USER MANUAL

MODEL 1193

Single-Mode Fiber Modem with Fixed G.703/G.704 Interface

PATTON Electronics Co.

ISO 9001 CERTIFIED

An ISO-9001 Certified Company

Part# 07M1193-UM
Doc# 01713U2-001, Rev. C
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(301)975-1000
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1.0 WARRANTY INFORMATION

Patton Electronics warrants all Model 1193 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. 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.

1.1 RADIO AND TV INTERFERENCE

The Model 1193 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 1193 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 1193 does cause interference to radio or television reception, which can be determined by disconnecting the unit, 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).

WARNING: This device utilizes a class IIIB laser device which emits invisible light. There is potential for eye damage if proper caution is not taken. The laser port output is classified as class IIIA due to attenuation in the fiber cable. Eye protection should be worn at all times when the unit is operational and the laser port is not connected. The laser assembly should not be modified in any way. The fiber cable should never be disconnected from the laser device for any reason. The laser's wavelength is specified in the range of 1280 nm to 1330 nm with a maximum power output of 800 uw. Eye protection should be specified to handle the stated wavelength. Never look directly into to the laser port.

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 European Union (EU). A Certificate of Compliance is available by contacting Technical Support.

1.3 SERVICE

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:

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 Model 1193. Technical Service 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 or problems arise during installation or use of this product, please do not hesitate to contact Patton Electronics Technical Support at (301) 975-1007.

2.1 FEATURES

- ITU G.703/G.704 (E1) transport over Single-mode fiber
- Full duplex operation over a single string of fiber
- Single-mode fiber with max distance 50km (31 miles)
- Two fiber connection options available: FC or SC
- 120 Ohm (RJ-48C) and 75 Ohm (dual coax) G.703/G.704 terminations
- Clocking options: Internal, Network (G.703/G.704), or Receive Recover (fiber link)
- Optional AMI or HDB3 G.703/G.704 data coding
- Six front panel LED status indicators: Fiber line, E1 line, LOS, TM, ER, and NS
- Testing/troubleshooting tools: V.54 compliant local/remote loopbacks, V.52 compliant 511/511E test patterns

2.2 DESCRIPTION

The Patton Electronics *Model 1193* extends E1 (G.703/G.704) service over Single-mode fiber. A pair of 1193 Single-Mode Fiber Modems provides G.703/G.704 network "extension" between remote locations (See Figure 1 below).

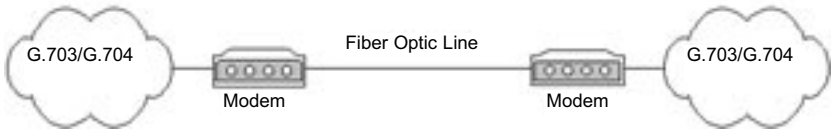

Figure 1. Network extension between remote locations

The Model 1193 is designed to transmit/receive G.703/G.704 data over one string of fiber. The Model 1193 allows transmission over Single-mode fiber with distances up to 50km (31 miles). The clocking options for the Model 1193 include Internal, Network (from G.703/G.704 Network), or Receive Recovered clock (from fiber line).

The Model 1193 also incorporates V.54 compliant local/remote loopbacks and V.52 compliant 511/511E test patterns. Front panel switches activate test patterns and loopbacks. LED status indicators monitor the fiber and G.703/G.704 links. The Model 1193 is available with either an AC or DC power supply and is supported by a wide range of applications and power supply environments.

3.0 CONFIGURATION

The Model 1193 is equipped with eight DIP switches, which allow configuration of the unit for a wide variety of applications. This section describes location of the switches and explains all possible configurations.

3.1 CONFIGURING THE HARDWARE DIP SWITCHES

The 8 external dip switches are accessible from the underside of the Model 1193 (See Figure 2 below).

