BLACK BOX®
NETWORK SERVICES

Mini Driver MP/5-Screw Terminal Block
Mini Driver MP/RJ-11
Mini Driver MP/RJ-45
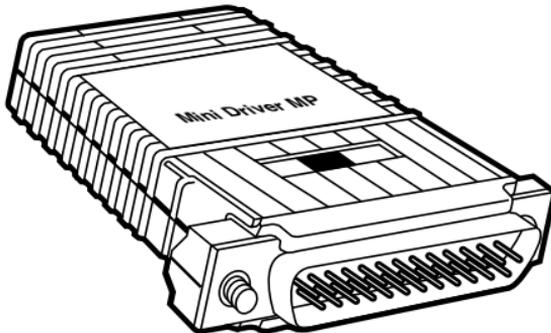
FEDERAL COMMUNICATIONS COMMISSION
AND
INDUSTRY CANADA
RADIO FREQUENCY INTERFERENCE STATEMENTS

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 B 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 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.

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CE NOTICE

The CE symbol on the Mini Driver MP indicates that it is in
compliance with the Electromagnetic Compatibility (EMC)
directive and the Low Voltage Directive (LVD) of the Union
European (EU).

Contents

1. Specifications

Protocol — Asynchronous

Speed — Up to 115,200 bps

Range — Up to 15 miles (24.1 km)

Serial Interface — DB25, male or female (DTE/DCE switchable)

Multipoint — 50 drops

Surge Protection — 600W power dissipation at 1 ms and response time of 1.0 picosecond

Control Signals — In DCE mode, DSR turns ON immediately after the terminal raises DTR; DCD turns ON after recognizing the receive signals from the line; CTS turns ON after the terminal raises RTS

Operation — 2- or 4-wire, full- or half-duplex

Connectors — ME772A-MSP-R2, ME772A-FSP-R2: RJ-11; ME773A-MSP-R2, ME773A-FSP-R2: RJ-45; ME771A-MSP-R2, ME771A-FSP-R2: 5–screw terminal posts (4 wires, 1 ground) and a strain-relief insert

Carrier — Switch-selected as either Constantly On or Controlled by RTS

RTS/CTS Delay — 8 ms or No Delay

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

Relative Humidity — 5 to 95%, noncondensing

Altitude Tolerance — 10,000 feet (3048 m)

Mean Time Between Failures (MTBF) —
209,384 hours

Mean Time To Repair (MTTR) — 1 hour

Power — No power required; uses ultra-low power
(at least 5 volts required) from EIA data and
control signals: Pins 3, 5, 6, 8, and 9 in DTE mode;
Pins 2, 4, 9, and 20 in DCE mode; 3 to 5 mA @ 10
volts

Size — 2.6"H x 2.1"W x 0.7"D (6.6 x 5.3 x 1.8 cm)

Weight — 0.2 lb. (0.1 kg)

**Note: The Mini Driver MP must be used in pairs. The unit is
compatible with the DB9 Microdriver (ME792A through
ME794A), the Mini Driver MP9 (ME775A through ME777A), and
the CS Mini Driver-A (ME731A through ME733A).**

Table 1-1. Distance (in Miles)

Data Rate	Wire Gauge			
(kbps)	19	22	24	26
115.2	3.5	2.6	1.4	0.9
38.4	5	2.9	2.2	1.5
9.6	7.1	4.6	3.5	2.8
1.2	9	6.5	5	3.9

2. Description

The Mini Driver MP requires no AC power or batteries to operate. It supports asynchronous RS-232 speeds of up to 115.2 kbps over one or two unconditioned twisted-pair wires. It also supports distances of up to 15 miles (24.1 km) at lower data rates (1.2 kbps, 19 AWG twisted pair).

The Driver can handle up to 50 terminal drops in a multipoint polling environment. For RS-485 and serial printer applications requiring hardware handshaking, the Mini DriverMP passes one control signal in each direction. You may configure the Driver for high- or low-impedance operation. Set the carrier to be Constantly On or Controlled by RTS. RTS/CTS delay can be set to No Delay or 8 ms. The Driver can also operate with or without echo.

