

**PATTON MODEL 2094
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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 Services at (301) 975-1007.

1.1 WARRANTY STATEMENT

Patton Electronics warrants all Model 2094 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. In the event the user detects intermittent or continuous product malfunction due to nearby high power transmitting radio frequency equipment, the user is strongly advised to use only data cables with an external outer shield bonded to a metal or metalized connector.

1.2 RADIO AND TV INTERFERENCE

The Model 2094 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 2094 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 2094 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 CE NOTICE

The CE symbol on your Patton Electronics equipment indicates that it is in compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the Union European (EU). A Certificate of Compliance is available by contacting Technical Support.

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 Support at:

tel: **(301) 975-1007**;
email: **support@patton.com**
www: **http://www.patton.com**.

NOTE: 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 Patton Model 2094. Technical Services hours: **8AM to 5PM EST, Monday through Friday.**

2.0 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 arise during installation or use of the unit, contact Patton Electronics Technical Services at (301) 975-1007.

2.1 FEATURES

- Terminates E1/FE1 Circuits over a 4-Wire RJ-48C interface
- Connects to standard CPE Serial Interfaces
- Common Framed nx64 rates up to 1.984 Mbps
- Unstructured Rate of 2.048 Mbps
- G.703 or G.704 Framing (with or without CRC-4, CAS multi-frame)
- Selectable AMI or HDB3 Line Coding
- Configuration via Control Port or Internal DIP Switches
- Seven Easy-to-Read LED Indicators Monitor Data & Diagnostics
- Internal, External or Receive Recover Clocking
- Also Operates as a High-Speed Point-to-Point Modem
- Compact Size Plugs Directly into a Router, Switch or other DTE
- Made in USA

2.2 GENERAL PRODUCT DESCRIPTION

The Patton **Model 2094 V.35 to E1/Fractional E1 Converter** connects equipment with standard ITU-T V.35 Interfaces to 2.048 Mbps G.703 E1 (clear channel) and fractional E1 G.704 (n x 64) 4-wire 120 ohm interfaces. Housed in our MicroPak enclosure measuring only 9x 5.3 x 2 cm (3.55 x 2.1 x 0.78 in.) the Model 2094 plugs directly into the V.35 DTE interface of a router, switch, FRAD, multiplexer or other networking device.

The Model 2094 supports all necessary G.703/G.704 diagnostics, DTE local/remote loops, and V.54 loop up/loop down. Diagnostics are initiated via the Model 2094's control port, or through the DTE or line interfaces. Easily readable LED indicators include TD, RD, Loss of Sync (LOS), Alarm, Error, Test and Power. Configuration of the Model 2094 is done through the control port or using DIP switches.

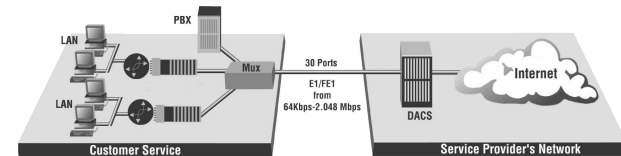
The Model 2094 presents a RJ48C 120 ohm interface to the line and a V.35 interface to the customer's device using a Male M/34 connector. An M/34 to DB-60 adapter cable is available for convenient connection to Cisco routers. The Model 2094 is powered by an external Universal Input 100-240VAC adapter.

2.3 SUPPORTED APPLICATIONS

The Model 2094 provides an E1 network termination between E1 and Fractional E1 equipment and customer premises equipment (CPE) such as a router. The Model 2094 can also be used as a high-speed short haul modem for campus applications.

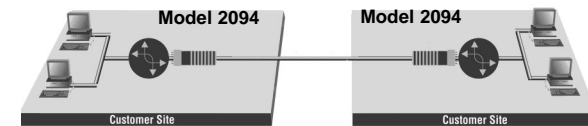
2.3.1 The 2094 as the Interface between the Telco and CPE

The Model 2094 provides the interface between an E1/Fractional E1 multiplexer and a router or switch (See below).



2.3.2 The 2094 as a High-Speed Short Range Modem

The Model 2094 can also be installed into high-speed campus applications. In this application, a pair of Model 2094 units operate as short range modems (See below).



3.0 CONFIGURATION

The Model 2094 features configuration capability via hardware switches or a software control port. This section describes all possible hardware and software switch configurations of the Model 2094.

3.1 DIP SWITCH CONFIGURATION

The Model 2094 has eight internal DIP switches that allow configuration for a wide range of applications. The eight switches are accessed by opening the plastic case with a small screwdriver. Figure 1 (below) shows the location of the DIP switches on the bottom of the printed circuit board.

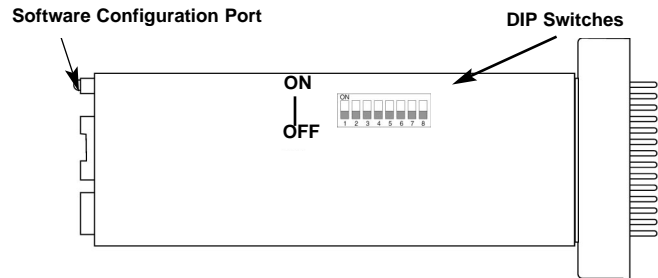


Figure 1. Model 2094 bottom view, showing location of DIP switches

The Model 2094 DIP switches (Switches SW1 - SW8) can be configured as either "On" or "Off". Figure 2 (below) shows the orientation of the DIP switches with respect to ON/OFF positions.

