USER MANUAL

MODEL 2500 Series
Models 2500, 2510, 2520
All-Rate CSU/DSU

PATTON
Electronics Co.

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1.0 GENERAL INFORMATION

Thank you for your purchase of this Patton Electronics product. This product has been thoroughly inspected and tested and is warranted for One Year parts and labor. If any questions or problems arise during installation or use of this product, please do not hesitate to contact Patton Electronics Technical Support at (301) 975-1007.

1.1 WARRANTY STATEMENT

Patton Electronics warrants all Model 2500 Series components to be free from defects, and will—at our option—repair or replace the product should it fail within one year from the first date of shipment.This warranty is limited to defects in workmanship or materials, and does not cover customer damage, abuse, or unauthorized modification. This product contains no serviceable parts; therefore the user shall not attempt to modify the unit in any way. If this product fails or does not perform as warranted, your sole recourse shall be repair or replacement as described above. Under no condition shall **Patton Electronics** be liable for any damages incurred by the use of this product. These damages include, but are not limited to, the following: lost profits, lost savings and incidental or consequential damages arising from the use of or inability to use this product. **Patton Electronics** specifically disclaims all other warranties, expressed or implied, and the installation or use of this product shall be deemed an acceptance of these terms by the user.

1.2 RADIO AND TV INTERFERENCE

The Model 2500 Series generates and uses 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 and television reception. The Model 2500 Series 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 from such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If the Model 2500 Series does cause interference to radio or television reception, which can be determined by disconnecting the cables, the user is encouraged to try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna, and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

1.3 FCC INFORMATION

The Model 2500 Series has been tested and registered in compliance with the specifications in Part 68 of the FCC rules. A label on the equipment bears the FCC registration number. You may be requested to provide this information to your telephone company.

Your telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper operation of the Model 2500 Series. If this happens, the telephone company should give you advance notice to prevent the interruption of your service.

The telephone company may decide to temporarily discontinue your service if they believe your Model 2500 Series may cause harm to the telephone network. Whenever possible, they will contact you in advance. If you elect to do so, you have the right to file a complaint with the FCC.

If you have any trouble operating the Model 2500 Series, please contact Patton Technical Support at (301) 975-1000. The telephone company may ask you to disconnect the equipment from the telephone network until the problem has been corrected or until you are certain that the Model 2500 Series is not malfunctioning.

The following information may be required when applying to your local telephone company for leased line facilities:

Service Type	Digital Facility Interface Code	Service Order Code	Network Jacks
2.4 Kbps Digital Interface	04DU5-24	6.0F	RJ48S
4.8 Kbps Digital Interface	04DU5-48	6.0F	RJ48S
9.6 Kbps Digital Interface	04DU5-96	6.0F	RJ48S
56 Kbps Digital Interface	04DU5-56	6.0F	RJ48S

(Note: As of this publication date, 19.2 and 64Kbps digital services have not been assigned Digital Facility Interface Codes)

1.4 SERVICE INFORMATION

All warranty and non-warranty repairs must be returned freight prepaid and insured to Patton Electronics. All returns must have a Return Materials Authorization number on the outside of the shipping container. This number may be obtained from Patton Electronics Technical Service at **(301) 975-1007**. *Packages received without an RMA number will not be accepted.*

Patton Electronics' technical staff is also available to answer any questions that might arise concerning the installation or use of your Model 2500 Series. Technical Service hours: **8AM to 5PM EST, Monday through Friday.**

2.0 PRODUCT OVERVIEW

This section provides an overview of the Model 2500 Series, including features, general description, and a breakdown of model numbers by application.

2.1 PRODUCT FEATURES

- Operates over 4-wire dedicated digital lines
- Supports rates of 56 kbps and 64 kbps and all sub rates
- Supports Switched 56 dialing
- Provides both RS-232 and V.35 interfaces
- Features V.52 and V.54 compliant tests
- Nine easy-to-read LED indicators to monitor data signals
- Internal, external or received loopback clocking
- AT&T 62310 compliant
- Can be used as a high speed modem for private twisted pair
- Available in rack card and clusterbox versions
- Made in the USA

2.2 GENERAL PRODUCT DESCRIPTION

The Model 2500 Series CSU/DSUs operate either synchronously or asynchronously over 4-wire circuits up to 64 kbps. Rate conversion allows operation with a variety of DTE devices. Diagnostics include V.54 and V.52 loopback tests, as well as CSU loops. Configuration is accomplished by either externally accessible DIP switches or RS-232 software switches (user provides terminal). Nine easy-to-read front panel LED indicators monitor data and control signals. The rear panel presents both RS-232/V.24 and V.35 DTE connections.

The Model 2500 Series is AT&T compliant and supports DDS, Switched 56, Clear Channel 64 and other digital services available from major service providers including AT&T, Sprint and MCI. Dedicated models can also be used as a high speed modem for private twisted pair. The Model 2500 Series is available in standalone or in rack-card configurations (only standalone versions are covered in this manual).

2.3 SUPPORTED APPLICATIONS

The Model 2500 Series includes three units: the Model 2500 All-Rate CSU/DSU, the Model 2510 Switched 56 CSU/DSU and the Model 2520 All-Rate/Switched 56 CSU/DSU. Depending upon the unit selected, the Mode 2500 Series supports three distinct modes of operation. These are outlined in the descriptions and table below:

Dedicated DDS/Clear Channel Operation (Models 2500, 2520)

The unit can be easily configured for dedicated DDS/Clear Channel operation by means of the dip switches on the bottom of the enclosure, or by means of the software control port. Set the Line Rate to match the rate of service to which you subscribe. Set the Mode switches for Network Clocking. The Rate Converter and the Data Format options should be set as required for your application. The remaining options may need to be set depending on your terminal equipment and your application.

Switched-56 Operation (Models 2510, 2520)

The unit can be used in Switched 56 applications. Set the Line Rate to 56 kbps. Set the Mode switches for Switched 56, and enable Force RTS and Circuit Assurance. Dial or store a number using the control port. The Rate Converter and the Data Format options should be set as required for your application. The remaining options may need to be set depending on your terminal equipment and your application.

Campus Area Short Haul Operation (Models 2500, 2520)

The unit can also be used for campus area point-to-point short-haul applications on private twisted-pair wires. Set the Line Rates the same on both units. Set the Mode switch for the appropriate Transmit Clock Mode for your application. Internal, External and Looped Clock Modes are available. Set the remaining options as needed by your terminal equipment or your application.