There are three options for twisted-pair connection: terminal blocks with strain relief, RJ-11, and RJ-45.

The Mini Driver MP also incorporates Silicon Avalanche Diode technology, which provides 600 watts per wire of protection against harmful data-line transient surges.

Features

- Operates asynchronously, point-to-point or multipoint, over 2 or 4 wires.

- Supports up to 50 multipoint device drops in a polling environment.

- Supports speeds up to 115.2 kbps.

- Passes transmit and receive data, one control signal each direction.

- DTE/DCE switch-selectable on RS-232 interface.

- Able to operate with or without echo.

- Twisted-pair connection via terminal blocks with strain relief, RJ-11, or RJ-45.

- Interface-powered—no AC power or batteries required.

- Variable high/low impedance settings.

- Carrier can be set as Constantly On or Controlled by RTS.

- Compatible with the DB9 Microdriver (ME792A through ME794A), the Mini Driver MP9 (ME775A through ME777A), and the CS Mini Driver-A (ME731A through ME733A).

- No AC power or batteries are required.

3. Configuration

You can configure the Mini Driver MP with an eight-position DIP switch and a DTE/DCE switch. Figure 3-1 shows the DTE/DCE switch (externally accessible), as well as the power-supply daughterboard and terminal block.
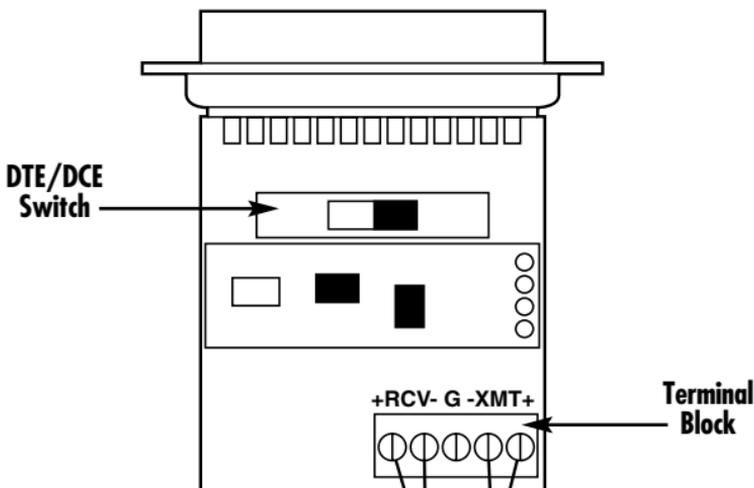

Figure 3-1. The Mini Driver MP board and DTE/DCE switch.

Figure 3-2 shows the location of the 8-position DIP switch on the underside of the Driver's PC board. Figure 3-3 shows a closeup of the DIP switches.
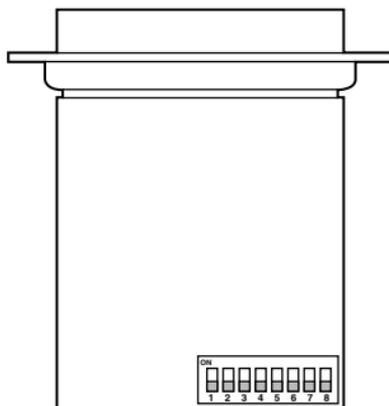
**Figure 3-2. Bottom view of the PC board,
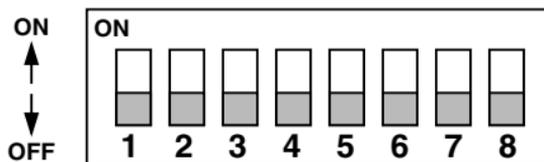showing the internal DIP switch.**

**Figure 3-3. Closeup of the DIP switch.
All eight switches are ON.**

3.1 Setting the DTE/DCE Switch

For your convenience, the Driver includes a DTE/DCE switch on the outside of the unit (see Figure 3-4). If the device connected to the Driver is a modem or mux (or is wired like one), set the switch to DTE. This setting causes the Driver to act like data terminal equipment and transmit on Pin 2.

