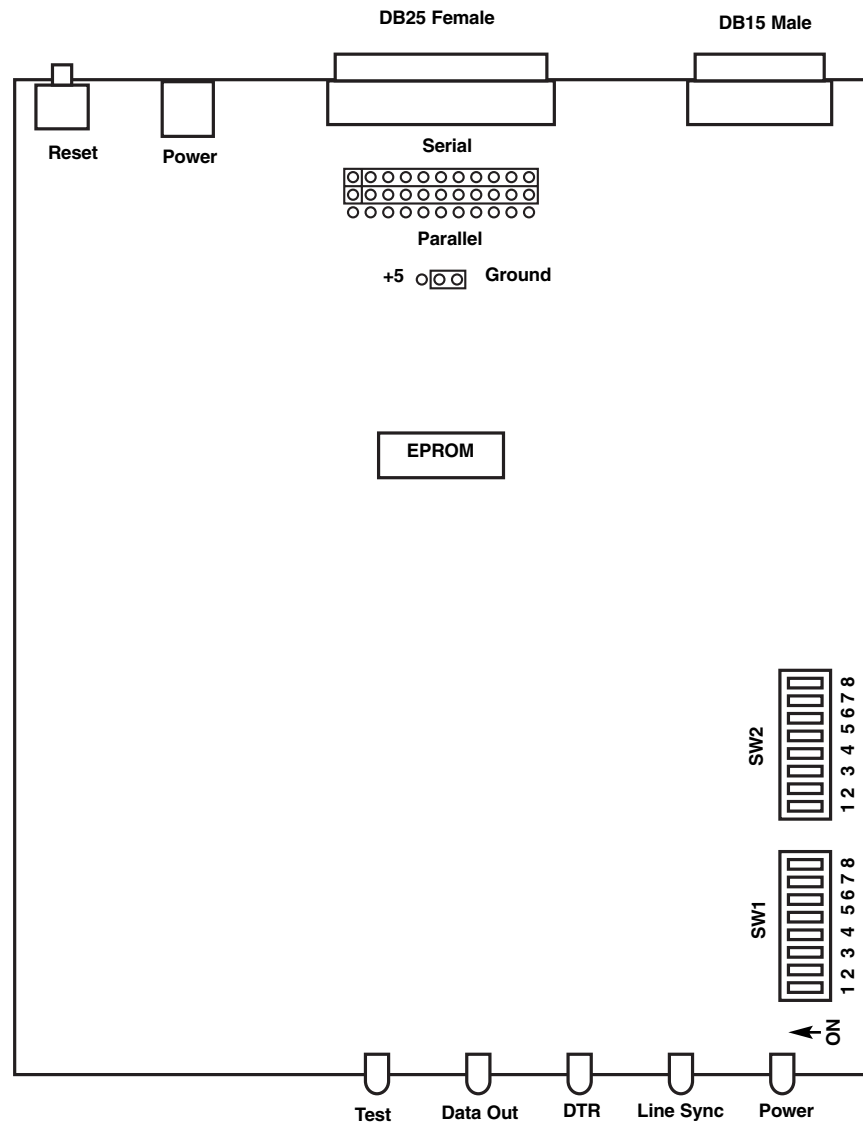
Option Switch SW1.

Switch Bank 1				Baud Rate
5	6	7	8	
OFF	OFF	OFF	OFF	50
OFF	OFF	OFF	ON	75
OFF	OFF	ON	OFF	110
OFF	OFF	ON	ON	134.5
OFF	ON	OFF	OFF	150
OFF	ON	OFF	ON	300
OFF	ON	ON	OFF	600
OFF	ON	ON	ON	1200
ON	OFF	OFF	OFF	1800
ON	OFF	OFF	ON	2000
ON	OFF	ON	OFF	2400
ON	OFF	ON	ON	3600
ON	ON	OFF	OFF	4800
ON	ON	OFF	ON	7200
ON	ON	ON	OFF	9600
ON	ON	ON	ON	19200

Option Select

1 (OPT4)	ON=Buffer print mode.
2 (OPT3)	ON=Serial OFF=Parallel
3 (OPT2)	ON=Enable Command Pass Thru
	OFF=Disable Command Pass Thru
4 (OPT1)	OFF=Use FF (Form Feed) character for page eject.
	ON=Use Multiple Line Feed for page eject.

Option Switch SW2.

Switch Bank 2 Position	Function
1, 2	Printer type select (00=5256, 01=5224, 10=5225, 11=illegal)
3	Parallel Print option (OFF=PQ-6 responds to the busy and acknowledge signals from the printer. ON=PQ-6 responds to the busy signal only. This setting increases the data transfer rate to the printer.)
4	Configuration option (ON=DIP switch, OFF=Front panel)
5	Self-Test
6, 7, 8	Address select (0-6) 0=OFF, 1=ON

Baud Rate.

	Switch				Baud Rate
	S5	S6	S7	S8	
	OFF	OFF	OFF	OFF	50
0=OFF	OFF	OFF	OFF	ON	75
1=ON	OFF	OFF	ON	OFF	110
	OFF	OFF	ON	ON	134.5
	OFF	ON	OFF	OFF	150
	OFF	ON	OFF	ON	300
	OFF	ON	ON	OFF	600
	OFF	ON	ON	ON	1200
	ON	OFF	OFF	OFF	1800
	ON	OFF	OFF	ON	2000
	ON	OFF	ON	OFF	2400
	ON	OFF	ON	ON	3600
	ON	ON	OFF	OFF	4800
	ON	ON	OFF	ON	7200
	ON	ON	ON	OFF	9600
	ON	ON	ON	ON	19200

Printer Options/Address Selection DIP Switch.

	Device Address		
Decimal	SW6 ADR4	SW7 ADR2	SW 8 ADR1
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON (ON=ILLEGAL)

Settings for Printer Type.

ID2 SW2-1	ID1 SW2-2	Printer Type
OFF	OFF	5256
OFF	ON	5224
ON	OFF	5225
ON	ON	UNUSED

Appendix B: PQ-6 PLUS (RO) Quick Setup Guide

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