MODEL 2500 SERIES APPLICATIONS			
	2500	2510	2520
Line Rate Switches	All line rates Supported	56 Kbps only	All line rates Supported
Mode Switches	Supports all modes except Sw-56	Switched 56 only	All modes Supported
Dialing Comments	Not Supported	Supported	Supported

This section describes connection of the Model 2500 Series to the DTE and telco (line) interfaces, as well as AC power connection

3.1 DTE INTERFACE CONNECTION

The Model 2500 Series has connectors for both V.35 and RS-232 interfaces.   Signals *output* by the Model 2500 Series will appear on both interfaces. An internal jumper is used to select which interface will be used for *input*. With the jumper in the factory default position, the Model 2500 Series automatically selects which interface will be used for input. If the DTR signal on the RS-232 is active, then the RS-232 inputs are selected. Otherwise, the V.35 inputs are selected. If you choose, you may re-configure the Model 2500 Series for fixed V.35 or fixed RS-232 operation. To do this, follow the steps below:

1) Turn the power switch off.
2) Remove the power cord from the unit.
3) Remove the two screws on the rear panel and slide the board out from the rear.
4) Locate the DTE port selection jumper near the middle of the PC board. This jumper has three pins, two of which are covered by the strap. The factory position of the jumper is with the strap covering the two pins *closest to the rear* of the unit.
5) To reconfigure the Model 2500 Series for fixed V.35 operation, move the strap so that it covers the two pins *closest to the front* of the unit.
6) To reconfigure the Model 2500 Series for fixed RS-232 operation, *remove the strap* altogether (be sure not to lose the strap).

3.1.1 V.35 INTERFACE PORT

For V.35 operation, attach your DTE (terminal) cable to the 34 pin rectangular M/34 connector. The DTE cable should be pinned according to the diagram in **Appendix D.**

3.1.2 RS-232 INTERFACE PORT

For RS-232 operation, attach your DTE (terminal) cable to the 25 pin   DB-25 connector. The DTE cable should be pinned according to the diagram in **Appendix D.**

3.2 NETWORK INTERFACE CONNECTION

The Network Interface is an 8 position modular connector. Connect this port to the RJ-48S jack provided by the digital data service provider. If the Model 2500 Series is being used for private short haul communication, the twisted pair cable will connect to this port. See **Appendix D** for the pin assignments of this connector.

3.3 CONTROL PORT INTERFACE

The Control Port Interface is an 8 position modular connector. If it is to be used, connect this port to an asynchronous terminal using a shielded cable. See **Section 4.4** for control port operation.

3.4 POWER

The model 2500 series has a built-in powers supply that is factory configured for either 115 or 230 VAC, depending on how the product is ordered. This power supply is equipped with a shrouded male IEC-320 power entry connector, and is available with a variety of domestic and international power cords (see **Appendix C**).

In order for the Model 2500 Series unit to operate, the power cord (supplied) must be attached to the power entry connector on the rear of the unit and plugged into an outlet that is easily accessible. The power switch on the rear of the unit must also be turned ON.

> **WARNING!** **There are no user-serviceable parts in the power supply section of the Model 2500 Series. Voltage setting changes and fuse replacement should only be performed by qualified service personnel. Contact Patton Electronics Technical support at (301)975-1007 for more information.**

4.0 CONFIGURATION

Before you can operate your Model 2500 Series CSU/DSU, you must configure the unit. Configuration may be done using the externally accessible hardware switches or by using the software switches. Software switches can be accessed from the front panel control port using a VT-100 type RS-232 terminal that responds to ANSI escape sequences.

4.1 CONFIGURATION USING HARDWARE SWITCHES

The Model 2500 Series defaults to the use of hardware switches for configuration. The unit can also use software switches for configuration (see Section 4.3), in which case the hardware switches *will be ignored*.

Note: If you are attempting to configure the unit using hardware switches and find they are being ignored, you will need to override the software switches and force the unit back into hardware switch mode. To do this, power-up the unit once with the **Line Rate (SW1-1, 1-2, 1-3) set to Off, Off, Off**. Then set the hardware switches as you require and power-up the unit again.

The hardware configuration mode for the Model 2500 Series uses sixteen externally accessible DIP switches. Figure 1 (below) shows the location of the Model 2500 Series' DIP switches.

The Model 2500 Series' DIP switches can be configured as either "On" or "Off". Figure 2 (opposite page) shows the orientation of the DIP switches with respect to ON/OFF positions.
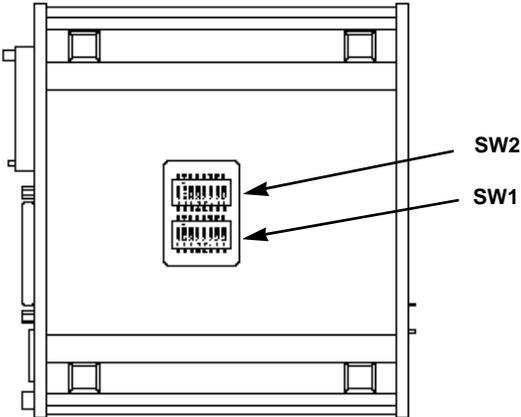

Figure 1. Model 2500 Series bottom view, showing location of DIP switches
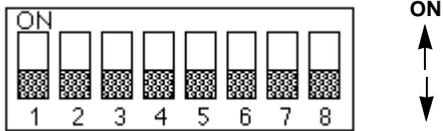
ON

Figure 2. Close up of DIP switches showing ON/OFF positions.

4.1.1 SWITCH SET SW1

The configuration switches on switch set SW1 allow you to specify Line Rate, Circuit Assurance, RTS, Character Length, Data Format and DSR Loop Status. Figure 3 (below) summarizes SW1 switch settings, including the factory defaults. Following Figure 4 is a description of each switch setting.

SWITCH SET 1 SUMMARY TABLE			
Position	**Function**	**Factory Default**	
Switch SW1-1	Line Rate	Off ⎫	
Switch SW1-2		On ⎬ 56,000 bps	
Switch SW1-3		On ⎭	
Switch SW1-4	Circuit Assurance	Off Disabled	Model 2510 Enabled
Switch SW1-5	RTS	Off Forced On	
Switch SW1-6	Character Length	Off 10 Bit	
Switch SW1-7	Data Format	Off Synchronous	
Switch SW1-8	DSR Loop Status	Off DSR Off	

Figure 3. Summary of switch settings, showing factory defaults

Line Rate

These switches control the signalling rate on the line (RJ-48S port). They should match the speed of your digital service.