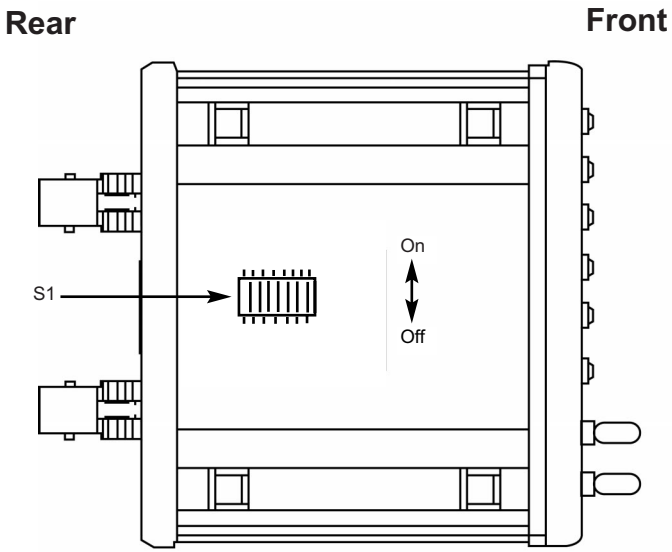

Figure 2. Underside of Model 1193, showing location of the DIP switches

Figure 3 shows the orientation of the DIP switches in the "ON" and "OFF" positions.

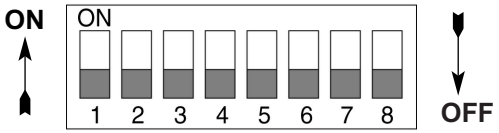

Figure 3. Close up of configuration switches

3.1.1 Configure the Model 1193

Switches S1 through S8 may be used to configure clocking modes and line coding. Default settings of the switches are shown in the table below. A description of the switch options follows the table.

Position	Function	Default Setting
S1	Clock Source	**ON** } Internal
S2	Clock Source	**ON** } Clock
S3	Line	**OFF** } HDB3
S4	Coding	**OFF** }
S5 **S6** **S7** **S8**	Reserved for Future Applications	OFF

Switches S1 and S2: Clock Mode

Use switches S1 and S2 to determine clock mode of the 1193.

S1	S2	Setting	Description
On	On	Internal	Transmit clock generated internally
On	Off	Receive Recover	Transmit clock derived from the line
Off	On	Network	Transmit clock derived from G.703/G.704 equipment interface
Off	Off		Internal use only

Switch S3 and S4: Line Coding Options

Note: The Model 1193 units are intended to work in pairs. Set the clock modes for the Model 1193 units with one end of the link set for receive recover and the other end set for either internal or network.

Use switches S3 and S4 to determine whether the G.703/G.704 line coding is HDB3 or AMI (for older telecommunications equipment). The line coding must be the same line coding prescribed by the NAP (Network Access Provider). Most applications will use HDB3.

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 vio-

lations 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 defines a pulse as a "mark," a binary one, as opposed to a zero. In an 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 modem receiving the signal relies on the signal to recover the 2.048 Mbps clock.

If you must use AMI, 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. AMI coding does not inherently account for ones density. To meet this requirement, ensure that the data inherently meets pulse density requirements.

S3	S4	DTE Line Coding
Off	Off	HDB3
On	Off	Internal use only
Off	On	Internal use only
On	On	AMI

Switches S5 through S8: Reserved

Switches S5 through S8 are reserved for future applications and should be set to OFF.

3.1.2 Select RJ-48C or BNC Connectors

The Model 1193 is shipped configured for use with a BNC connection to the G.703/G.704 Network. If your Network connection is using BNC, skip this section.

Jumper Configuration

The Model 1193 uses four internal jumpers: JP2, JP3, JP4, and JP5 to match input/output impedance between the module and external line on the G.703/G.704 interface. The jumper settings select either a BNC (75-ohm) or an RJ-48C (120-ohm) interface. Figure 4 below shows the top view of the printed circuit board (PCB) and the location of the jumpers.