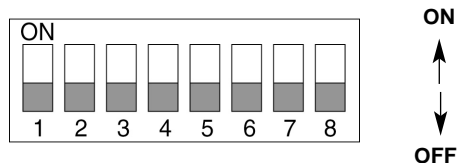


Figure 2. Close up of DIP switches showing ON/OFF positions. The switch is shown in the Off position.

Default positions for Switches SW1-SW8 are shown in the table on the following page. Descriptions of each switch follow the table.

SWITCH SET SUMMARY TABLE			
Position	Function	Factory Default	Selected Option
SW1	Line Coding	Off	HDB3
SW2	CAS Multiframe	Off	Disabled
SW3	CRC-4 Multiframe	Off	Disabled
SW4	Clock Mode	Off	Network
SW5	DTE Rate	Off	} 2.048 Mbps Clear Channel
SW6	DTE Rate	Off	
SW7	DTE Rate	Off	
SW8	DTE Rate	Off	

Switch SW1: Line Coding

Use Switch SW1 to control the Network Line Coding options. Set these options to be the same as the Line Coding given to you by your Service Provider. If you are using two Model 2094s together as short range modems, set both units to HDB3.

SW4	<u>Line Framing & Coding</u>
Off	HDB3
On	AMI

Line Coding Options:

High Density Bipolar 3 (HDB3): In HDB3 coding, the transmitter deliberately inserts a bipolar violation when excessive zeros in the data stream are detected. The receiver recognizes these special violations and decodes them as zeros. This method enables the network to meet minimum pulse density requirements. Use HDB3 unless AMI is required in your application .

Alternate Mark Inversion (AMI): AMI coding does not inherently account for ones density. To meet this requirement, the user should ensure that the data inherently meets pulse density requirements.

Switch SW2: CAS Multiframe

The Channel Associated Signaling (CAS) multiframe uses Timeslot 16 (TS16) to send multiframe (MF) alignment data. In CAS MF, a multiframe is defined as 16 frames, where a frame consists of 32 64kb/s timeslots, numbered 0 to 31. TS16 of the first frame in the MF contains the CAS MF alignment word in the upper four bits. The alignment word is always 0000 (binary). The 2094 does not perform any signaling in TS16 other than to insert the MF alignment word, in order to maintain MF alignment. When CAS MF is disabled, the unit transmits user data in TS16; therefore, up to 31 channels are available for user data. When it is enabled, TS16 is not available to the user. In this case, the user can use up to 30 channels for data. CAS MF can be used with CRC-4 MF or by itself. When enabled, both units must employ CAS MF; if one unit is set for CAS MF, and the other is not, the one using CAS MF will detect a loss of sync.

SW2	Option
Off	Disabled
On	Enabled

Switch SW3 & SW4: CRC-4 Multiframe/Clock Mode

In framed mode, SW3 is used for CRC-4 MF. CRC-4 Multiframe uses Time Slot zero to carry CRC-4 information. It operates independently of CAS MF. When CRC-4 is enabled, the unit monitors the incoming data stream for CRC-4 errors. It transmits CRC-4 error counts to the transmitting unit. Excessive errors may cause loss of frame or loss of sync. If CRC-4 MF is used, both units must be set for set for CRC-4 MF. Otherwise, the one using CRC-4 MF will detect loss of sync.

In unframed mode, SW3 is used to along with SW4 to determine the clock mode. In unframed mode, the model 2094 can be set to network, internal or external clock mode.

In framed mode SW4 is used alone to determine the 2094 transmitter timing. In framed mode the 2094 can be set to Network or Internal clock.

The following charts represent both cases.

MULTIFRAME(G.704)

SW3	CRC-4 MF	SW4	Clock Mode
On	On	Off	Network
Off	Off	On	Internal

UNFRAMED (G.703)

SW3	SW4	Clock Mode
Off	Off	Network (Default)
Off	On	Internal
On	On	External
On	Off	Network

CLOCK MODES

- Network Clock** Transmitter timing is derived from the received line signal.
- Internal Clock** Transmitter clock is derived from an internal clock source.
- External Clock** Transmitter timing is derived from the local DTE device. Valid only in unframed mode.

Note: When using the 2094 as a high-speed short range modem, one unit of the link must be configured in either internal or external clock, and the other end must be configured for network clock mode.

Switches SW5, SW6, SW7, and SW8

Use Switches SW5, SW6, SW7, and SW8 to set the DTE data rate.

SW5	SW6	SW7	SW8	Speed
Off	Off	Off	Off	Clear Channel (2.048Mbps)
On	Off	Off	Off	64kbps
Off	On	Off	Off	128kbps
On	On	Off	Off	192kbps
Off	Off	On	Off	256kbps
On	Off	On	Off	384kbps
Off	On	On	Off	512kbps
On	On	On	Off	640kbps
Off	Off	Off	On	768kbps
On	Off	Off	On	1024kbps
Off	On	Off	On	1280kbps
On	On	Off	On	1536kbps
Off	Off	On	On	1600kbps
On	Off	On	On	1920kbps
Off	On	On	On	1984kbps
On	On	On	On	invalid

NOTE: When the data rate is set to 2.048Mb/s, then the unit is forced into G.703 mode, and it transmits user data on all 32 timeslots. There is no framing information; therefore, the CAS MF (SW2) switch is ignored. SW3 is defaulted to clock mode. In all other rate settings, the unit employs G.704 framing; TS0 is reserved for signaling.

3.2 SOFTWARE CONFIGURATION

The Model 2094 features a menu-driven command system that allows you to monitor/configure its operating parameters. Follow the instructions below to configure the Model 2094 using the software switches:

- 1) Plug the 9-pin male end of the cable to your terminal or computer's DB-9 serial port and start up the terminal emulator software if necessary. Plug the miniature stereo plug into the rear of the unit. The small recessed jack on the right side of the unit is the control port jack.

