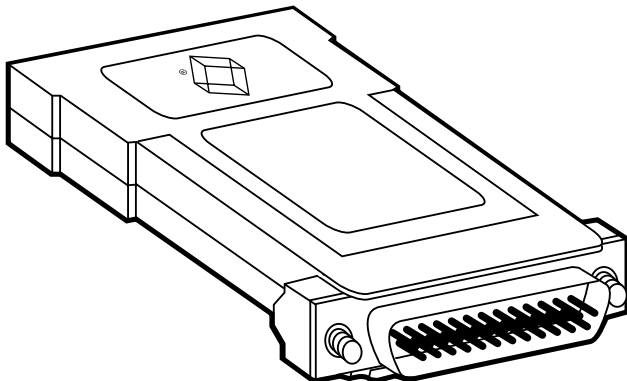




APRIL 2000

ME729A-FSP ME734A-MSP  
ME729A-MSP ME735A-F  
ME734A-F ME735A-M  
ME734A-M ME735A-FSP  
ME734A-FSP ME735A-MSP

## Sync SHM-NPR MP



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### CUSTOMER SUPPORT INFORMATION

Order **toll-free** in the U.S.: Call **877-877-BBOX** (outside U.S. call **724-746-5500**)

FREE technical support 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**

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**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 classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.*

## **NORMAS OFICIALES MEXICANAS (NOM) ELECTRICAL SAFETY STATEMENT**

### **INSTRUCCIONES DE SEGURIDAD**

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 líneas 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 objetos 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: Objetos 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 USED IN THIS MANUAL**

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# 1. Specifications

**Protocol** — Synchronous

**Speed** — 1200 to 19,200 bps

**Distance** — Wire Gauge

<b>Speed (bps)</b>	<b>19</b>	<b>24</b>	<b>26</b>
19,200	7.5 mi (12.1 km)	3.5 mi (5.6 km)	2.5 mi (4.0 km)
9600	10.0 mi (16.1 km)	3.5 mi (5.6 km)	2.5 mi (4.0 km)
4800	10.0 mi (16.1 km)	7.0 mi (11.2 km)	4.0 mi (6.4 km)
2400	10.0 mi (16.1 km)	8.5 mi (13.7 km)	5.0 mi (8.0 km)
1200	11.0 mi (17.7 km)	8.5 mi (13.7 km)	6.0 mi (9.7 km)

**Surge Protection** — 600W power dissipation at 1 ms and response time less than 1 picosecond

**Control Signals** — RTS/CTS delay of 7 or 53 ms;  
Carrier continuous or controlled by RTS; DCD turns “On” after recognizing the receive signal

**Clocking** — Internal, external, or loopback derived from the receive signal

**Operation** — 4-wire unconditioned twisted-pair, full- or half-duplex

**Connectors** — (1) DB25 male or female and either (1) 5-screw terminal lock, (1) RJ-11, or (1) RJ-45

**Transmit Level** — -6 dBm

**Range** — Up to 11 miles (17.7 km)

**Temperature** — 32° to 140° F (0° to 60° C)

**Humidity** — 95% noncondensing

**Power** — No power required; uses ultra-low power (6 volts required) from EIA data and control signals—Pins 2, 4, 9, and 20 in DCE mode (the Sync SHM-NPR MP does not operate in DTE mode)

**Size** — 2.7"H x 2.1"W x 0.7"D (6.9 x 5.3 x 1.8 cm)

**Weight**—0.1 lb. (0.05 kg)

#### **NOTE**

The Sync SHM-NPR MP must be used in pairs. The Sync SHM-NPR MP is compatible with the Mini Driver 4W-S Series (ME750A-ME754A, ME756A).



## 2. Description

The Sync SHM-NPR MP features surface-mount technology and a custom VLSI chip. It supports up to 12 drops and is powered by data only. It operates at speeds from 1.2 to 19.2 kbps. The unit has the best speed-to-distance ratio of any available data-powered sync SHM—11 miles (17.7 km) at low data rates and four miles (6.4 km) at 19.2 kbps over two 22-AWG twisted-pair wires (conservatively rated).

The SHM-NPR operates at full- or half-duplex and uses three clocking methods: internal, external, and received loopback. It's also transformer-isolated for ground-loop protection. You can select RTS/CTS delay of 7 or 53 ms, and carrier status of constantly on or RTS-controlled.