SW1-1	SW1-2	SW1-3	Setting
On	On	On	2.4 kbps
On	On	Off	4.8 kbps
On	Off	On	9.6 kbps
On	Off	Off	19.2 kbps
Off	On	On	56 kbps
Off	On	Off	64 kbps
Off	Off	Off	Force configuration pointer to default to hardware switches (See **Section 4.2**)

(continued)

For line rates of 56 and 64 kbps, it is possible to operate the DTE interface at a lower rate. To do this, set these switches to 56 or 64 kbps and set the Rate Converter/DTE Rate switches as required.

Circuit Assurance

On dedicated circuits, the transmitter and the CTS output can be configured to go On only when a working communication circuit is established. If Circuit Assurance is used, enable it on only one end of the communication link. In Switched 56 mode, this switch should be set to On on both ends of the circuit.

	Circuit	
SW1-4	Assurance	Description
On	Enabled	CTS will go low and the transmitter will be held off if the receiver is in the No Signal state or CD is low
Off	Disabled	The transmitter and CTS will operate without regard to the receiver state

RTS

The RTS input can be forced on, ignoring the terminal's RTS signal. RTS controls the transmitter by either sending the user's data or sending an idle code. Force RTS should be enabled in Switched 56 mode.

SW1-5	RTS	Description
Off	Forced On	An On (high) condition is trans-mitted regardless of the state of this unit's RTS input
On	Follows DTE	The RTS input controls the transmitter

Note: At 64K line rate, RTS is always Forced On.

Character Length

In asynchronous data format, 10 and 11 bit characters are supported. This setting is ignored in synchronous data format.

		Character Description			
SW1-6	Character Length	Start	Data bits	Parity	Stop bits
Off	10-bit	1	8	None	1 or more
		1	7	1	1 or more
		1	7	None	2
On	11-bit	1	8	1	1 or more
		1	9	None	1 or more

Data Format

The data format selection controls whether an async-to-sync conversion is performed. (Data is always transferred synchronously between the two CSU/DSU's)

SW1-7	Data Format
On	Asynchronous
Off	Synchronous

Note[1]: The async rate of 57.6 kbps is supported at the 56kbps line rate, provided the DTE equipment transmits two stop bits. Two stop bits can be configured on most DTE equipment. This extra stop bit reduces the DTE's effective data rate by a few percent to allow synchronization with the 56kbps line speed.

Note[2]: Lower speed asynchronous data can be transmitted on synchronous circuits by simple over-sampling. To do this, leave Data Format set to synchronous. Make sure the CSU/DSU's sync data rate is at least 4 times more than the async data rate you wish to send.

DSR Loop Status

The behavior of the DSR output during performance of a local loop can be controlled.

SW1-8	DSR Loop Status	Description
On	DSR On	DSR remains high (On) during the Analog Loop
Off	DSR Off	DSR goes low (Off) during the Analog Loop

4.1.2 SWITCH SET SW2

The configuration switches on switch SW2 control the Rate Adapter/DTE Rate, Clock Mode, Anti-Stream Timer and RTS/CTS Delay. Figure 5 (below) summarizes SW2 switch settings, including the factory defaults. Following Figure 4 is a description of each switch setting.

SWITCH SET 2 SUMMARY TABLE			
Position	**Function**	**Factory Default**	
Switch SW2-1	Rate Adapter/	Off ⎫	
Switch SW2-2	DTE Rate	Off ⎬ DTE Rate	
Switch SW2-3		Off ⎭	
Switch SW2-4	DTE Loop Control	Off Disabled	
Switch SW2-5	Clock Mode	Off ⎫ Network	Off ⎫ Model 2510
Switch SW2-6		Off ⎬ Clock	On ⎬ Switched 56
Switch SW2-7	Anti-Stream Timer	On Disabled	
Switch SW2-8	RTS/CTS Delay	Off Normal	

Figure 4. Summary of switch settings, showing factory defaults

Rate Adapter/DTE Rate

The Model 2500 Series includes a rate adapter that allows the unit to be used with DTE devices that support rates lower than 56/64 kbps. All switch settings below are valid for line rates of 56 or 64 kbps.

SW2-1	SW2-2	SW2-3	DTE Rate
On	On	On	2.4 kbps
Off	On	On	4.8 kbps
On	Off	On	9.6 kbps
Off	Off	On	19.2 kbps
On	On	Off	38.4 kbps
Off	Off	Off	Line Rate = DTE Rate

Note: for DTE devices that operate at **57.6 kbps**, set the Line Rate to 56 kbps (see **Section 4.1.1**), set the rate adapter for "Line Rate=DTE Rate", and configure your DTE device for two stop bits (set character length accordingly).

DTE Loop Control

The local loop and remote loop can be activated from the DTE interface using signals "LL" and "RL".

SW2-4	
On	Enable LL and RL inputs
Off	Disable

Clock Mode

The appropriate transmitter clocking modes can be selected for Dedicated DDS, Switched-56 or campus-area (private) operation.

SW2-5	SW2-6	Mode	Description
On	Off	External Clock Mode	Transmit Clock derived from terminal interface
Off	Off	Network Clock Mode (Looped Clock Mode)	Transmit clock derived from the received line signal; Use this mode for Dedicated DDS operation
On	On	Internal Clock Mode	Transmit Clock derived internally
Off	On	Switched 56	(Model 2510, 2520)

Anti-Stream Timer

The anti-stream timer protects multidrop networks from a drop that is continuously transmitting. If the terminal keeps RTS raised for more than 30 seconds, the timer forces RTS off internally. This allows the rest of the multidrop network to resume operation. The CSU/DSU remains in the forced-off condition until the terminal drops RTS.

		Timer Value in Sec at Various Line Rates				
SW2-7	Timer	56	19.2	9.6	4.8	2.4
On	Disabled					
Off	Enabled	2	4	8	15	30

CTS Delay

The RTS/CTS turn-on delay can be set to Normal or Extended.

		Delay in mSec at Various Line Rates				
SW2-8	CTS Delay	56	19.2	9.6	4.8	2.4
Off	Normal	0.3	0.9	1.9	3.8	7.5
On	Extended	1.3	3.8	7.5	15	30

4.2 CONFIGURATION USING SOFTWARE SWITCHES

The Model 2500 Series CSU/DSUs can be soft configured using a VT100 terminal or similar RS-232 DTE with terminal emulation. To use software switches for configuration, follow these steps:

1) Connect the serial RS-232C port of the terminal to the modular EIA-561 control port on the front panel of the Model 2500 Series. To construct an RS-232 to EIA-561 patch cable, refer to the control port pinout diagram in **Appendix D**.