If the device connected to the Driver is a PC, terminal, or host computer (or is wired like one), set the switch to DCE. This setting causes the Driver to act like data communications equipment and transmit on Pin 3.
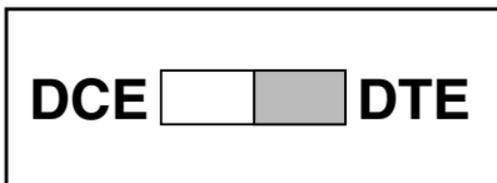
DCE ☐▦ DTE

Figure 3-4. Closeup of the external DTE/DCE switch.

3.2 Setting the DIP Switches

The eight switches on switch set S1 (see Figures 3-2 and 3-3) configure the Driver for RTS/CTS delay, echo mode, method of carrier control, impedance, and 2-wire/4-wire operation. These switches are located inside the unit on the Driver's PC board. To access switch set S1, use a small flat-blade screwdriver to pop open the Driver's case as shown in Figure 3-5.
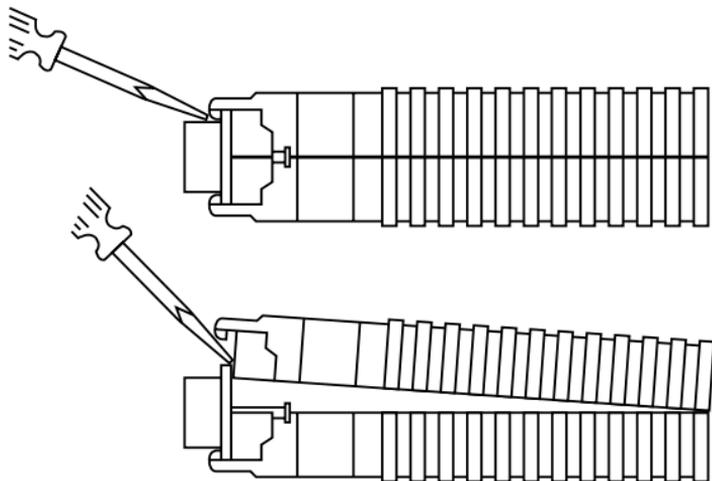

Figure 3-5. Opening the Driver's plastic case with a small screwdriver.

3.2.1 FUNCTIONS OF THE CONFIGURATION SWITCH

The table and descriptions below detail the functions of the eight configuration switches. Read this information carefully before setting the switches.

Table 3-1. Switch Summary Table

Position	Function	Factory Default	
S1-1*	"Transmit Off" Impedance	Off	
			High Impedance
S1-2*	"Transmit Off" Impedance	Off	
S1-3	RTS/CTS Delay	On	8 ms
S1-4	Echo Mode	Off	Echo Off
S1-5	Carrier Control	Off	Constantly On
S1-6	Receive Impedance	On	120 ohms
S1-7*	2-wire/4-wire	Off	
			4-wire
S1-8*	2-wire/4-wire	Off	

*Switches S1-1 and S1-2 should be switched simultaneously. Switches S1-7 and S1-8 should also be switched simultaneously.

S1-1 and S1-2: "Transmit Off" Impedance

Switches S1-1 and S1-2 are set together to determine whether the receiving device "sees" the impedance of the Driver's transmitter as being "high" or "intermediate" when the transmitter is turned off. The "intermediate" setting is useful in half-duplex environments where the receiving device does not respond well to the "high" setting.

<u>S1-1</u>	<u>S1-2</u>	<u>Setting</u>
On	On	Intermediate Impedance
Off	Off	High Impedance

S1-3: RTS/CTS Delay
The setting for switch S1-3 determines the amount of delay between the time the Driver "sees" RTS and when it sends CTS. Note: The RTS/CTS Delay setting should be based upon transmission timing.

<u>S1-3</u>	<u>Setting</u>
On	8 ms
Off	no delay

S1-4: Echo Mode
The setting for switch S1-4 determines whether the Driver echoes back to the transmitting device (half-duplex mode only).