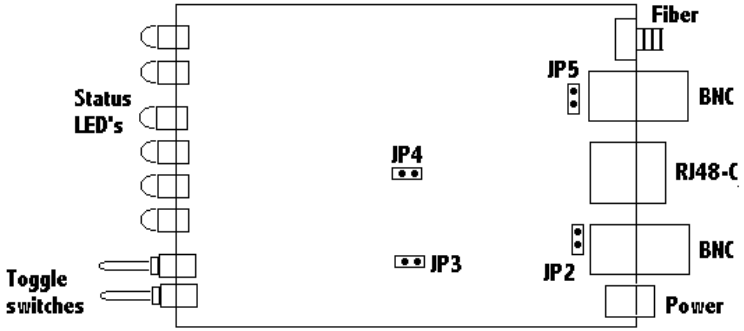

Figure 4: Top view of 1193 circuit board and location of jumpers

Open the Case

Note: When opening and closing the case, be sure not to damage the fiber optic cable inside the unit.

To open the case, insert a screwdriver into the slots and twist the screwdriver head slightly. The top half of the case will separate from the lower half of the case. Take caution not to damage any of the PC board mounted components.

Note: Electronic equipment is sensitive to ESD (electrostatic discharge). When you change the internal jumpers on the 1193, use a grounding strap to avoid damages. For more information call Patton Technical Support (301) 975-1007.

The following is a description of the jumper settings and the interface selection:

1. For a 75-ohm connection (BNC/coax), insert jumpers JP2, JP3, JP4, and JP5 (default).
2. For a 120-ohm connection (RJ-48C/twisted pair), remove jumpers JP2, JP3, JP4, and JP5.

4.0 INSTALLATION

Once the Model 1193 is properly configured, it is ready to connect to the fiber interface, to the G.703/G.704 equipment, and to the power source. This section describes how to make these connections.

The Power, G.703/G.704 and Fiber Line connections are located on the rear panel of the Model 1193. Figure 5 below shows the location of each of these ports.

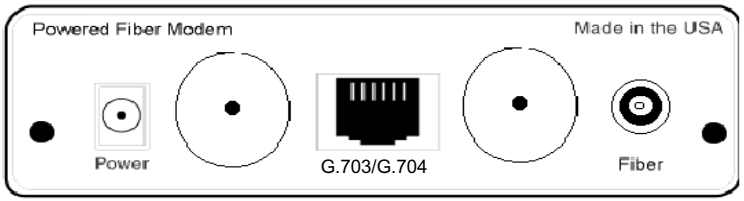

Figure 5. G.703/G.704 interface and power connection ports

4.1 CONNECT THE G.703/G.704 NETWORK

There are two ways of connecting to the G.703/G.704 Network. This section describes both options. After selecting the appropriate connection, set the internal jumpers as described in section 3.1.2.

4.1.1 Connect the Twisted Pair (120 Ohm) to the G.703/G.704 Network

The Model 1193 is equipped with a single RJ-48C jack for connections to a G.703/G.704 network. If your G.703/G.704 Network terminates via an RJ-48C, see Figure 6 below.

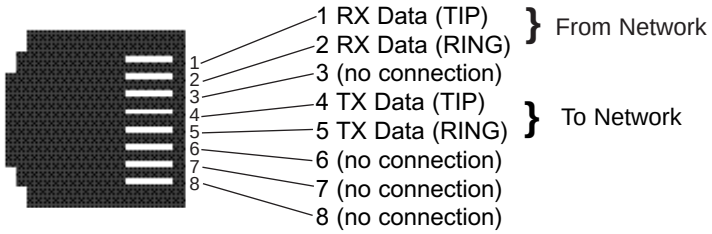

Figure 6. G.703/G.704 network interface

4.1.2 Connect Coax Cable to the G.703/G.704 Network

The Model 1193 is also equipped with dual female BNCs (TX and RX) for connection to a 75 ohm dual coax G.703/G.704 Network interface. If your G.703/G.704 Network terminates via dual coaxial cable, see Figure 7 below to make the proper connections.

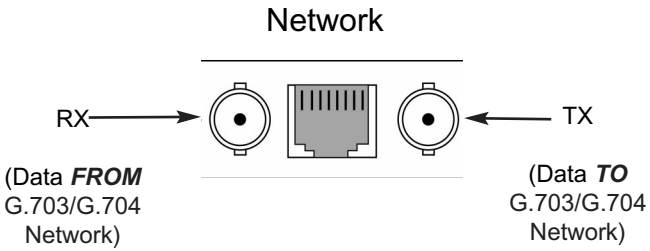

Figure 7: Connecting fiber cable to G.703/G.704 Interface

4.2 CONNECT THE FIBER INTERFACE

The Model 1193 is designed to be connected to another Model 1193. The Model 1193 supports communication between G.703/G.704 equipment over Single-mode fiber at distances up to 50 km (31 miles). One modem can connect to another on the end of a single string of fiber optic cable.