Ten models are available:

- Sync SHM-NPR MP (DB25) with Surge Protection (4-Screw Terminal Block) (ME729A-MSP)
- Sync SHM-NPR MP (DB25) with Surge Protection (4-Screw Terminal Block) (ME729A-FSP)

- Sync SHM-NPR MP/RJ-11 (ME734A-M)
- Sync SHM-NPR MP/RJ-11 (ME734A-F)
- Sync SHM-NPR MP/RJ-11 (ME734A-MSP)
- Sync SHM-NPR MP/RJ-11 (ME734A-FSP)
- Sync SHM-NPR MP/RJ-45 (ME735A-M)
- Sync SHM-NPR MP/RJ-45 (ME735A-F)
- Sync SHM-NPR MP/RJ-45 with Surge Protection (ME735A-MSP)
- Sync SHM-NPR MP/RJ-45 with Surge Protection (ME735A-FSP)

## **Features**

- New design uses a custom VLSI chip and surface-mount technology.
- Internal, external, or receive loopback clocks (switch-selected).
- Speeds up to 19.2 kbps.

- Range of up to 11 miles (17.7 km).
- Carrier “on” or “controlled” (switch-selected).
- Options for easy daisychain installation.
- Full- or half-duplex operation.
- Transformer (DC) isolated.
- Ideal for multipoint configurations.
- Built-in high-speed surge protection with power-handling capacity of 600W per wire at 1 ms.
- Compatible with the Mini Driver 4W-S Series (ME750A through ME754A, and ME756A).

## 3. Configuration

The Sync SHM-NPR MP has seven configuration switches, which allow selection of carrier control method, clocking method, RTS/CTS delay, and data rate. This section describes switch locations and explains all possible switch configurations.

### 3.1 Switch Locations

For your convenience, all configuration switches are located on a SIP (single in-line package) mounted on the PC board. **Figure 3-1** shows the location of the SIP on the board. For instructions on opening the SHM-NPR case, see **Section 4.1.2**.

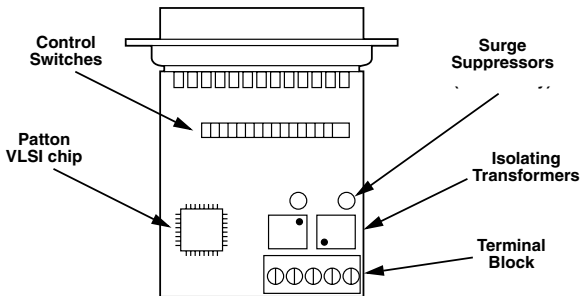
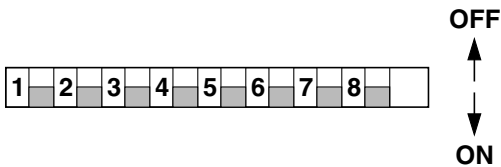


Figure 3-1. Switch Locations.

**Figure 3-2** shows the orientation of the switches on the SIP, including ON/OFF position.



**Figure 3-2.** Close-up of Configuration Switches.

### 3.2 Switch Settings

All possible settings for the Sync SHM-NPR’s configuration switches are presented in **Table 3-1**. If you have additional questions about configuration, contact technical support.

**Table 3-1.** Switch summary table

Position	Function	Factory default
Switch 1	Not used	Off Not used
Switch 2	Carrier enable	On Constant Carrier
Switch 3	Transmit clock	Off } Internal
Switch 4	Transmit clock	On } clock
Switch 5	RTS/CTS delay	On 7-ms delay
Switch 6	Data rate	On } 9,600 bps
Switch 7	Data rate	Off }
Switch 8	Data rate	Off }

**SWITCH 1: NOT USED****SWITCH 2: CARRIER ENABLE**

Use switch 2 to specify how the carrier signal is raised. In most point-to-point, full-duplex applications, the carrier signal can remain constantly “high.” In a multipoint environment, contention for the line is controlled by RTS.

<u>Switch 2</u>	<u>Setting</u>
On	Constant carrier (Default)
Off	Controlled by RTS

**SWITCHES 3 AND 4: TRANSMIT CLOCK**

Use switches 3 and 4 together to specify the clocking method. The SHM-NPR can provide an internal clock (pin 15), receive an external clock (from pin 24), or loop back a receive clock.

<u>Switch 3</u>	<u>Switch 4</u>	<u>Setting</u>
On	On	External clock
On	Off	External clock
Off	On	Internal clock (Default)
	Off	Off Receive loopback

**SWITCH 5: RTS/CTS DELAY**

After the host terminal raises a request to send (RTS), the SHM-NPR raises CTS after a slight delay in order to give the remote terminal time to receive an incoming signal. Depending on the type of environment, either a 7- or 53-ms delay can be selected.