<u>S1-4</u>	<u>Setting</u>
On	Echo On
Off	Echo Off

S1-5: Carrier Control Method
The setting for switch S1-5 determines whether the carrier is "Constantly On" or "Controlled by RTS." This setting allows for operation in switched carrier, multipoint, and hardware handshaking applications.

S1-5	Setting
On	Controlled by RTS
Off	Constantly On

NOTE: See Section 4.5 for information on operating the Mini Driver MP in half duplex.

S1-6: Receive Impedance
The setting for switch S1-6 selects the impedance of the input receiver. You may select either a "low" impedance of 120 ohms or a "high" impedance of 16K ohms. By selecting the proper impedance for each drop, you can have up to 50 receivers in one application.

The Master and last slave should always be set for low impedance (see Table 3-2). Any drops in between them should be set for high impedance.

S1-6	Setting
On	Low (120 ohms) [Terminated]
Off	High (16K ohms) [Unterminated]

S1-7 and S1-8: 2-wire/4-wire Modes
Switches S1-7 and S1-8 are set together to determine
whether the Driver is in 2- or 4-wire operating
modes. Note: 2-wire mode is half-duplex only.

S1-7	S1-8	Setting
On	On	2-wire mode
Off	Off	4-wire mode

3.2.2 CONFIGURATION SWITCH APPLICATIONS
The table below shows you how to set the Driver's
configuration switches to fit several common
applications. If you have any questions about the
proper settings for your application, call your
supplier.

Table 3-2. Typical Switch Applications

	Point to Point		Multipoint	
Switch Settings HDX	**4W**	**4W HDX**	**4W HDX**	**2W**
S1-1: "Xmt Off" Impedance	Off	Off	Off	Off
S1-2: "Xmt Off" Impedance	Off	Off	Off	Off
S1-3: RTS/CTS Delay	On	On	Off	On
S1-4: Echo	Off	Off	Off	Off
S1-5: Carrier Control	Off	On	Master—Off Slaves—On	On
S1-6: Rcv Impedance	On	On	Master—On Slaves—Off Last Slave—On	
S1-7: 2-wire/4-wire	Off	Off	Off	On
S1-8: 2-wire/4-wire	Off	Off	Off	On

3.2.3 WHEN YOU'RE FINISHED CONFIGURING....

Once you've finished setting the Mini Driver MP's configuration switches, pause before you snap the case halves back together. If you are connecting the Driver to twisted-pair using the internal terminal blocks, go to **Section 4.1.1** and continue the installation process. If you are connecting the Driver to twisted-pair using the RJ-11 or RJ-45 jacks, go ahead and snap the case halves back together now. Don't force the pieces to fit. Make sure all the pieces are properly seated before snapping the case halves shut.

4. Installation

Once you've set the configuration switches, you're ready to connect the Driver to your system. This section tells you how to properly connect two or more Drivers to each other and to the RS-232 interfaces. It also explains how to operate the Driver.

4.1 Twisted-Pair Connection

Keep these points in mind as you connect the twisted-pair side of the Driver:

The Driver operates over one or two metallic twisted pairs—two or four wires. The wires must be dry, unconditioned metallic wire between 19 and 26 AWG (lower-number gauges allow the longest distances). Standard dialup telephone circuits, or leased circuits that run through signal-equalization equipment, are not acceptable.

The units must be used in pairs—one at each end of the twisted-pair line. In multipoint environments, there should be one Driver at the RS-232 host and one at each RS-232 terminal.

The Driver is available with several different options for connecting to twisted pair: terminal block with strain relief, RJ-11 jack, or RJ-45 jack. The following pages tell you how to connect twisted-pair wires to the Driver.

4.1.1 TERMINAL-BLOCK TWISTED-PAIR CONNECTION

If your application requires you to connect one or two pair of bare wires to the Driver, you'll need to get into the internal terminal blocks. Follow these instructions to open the case, connect the bare wires to the terminal blocks, and fasten the strain-relief collar in place, so that the wires don't pull loose.