2) Power up the terminal and set its RS-232C port as follows:

> 9600 baud
> 8 data bits, 1 stop bit, no parity
> local echo
> CR = CR/LF on inbound data
> ANSI, VT-100 emulation

3) Key **menu**, then press [RETURN]. The Model 2500 Series Main Menu should then display on the terminal screen (see below).

```
**********************************************************
*                                                        *
*       MAIN MENU - Esc to exit menu mode                *
*                                                        *
*                                                        *
*    1. Select Hardware/Software Switch Control          *
*                                                        *
*    2. Read Hardware/Software Configuration             *
*                                                        *
*    3. Set Software Switch Parameters                   *
*                                                        *
*    4. Display Line/Loop Status                         *
*                                                        *
*    5. Set Switched 56 Parameters                       *
*                                                        *
**********************************************************
```

4.2.1 USING THE SOFTWARE MENU SYSTEM

The Model 2500 Series Menu System operates as follows:

1) All selections must be followed by [RETURN].

2) To make a selection from any menu, enter the option number at the prompt and press [RETURN].

3) To exit any menu without making a selection, press [ESC] followed by [RETURN]. (Note: You can also exit by just pressing [RETURN]. However, doing this in the Store Phone Number Menu will clear the buffer of the currently stored number.)

4.2.2 VERIFYING SOFTWARE SWITCH CONTROL

In order to use software switches for configuration, it is necessary to disable the hardware switch settings. To do this, use the following procedure (**Note:** If this procedure is omitted, your software configurations will be overridden by the hardware switch settings):

1) On the Main Menu (opposite page), choose item 1, "Select Hardware/Software Switch Control". The following screen will appear:

```
**********************************************************
*                                                        *
*    HARDWARE/SOFTWARE CONTROL MENU - Esc to exit        *
*                                                        *
*                                                        *
*       1. Use Hardware Switch Control                   *
*                                                        *
*       2. Use Software Switch Control                   *
*                                                        *
**********************************************************
```

2) In the Hardware/Software Control Menu, select   item 2 to enable software switch control.

3) The Main Menu will automatically reappear after your selection is entered.

4.2.3 SETTING SOFTWARE SWITCH PARAMETERS

From the Main Menu, selecting item 3, "Set Software Switch Parameters" will take you to the Software Switch Menu (below). From this screen, you can select any parameters that you wish to soft configure.

```
**********************************************************
*                                                        *
*          SOFTWARE SWITCH MENU - Esc to exit            *
*                                                        *
*  1. Line Rate              8. DTE Loop Control         *
*                                                        *
*  2. Circuit Assurance      9. Clock Mode               *
*                                                        *
*  3. RTS                    A. Anti-Stream Timer        *
*                                                        *
*  4. Character Length       B. RTS/CTS Delay            *
*                                                        *
*  5. Data Frmt (Sync/Async) C. 511 Test Pattern         *
*                                                        *
*  6. DSR Loop Status        D. Remote Digital Loop      *
*                                                        *
*  7. Rate Adapter/DTE Rate  E. Local Line Loop          *
*                                                        *
**********************************************************
```

For each screen described below, selecting a numbered option and pressing [RETURN] stores that option setting and returns you to the Software Switch Menu (**Note:** All lettered options must be entered in lower case).

Line Rate

Choosing option 1 in the Software Switch Menu takes you to the Line Rate Menu (below). This option controls the signaling rate on the line. Set it to match the speed of your digital service. For line rates of 56 or 64 kbps, it is possible to operate the DTE interface at a lower rate. To do this , set the line rate to 56 or 64 kbps. Then set the DTE Speed as required (Software Switch Menu option 7).

```
****************************************************
*                                                  *
*          LINE RATE MENU - Esc to exit            *
*                                                  *
*  1. 2400 bps             4. 19.2 kbps            *
*                                                  *
*  2. 4800 bps             5. 56 kbps (DEFAULT)    *
*                                                  *
*  3. 9600 bps             6. 64 kbps              *
*                                                  *
****************************************************
```

Circuit Assurance

Choosing option 2 in the Software Switch Menu takes you to the Circuit Assurance Menu (below). On dedicated (DDS) circuits, the transmitter and the CTS output can be configured to go ON only when a working communication circuit is established. If you use Circuit Assurance with DDS services, enable it on only one end of the communication link. For Switched-56 service, enable Circuit Assurance on both ends of the circuit. When Circuit Assurance is disabled, the transmitter and CTS operate without regard to the receiver state.

```
*****************************************************
*                                                 *
*     CIRCUIT ASSURANCE MENU - Esc to exit        *
*                                                 *
*  1. Enable Circuit Assurance                    *
*                                                 *
*  2. Disable Circuit Assurance (DEFAULT)         *
*                                                 *
*****************************************************
```

Force RTS

Choosing option 3 in the Software Switch Menu takes you to the RTS Menu (below). The RTS input can be forced ON, ignoring the RTS signal from the DTE. RTS controls the transmitter by sending either user data (when high) or idle code (when low). On a Model 2510 or 2520, Force RTS should be enabled for Switched-56 operation.

```
******************************************
*                                      *
*      RTS MENU - Esc to exit          *
*                                      *
*  1. RTS Forced On (DEFAULT)          *
*                                      *
*  2. RTS Follows DTE Signal           *
*                                      *
******************************************
```

Note: When the Line Rate (Software Switch Menu option 1) is 64 kbps, RTS is always forced ON, regardless of the Force RTS switch setting.

Character Length

Choosing option 4 in the Software Switch Menu takes you to the Character Length Menu (below). In asynchronous data format, the Model 2500 Series supports 10-bit and 11-bit character lengths. Set this option according to the characteristics of the data being transmitted.

```
***********************************************
*                                           *
*     CHARACTER LENGTH MENU - Esc to exit   *
*                                           *
*  1. 10 Bit Character Length (DEFAULT)     *
*                                           *
*  2. 11 Bit Character Length               *
*                                           *
***********************************************
```

DTE Data Format

Choosing option 5 in the Software Switch Menu takes you to the Data Format Menu (below). This option controls whether an async-to-sync conversion is performed between the DTE and the Model 2500 Series. (Data is always transferred synchronously between two Model 2500 Series units.) For an *asynchronous* DTE, select the asynchronous data format[1,2]; for a *synchronous* DTE, select the synchronous data format.

```
***********************************************
*                                           *
*     DATA FORMAT MENU - Esc to exit        *
*                                           *
*  1. Asynchronous Data Format              *
*                                           *
*  2. Synchronous Data Format (DEFAULT)     *
*                                           *
***********************************************
```

Note[1]: The async rate of 57.6 kbps is supported at the 56 kbps line rate, provided the DTE equipment transmits two stop bits. Two stop bits can be configured on most DTE equipment. This extra stop bit reduces the DTE's effective data rate by a few percent to allow synchronization with the 56 kbps line speed. *Set the Model 2500 Series for two stop bits by selecting "11 bit character length" in the Character Length Menu.*

(continued)

Note[2]: You can use the Model 2500 Series to transmit lower-speed asynchronous data (up to 9.6 kbps) over synchronous circuits by simple over-sampling. To do this, select the synchronous data format and set the line Line Rate (Software Switch Menu option 1) to at least four times that asynchronous data rate you wish to send. For example, use a Line Rate of 9.6 kbps or higher for 2.4 kbps async data.