<u>Switch 5</u>	<u>Setting</u>
On	7 ms (Default)
Off	53 ms

**SWITCHES 6, 7, AND 8: DATA RATE**

Switches 6 through 8 are set in combination to allow the SHM-NPR to support data rates from 1.2 to 19.2 kbps.

<u>Switch 6</u>	<u>Switch 7</u>	<u>Switch 8</u>	<u>Setting</u>
On	On	On	1.2 kbps
On	On	Off	2.4 kbps
On	Off	On	4.8 kbps
Off	On	On	7.2 kbps
On	Off	Off	9.6 kbps
Off	On	Off	14.4 kbps
Off	Off	On	19.2 kbps
Off	Off	Off	19.2 kbps

## 4. Installation

Once the Sync SHM-NPR is properly configured, it is ready to connect to your system. This section tells you how to properly connect the Sync SHM-NPR MP to the twisted-pair and RS-232 interfaces, and how to operate the unit.

### 4.1 Connection to the Twisted-Pair Interface

The Sync SHM-NPR supports data-only communication between two RS-232 devices at distances to 11 miles (17.7 km) and data rates to 19.2 kbps. There are two essential requirements for installing the Sync SHM-NPR:

1. These units work in pairs. Therefore, you must have one Sync SHM-NPR at each end of a two-twisted-pair interface.
2. To function properly, the Sync SHM-NPR needs two twisted pairs of metallic wire. These pairs must be unconditioned, dry metallic wire, between 19 and 26 AWG (the higher number gauges may limit distance somewhat). Standard dial-up telephone circuits, or leased circuits that run through signal equalization equipment, are not acceptable.



For your convenience, the Sync SHM-NPR is available with three different twisted-pair interfaces: RJ-11 jack, RJ-45 jack, and terminal blocks with strain relief.

#### 4.1.1 TWISTED-PAIR CONNECTION USING RJ-11 OR RJ-45

The RJ-11 and RJ-45 jacks on the SHM-NPR's twisted-pair interface are pre-wired for a standard telco wiring environment. The signal/pin relationships are shown in **Figure 4-1**.

<u>RJ-11</u>	<u>Signal</u>	<u>RJ-45</u>	<u>Signal</u>
1 .....	GND <sup>1</sup>	1 .....	N/C
2 .....	RCV <sup>2</sup>	2 .....	GND <sup>1</sup>
3 .....	XMT	3 .....	RCV <sup>2</sup>
4 .....	XMT	4 .....	XMT
5 .....	RCV	5 .....	XMT
6 .....	GND1	6 .....	RCV
.....		7 .....	GND1
.....		8 .....	N/C

<sup>1</sup>Connection to ground is optional.

<sup>2</sup>The Sync SHM-NPR is not polarity sensitive.

**Figure 4-1. RJ-11 and RJ-45 Signal/Pin Relationships.**

When you connect two SHM-NPRs, you must use a crossover cable. **Figure 4-2** shows how you should construct a crossover cable for an environment where both SHM-NPRs use a 6-wire RJ-11 connector. Use a similar method when you use an RJ-45 connector or a combination of both RJ-11 and RJ-45.

<u>SIGNAL</u>	<u>PIN#</u>	<u>COLOR</u> <sup>2</sup>	<u>COLOR</u>	<u>PIN#</u>	<u>SIGNAL</u>
<b>GND</b> <sup>1</sup>	<b>1</b>	<b>Blue . . . . .</b>	<b>White</b>	<b>6</b>	<b>GND</b>
<b>RCV</b> <sup>3</sup>	<b>2</b>	<b>Yellow . . .</b>	<b>Red</b>	<b>4</b>	<b>XMT</b>
<b>XMT</b>	<b>3</b>	<b>Green . . .</b>	<b>Black</b>	<b>5</b>	<b>RCV</b>
<b>XMT</b>	<b>4</b>	<b>Red . . . . .</b>	<b>Yellow</b>	<b>2</b>	<b>RCV</b>
<b>RCV</b>	<b>5</b>	<b>Black . . . .</b>	<b>Green</b>	<b>3</b>	<b>XMT</b>
<b>GND</b>	<b>6</b>	<b>White . . . .</b>	<b>Blue</b>	<b>1</b>	<b>GND</b>

<sup>1</sup>Connection to ground is optional.