1. You should already have the case open for the configuration procedure. If not, open the case according to Figure 3-5.

2. Strip the outer insulation from the twisted-pair wires about one inch (2.5 cm) from the end.
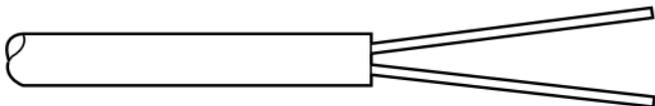
3. Strip back the insulation on each of the 2 twisted-pair wires about ¼ inch (0.6 cm).
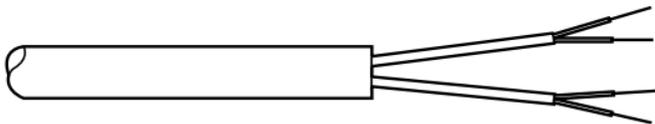
4. In a two-pair circuit, connect one pair of wires to XMT+ and XMT- (transmit positive and negative) on the terminal block, making careful note of which color is positive and which color is negative.

5. Connect the other pair of wires to RCV+ and RCV- (receive positive and negative) on the terminal block. Again make careful note of which color is positive and which is negative.

Your completed cross-over cable should be pinned electrically as follows:

```
       Mini Driver MP          Mini Driver MP
           XMT+..........................RCV+
           XMT-...........................RCV-
           G......To Shield (optional)   G
           RCV+..........................XMT+
           RCV-...........................XMT-
```

6. In a single-pair circuit, use only the transmit (XMT) pair as follows:

> **Mini Driver MP**   **Mini Driver MP**
> XMT+ ....XMT+
> XMT- ....XMT-

7. If there is a shield around the telephone cable, it may be connected to G on the terminal block. We recommend connecting the shield at the computer end only to avoid ground loops. A ground wire is not necessary to properly operate the Driver.

8. When you finish connecting the wires to the terminal block, the assembly should resemble the following diagram:
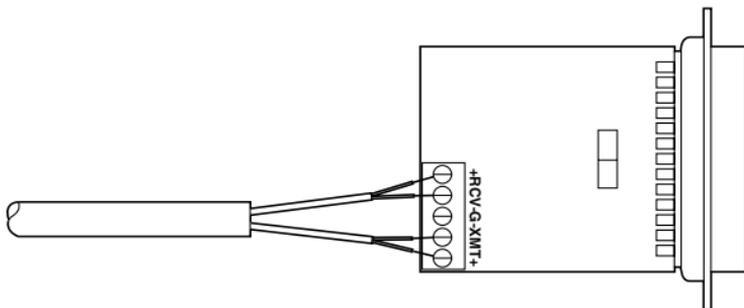
9. Place the two halves of the strain-relief assembly on either side of the telephone wires and press together very lightly. Slide the assembly so that it is about two inches (5 cm) from the terminal posts and press together firmly.
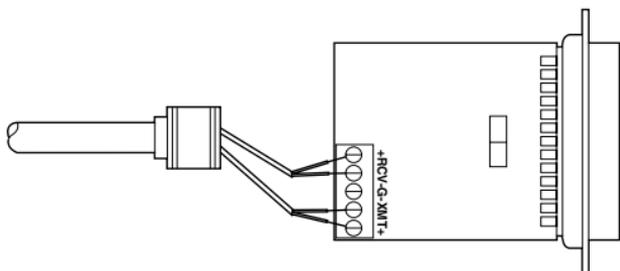
10. Insert the strain-relief assembly, with the wire going through it, into the slot in the bottom half of the modem case and seat it into the recess in the case.
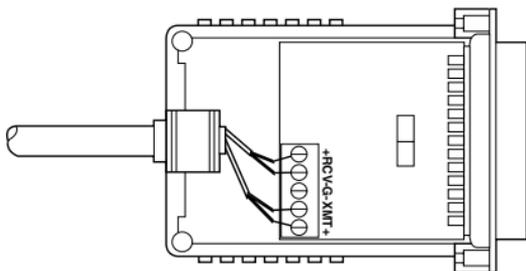
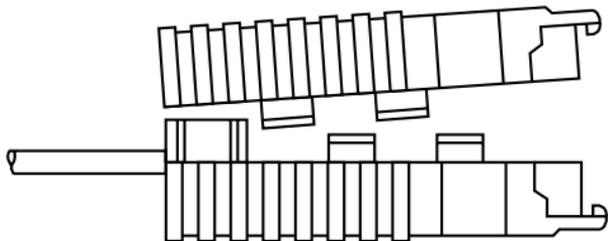11. Bend the top half of the case to place it over the strain relief assembly. Do not snap the case together.