DSR Status During Local Loopback

Choosing option 6 in the Software Switch Menu takes you to the DSR Loop Status Menu (below). This option controls the behavior of the DSR output during local loopback. To force DSR high (ON) during local loopback, enable this option. To force DSR low (OFF) during a local loopback, disable it.

```
****************************************************
*                                                  *
*        DSR LOOP STATUS MENU - Esc to exit        *
*                                                  *
*  1. DSR On During Local Line Loop                *
*                                                  *
*  2. DSR Off During Local Line Loop (DEFAULT)  *
*                                                  *
****************************************************
```

Rate Converter/DTE Rate

Choosing option 7 in the Software Switch Menu takes you to the Rate Adapter/DTE Rate Menu (opposite page). The Model 2500 Series rate converter adapts a 56 kbps or 64 kbps line rate to slower DTE data rates. Set the Rate Converter to match the DTE data rate. If the DTE data rate is the same as the line rate, disable rate conversion by selecting item 6 on this menu.

(continued)

19

```
****************************************************
*                                                  *
*    RATE ADAPTER/DTE RATE MENU - Esc to exit      *
*                                                  *
*  1. Line=56/64, DTE=2.4                          *
*                                                  *
*  2. Line=56/64, DTE=4.8                          *
*                                                  *
*  3. Line=56/64, DTE=9.6                          *
*                                                  *
*  4. Line=56/64, DTE=19.2                         *
*                                                  *
*  5. Line=56/64, DTE=38.4                         *
*                                                  *
*  6. Line Rate=DTE Rate (DEFAULT)                 *
*                                                  *
*  For 57.6, use Line Rate=DTE Rate, set Line      *
*     Rate to 56 kbps, config DTE for 2 Stop       *
*       bits & set Char Length accordingly.        *
*                                                  *
****************************************************
```

Note: For DTE data rates of 56 kbps or 64 kbps, set the rate adapter to "Line Rate = DTE Rate", and the line rate to 56 or 64 kbps, respectively. For DTE rate of 57.6 kbps, set the rate adapter to "Line Rate = DTE Rate", set line rate to 56 kbps, set DTE for two stop bits, and set CSU/DSU character length to "11 bits".

DTE Loop Control

Choosing option 8 in the Software Switch Menu takes you to the DTE Loop Control Menu (below). The local and remote loopbacks on the Model 2500 Series can be controlled from the DTE interface by raising or lowering the LL and RL signals. To allow the DTE to control these loopbacks in this manner, enable this option. Disable if you want the Model 2500 Series to ignore these signals.

```
**********************************************
*                                            *
*    DTE LOOP CONTROL MENU - Esc to exit     *
*                                            *
*  1. Enable DTE Loop Control                *
*                                            *
*  2. Disable DTE Loop Control (DEFAULT)     *
*                                            *
**********************************************
```

(continued)

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Clock Mode

Choosing option 9 in the Software Switch Menu takes you to the Clock Mode Menu (below).

```
********************************************
*                                          *
*      CLOCK MODE MENU - Esc to exit       *
*                                          *
*    1. Internal (Master) Clock            *
*                                          *
*    2. Network (Looped) Clock (DEFAULT)   *
*                                          *
*    3. External (DTE) Clock               *
*                                          *
*    4. Switched 56 Clock                  *
*                                          *
********************************************
```

Set this option as follows:

• **Internal (Master):** To use the Model 2500 Series internal reference clock as the timing source, select item 1. Use internal timing in point-to-point applications where the Model 2500 Series is being used as a limited distance modem. (Set the far-end Model 2500 Series unit for looped timing as described below.)

• **Network (Looped):** To have the Model 2500 or 2520 derive a transmit clock from the incoming data stream from the network, select item 2. This is the default setting and appropriate for most applications.

• **External (Terminal Timing):** To have the Model 2500 Series use the DTE-supplied transmit clock (pin 24 on and RS-232/V.24 interface or pins U and W on a V.35 interface), select item 3. Use external timing for tail-circuit applications, in which the RS-232 or V.35 ports of two Model 2500 Series units are interconnected.

• **Switched 56 (Model 2510 and 2520 only):** When using a Model 2510 or 2520 with Switched 56 service, select item 4.

(continued)

Anti-Streaming Timer

Choosing option "a" in the Software Switch Menu takes you to the Anti Stream Timer Menu (below). (**Note:** You must use *lower case* letters for options "a" thru "e") This option lets you enable or disable the anti-streaming timer, which protects multidrop networks from a drop that is continuously transmitting. If the DTE asserts RTS for a period of time exceeding the timer interface, the timer forces RTS off internally. This allows the rest of the multidrop network to resume operation. The Model 2500 Series holds RTS off until the terminal drops RTS. The timer interval decreases as the line rate increases.

```
**********************************************
*                                            *
*    ANTI-STREAM TIMER MENU - Esc to exit    *
*                                            *
*   1. Enable Anti-Stream Timer              *
*                                            *
*   2. Disable Anti-Stream Timer (DEFAULT)   *
*                                            *
**********************************************
```

RTS/CTS Delay

Choosing option "b" in the Software Switch Menu takes you to the RTS/CTS Delay Menu (below). This option lets you set the RTS/CTS turn-on delay to Normal or Extended. The delay interval decreases as the line rate increases.

```
*********************************************
*                                           *
*     RTS/CTS DELAY MENU - Esc to exit      *
*                                           *
*   1. Normal RTS/CTS Delay (DEFAULT)       *
*                                           *
*   2. Extended RTS/CTS Delay (4xNormal)    *
*                                           *
*********************************************
```

Once the Model 2500 Series unit is installed and configured properly it is ready to operate. This section describes the function of the LED indicators, the status displays, the use of loopback test modes, and Switched 56 dialing procedures (Models 2510 and 2520 only).