NOTE: If your terminal uses a DB-25 connector, please use a DB-9 to DB-25 Adapter to connect to the cable (See Model 18PC-M).

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

9600 Baud
 8 data bits, 1 stop bit, no parity
 Local echo off
 ANSI or VT-100 emulation
 Xon/Xoff software flow control enabled

- 3) Here is an example of a terminal emulator setup session. In normal font are the various parameter types. In **bold type** are the values that should be used for best results. Your terminal program's setup screen may differ from this one:

Baud rate: 9600	Parity: None	Data Length: 8	Stop Bits: 1
Default terminal type:	VT100		
Local Echo:	Off		
Add Line Feeds after CRs:	Off		
Received Backspace Destructive:	On		
Backspace key sends:	BS		
XON/XOFF software flow control:	On		
CTS/RTS hardware flow control:	Off		
DSR/DTR hardware flow control:	Off		

- 4) When the unit is first turned on, the terminal screen may appear blank. Press the [Enter] key. If your serial connection is good, then the unit will immediately display a password prompt. The following message will appear in the middle of the screen:

```

Patton Electronics
Menu Management

Enter Password: _
  
```

- 5) Type in the password and press [Enter]. The factory default password for the unit is:

patton

NOTE: The password is case sensitive. If the entry is incorrect, the password screen will clear and prompt you again for the correct password. The password you enter will not be shown. For security, asterisks will be displayed for each letter you type. The maximum length of the password, which can include any character the terminal can generate, is 16 characters.

- 6) The Model 2094 will then display the Main Menu screen.

3.2.1 Introduction to Main Menu

After entering the password, you may access all of the system's functions and parameters. The Main Menu looks like this:

```
Patton Electronics
Menu Management
-----
Main Menu
a System Configuration
b System Diagnostics/Statistics
c Unit Options
d Save Changes
e Logoff

**NOTE** Unsaved changes will be lost after this session.

ACTION
Select Item = [Highlighted Letter]      Go to Sub-menu = [Enter]
Redraw Screen = [Ctrl-L]

Model 2094 E1 SRM>_
```

HELPFUL HINTS

1. To make a selection, key the highlighted letter that corresponds to a menu selection.
2. To execute the selection, type [Enter/CR]
3. Select **d** Save Changes from Main Menu after making modifications to any Model 2094 parameter. Otherwise, changes will be lost when the Model 2094 is turned off.

The Main Menu options are briefly described below.

- a System Configuration** options allow you to change various aspects of the Model 2094's operation, e.g., framing, line coding, and aggregate bandwidth.
- b System Diagnostics/Statistics** options allow you to monitor the network performance, initiate V.54 loops, local loops, and send test patterns. Network performance parameters are updated once a second, giving you the ability to quickly determine if there is a problem.
- c Unit Options** allow you to customize the Model 2094 for your location. You can change the default header names to give each unit a unique name and password. Also, you can reset the unit to its default settings without the manual. It also has a Service Information screen in case you need technical assistance from Patton.
- d Save Changes** Once you have configured the unit to your satisfaction, you can save the changes permanently by executing the Save Changes command. This will update the units configuration and save all the parameters to permanent memory.
- e Logoff** For security, log off the control menu by executing the Logoff command. This will blank the screen until an [Enter] key is pressed.

3.2.2 System Configuration

The System Configuration menu looks like this:

```
System Configuration                               Patton Electronics
Menu Management
-----
a Line Format:           G.703
b Line Coding:         HDB3
  TS Channel Rate:     64kbps
a Clocking:           Network
  Line Build Out (dB): 120 ohm, normal
  CRC-4 Setting:       Disabled
  CAS MF Setting:      Disabled

a V.54 Loop:          Enabled
  Default Config Source: Switch
  DSO Channel Configuration Menu [ Bandwidth/# Channels = 2,048k/na ]

ACTION
Select Item = [Highlighted Letter]      Go to Sub-menu = [Enter]
Select Option = [Space Bar]            Exit = [Esc]
Redraw Screen = [Ctrl-L]

Model 2094 E1 SRM>
```

The System Configuration options are described below:

a Line Format: G.703 (default)

Options: **G.703, G.704**

G.703: G.703 is unframed, 2.048Mb/s. In this case, the DTE rate is equal to the line rate at the network interface (NI). CAS MF and CRC-4 are disabled.

G.704: G.704 reserves TS0 for signaling and frame alignment. Maximum data rate depends on whether CAS MF is enabled or not.

b Line Coding: HDB3 (default)

Options: **HDB3, AMI**

HDB3: In this line coding, the transmitter substitutes a deliberate bipolar violation when excessive zeros in the data stream are detected. The receiver recognizes these special violations and decodes them as zeros. This method enables the network to meet minimum pulse density requirements. Unless AMI is required in your application, HDB3 should be used whenever possible.

AMI: Alternate Mark Inversion defines a pulse as a "mark," a binary one, as opposed to a zero. In a E1 network connection, signals are transmitted as a sequence of ones and zeros. Ones are sent as pulses, and zeros are sent as spaces, i.e., no pulse. Every other pulse is inverted from the previous pulse in polarity, so that the signal can be effectively transmitted. This means, however, that a long sequence of zeros in the data stream will cause problems, since the NTU receiving the signal relies on the signal to recover the 2.048 Mb/s clock. If you must use AMI, you should ensure that the data terminal equipment connected to the unit provides a minimally acceptable pulse density. For this reason, there are advantages to using HDB3 instead.

d **Clocking:** Network *(default)*

Options: **Network, Internal, External**

Network: This is the most commonly used setting when connecting to a carrier's network. In this mode, the unit recovers the clock from the received signal and uses it to transmit data. In this way the unit remains synchronized to a master clock. In campus applications, one of the units must be set to Internal clock, and the other end is set to Network clock. At all times, there must be only one clock source. Otherwise, clock slips, framing errors, and bit errors may occur.