12. Insert one captive screw through a saddle washer and then insert the captive screw with the washer on it, through the hole in the DB25 end of the case. Snap that side of the case closed. Repeat the process for the other side.

The cable installation is now complete.

4.1.2 MODULAR TWISTED-PAIR CONNECTION
The Mini Driver MP offers three interface options for twisted-pair connection: 5-screw terminal block, RJ-11 (6-wire) jack, and RJ-45 (8-wire) jack. The following pages show signal/pin assignments for the jacks, as well as pin-outs for the appropriate twisted-pair cable topologies.

Pin Connections for RJ-11/RJ-45 Twisted-Pair Interface

The 6-wire RJ-11 and 8-wire RJ-45 jack options for the Driver are prewired for a standard AT&T® wiring environment. Use the following tables as guides when ordering or constructing twisted-pair cables:

RJ-11	Signal	RJ-45	Signal
1	GND*	1	N/C
2	RCV-	2	GND*
3	XMT+	3	RCV-
4	XMT-	4	XMT+
5	RCV+	5	XMT-
6	GND*	6	RCV+
		7	GND*
		8	N/C

* Connection to ground is optional.

FOUR-WIRE TWISTED-PAIR CONNECTION

Connecting a 4-wire twisted-pair circuit between two
or more Drivers requires a crossover cable. The
tables that follow give the pinnings for that cable.

RJ-11

Signal	Pin #	Pin #	Signal
GND*	1.....................6		GND*
RCV-	2.....................4		XMT-
XMT+	3.....................5		RCV+
XMT-	4.....................2		RCV-
RCV+	5.....................3		XMT+
GND*	6.....................1		GND*

* Connection to ground is optional.

RJ-45

Signal	Pin #	Pin #	Signal
GND*	2.....................7		GND*
RCV-	3.....................5		XMT-
XMT+	4.....................6		RCV+
XMT-	5.....................3		RCV-
RCV+	6.....................4		XMT+
GND*	7.....................2		GND*

* Connection to ground is optional.

TWO-WIRE TWISTED-PAIR CONNECTION

Connecting a 2-wire twisted-pair circuit between two or more Drivers requires a crossover cable, as shown in the following figures.

	RJ-11		
Signal	**Pin #**	**Pin #**	**Signal**
XMT+	**3......................3**		**XMT+**
XMT-	**4......................4**		**XMT-**
	RJ-45		
Signal	**Pin #**	**Pin #**	**Signal**
XMT+	**4......................4**		**XMT+**
XMT-	**5......................5**		**XMT-**

4.2 Wiring for Multipoint Circuits

The Mini Driver MP supports multipoint applications that use either a star or daisychain topology. Both topologies require special wiring, as well as specific DIP-switch settings for master and slave units. Refer to **Section 3.2.1** for multipoint DIP switch settings.

4.2.1 STAR TOPOLOGY

Using a star topology you may connect several Drivers together in a master/slave arrangement. Maximum distance between the Drivers will vary based on the number of drops, speed, wire gauge, etc. Call your supplier for specific distance estimates.

Table 4-1 shows how to wire the two-pair cables for a Mini Driver MP star topology. Note that the ground connection is not needed.

