

USER MANUAL

MODEL 2702

G.703 Interface Converter



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PT **PATTON**
Electronics Co.



An ISO-9001
Certified Company

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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 Services at (301) 975-1007.

1.1 WARRANTY STATEMENT

Patton Electronics warrants all Model 2702 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 2702 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 2702 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 2702 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 AND TELECOMMUNICATION APPROVALS

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.

The Model 2702 is in compliance with the Telecommunication technical requirements CRT-12; 2.048 Mbps digital unstructured leased line (D2048U) attachment requirements for terminal equipment interface.

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 2702. 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

- Converts Synchronous unframed 2 Mbps G.703 to V.35
- Integral V.35 (M/34) Male connector (6 Pin Cisco router also available)
- V.54 Compliant Loopback Diagnostics
- Easy to Read LEDs for TXD, RSD, ALM, LOTC, TST, and ERR
- AMI or HDB3 Line Coding
- Configuration via DIP Switches
- External 100-240VAC Power Supply

2.2 GENERAL PRODUCT DESCRIPTION

The Patton Model 2702 fits into an environment where high-speed E1/G.703 services are being offered to customers with Router/FRADS and other networking devices. These G.703 Interface Converters are required to convert signals from the unstructured, synchronous line interface - delivered by the carrier - to a 2 Mbps digital interface required by the users networking equipment.

To accomplish this, the Model 2702 presents a RJ48C interface to the line and a V.35 interface to the customer's device. The V.35 interface is presented using a Male M/34 connector. Line coding and clock options may be selected using internally accessible DIP Switches

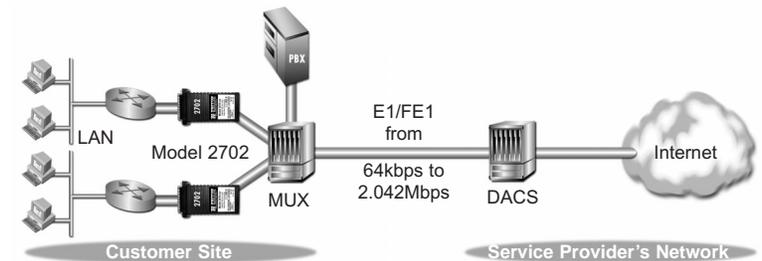
If other interfaces are required, you may select our Model 2703 converter which presents the following interfaces: X.21, RS422/530, V.36/RS449 and V.24/RS232. These interfaces are delivered through a standard interface cable which connects to the Female DB25 on one end and the desired interface on the other end. If other DTE speeds are necessary, our Model 2094 connects Fractional E1 at nx64 speeds up to 2 Mbps. Please see the interface converter section of the Patton Catalogue for the required converter.

2.3 SUPPORTED APPLICATIONS

The Model 2702 provides a E1 network termination between E1 and customer premises equipment (CPE) such as a router. The Model 2702 can also be used as a high-speed short haul modem for campus applications.

2.3.1 The 2702 as the Interface between the Telco and CPE

The Model 2702 provides the interface between an E1 multiplexer and a router or switch (See below).



2.3.2 The 2702 as a High-Speed Short Range Modem

The Model 2702 can also be installed into high-speed campus applications. In this application, a pair of Model 2702 units operate as short range modems (See below).



3.0 CONFIGURATION

The Model 2702 features configuration capability via hardware switches. This section describes all possible hardware switch configurations of the Model 2702.

3.1 DIP SWITCH CONFIGURATION

The Model 2702 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.

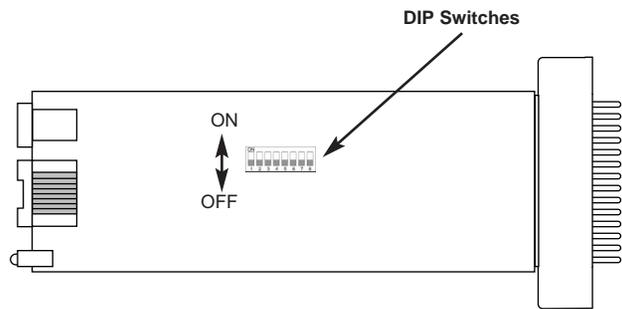


Figure 1. Model 2702 bottom view, showing location of DIP switches

The Model 2702 DIP switches (SW1, SW3 & SW4) can be configured as either "On" or "Off". Figure 2 (below) shows the orientation of the DIP switches with respect to ON/OFF positions.