Internal: This is commonly used in campus applications, where the unit is not connected to the public telephone network directly. In this mode, the unit uses the on-board oscillator as the transmit clock source.

External: This is a special mode that can only be used with the Unframed format. In this mode, the unit requires a 2.048 Mhz clock signal from the DTE via the external clock pin on the DTE interface connector. Most applications will use Network or Internal clock modes.

f **CRC-4 Setting:** Disabled *(default)*

Options: **Enabled, Disabled**

CRC-4 Multiframe: CRC-4 Multiframe uses TS0 to carry CRC-4 information. It operates independently of CAS MF. When CRC-4 is enabled, the unit monitors the incoming data stream for CRC-4 errors. It transmits CRC-4 error counts to the transmitting unit. Excessive errors may cause loss of frame or loss of sync. If CRC-4 MF is used, both units must be set for CRC-4 MF; otherwise, the one using CRC-4 MF will detect a loss of sync.

g **CAS MF Setting:** Disabled *(default)*

Options: **Enabled, Disabled**

CAS MF: CAS multiframe uses Timeslot 16 (TS16) to send multi-frame (MF) alignment data. In CAS MF, a MF is defined as 16 frames, where a frame consists of 32 64kb/s timeslots, numbered 0 to 31. TS16 of the first frame in the MF contains the CAS MF alignment word in the upper four bits. The alignment word is always 0000 (binary). The 2094 does not perform any signaling in TS16 other than to insert the MF alignment word, in order to maintain MF alignment. When CAS MF disabled, the unit transmits user data in TS16; therefore, up to 31 channels are available for user data. When it is enabled, TS16 is not available to the user. In this case, the user can use up to 30 channels for data. CAS MF can be used with CRC-4 MF or by itself. When enabled, both units must employ CAS MF; if one unit is set for CAS MF, and the other is not, the one using CAS MF will detect a loss of sync.

i **V.54 Loops:** Enabled *(default)*

Options: **Enabled, Disabled**

This is a special in-band loopback facility that sends a special pseudo-random pattern over the data stream. This is the only loopback that the unit can initiate. This is useful for campus applications when you need to put a remote unit in loopback. The unit responds to the V.54 loopback command, and the whole process takes only a few seconds to complete. When V.54 Loopback is disabled, the unit will not be able to send or respond to V.54 loopback commands. The duration of the loopback is limited by the loopback timeout setting. While V.54 is being activated, user data is overwritten.

j **Default Config Source:** Switch *(default)*

Options: **EEPROM, Switch**

The Model 2094 can be initialized via the configuration in the on-board permanent memory (EEPROM) or via the internal DIP switches (Switch). Once the unit is powered up, you may change the settings through the control port or the DIP switches. When you make changes through the control port, no changes will take place or be saved to permanent memory until you Save Changes (Main Menu option "d" + [Enter]). When you make changes through the switches, all changes are made immediately.

If you do not have a terminal, you may force the unit to use the DIP switches as the default configuration source by turning off the unit, setting all the DIP switches to the ON position, then powering on the unit. This will cause the unit to enter a special mode. Then turn off the unit and change the switch settings to the desired settings. When you turn the unit on again, the unit will be set up with the selected switch settings.

1 **DS0 Channel Configuration Menu** [Bandwidth/# Channels = 2,048k/na] (default)

The Channel Configuration Menu has a sub-menu that looks like this:

```

Patton Electronics
Menu Management
-----
Display Bandwidth Allocation
-----
a: 1 On      i: 9 On      q:17 On      y:25 On
b: 2 On      j:10 On     r:18 On      z:26 On
c: 3 On      k:11 On     s:19 On      1:27 On
d: 4 On      l:12 On     t:20 On      2:28 On
e: 5 On      m:13 On     u:21 On      3:29 On
f: 6 On      n:14 On     v:22 On      4:30 On
g: 7 On      o:15 On     w:23 On      5:31 On
h: 8 On      p:16 On     x:24 On

Bandwidth Selected: 1,984k      Total Channels: 31

ACTION
Select Item = [Highlighted Letter]      Redraw Screen = [Ctrl-L]
Change Options = [Space Bar]           Exit = [Esc]

Model 2094 E1 SRM>

```

You may configure the Model 2094 to operate with any combination of active and inactive DS0 channels in this screen. When you execute the Save Changes command, the selected settings will be saved to permanent memory, and the system will be updated to operate with the new channel settings.

NOTE: In Unframed format, the Bandwidth Selected will display “2.048k,” and the Total Channels will display “na.” When using the DIP switches to set the bandwidth, the starting channel is always channel 1 or 0.

3.2.3 System Diagnostics

The System Diagnostics/Statistics screen looks like this:

```

Timeout: 0      Patton Electronics
System Diagnostics/Statistics      Menu Management
-----
a Local Loop: Idle      NI STATUS
b Remote Loop: Idle    [ ] [RCL]
c Test Pattern: Idle   OK [ ] [ ]
d Error Insertion: Off [ ] [ ]
e Selected Pattern: QRSS [ ] [ ]
Switch 1:Off
      2:Off
      3:Off
      4:Off
      5:Off
      6:Off
      7:Off
      8:Off

ACTION
Select Item = [Highlighted Letter]
Change Options = [Space Bar]      Exit = [Esc]
Redraw Screen = [Ctrl-L]          Clear ESF Stats = [Ctrl-H or Backspace]

Model 2094 E1 SRM>

```

NOTE: This screen is updated once per second.

