

USER MANUAL

MODEL 1088/K

mDSL Modem with fixed
G.703/G.704 Interface



PATTON
Electronics Co.



An ISO-9001
Certified
Company

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1.0 WARRANTY INFORMATION

Patton Electronics warrants all Model 1088 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 1088 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 1088 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 1088 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).

1.2 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 1088. Technical Service hours: **8AM to 5PM EST, Monday through Friday.**

IMPORTANT: The Model 1088 is equipped with flash upgrade. Please refer to Patton website, or contact Technical Support for the latest version of the software.

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

- Multi-Rate Symmetric DSL
- Supports DTE Speeds from 64 kbps to 2.048 Mbps
- 2-wire Operation
- 120 ohm (RJ-45) and 75 ohm (dual coax) G.703/G.704 terminations
- 2Mbps G.703 Clear Channel (Unframed) or nx64 G.704 (Framed) Operation
- SNMP Manageable as the CP (Customer Premises) modem when connect to Model 1095RC
- Selectable AMI or HDB3 Line Coding
- LED indicators for DSL Link, E1/FE1 Link, LOS, TM, ER and NS

2.2 DESCRIPTION

The Patton Electronics *mDSL Rocket* offers the ability to extend G.703/G.704 service over Multi-rate Symmetric Digital Subscriber Line technology. Multi-rate DSL offers the ability to deliver the maximum bit rate that a twisted pair line can accommodate. Now, ISPs, CLECs and corporate enterprises can terminate G.703/G.704 (E1) service and either extend nx64 G.703/G.704 service or provide a remote serial connection to a router or switch when paired with Model 1088/C (V.35) or 1088/D (X.21).

As Model 1088/K receives data from E1 line, it extracts the E1 clock, and delivers smooth clock and data to the remote DSL modem over a two-wire DSL span. In a **network extension** application, a remote 1088/K delivers nx64kbps to 2 Mbps G.703 data and clocking to device with an E1 interface. In a **network termination** application, a remote Model 1088/C or 1088/D accepts this data and clock stream and provides nx64kbps data to CPE with a V.35, or X.21 interface.

As a symmetric DSL NTU, Model 1088/K offers the same data rates in both directions over a single pair of regular telephone lines using Carrierless Amplitude and Phase (CAP) modulation. Equipped with both 75 ohm (dual coax) and 120 ohm (RJ-45), the Model 1088/K is easy to configure and install. DSL line connection is via RJ-45 jack. Standard versions of Model 1088 are powered by a 100/230VAC (Universal) supply. A DC power supply option supports any DC input between 36-72VDC.

3.0 CONFIGURATION

The Model 1088/K is equipped with two sets of eight DIP switches, which allow configuration of the unit for a wide variety of applications. This section describes switch locations and explains all possible configurations.

3.1 CONFIGURING THE HARDWARE DIP SWITCHES

The 16 external switches are grouped into two eight-switch sets, and are externally accessible from the underside of the Model 1088/K (See Figure 1, below).

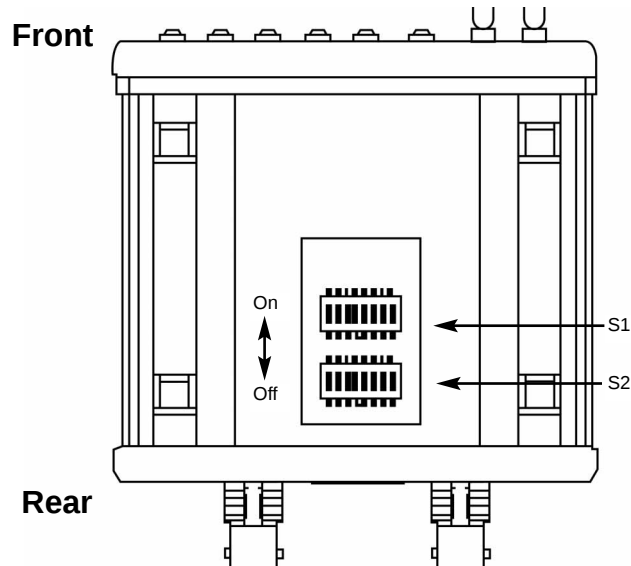


Figure 1. Underside of Model 1088/K, Showing Location of DIP Switches

The two sets of DIP switches on the underside of the Model 1088/K will be referred to as S1 and S2. As Figure 2 shows, the orientation of all DIP switches is the same with respect to "ON" and "OFF" positions.

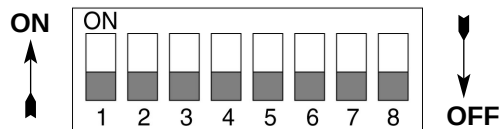


Figure 2. Close Up of Configuration Switches (all sets are identical in appearance)

3.1.1 Configuration DIP Switch Set "S1"

Switches S1-1 through S1-8 may be used to configure CO/CP operation, line framing and coding, CRC-4 operation, and DTE initiated loop diagnostics. Default settings of S1 Switches are shown in the table below.