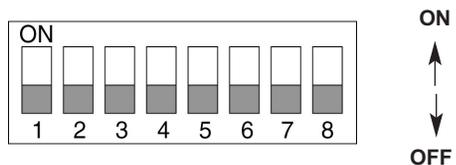


Figure 2. Close up of DIP switches showing ON/OFF positions.

Default positions for Switches SW1, SW3, and SW4 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
SW3	Clock Mode	Off	} Network
SW4	Clock Mode	Off	

NOTE: Switches SW2, SW5, SW6, SW7, and SW8 are not used.

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 2702s together as short range modems, set both units identically.

<u>SW4</u>	<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.

4.0 INSTALLATION

Switch SW3 and SW4: Clock Mode

SW3 is used to along with SW4 to determine the clock mode. For example the Model 2702 can be set to external clock mode by setting both SW3 and SW4 to the on position. Please refer to the Clock Mode chart below for the desired settings.

CLOCK MODE SETTINGS

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. A 2.048 MHz timing signal must be present at the external clock pin U and pin W on the M/34 connector.

Note: When using the 2702 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, or both units could be either Internal or External Clock. But both units cannot be network clock mode in SRM applications

The Model 2702 is equipped with DTE, network, and power interfaces. This section briefly describes connection to each.

4.1 DTE INTERFACE CONNECTION

The DTE/DCE 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.

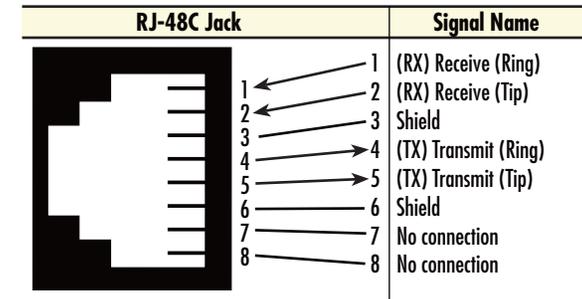


Figure 3. Model 2702 twisted pair line interface.

NOTE: If the Model 2702 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, and should be configured as shown below. See Appendix D for Interface pin assignments.

SIGNAL	PIN NO.	PIN NO.	SIGNAL
RX Data (Ring)	1.....	4	TX Data (Tip)
RX Data (Tip)	2.....	5	TX Data (Ring)
TX Data (Ring)	4.....	1	RX Data (Ring)
TX Data (Tip)	5.....	2	RX Data (Tip)

4.3 POWER CONNECTION

The Model 2702 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 2702 uses a 5VDC, 400mA 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 2702 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 2702 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 2702. 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 2702.



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 regulated 5VDC \pm 5%, 300mA minimum.

NOTE: Model 2702 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 2702 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.

5.1 LED DESCRIPTIONS

The Model 2702 is equipped with seven LED indicators that monitor the status of communication. Figure 4 (below) shows the location of the LEDs on the Model 2702 front panel.

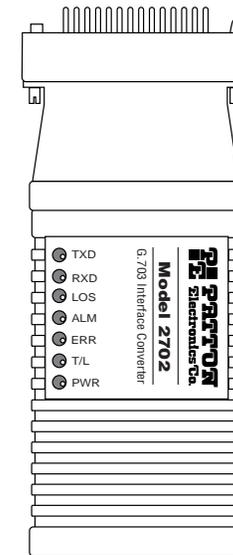


Figure 4. Top of Model 2702, Showing LED Indicators

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.

LOT	The Loss of Transmit Clock LED lights when the unit detects that there is no transmit clock.
ALM	The alarm LED indicates the loss of carrier, i.e., no activity on the network.
ERR	The error LED is not used in Model 2702.
TST	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. The test mode is V.54 Loopback & Local loopback.
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 2702 offers two V.54 loop diagnostics and is compatible with two Telco loop diagnostics. Use these diagnostics to test the NTU and any communication links. These tests can be activated via signals on the DTE interface.