The System Diagnostics/Statistics options and functions are described below.

a **Local Loop Idle** (default)

The Local Loop is a bi-lateral loopback in which the data from the local DTE and the data from the remote unit are looped back to their respective sources (See **Section 5.3**). Activate this loop to test the each of the DTE’s connection to the Model 2094.

The Local Loop test has four states:

- Idle** No user-controlled loopbacks are active.
- LL** The Model 2094 is in local loopback mode.
- Off** The Model 2094 is in remote loopback mode or sending a pattern. Local loopback is disabled.
- LocP** The Model 2094 is in local loopback mode, and is sending a test pattern.

b Remote Loop Idle (default)

The Remote Digital Loopback (RDL) test checks the performance of both the local and remote Model 2094s, as well as the communication link between them. Data from the local DTE is sent across the entire communication circuit and looped back to the local DTE.

The Model 2094 Initiating a RDL can be in one of the following states:

- Idle** No user-controlled loopbacks are active.
- TxPr** The Model 2094 is sending the preparatory phase pattern lasting for approximately 2 - 5 seconds.
- WtAk** The Model 2094 is waiting for an acknowledgement from the remote unit. If the remote unit does not respond, the WtAk message will remain on the screen.
- RxAk** The Model 2094 has received an acknowledgement from the remote unit.
- Tout** The Model 2094 is waiting before entering the Remote Loopback test mode.
- TM** The Model 2094 has successfully negotiated the Remote Loopback test and is in control of the remote unit. You may send a test pattern at this point by pressing:
c <spacebar>
- TxTr** The Model 2094 is sending a Terminate Loopback message to the remote unit. If the remote unit does not respond, the local unit will return to the Idle state.
- Tx1s** If the remote Model 2094 responds to the local Model 2094's terminate loopback request, the local unit then sends an all ones pattern before returning to the Idle state
- TxP** The Model 2094 is sending a test pattern while in Test Mode
- IdIP** The Model 2094 is sending a test pattern in place of data. The Model 2094 is not in test mode.

The Model 2094 receiving a RDL can be in one of the following states:

- RxPr** The Model 2094 is receiving a preparatory pattern.
- Sack** The Model 2094, upon receiving a preparatory pattern, sends an acknowledgement message.
- RL** The Model 2094 is in remote loopback mode.
- RxTr** The Model 2094 is receiving a terminate loopback message.
- WE1s** The Model 2094 is waiting for a sequence of all ones and will time out if it does not receive it.
- IdleP** The Model 2094 is sending a QRSS, 511, or 2047 pattern.
- Off** The Model 2094 is in local loopback.

c Test Pattern Idle (default)

Options: **Idle** or **Sending**

To send a pattern, press the 'c' key and press <spacebar> to send the test pattern. The "OK" message indicates the received test pattern is error-free. The "BE" message indicates errors in the received pattern. You may also hear a beep (from your terminal) once a second as long as the unit detects a bit error in the pattern.

- Idle** Indicates that Model 2094 is not sending a pattern.
- Sending** Indicates that Model 2094 is sending a pattern.

d Error Insertion Off (default)

Options: **On**, **Off**

You may inject intentional errors into the test pattern by turning Error Insertion ON. The Error (ERR) LED will blink once per second.

e Selected Pattern

Options: **QRSS**, **511**, or **2047**

Use this option to select the test pattern used to test the link.

NI STATUS

The Network interface (NI) status is shown in the middle of the Diagnostics/Statistics screen. The brackets are empty when the link is operating normally. Only one error message is provided

```
NI STATUS
[ ] [RCL]
[ ] [ ]
[ ] [ ]
[ ] [ ]
```

Receiver Carrier Loss [RCL] occurs when 255 consecutive zeros have been detected at the network interface. RCL clears when a pulse is detected.

Current DIP Switch Settings

The Switch settings are displayed here to facilitate troubleshooting your unit without opening up the unit first.

```
Switch 1:On
2:On
3:On
4:Off
5:On
6:Off
7:Off
8:Off
```

3.2.4 Unit Options

The Unit Options screen looks like this (factory default):

```
Patton Electronics
Menu Management
-----
Unit Options
a Header Line 1: Patton Electronics
b Header Line 2: Menu Management
c Password: patton
d Loop Timeout: 00:30 (hh:mm)

f Set to Default Configuration
g Service Information

ACTION
Select Item = [Highlighted Letter]      Accept Selection = [Enter]
Change Options = [Space Bar]           Exit = [Esc]
Redraw Screen = [Ctrl-L]

Model 2094 E1 SRM>
```

a Header Line 1 & **b** Header Line 2

Headers 1 and 2 are provided for easy identification of your unit after installation. You may want to give each unit a unique name via the header lines to help distinguish one unit from another. You can enter a header up to 40 letters long. Two lines provide 80 letters for your use. That's a lot of flexibility!

c Password

The Password facility provides security by allowing only those who know the correct password to configure the unit via the control port. You can still configure the unit via the DIP switches. The password can be up to 16 characters long, with no restriction on the combination of characters you can use, so be sure to remember the password. The password is case sensitive. If you lose your password, you will lose the ability to access the unit via the control port.