S1 SUMMARY TABLE			
Position	Function	Factory Default	
S1-1	CO/CP Setting	On	CP Mode
S1-2	Line Coding	Off	HDB3
S1-3	CRC-4 Enable	Off	Disabled
S1-4	Reserved	Off	
S1-5	Reserved	On	
S1-6	Reserved	Off	
S1-7	Reserved	On	
S1-8	Reserved	Off	

Switch S1-1: CO/CP

Use Switch S1-1 configure the CO (located at the **C**entral **O**ffice or G.703/G.704 demarcation point) or CP (located at the **C**ustomer **P**remises) mode of the 1088/K.

<u>S1-1</u>	<u>CO/CP Mode</u>
Off	CO = located at the C entral O ffice
On	CP = located at the C ustomer P remises

CO/CP Configuration:

The Model 1088/K does not use clock mode settings as described in other Patton mDSL products. Instead, the Model 1088/K will always recover the clocking from the G.703/4 network and use this clock to send data across the DSL span to the remote DSL modem, which will use the incoming to send data out to G.703/4 network. Therefore, one unit must be set for CO mode (located at the G.703 demarcation), and the other unit must be set for CP mode (located at the customer premises). This type of clocking method was employed for two reasons:

- 1) To allow two independent networks to use the modems as independent clocking paths.
- 2) To allow the user to independently specify the timing source for the network based on external equipment.

CO/CP and Using the 1088/K with other Patton mDSL modems

Other Patton mDSL modems allow the option of specifying the clock mode, but not the CO/CP designation. This is already done internally within the unit. When connecting a 1088/K to an mDSL modem (e.g. Model 1088/C, 1088/D or 1095) other than a Model 1088/K, determine the source of the system clock and then determine the Model 1088/Ks CO/CP designation based upon the following chart.

MDSL Modem Clock Mode ^{109X}	MDSL Modem Unit Designation ^{109X}	1088/K setting required
External	CO	CP
Internal	CO	CP
Receive Recover	CP	CO

*Reminder: In each DSL modem pairing, one unit must act as the CO unit, the other must act as the CP unit.

Switch S1-2: Line Coding

Use Switch S1-2 to configure the G.703/G.704 network line coding. The line coding must be the same line coding prescribed by the NAP (Network Access Provider). Most applications will use HDB3

SW4	Line Framing & Coding
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, you should ensure that the data inherently meets pulse density requirements.

Switch S1-3: CRC-4 Multiframe

CRC-4 Multiframe uses Time Slot zero to carry CRC-4 information. When CRC-4 is enabled (ON), the unit synchronizes to the CRC-4 multi-frame protocol.

S1-3	Option
Off	Disabled
On	Enabled

NOTE: When the DTE rate is set to 2048 Kbps, Model 1088/K transmits user data on all 32 timeslots, ignoring framing information. In this case, Switch S1-3 will need to be in the disabled (Off) position.

Switches S1-4, S1-5, S1-6, S1-7 and S1-8: Reserved

Switches S1-4, S1-5, S1-6, S1-7, S1-8 are reserved for factory usage and must remain in the default configuration, *except when using the Netlink Plug-and-Play feature.*

S1-4	S1-5	S1-6	S1-7	S1-8	Default Setting
Off	On	Off	On	Off	Only Valid Setting

3.1.2 Configuration DIP Switch Set “S2”

Use the eight DIP Switches in Switch S2 to enable the DTE connection rate. The following table summarizes default positions of DIP Switch S3. Detailed descriptions of each switch follow the table.

S2 SUMMARY TABLE		
Position	Function	Factory Default
S2-1	DTE Rate	Off
S2-2	DTE Rate	Off
S2-3	DTE Rate	On
S2-4	DTE Rate	On
S2-5	DTE Rate	On
S2-6	DTE Rate	Off
S2-7	Reset Software Defaults	On Normal Operation
S2-8	Transmit Data Sample Point	On Normal Operation

Switch S2-1: DTE Rate

Use Switch S2-1 through S2-6 to set the DTE bit rate.