Host	First Slave	Second Slave
XMT+ ————RCV+		
	————————————RCV+	
XMT- ————RCV-		
	————————————RCV-	
RCV+ ————XMT+		
	————————————XMT+	
RCV- ————XMT-		
	————————————XMT-	

Table 4-1. Star wiring for Mini Driver MP host and slaves

4.2.2 DAISYCHAIN TOPOLOGY

Using a daisychain topology you may connect several Mini Driver MPs together in a master/slave arrangement. Maximum distance between the units will vary based on the number of drops, speed, wire gauge, etc. Call your supplier for specific distance estimates.

The following table shows how to wire the two-pair cables for a Mini Driver MP daisychain topology. Note that the ground connection is not needed.

Host	First Slave	Other Slave(s)
XMT+ ----------------RCV+ -------------------- RCV+		
XMT- ----------------RCV- --------------------- RCV-		
RCV+ ----------------XMT+ ------------------ XMT+		
RCV- ----------------XMT- --------------------- XMT-		

Table 4-2. Daisychain wiring for Mini Driver MP host and slaves

4.3 Connection to the RS-232 Interface

Once you've configured the Driver and connected the twisted-pair wires correctly, plug the Driver directly into the DB25 port of the RS-232 device. Remember to insert and tighten the two captive connector screws.

If you must use a cable to connect the Driver to the RS-232 device, make sure it is a straight-through cable of the shortest possible length. We recommend 6 ft. (1.8 m) or less.

4.4 Operating the Mini Driver MP

Once you've installed the Driver, it should operate transparently—as if it were a standard cable connection. It derives operating power from the RS-232 data and control signals. There is no ON/OFF switch. All data from the RS-232 and RS-485 interfaces is passed straight through. In addition, one hardware flow control signal is passed *in each direction.*
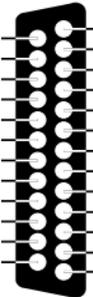
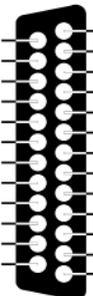### 4.5 Operating the Mini Driver MP in Half Duplex

When Switch S1-5 (Carrier Control) is in the OFF position, the Mini Driver MP's transmitter is operating constantly. In addition, the RD (Receive Data) and CD (Carrier Data) signals behave according to the true activity on the receive twisted-pair connection. Therefore, if there is a signal present, the CD signal will be high (+V) and RD will indicate whether it is in the Mark (1) or Space (0) state.

When Switch S1-5 is in the ON position, the Mini Driver MP's transmitter, as well as the CD and RD signals, are controlled by RTS. This is true for both 4-wire half-duplex and 2-wire half-duplex operation.

- When RTS is low (-V, the OFF state), the RD and CD signals will reflect exactly the state of the receive input signal on the twisted pair. The transmitter is turned off and will be either a high (tri-state) or intermediate impedance. (The impedance is set by Switches S1-1 and S1-2.)

- When RTS is high (+V, the ON state), the transmitter is ON and both RD and CD are clamped—RD to Mark (-V) and CD to Off (-V).

Appendix: RS-232
Pin Configurations

DIRECTION	STANDARD "DCE" SETTING	DIRECTION
	1- (FG) Frame Ground	
	2- (TD) Transmit Data	To Mini Driver MP
	3- (RD) Receive Data	From Mini Driver MP
	4- (RTS) Request to Send	To Mini Driver MP
	5- (CTS) Clear to Send	From Mini Driver MP
	6- (DSR) Data Set Ready	From Mini Driver MP
	7- (SG) Signal Ground	
To Mini Driver MP	Data Term. Ready (DTR) - 20 8- (DCD) Data Carrier Detect	From Mini Driver MP

DIRECTION	STANDARD "DTE" SETTING	DIRECTION
	1- (FG) Frame Ground	
	2- (TD) Transmit Data	From Mini Driver MP
	3- (RD) Receive Data	To Mini Driver MP
	4- (RTS) Request to Send	From Mini Driver MP
	5- (CTS) Clear to Send	To Mini Driver MP
	6- (DSR) Data Set Ready	To Mini Driver MP
	7- (SG) Signal Ground	
From Mini Driver MP	Data Term. Ready (DTR) - 20 8- (DCD) Data Carrier Detect	To Mini Driver MP

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