To connect two Model 1193s, use one string of 9/125 micron Single-mode fiber. The fiber connects to each Model 1193 using either an FC or SC connector.

Figure 8 below shows a close-up of SC and FC connector types.

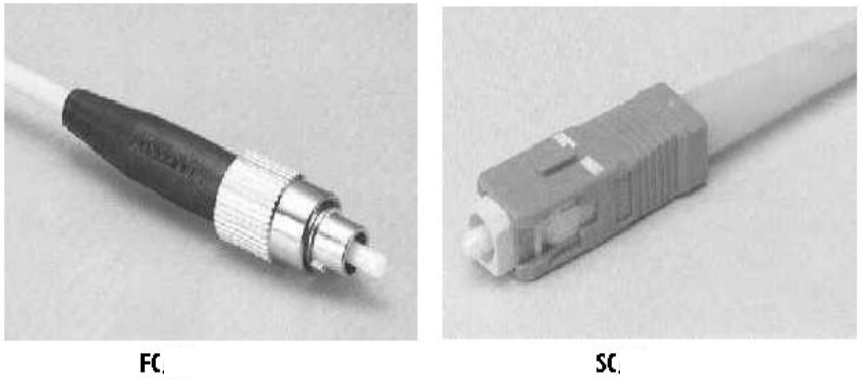

Figure 8. Single-mode fiber connectors (FC and SC)

WARNING: Model 1193 uses a Laser Diode to transmit invisible light into the fiber. Exposing eyes to this light can cause permanent damage. To prevent eye damage, DO NOT DIRECT DISCONNECTED FIBER OR FIBER CONNECTOR OF THE MODEM IN THE DIRECTION OF THE EYES.

4.3 POWER CONNECTION

4.3.1 Universal AC Power (100-240VAC)

The Model 1193 uses a 5VDC, 2A universal input 100-240VAC, power supply (center pin is +5V). The universal input power supply has a male IEC-320 power entry connector. This power supply connects to the Model 1193 by means of a barrel jack on the rear panel. Many international power cords are available for the universal power supply (Refer to Appendix B for country-specific power cords).

The Model 1193 is ready for operation as soon as it is plugged into an AC outlet. The unit does not have a power switch.

4.3.2 DC Power

The 36-60 VDC DC to DC adapter is supplied with the DC version of the Model 1193. 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 rear panel of the 1193. (See Figure 9).

Figure 9. Connecting DC power to the 48V-PSM3 DC power supply.

WARNING! There are no user-serviceable parts in the power supply section of the Model 1193. Fuse replacement should only be performed by qualified service personnel. Contact Patton Electronics Technical support at (301)975-1007, via our web site at http://www.patton.com, or by e-mail at support@patton.com, for more information.

5.0 OPERATION

Once the Model 1193 is properly configured and installed, it should operate transparently. This section describes power-up, LED status monitors, and the built-in loopback test modes.

5.1 POWER-UP

To apply power to the Model 1193, read Section 4.3, and be sure that the unit is connected to the appropriate power source.

Set front panel switches to Normal. Then, plug the provided power adapter (see section 4.3) into the rear panel outlet of the Model 1193 and then into an acceptable power outlet (AC or DC depending on the model -UI or -DC). After both the local and remote Model 1193s are powered up, a synchronization process will occur to establish a link. The synchronization process should take approximately 5 seconds. Any time one of the Model 1193s lose power (i.e., in a lightning storm), the local and remote units will re-synchronize before they can resume data transmission.

When the local and remote Models 1193 have established a link and are passing reliable data, the following LED conditions will exsit:

- Fiber = GREEN
- E1 = GREEN
- LOS = OFF
- NS = OFF
- ER = OFF
- TM = OFF

5.2 LED STATUS MONITORS

The Model 1193 features six front panel status LEDs that indicate the condition of the modem and communication link. Figure 10 below shows the front panel location of each LED.