5.2.1 Operating Local Loopback (LL)

The Local Loopback (LL) test checks the operation of the local Model 2702, and is performed separately on each unit. Any data sent to the local Model 2702 in this mode will be echoed (returned) back to the user device. To perform a LL test, follow the steps below.

1. Activate the “LL” signal on the DTE pin L. 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. 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 2702.

5.2.2 Operating Remote Digital Loopback (RL)

The Remote Digital Loopback (RL) test checks the performance of both the local and remote Model 2702, as well as the communication link between them. To perform a RDL test, follow the steps below.

1. Activate the “RL” signal on the DTE pin N. If you are not sure which lead is the “RL” signal, please refer to Appendix D.
2. Perform a bit error rate test (BERT) 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.

APPENDIX A

PATTON MODEL 2702

SPECIFICATIONS

Network Data Rate:	2.048 Mbps \pm 50ppm
Network Connector:	RJ-48C
Nominal Impedance:	120 ohm (75 ohm available when using Patton Model 460 Balun)
DTE/DCE Interface:	V.35 (DCE Orientation) on Male M/34
Line Coding:	Selectable AMI or HDB3
Line Framing:	G.703 (Unframed)
Clocking:	Network, Internal, External (from DTE)
DTE Data Rates:	2.048 Mbps
Diagnostics:	V.54 Loopback & Local Loopback
Indicators:	Power, Transmit Data, Receive Data, Alarm, Loss of Tx Clock, Test Mode, Error
Configuration:	8-Position DIP Switch
Power:	Regulated 5VDC \pm 5%, 300 mA minimum
Humidity:	Up to 90% non-condensing
Temperature:	0 to 50° C
Dimensions:	4.8"L x 2.0"W x 0.88"H (12.2 x 5.1 x 2.2 cm)

APPENDIX B

PATTON MODEL 2702

CABLE RECOMMENDATIONS

The Patton Model 2702 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 2702, 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 2702

**FACTORY REPLACEMENT PARTS
AND ACCESSORIES**

<u>Patton Model #</u>	<u>Description</u>
2702/CM/UI	V.35 to E1 Converter (V.35 M/34 Male, UI)
10 - 09F	6 Foot Control Port Cable, 25 mm to DB9F
07M2702	User Manual
08055DCUI.....	Universal Input Power Supply

APPENDIX D

PATTON MODEL 2702

INTERFACE PIN ASSIGNMENT

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

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

APPENDIX D

(continued)

PATTON MODEL 2702

INTERFACE PIN ASSIGNMENT

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 2702

POWER SUPPLY INTERFACE

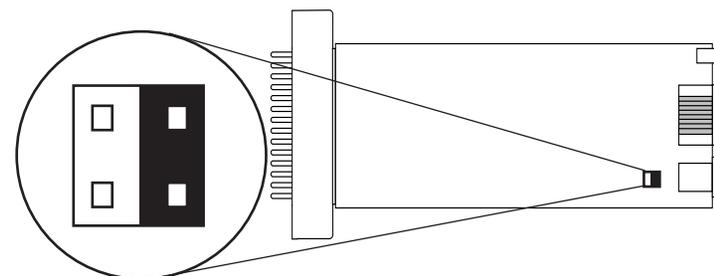
Via Main 5VDC power jack (J1)

Center Pin: 5VDC @ 300 mA

Outer Barrel: Ground

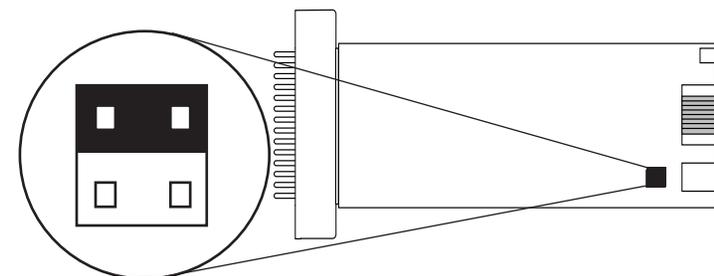
Barrel Plug: 2.1/5.5/10mm I.D./O.D./Shaft Length dimensions.

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 2702 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)