S2-1	S2-2	S2-3	S2-4	S2-5	S2-6	DTE Rate (kbps)
Off	Off	On	On	On	On	64
On	On	Off	On	On	On	128
Off	On	Off	On	On	On	192
On	Off	Off	On	On	On	256
Off	Off	Off	On	On	On	320
On	On	On	Off	On	On	384
Off	On	On	Off	On	On	448
On	Off	On	Off	On	On	512
Off	Off	On	Off	On	On	576
On	On	Off	Off	On	On	640
Off	On	Off	Off	On	On	704
On	Off	Off	Off	On	On	768
Off	Off	Off	Off	On	On	832
On	On	On	On	Off	On	896
Off	On	On	On	Off	On	960
On	Off	On	On	Off	On	1024
Off	Off	On	On	Off	On	1088
On	On	Off	On	Off	On	1152
Off	On	Off	On	Off	On	1216
On	Off	Off	On	Off	On	1280
Off	Off	Off	On	Off	On	1344
On	On	On	Off	Off	On	1408
Off	On	On	Off	Off	On	1472

On	Off	On	Off	Off	On	1536
On	On	Off	Off	Off	On	1600
Off	On	Off	Off	Off	On	1664
On	Off	Off	Off	Off	On	1728
Off	Off	Off	Off	Off	On	1792
On	On	On	On	On	Off	1856
Off	On	On	On	On	Off	1920
On	Off	On	On	On	Off	1984
Off	Off	On	On	On	Off	2048

NOTE: Based on the DTE rate chosen, the Model 1088/K will automatically select the optimum line rate for the distance. This selection is based on the lowest line rate that will support the DTE rate.

Switch S2-7: Reset Software Defaults

Switch S3-7 allows the user to reset the software configured factory defaults. This will only be needed when using the Model 1001MC to SNMP manage your units. For more information, please refer to the Model 1001MC Operations Manual.

S3-7	Setting
On	Normal Operation
Off	Reset

Switch S2-8: Transmit Data (TD) Sampling Point

Switch 3-8 controls the Transmit Data (TD) sampling point.

S3-8	Setting	Description
On	Normal	TD sampled on the falling edge of the 1088 Transmit Clock (TC)
Off	Invert	TD sampled on the rising edge of the 1088 Transmit Clock.

3.2 NETLINK PLUG-AND-PLAY

The NetLink Plug-and-Play feature allows ISPs, carriers and PTTs to quickly upgrade the link speed for a customer without requiring a visit to re-configure the Customer Premise (CP) Model 1088. This feature also allows service providers to set up all of the configurations at the Central Office (on the rack cards) before installing the stand alone units, saving time spent configuring or re-configuring DIP switches.

NOTE: NetLink Plug-and-Play is only available when using a rack-mounted NetLink Model 1095RC as the CO unit.

The NetLink Plug-and-Play feature allows the user to configure the DTE rate (bandwidth allocation, see Switches S2-1 through S2-6) of the CP unit from the rack card at the Central Office (CO). The stand alone unit at the Customer Premise (CP) site will automatically configure itself to the DTE rate (Bandwidth Allocation) of the rack card. Other configuration parameters remain in the default setting.

Follow the instructions below to activate NetLink Plug-and-Play between CO (Model 1095RC and CP (Model 1088) units:

1. Set the Model 1095RC (CO) to either Internal or External clocking mode as defined by the application.
2. Set the Model 1088 (CP) to "NetLink Plug-and-Play CP" by setting S1 and S2 DIP switches in the ON position as described in Figure 3, below.

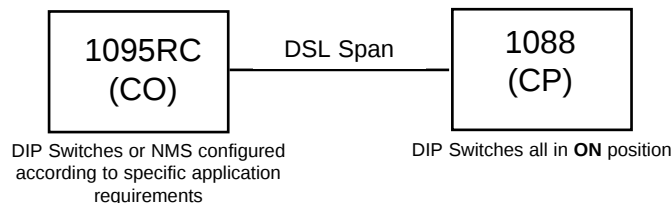


Figure 3. Typical NetLink Plug-and-Play Application

When the CO and CP units connect over DSL, the CP will enter a pre-defined default configuration (Receive Recovered Clocking). During the negotiation process between the units, the CO unit will configure the DTE rate/line rate on the CP unit as defined by the settings of the CO unit. When additional bandwidth is required, only the configuration of the CO unit should be changed. This feature gives ISPs, LECs and PTTs the ability to provision bandwidth on an as needed basis to customers.

The NetLink Plug and Play application will also work in an HTTP/SNMP managed system using the NetLink Model 1001MC SNMP agent card with 1095RC cards installed in Patton's 2U rack system. In this application, the system administrator can configure the entire rack through the Network Management Station (NMS) before the stand alone (CP) units are installed. For more information on the HTTP/SNMP management, please refer to the Model 1001MC Operations Manual.

4.0 INSTALLATION

Once the Model 1088/K is properly configured, it is ready to connect to the twisted pair interface, to the serial port, and to the power source. This section describes how to make these connections.

4.1 CONNECT G.703 NETWORK

The Power, G.703/G.704 and DSL Line connections are located on the rear panel of the Model 1088/K. Figure 4, below, shows the location of each of these ports.