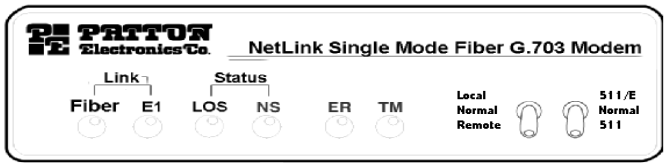

Figure 10. Model 1193 front panel

Functions of LEDs are as follows:

Fiber The green Fiber LED indicates reliable data on the fiber side.

E1 The green E1 LED indicates reliable data on the G.703/G.704 side.

LOS The red LOS indicates that syncronization between modems has not been established. Blinking red LOS LED indicates the presense of coding errors.

NS The red NS LED indicates that the signal on the fiber side is too weak to be detected. That could be due to any of the following reasons:
- break in the fiber optic cable
- length of the fiber optic cable exceeds the maximum distance
- problem with Fiber LED.

ER Flashing red ER LED indicates errors in 511 test pattern

TM The yellow TM LED indicates that the modem is in a test mode (Local/Remote Loopback or 511/511E test pattern). Opaque LED indicates normal operation.

5.3 TEST MODES

The following section describes the test patterns and loopbacks used in the Model 1193. The Model 1193 offers V.54 compliant local/remote loopback tests, plus a built-in V.52 BER test pattern generator to evaluate the condition of the modems and the communication link. These tests can be activated physically from the front panel.

5.3.1 Local Loopback

The local loopback test checks the operation of the local Model 1193, and is performed separately on each unit. The following section describes how to perform a local loopback test between the Network and a local connection.

Any data sent to the local Model 1193 in this test mode will be echoed (returned) back to the user (see Figure 11 below). If two Model 1193 units are linked when the LAL is activated, data sent from the remote modem will also be looped back to the remote terminal equipment.

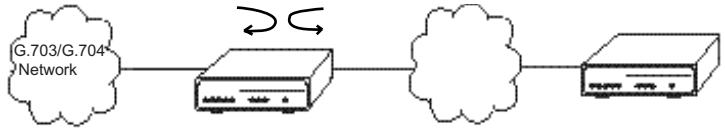

Figure 11. Local loopback diagram

To test the local connection, follow these steps:

1. Activate LAL by moving the front panel toggle switch UP to "Local". Once the Local Loopback is activated, the Model 1193 transmit output will be connected to its own receiver. The TM LED will light up.

2. Perform a BER (Bit Error Rate) test on each unit using a separate BER tester. If the BER test equipment indicates no faults but the data indicates a fault, follow the manufacturer's checkout procedures for the data terminal. Also check the interface cable between the terminal and the Model 1193. The BER test can also be performed using a built-in 511/511E pattern generator. (See section 5.3.3 on how to use the built-in 511/511E pattern generator.)

3. Upon completion of the LAL test, return the front panel switch to NORMAL position. The TM LED should turn off.

5.3.2. Remote Digital Loopback (RDL)

The Remote Digital Loopback test checks the performance of both the local and remote Models 1193, and the communication link between them. In this test, any characters sent from the originating device to the remote unit will be returned (see figure 12). Any data sent to the remote unit from the remote DTE wil be ignored.

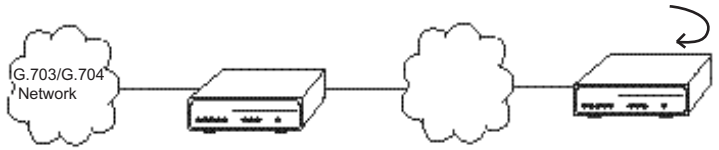

Figure 12. Remote loopback diagram.

To perform a RDL test, follow these steps:

1. Activate RDL by moving front panel toggle switch DOWN to "Remote". The TM LED on both local and remote units will light up.

2. Perform a BER (Bit Error Rate) test on the system, using BER tester on the local end. BER test can also be performed using built-in 511/511E pattern generator. (See section 5.3.3 on how to use the built-in 511/511E pattern generator.)