4.0 INSTALLATION

d Loop Timeout

The Loop Timeout setting can be set to one of the following:

- 00:05 = five minutes
- 00:10 = ten minutes
- 00:15 = fifteen minutes
- 00:30 = thirty minutes (default setting)
- 00:45 = forty-five minutes
- 01:00 = one hour
- 01:30 = 90 minutes
- 02:00 = two hours
- 03:00 = three hours
- NEVER = forever—the unit will remain in loopback without user intervention.

f Set to Default Configuration

You may set the Model 2094 to its factory default configuration, except for the header lines and the password, by executing the Set to Default Configuration command.

g Service Information

If you need to contact us for help, you can view the Service Information screen. Here is what it looks like:

```

Service Information          Patton Electronics
                             Menu Management
-----
                             Firmware Revision: 0.80
                             Customer Support

Tel: 301-975-1000           Patton Electronics
                             Customer Support Department
                             7622 Rickenbacker Drive
                             Gaithersburg, MD 20879
                             USA

Fax: 301-869-9293

Web: http://www.patton.com

Email: support@patton.com

ACTION
Exit = [Esc]                Redraw Screen = [Ctrl-L]

Model 2094 E1 SRM>

```

The Model 2094 is equipped with DTE, network, and power interfaces. This section briefly describes connection to each.

4.1 DTE INTERFACE CONNECTION

The DTE interface is a V.35 DCE presented as an M/34 male connector. This interface is designed to plug directly into a DTE interface (See Appendix D for V.35 interface pin assignments).

4.2 NETWORK INTERFACE CONNECTION

The Network Line Interface is an eight position keyed modular jack configured as a RJ-48C. This interface will need to be configured to match the line parameters (i.e. framing, line coding, etc.) supplied by the central office.

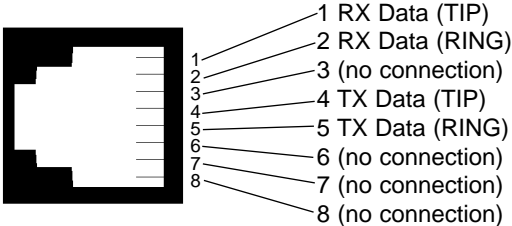


Figure 3. Model 2094 twisted pair line interface.

NOTE: If the Model 2094 is being used for private short range modem applications, the twisted pair cable connected to its port will need to be a cross-over cable. See Appendix D for Interface pin assignments.

4.3 POWER CONNECTION

The Model 2094 offers three ways to supply external power: AC power, DC power and interface power.

4.3.1 Using the AC Power Supply (100-240VAC)

The Model 2094 uses a 5VDC, 2A universal input 100-240VAC, power supply (center pin is +5V). The universal input power supply is equipped with a male IEC-320 power entry connector. This power supply connects to the Model 2094 by means of a barrel jack on the rear panel. There are a variety of international power cords available for the universal power supply. The Model 2094 powers up as soon as it is plugged into an AC outlet—there is no power switch.

4.3.2 Supplying DC Power

The 36-60 VDC DC to DC adapter is supplied with the DC version of the Model 2094. The black and red leads plug into a DC source (nominal 48VDC) and the barrel power connector plugs into the barrel power supply jack on the 2094.



4.3.3 Supplying Power via pin KK

You may also supply DC power directly to pin KK of the V.35 interface. DC Power supplied to pin KK must be +5VDC \pm 5%, 300mA minimum.

NOTE: Model 2094 is factory configured to accept power from the enclosed DC wall adapter (See Sections 4.3.1 and 4.3.2 above). If you wish to supply power via pin KK on the interface, you must change the setting of the *power supply jumper* on the printed circuit board. See **Appendix E**. All power sources must be SELV (Circuit, Safety Extra Low Voltage) specified. (See CENELEC EN60950, Section 1.2.8.5)

5.0 OPERATION

Once the Model 2094 is installed and configured properly it is ready to place into operation. This section describes the function of the LED indicators, and the use of the loopback and pattern test modes.

5.1 LED DESCRIPTIONS

The Model 2094 is equipped with seven LED indicators that monitor the status of communication. Figure 4 (below) shows the location of the LEDs on the Model 2094 front panel.

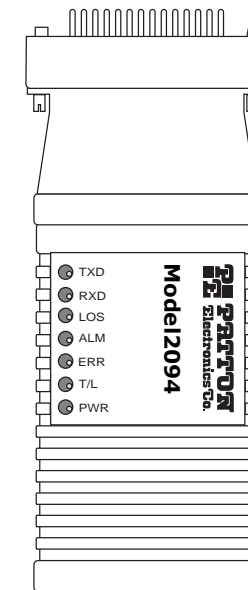


Figure 4. Top of Model 2094, Showing LED Indicators

- | | |
|------------|--|
| TXD | When the unit sends a one, the TXD LED is turned on. When it sends a zero, the TXD LED is turned off. Moreover, the TXD LED is active only in active DS0 channels. In inactive channels, the TXD LED is off. |
| RXD | When the unit receives a one, the RXD LED is turned on. When it receives a zero, the RXD LED is turned off. Moreover, the RXD LED is active only in active DS0 channels. In inactive channels, the RXD LED is off. |