<sup>2</sup>Standard color codes—yours maybe different.

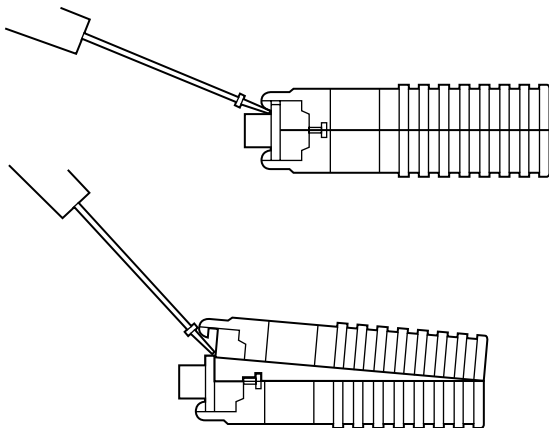
<sup>3</sup>The Sync SHM-NPR is not sensitive to polarity.

**Figure 4-2. Crossover-Cable Construction.**

#### **4.1.2 TWISTED-PAIR CONNECTION USING TERMINAL BLOCKS**

If your application requires you to connect two pairs of bare wires to the Sync SHM-NPR, you will need to open the case to access the terminal blocks. The instructions on the following pages will tell you how to open the case, connect the bare wires to the terminal blocks, and fasten the strain-relief collar in place so that the wires won't pull loose.

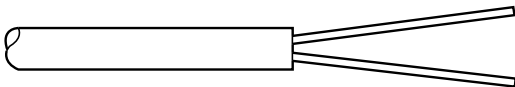
1. Open the unit by gently inserting a screwdriver between the DB25 connector and the lip of the plastic case (see Figure 4-3). You don't have to worry about breaking the plastic, but be careful not to bend the D-sub connector.



**Figure 4-3. Opening the Sync SHM-NPR.**

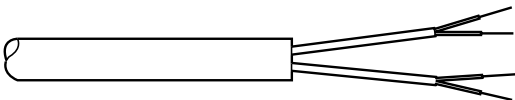
Once the unit has been opened, you will be able to see the terminal blocks located at the rear of the PC board.

2. Strip the outer insulation from the twisted pairs about one inch from the end.



**Figure 4-4. Stripping the Outer Insulation from the Twisted Pairs.**

3. Strip back the insulation on each of the two twisted-pair wires about 0.25".



**Figure 4-5. Stripping the Insulation on Each of the Two Twisted-Pair Wires.**

4. Connect one pair of wires to the two XMT (transmit) poles on the terminal block. The Sync SHM-NPR is not polarity sensitive, so either wire may connect to either pole.
5. Connect the other pair of wires to the two RCV (receive) poles on the terminal block. The Sync SHM-NPR is not polarity sensitive, so either wire may connect to either pole.

Ultimately, you will want to construct a two-pair crossover cable that makes a connection with the two Sync SHM-NPRs as shown in **Figure 4-6**.

```

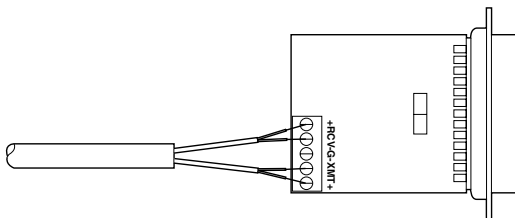
XMT----- RCV One pair
XMT----- RCV
G---- To Shield (Optional)    G
RCV----- XMT One pair
RCV----- XMT

```

**Figure 4-6. Two-Pair Crossover-Cable Configuration.**

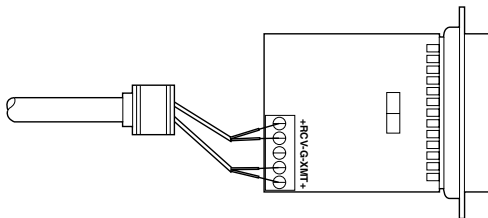
6. If there is a shield around the telephone cable, it may be connected to “G” on the terminal block. To avoid ground loops, we recommend connecting the shield at the computer end only. A ground wire is not necessary for proper operation of the Sync SHM-NPR.