3. If the BER test equipment indicates a fault and the Local Analog Loopback test was successful for both Model 1193s, there may be a problem with the line between the units.

4. Upon completion of the RDL test, return the front panel switch to NORMAL position. The TM LED should turn off on both local and remote units.

5.3.3. The V.52 Test Pattern Generator

To use the V.52 BER test in conjunction with the Local or Remote Loopbacks, follow these instructions:

1. Locate the "511/511E" toggle switch on the front panel of the Model 1193 and move it UP. This activates the V.52 BER test mode and transmits a "511" test pattern into the loop. If any errors are present, the local modem's red "ER" LED will blink intermittently.

2. If the above test indicates no errors, move the V.52 toggle switch DOWN, activating the "511/E" test with errors present. If the test is working properly, the local modem's red "ER" LED will blink approximately once every 2 seconds. A succesful "511/E" test will confirm that the link is in place, and that the Model 1193's built-in "511" generator and detector are working properly.

Note: When the unit is set for Network Clock Mode, the unit will derivew its timing from the G.703/G.704 Interface. Failure to connect to G.703/G.704 may result in bit errors during the 511 or 511/E test.

APPENDIX A

PATTON ELECTRONICS G.703/G.704 SDSL MODEM SPECIFICATIONS

Clocking Modes:	Network (G.703/G.704), Internal, Receive Recover
Line Rate:	2048 kbps
Diagnostics:	V.52 compliant (511/511E) pattern generator and detector with error injection mode. Remote Loopback (toward fiber line) and local loopback (toward G.703/G.704 Network) controlled by a single front panel switch
LED Status:	The following LEDs are displayed on the front panel: **Fiber:** The green Fiber LED indicates reliable data on the fiber side **E1:** The green E1 LED indicates reliable data on the G.703/G.704 side **LOS:** The red LOS indicates that syncronization between modems has not been established. Blinking red LOS LED indicates the presense of coding errors. **NS:** The red NS LED indicates that the sig nal on the fiber side is too weak to be detected. **ER:** Flashing red ER LED indicates errors in 511 test pattern **TM:** The yellow TM LED indicates that modem is in a test mode (Local/Remote Loopback or 511/511E test pattern). Opaque TM LED indicates normal operation.
Configuration:	Externally accessible dip switches
Power:	5 VDC from external desk top power supply, 90-260VAC, 50-60 Hz (Universal Input), 10W or -48 VDC
Compliance:	FCC Part 15, CE, CTR12
Transmission Line:	Single fiber
Line Coding:	8B10B
Line Interface:	Transformer coupled, 1500 VAC isolation
Fiber Physical Connection:	One string of 9/125 micron fiber with FC or SC connectors

G.703/G.704 Specific

Interface:	Female Dual Coaxial 75 ohm or Female RJ-48C 120 ohm
Line rate:	2.048 Mbps
Line coding:	AMI or HDB3 (HDB3 is the default)
Isolation:	1500 Vrms
Physical Connection: (RJ-48C)	pin 1 Rx Data + pin 2 Rx Data - pin 4 Tx Data + pin 5 Tx Data - pins 3, 6, 7, 8 no connection

APPENDIX B

PATTON ELECTRONICS MODEL 1193 FACTORY REPLACEMENT PARTS AND ACCESSORIES

Patton Electronics Model #	Description
1193	Single-mode fiber optic modem
1193RC	Single-mode fiber rack card modem
48V-PSM	DC Power Supply Module
08055DCUI	100-240VAC (+5V ±5% reg. DC/2A) Universal Input Adapter
0805EUR	European Power Cord CEE 7 (“A”)
0805UK	United Kingdom Power Cord (“D”)
0805US	American Power Cord (“K”)
0805AUS	Australia/New Zealand Power Cord (“C”)
0805DEN	Denmark Power Cord (“E”)
0805FR	France/Belgium Power Cord (“F”)
0805IN	India Power Cord (“G”)
0805IS	Israel Power Cord (“H”)
0805JAP	Japan Power Cord (“J”)
0805SW	Switzerland Power Cord (“L”)
07M1193	User Manual