5.1 LED DESCRIPTIONS

The Model 2500 Series is equipped with nine LED indicators that monitor the status of communication. Figure 5 (below) shows the location of the LEDs on the Model 2500 Series front panel. Note also the location of the test mode switches and RS-232 control port (used in Switched 56 dialing as well as software configuration). Following Figure 5 is a description of each LED's function.
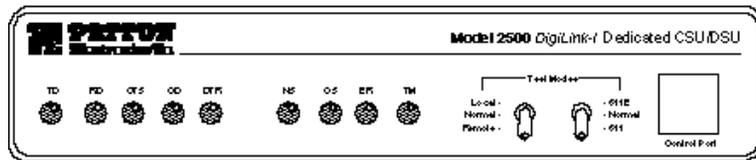

Figure 5. The Model 2500 Series' front panel LEDs

- "TD" and "RD" will glow red to indicate an Idle condition or Binary "1" data on the respective terminal interface signals. Green indicates Binary "0" data.

- "CTS" will glow red to indicate an Off condition. Green indicates an On condition. When on, the unit is ready to send data. If CTS remains off, check the Forced RTS, Circuit Assurance and Anti-Stream settings.

- "CD" will glow green to indicate that the a valid carrier is present. Red indicates that there is no valid carrier detected.

- "DTR" will glow green to indicate that the DTR signal from the terminal is active.

- "NS" will glow red to indicate No Signal. This means the Model 2500 Series receiver does not detect a signal from the digital service provider (or, in the case of short-haul operation, from the remote Model 2500 Series). If NS is lit, check for an unplugged cable, broken wire or an incorrect Line Rate selection.

(continued)

- "OS" glows red to indicate Out-of-Service. This means the Model 2500 Series has received an Out-of-Service signal from the digital service provider and indicates a problem with the service provider's equipment. If this condition persists, contact your service provider.

- "ER" glows red to indicate that an error has been detected in the received signal. ER will flash if the Model 2500 Series receives illegal bi-polar violations or framing errors. During the 511 or 511/E test, ER will flash to indicate that the Test Pattern Detector has detected a bit error.

- "TM" glows red to indicate Test Mode. It will light if the unit is placed into a test mode. The unit can be placed in test mode by the local user, by the remote user or by the service provider.

5.2 STATUS DISPLAYS

The Model 2500 Series lets you use a VT-100 type RS-232 terminal to display the current configuration settings, as well as the line/loop status.

5.2.1 DISPLAYING CONFIGURATION SETTINGS

To display the current settings of the hardware and /or software switches, go to the Main Menu (see **Section 4.2**) and select item 2, "Read Configuration". This will take you to the Read Configuration Menu (below).

```
********************************************************
*                                                      *
*      READ CONFIGURATION MENU - Esc to exit           *
*                                                      *
*                                                      *
*    1. Read Hardware Configuration                    *
*                                                      *
*    2. Read Software Configuration                    *
*                                                      *
********************************************************
```

(continued)

In the Read Configuration Menu, you may select item 1 to read the hardware switch configuration or item 2 to read the software switch configuration. A sample screens is shown below:

```
HARDWARE SWITCH CONFIGURATION
*****************************

RTS: FOLLOWS DTE SIGNAL
Circuit Assurance: DISABLED
Data Format: SYNCHRONOUS
Character Length: 10 BITS
511 Test Pattern: DISABLED
Remote Digital Loop: DISABLED
Local Line Loop: DISABLED
Anti-Stream Timer: DISABLED
DSR Loop Status: ON DURING LOCAL LOOP
Line Rate: 56 kbps
Clock Mode: NETWORK (LOOPED)
RTS/CTS Delay: NORMAL
DTE Loop Control: DISABLED
Rate Adapter/DTE Rate: LINE RATE=DTE RATE
```

5.2.2 DISPLAYING LINE/LOOP STATUS

To check the current status of the Model 2500 Series and the associated circuit, go to the Main Menu (see **Section 4.2**) and select item 4, "Display Line/Loop Status"[1,2]. This will take you to a screen similar to the Line/Loop Status Monitor Screen (below).

```
LINE/LOOP STATUS MONITOR
************************

CD ON
Test Mode Indicator: ACTIVE
ERROR DETECTED
511 Test Pattern Error Injector: ACTIVE
511 Test Pattern: ACTIVE
Local Line Loop: ACTIVE

 ERROR COUNT:14
```

Note[1]: To refresh the display with the most up-to-date information, key "4" and press [RETURN].

Note[2]: The error count is <u>reset</u> after each time it is displayed.

5.3 LOOPBACK TEST MODES

The Model 2500 Series offers three loopback tests to evaluate the condition of the CSU/DSUs and the communication link: local analog loopback, remote digital loopback and telco loopback (C.O. Loopback).

5.3.1 LOCAL ANALOG LOOPBACK (LAL)

The Local Analog Loopback (LAL) test checks the operation of the local Model 2500 Series. Any data sent to the local Model 2500 Series in this test mode will be echoed (returned) back to the user device. For example, characters typed on the keyboard of a terminal will appear on the terminal screen (see Figure 6, below).
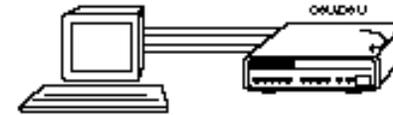

Figure 6. Local analog loop

LAL Test Activation

The LAL test may be activated in one of three ways:

1) Toggle the front panel "Local/Normal/Remote" switch UP to the "Local" position.

2) Activate the LL lead from the DTE (Note: in order to use this option, the DTE Loop Control option must be enabled–see **Section 4.1.2**).   If you are not sure which pin is the LL lead, please refer to the pinout diagrams in **Appendix D**.

3) From a terminal, first go to the Main Menu and select item 3 to display the Software Switch Menu (**Section 4.2**) In the Software Switch Menu, select item "e" to go to the Local Line Loop Menu (see below). To activate LAL, select item 1.

```
*******************************************
*                                         *
*   LOCAL LINE LOOP MENU - Esc to exit    *
*                                         *
*   1. Initiate Local Line Loop           *
*                                         *
*   2. Terminate Local Line Loop          *
*                                         *
*******************************************
```

LAL Test Procedure

Once LAL is activated, the Model 2500 Series transmit output is connected to its own receiver. The "Test" LED should be lit. Follow these steps to complete the test:

1) Verify that the data terminal equipment is operating properly and can be used for a test. If a fault is indicated, call a technician or replace the unit.

2) Perform a BER (bit error rate) test on each unit using a separate BER tester (The Model 2500 Series has a built-in BER tester–see **Section 5.4**). If the BER test equipment indicates no faults but the data terminal indicates a fault, follow the manufacturer's checkout procedures for the data terminal. Also, check the interface cable between the terminal and the Model 2500 Series.