LOS	The Loss of Sync LED lights when the unit loses synchronization with the incoming signal. This may happen when there is a framing mismatch or a loss of signal. In unframed mode, the LOS LED monitors the status of the transmit clock.
ALM	<p>The alarm LED indicates the presence of a AIS or RAI, or Out of Frame condition. The ALM LED will blink on every half-second. Alarms may occur due to:</p> <ul style="list-style-type: none"> • Loss of Synchronization • Loss of Frame • AIS (Blue Alarm) • RAI (Yellow Alarm)
ERR	The error LED indicates various error conditions, including framing bit errors, excessive zeros, controlled slips, severe errors, or bit errors (when sending V.52 test patterns). When sending a test pattern, the LED will remain lit if the unit does not receive the identical pattern. When it receives the correct pattern, the LED will turn off. If error insertion is on, the LED will blink once a second if everything is operating properly.
TST	<p>The test indicator LED blinks with a specific pattern depending on the type of test mode. When the unit is in local analog loop, the LED will blink on briefly. When the unit is in remote loop, the TST LED will blink off briefly. When the unit is sending a test pattern or is putting the remote unit into V.54 loopback, the TST LED will stay on. These are the test modes:</p> <ul style="list-style-type: none"> • V.54 Loopback & V.52 Patterns
PWR	The power indicator LED will remain lit while the unit is powered. It turns off when the unit is not powered.

5.2 LOOP (V.54 & TELCO) DIAGNOSTICS

The Model 2094 offers three V.54 loop diagnostics. Use these diagnostics to test the NTU and any communication links. These tests can be activated via the software control port (See Section 3.2.3 **System Diagnostics**) or via signals on the serial port interface.

5.2.1 Operating Local Loopback (LL)

The Local Loopback (LL) test checks the operation of the local Model 2094, and is performed separately on each unit. Any data sent to the local Model 2094 in this test mode will be echoed (returned) back to the user device (i.e., characters typed on the keyboard of a terminal will appear on the terminal screen).

To perform a LL test, follow these steps:

1. Activate LL. This may be done in one of two ways:
 - a. Enter **[a] Local Loop** from the System Diagnostics/Statistics menu and toggle the <Spacebar> until "LL" appears next to the **[a] Local Loop** option.
 - b. Activate the "LL" signal on the DTE. If you are not sure which lead is the "LL" signal, please refer to Appendix D.
2. Verify that the data terminal equipment is operating properly and can be used for a test.
3. Perform a V.52 BER (bit error rate) test as described in **Section 5.3.3**. 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 2094.

5.2.2 Operating Remote Digital Loopback (RDL)

The Remote Digital Loopback (RDL) test checks the performance of both the local and remote Model 2094, as well as the communication link between them. Any characters sent to the remote Model 2094 in this test mode will be returned back to the originating device (i.e., characters typed on the keyboard of the local terminal will appear on the local terminal screen after having been passed to the remote Model 2094 and looped back).

To perform an RDL test, follow these steps:

1. Activate RDL. This may be done in two ways:
 - a. Enter **b Remote Loop** from the System Diagnostics/Statistics menu and toggle the <Spacebar> until "TM" appears next to the **b Remote Loop** option.;
 - b. Activate the "RL" signal on the DTE. If you are not sure which lead is the "RL" signal, please refer to Appendix D.
2. Perform a bit error rate test (BERT) using the internal V.52 generator (as described in **Section 5.3**), or using a separate BER Tester. If the BER test indicates a fault, and the Local Line Loopback test was successful for both NetLink™s, you may have a problem with the twisted pair line connection.

5.3 BIT ERROR RATE (V.52) DIAGNOSTICS

The Model 2094 offers three V.52 Bit Error Rate (BER) test patterns. These test patterns may be invoked along with the LAL and RDL tests to evaluate the unit(s) and the communication links.

When a 511, 2047, or QRSS test is invoked, the Model 2094 generates a pseudo-random bit pattern of 511 bits, 2047 bits or 2^{20} bits, respectively, using a mathematical polynomial. The receiving model 2904 then decodes the received bits using the same polynomial. If the received bits match the agreed upon pseudo-random pattern, then the Model 2094(s) and the communication link(s) are functioning properly.

511	Initiates a built-in 511 bit pseudo-random pattern generator and detector.
2047	Initiates a built-in 2047 bit pseudo-random pattern generator and detector.
QRSS	Initiates a built-in 2^{20} bit pseudo-random pattern generator and detector.

To perform a V.52 test, follow these steps:

1. Activate the local loopback or remote loopback diagnostic.
2. Activate the test pattern. This may be done in one of two ways:
 - a. Enter **e Selected Pattern** from the System Diagnostics/Statistics menu and toggle the <Spacebar> until the desired test pattern appears.
 - b. Enter **c Test Pattern** and toggle the <Spacebar> to send the selected pattern.
 - c. One of two result codes will appear to the right of the **c Test Pattern** listing:
 - OK** Indicates that the received test pattern is error-free.
 - BE** Indicates that there are errors in the test pattern (to deliberately insert errors in the pattern, toggle **d Error Insertion** to ON).