7. When you finish connecting the wires to the terminal block, the assembly should resemble **Figure 4-7**.



**Figure 4-7. Terminal Block with Wires Connected.**

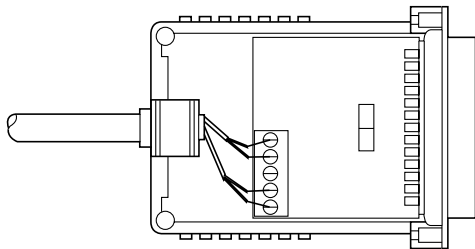
- Place the two halves of the strain-relief assembly on either side of the telephone wire and press together very lightly. Slide the assembly so that it is about two inches (5 cm) from the terminal posts and press together firmly.



**Figure 4-8. Pressing Together the Two Halves of the Strain- Relief Assembly.**

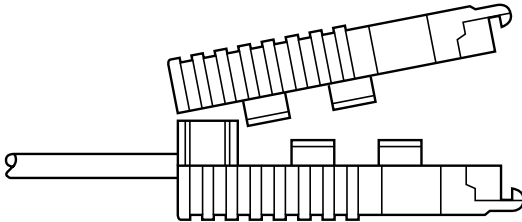


9. Insert the strain-relief assembly with the wire going through it into the slot in the bottom half of the modem case and set it into the recess in the case.



**Figure 4-9. Inserting the Strain-Relief Assembly into the Modem Case.**

10. Bend the top half of the case as necessary to place it over the strain-relief assembly. Do not snap the case together yet.



**Figure 4-10. Placing the Top Half of the Case Over the Strain-Relief Assembly.**

11. Insert one captive screw through a saddle washer and then insert the entire piece through the hole in the DB25 end of the case. Snap that side of the case closed. Repeat the process for the other side. This completes the cable installation.

## **4.2 Connection to the RS-232 Interface**

Once you have connected the twisted-pair wires correctly, simply plug the Sync SHM-NPR directly into the DB25 port of the RS-232 device. After doing so, remember to insert and tighten the two captive connector screws.

### **4.2.1 CONNECTION TO A DTE DEVICE**

The Sync SHM-NPR is wired as a DCE, and therefore wants to plug into a DTE such as a terminal, PC, or host. Because the Sync SHM-NPR is interface powered, a direct connection to the RS-232 DTE port is preferred. If you must use a cable to connect the Sync SHM-NPR to the DTE port, make sure it is a straight-through cable of the shortest possible length—we recommend 6 feet (1.8 m) or less.

### **4.2.2 CONNECTION TO A DCE DEVICE**

Since the Sync SHM-NPR is wired as a DCE, you cannot connect it directly to another DCE such as a modem, multiplexor, or printer. If you need to connect the Sync SHM-NPR to another DCE device, you must use a null-modem cable wired according to Figure 4-11. We recommend that the cable be as short as possible, preferably 6 feet (1.8 m) or less.

Connection to Sync SHM-NPR MP <sup>1</sup> DB25 Pin No.	Connection to DCE Device DB25 Pin No.
1 -----	1
2 -----	2
3 -----	3
4 -----	8
8 -----	4
6 -----	20
20 -----	6
17 -----	24
24 -----	17
7 -----	7

<sup>1</sup>When connecting to another DCE device, the Sync SHM-NPR MP should be configured for “external clock” (see **Section 3.2**).

**Figure 4-11. Null-Modem Cable Wiring.**

### 4.3 OPERATING THE SYNC SHM-NPR MP

Once the Sync SHM-NPR MP is properly configured and installed, it should operate transparently—as if it were a standard cable connection. Operating power is derived from the RS-232 data and control signals; there is no “ON/OFF” switch. All data signals from the RS-232 interface are passed straight through. All control signals from the RS-232 interface are looped back.

# Appendix: RS-232 Pin Configurations

DIRECTION	STANDARD "DCE" SETTING	DIRECTION
To Sync SHM-NPR	<p>Transmitter Timing - 15</p> <p>Receiver Timing -17</p> <p>Data Term. Ready (DTR) - 20</p> <p>1 - (FG) Frame Ground                  2 - (TD) Transmit Data                  3 - (RD) Receive Data                  4 - (RTS) Request to Send                  5 - (CTS) Clear to Send                  6 - (DSR) Data Set Ready                  7 - (SG) Signal Ground                  8 - (DCD) Data Carrier Detect</p>	To Sync SHM-NPR From Sync SHM-NPR
To Sync SHM-NPR		To Sync SHM-NPR
To Sync SHM-NPR		From Sync SHM-NPR From Sync SHM-NPR
		From Sync SHM-NPR

Figure A-1. RS-232 Pin Configurations.



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