5.3.2 REMOTE DIGITAL LOOPBACK (RDL)

The Remote Digital Loopback (RDL) test checks the performance of both the local and remote Model 2500 Series', *and* the communication link between them. Any characters sent to the remote Model 2500 Series in this test mode will be returned back to the originating device. For example, characters typed on the keyboard of the local terminal will appear on the local terminal screen *after* having been passed to the remote Model 2500 Series and looped back (see Figure 7, below).
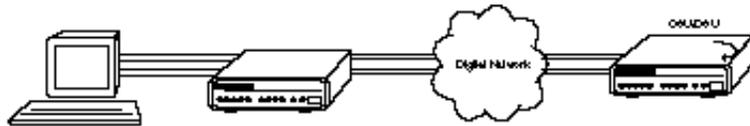

Figure 7. Remote digital loop

RDL Test Activation

The RDL test may be activated in one of three ways:

1) Toggle the front panel "Local/Normal/Remote" switch DOWN to the "Remote" position.

(continued)

2) Activate the RL lead from the DTE (Note: in order to use this option, the DTE Loop Control option must be enabled–see **Section 4.1.2**). If you are not sure which pin is the RL lead, please refer to the pinout diagrams in **Appendix D**.

3) From a terminal, first go to the Main Menu and select item 3 to display the Software Switch Menu (**Section 4.2**) In the Software Switch Menu, select item "d" to go to the Set Remote Digital Loop Menu (see below). To activate RDL, select item 1.

```
*************************************************
*                                               *
*   REMOTE DIGITAL LOOP MENU - Esc to exit      *
*                                               *
*   1. Initiate Remote Digital Loop             *
*                                               *
*   2. Terminate Remote Digital Loop            *
*                                               *
*************************************************
```

RDL Test Procedure

Once LAL is activated, the "Test" LED should be lit. Perform a BER (bit error rate) test on the system, using BER testers on both ends. If the BER test equipment indicates a fault and the Local Analog Loopback test was successful for both Model 2500 Series units, you may have a problem with the line between the CSU/DSUs. You should inspect the line for proper connections.

5.3.3 TELCO TESTING

The digital service provider's central office can perform CSU Loop and DSU Loop diagnostic testing. These diagnostics allow the central office to evaluate circuit operation without making visits to a customer's premises.

(continued)

CSU Loop

The CSU Loop is activated when the central office reverses the DC sealing current that flows between the TX pair and the RX pair. In this case, the Model 2500 Series recognizes this and loops signals on the RX pair back to the central office on the TX pair (see Figure 8, below). While the CSU Loop is activated by the central office, the TM light is illuminated.
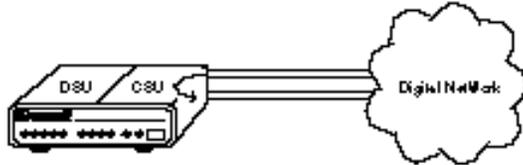

Figure 8. CSU loop

DSU Loop

The DSU Loop is activated when the central office sends a DSU loop signal over the twisted pair wire. The Model 2500 Series senses this signal and loops the digital data back to the central office (see Figure 9, below). While the DSU Loop is activated, the TM light is illuminated.
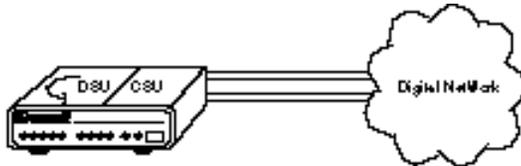

Figure 9. DSU loop

5.4 THE V.52 BER TEST PATTERN GENERATOR

The Model 2500 Series has a built-in test pattern generator and detector. It can be invoked at both ends of a link simultaneously (using two operators) or it can be invoked in conjunction with the LAL or RDL tests (using one operator). The following example requires two operators–one to initiate and monitor the test at the local Model 2500 Series, and one at the remote Model 2500 Series. To use the V.52 BER test by itself, both operators should *simultaneously* follow these steps:

(continued)

1) Locate the "511/511E" toggle switch on the front panel of the Model 2500 Series and move it DOWN (see Note 1). This activates the V.52 BER test mode and transmits a "511" pseudorandom test pattern to the other unit. If any errors are received, the receiving CSU/DSU's red "Error" LED will blink sporadically (see Notes 1 & 2, below).

2) If the test indicates no errors are present, move the V.52 toggle switch UP, activating the "511/E" test (see Note 2). The 511/E test transmits the 511 pseudorandom test pattern and injects intentional errors about once per second. If the test is working properly, the receiving CSU/DSU's red "Error" LED will blink *regularly*.

A successful "511/E" test will confirm that the link is in place, and that the Model 2500 Series' built-in "511" generator and detector are working properly.

Note[1]: The 511 BER pattern can also be activated using the software control port. Follow these steps: From a terminal, first go to the Main Menu and select item 3 to display the Software Switch Menu (**Section 4.2**) In the Software Switch Menu, select item "c" to go to the Send 511 Pattern Menu (see below). To send a 511 pattern, select item 1.

```
******************************************
*                                        *
* 511 TEST PATTERN MENU - Esc to exit    *
*                                        *
*   1. Send 511 Pattern                  *
*                                        *
*   2. Terminate 511 Pattern             *
*                                        *
******************************************
```

Note[2]: Control Port activation of the "511E" pattern is not possible. The "511E" pattern may only be activated using the front panel toggle switch.

5.5 SWITCHED 56 DIALING COMMANDS (MODELS 2510 & 2520)

> *CAUTION! For proper Switched 56 operation, you must enable the Circuit Assurance and Force RTS options as described in Section 4.0. Failure to do so may prevent the Model 2500 Series unit from answering incoming Switched 56 calls.*

To access the Switched 56 dialing capabilities of the Mode 2500 Series, go to the Main Menu (see **Section 4.2**) and select item 5, "Set Switched 56 Dialing Parameters". This will take you to the Switched 56 Menu (see below). The following paragraphs describe the commands in the Switched 56 Menu.

```
***********************************************************
*                                                         *
*           SWITCHED 56 MENU - Esc to exit                *
*                                                         *
*    1. Store Phone Number                                *
*                                                         *
*    2. Read Stored Number                                *
*                                                         *
*    3. Dial New Number (Will not affect stored #)        *
*                                                         *
*    4. Hang Up (Terminate Call)                          *
*                                                         *
***********************************************************
```

Store Phone Number (Enable DTR Dialing)

Selecting item 1 in the Dial Menu lets you activate the Model 2500 Series' "DTR Dialing" feature by storing a phone number in the unit's non-volatile memory. The Model 2500 Series automatically dials this number when the DTE raises the DTR lead. When you issue this command, the Model 2500 Series responds with this prompt:

```
Please Enter the Number to be Stored>_
```

Enter up to 12 digits (without hyphens or other alphabetic characters), followed by [RETURN]. For example: "13015551212."