APPENDIX A

PATTON MODEL 2094

SPECIFICATIONS

Network Data Rate:	2.048 Mbps
Network Connector:	RJ-48C
Nominal Impedance:	120 ohm (75 ohm available when using Patton Model 460 Balun)
DTE Interface:	V.35 (DCE Orientation) on Male M/34
Line Coding:	Selectable AMI or HDB3
Line Framing:	G.703 (Unframed) or G.704/G.732 (Framed)
CAS Multiframing:	Selectable On or Off
CRC-4 Multiframing:	Selectable On or Off
Clocking:	Internal, External, or Receive Recover
DTE Data Rates:	64, 128, 192, 256, 384, 512, 640, 768, 1024, 1280, 1536, 1600, 1920, 1984, 2048 kbps
Time Slot Rate:	64 kbps
DS0 Start Position:	Arbitrary
DS0 Mapping Position:	Contiguous or Arbitrary
Diagnostics:	V.54 Loopback; V.52 Patterns: 511, 2047, and QRSS
Indicators:	Power, Transmit Data, Receive Data, Alarm, Loss of Sync, Test Mode, Error
Configuration:	8-Position DIP Switch and RS-232 Control Port
Power Supply:	100-240VAC, 50-60Hz, 0.4A
Humidity:	Up to 90% non-condensing
Temperature:	0 to 70° C
Dimensions:	9.0 x 5.3 x 2.0 cm (3.5"L x 2.1"W x 0.78"H)

Model 2703B Distance Table - Km (Miles)		
Data Rate (kbps)	Wire Gauge	
	.7mm (22)	.5mm (24)
2048	1.2 (.76)	1.5 (.95)

APPENDIX B

PATTON MODEL 2094

CABLE RECOMMENDATIONS

The Patton Model 2094 has been performance tested by Patton technicians using twisted-pair cable with the following characteristics:

<u>Wire Gauge</u>	<u>Capacitance</u>	<u>Resistance</u>
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 2094 , 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 AWG numbers higher 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 distance obtainable at a particular site. Use the above data rate/distance table as a *general guideline only*.

APPENDIX C

PATTON MODEL 2094

**FACTORY REPLACEMENT PARTS
AND ACCESSORIES**

<u>Patton Model #</u>	<u>Description</u>
2094/CM/UI	V.35 to E1 Converter (V.35 M/34 Male, UI)
10 - 09F	6 Foot Control Port Cable, 25 mm to DB9F
08055DCUI.....	Universal Input Power Supply
10-CISCO-V35FT-1	Cable, V35 (M/34) Female To LFH60 Male
07M2094	User Manual

APPENDIX D

PATTON MODEL 2094

INTERFACE PIN ASSIGNMENTS

**RJ-48C E1 Network Interface
(RJ-48S Female Modular Jack)**

<u>Pin #</u>	<u>Signal</u>
1	RX Data (TIP)
2	RX Data (RING)
4	TX Data (TIP)
5	TX Data (RING)

APPENDIX D

(continued)

PATTON MODEL 2094

INTERFACE PIN ASSIGNMENTS

M/34 Connector, Terminal Interface

Pin #	Signal
A	GND (Earth Ground/Shield)
B	SGND (Signal Ground)
D	CTS (DCE Source)
E	DSR (DCE Source, Always On)
F	CD (DCE Source)
L	LL (Local Loop, DTE Source)
M	TM (Test Mode Indicator (DCE Source)
N	RL (Remote Loop, DTE Source)
P	TD (Transmit Data +, DTE Source)
R	RD (Receive Data +, DCE Source)
S	TD/ (Transmit Data -, DTE Source)
T	RD/ (Receive Data -, DCE Source)
U	SCTE (Transmit Clock+, DTE Source)
V	RC (Receiver Clock +, DCE Source)
W	SCTE/ (Transmit Clock-, DTE Source)
X	RC/ (Receiver Clock -, DCE Source)
Y	TC (Transmitter Clock +, DCE Source)
AA	TC/ (Transmitter Clock -, DCE Source)
KK	Aux. Power Input (+5VDC @ 300mA)

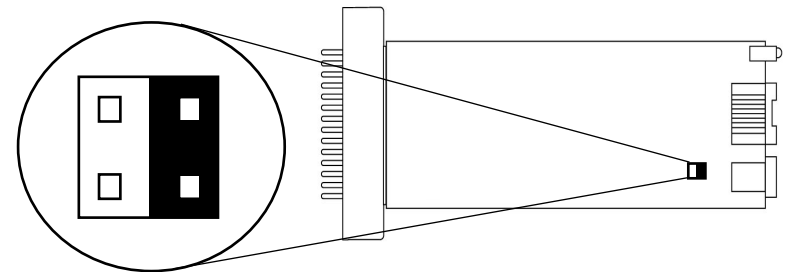
APPENDIX E

PATTON MODEL 2094

POWER SUPPLY INTERFACE

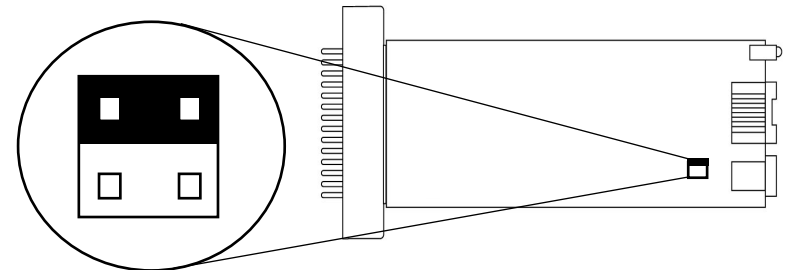
Via Main 5VDC power jack (J1)
Center Pin: 5VDC @ 300 mA
Outer Barrel: Ground

Jumper Position for Power via DC Power Jack (default):



Via Auxiliary Power Supplied to Pin KK on V.35 connector
DC Power supplied to pin KK must be 5VDC \pm 5%, 300mA minimum.

Jumper Position for Power via Pin KK:



NOTE: Model 2094 is factory configured to accept power from the enclosed DC wall adapter (See Sections 4.3.1 and 4.3.2 above). If you wish to supply power via pin KK on the interface, you must change the setting of the *power supply jumper* on the printed circuit board. All power sources must be SELV (Circuit, Safety Extra Low Voltage) specified. (See CENELEC EN60950, Section 1.2.8.5)