> *CAUTION! Pressing [RETURN] by itself will erase any previously stored number from the unit's non-volatile memory and cannot be undone. This will also disable DTR dialing.*

Note: To disable DTR dialing, press [RETURN] (and nothing else) when asked to enter the number to be stored.

(continued)

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Read Stored Number

Selecting item 2 in the Dial Menu lets you view the phone number currently stored in the Model 2500 Series non-volatile memory.

Dial New Number

Selecting item 3 in the Dial Menu lets you dial a number other than the one stored in non-volatile memory. When you select this menu item, the Model 2500 Series responds with this prompt:

```
Please Enter the Number to be Dialed>_
```

Enter up to 12 digits (without hyphens or other alphabetic characters), followed by [RETURN]. For example: "13015551212."

After dialing the number, the Model 2500 Series will display the message, "Dialing" and then display each number as it is dialed. The Model 2500 Series will then prompt the user to wait while the connection is made. One of the following messages will then be displayed to indicate the success or failure or the connection:

- **CONNECT:** The called unit has answered.
- **NO WINK:** The central office did not send a wink signal within 5 seconds of line seizure.
- **SHORT WINK:** A wink signal less than 120 milliseconds was received.
- **LONG WINK:** A wink signal greater than 320 milliseconds was received.
- **NO CARRIER:** The called unit did not answer within 30 seconds.
- **DTR OFF:** DTR must be on to dial.
- **OFF HOOK:** The Model 2500 Series is already off-hook and in data mode.

Note: The control port will not respond to additional commands until one of the above response messages is issued.

Hang Up

Selecting item 4 in the Dial Menu terminates the call.

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APPENDIX A
SPECIFICATIONS

DDS Type: Dedicated

Transmission Format: Asynchronous, synchronous

Interface: RS-232 and V.35

Standards: AT&T 62310 compliant

DDS Line Rates: 2.4, 4.8, 9.6, 19.2, 56 and 64 kbps

DTE Rates: 2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 kbps; 57.6 kbps, async, 2 stop bits

Control Port: Configuration and diagnostics

Transmission Line: 4-wire

Applications: DDS point-to-point or multipoint; campus-area point-to-point

Indicators: LED indicators for TD, RD, CTS, CD, DTR, No Signal, Out-of-Service, Error and Test Mode

Diagnostics: V.54 compliant local and remote loopback tests; V.52 compliant 511/511E BER test, TELCO CSU and DSU loops

Connectors: DB-25 and M/34

Power Supply: 115V or 230V AC

Dimensions: 7.3" x 6.6" x 1.6"

Model 2500 Series Distance Table (miles)			
Data Rate	Wire Gauge		
	22	24	26
64 Kbps	7.1	4.9	3.4
56 Kbps	7.6	5.2	3.6
19.2 Kbps	8.7	6.2	4.5
9600 bps	10.4	7.7	5.8
4800 bps	13.7	10.6	9.7
2400 bps	15.1	14.2	9.1

APPENDIX B
CABLE RECOMMENDATIONS

The Patton Model 2500 Series operates at frequencies of 20kHz or less and has been performance tested by Patton technicians using twisted-pair cable with the following characteristics:

Wire Gauge	Capacitance	Resistance
19 AWG	83nf/mi or 15.72 pf/ft.	.0163 Ohms/ft.
22 AWG	83nf/mi or 15.72 pf/ft.	.0326 Ohms/ft.
24 AWG	83nf/mi or 15.72 pf/ft.	.05165 Ohms/ft.

To gain optimum performance from the Model 2500 Series, please keep the following guidelines in mind:

• *Always* use **twisted pair** wire—this is not an option.

• Use twisted pair wire with a capacitance of 20pf/ft or less.

• Avoid twisted pair wire thinner than 26 AWG (i.e. avoid higher AWG numbers than 26)

• Use of twisted pair with a resistance greater than the above specifications may cause a reduction in maximum distance obtainable. Functionality should not be affected.

• Many environmental factors can affect the maximum distances obtainable at a particular site. Use the above data rate/distance table as a *general guideline only.*

APPENDIX C
FACTORY REPLACEMENT PARTS
AND ACCESSORIES

Patton Model #	Description
10-2500	DDS Cable, RJ48 - RJ48, 6 foot
10-561S	Control Port Cable, EIA-561, 6ft, shielded
12M-561	Adapter, EIA-561 to DB-25 Male
12F-561	Adapter, EIA-561 to DB-25 Female
082R2	Fuse 5x20mm, 200mA, 250V, Time-lag
	Little Fuse P/N 239.200
0805US	American Power Cord
0805EUR	European Power Cord CEE 7
0805EURP	Europlug Power Cord CEE 7/16
0805UK	United Kingdom Power Cord
0805AUS	Australia/New Zealand Power Cord
0805DEN	Denmark Power Cord
0805FR	France/Belgium Power Cord
0805IN	India Power Cord
0805IS	Israel Power Cord
0805JAP	Japan Power Cord
0805SW	Switzerland Power Cord

APPENDIX D
INTERFACE PIN ASSIGNMENT

DDS INTERFACE

The DDS Interface is an RJ-48S modular jack.

Pin #	Signal
1	TX+
2	TX-
3	no connection
4	no connection
5	no connection
6	no connection
7	RX+
8	RX-

M/34 CONNECTOR, TERMINAL INTERFACE

Pin #	Signal
B	SGND (Signal Ground)
C	RTS
D	CTS
E	DSR
F	CD
H	DTR
L	LL (Local Loop)
M	TM (Test Mode)
N	RL (Remote Loop)
P	TD
R	RD
S	TD/
T	RD/
U	XTC
V	RC
W	XTC/
X	RC/
Y	TC
AA	TC/

DB-25 CONNECTOR, TERMINAL INTERFACE

Pin #	Signal
1	Frame Ground
2	TD
3	RD
4	RTS
5	CTS
6	DSR
7	SGND (Signal Ground)
8	CD
15	TC
17	RC
18	LL (Local Loop)
20	DTR
21	RL (Remote Loop)
24	XTC
25	TM (Test Mode)

CONTROL PORT INTERFACE

8 Position modular connector compliant with EIA-561.

Pin #	Signal
4	Signal Ground
5	RD (Output)
6	TD (Input)

Clock Mode	Normal	Analog Loop	Originating Remote Loop	Receiving Remote Loop
Internal	INT	INT	INT	RC
External	EXT	INT	EXT	EXT
Network	RC	INT	RC	RC

RC = Received Clock