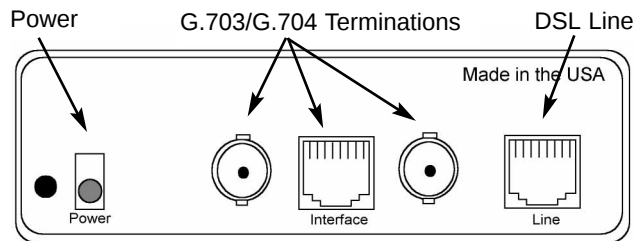


Figure 4. Model 1088/K Rear Panel

4.2 JUMPER CONFIGURATION

The Model 1088/K has six jumpers (two position headers): JP1-JP6. These jumpers are used to select input or output impedance matching between the module, external line, and to employ either BNC or RJ-45 interface. Figure 5 (below) shows the top view of the printed circuit board (PCB) and the location of the jumpers.

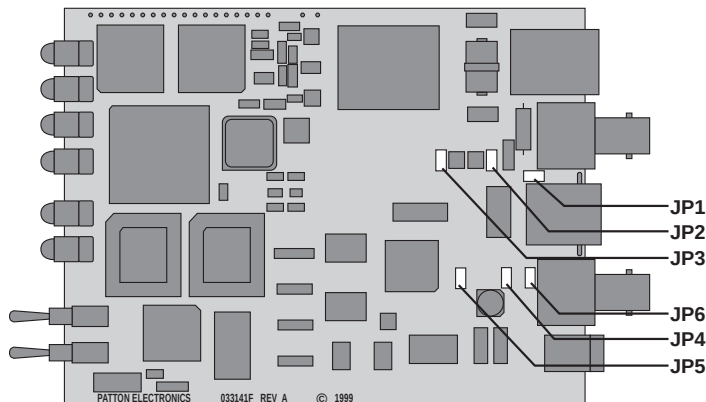


Figure 5. Top view of 1088/K, showing location of JP1-JP6

The following is a description of the jumper settings with respect to the front panel connectors.

1. For a 75 Ohm connection (coax) insert JP1, JP4, JP5, and JP6 (default)
2. For a 120 Ohm connection (RJ45) remove JP1 and JP4, JP5, and JP6.

4.2.1 Connect Twisted Pair (120 ohm) to G.703 Network

The Model 1088/K is equipped with a single RJ-48C jack for connections to a 120 ohm twisted pair G.703/G.704 network interface. If your G.703/G.704 network terminates via RJ-48C, use the diagram below and the table on the following page to make the proper connection.

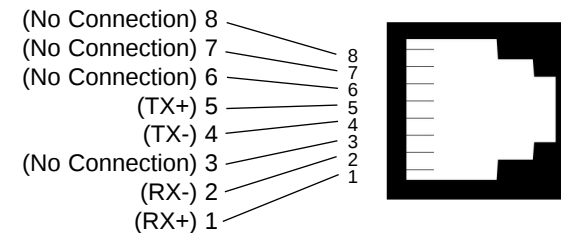


Figure 6: 120 Ohm RJ-48C G.703 Interface

tions. The connector pinout and signals are shown in Figure 6, below.

Use the following connection diagram to connect the 120 ohm G.703/G.704 network channel.

RJ-45 Cable (8-Wire)

<u>1088/K SIGNAL</u>	<u>PIN#</u>	<u>G.703/G.704 NETWORK SIGNAL</u>
RX+	1-----	TX+
RX-	2-----	TX-
TX+	5-----	RX+
TX-	4-----	RX-
Shield	3-----	Shield
Shield	6-----	Shield

4.2.2 Connect Dual Coaxial Cable (75 ohm) to G.703 Network

The Model 1088/K is also equipped with dual female BNCs (TX and RX) for connection to a 75 ohm dual coax G.703 network interface. If your G.703/G.704 network terminates via dual coaxial cable, use the diagram below to make the proper connections. The connector pinout and signals are shown in Figure 7, below.

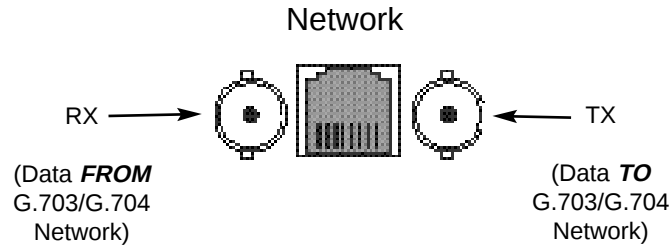


Figure 7: 75 Ohm Dual Coaxial G.703 Interface

NOTE: The outer conductor of the coax cables are isolated from system earth ground.

4.3 CONNECT TWISTED PAIR DSL INTERFACE

The Model 1088/K supports communication between two DTE devices at distances to 5 miles (8 km) over 24 AWG (.5mm) twisted pair wire. Two things are essential:

1. These units operate as a **pair**. Both units at the end of the twisted pair DSL span must be set for the same DTE rate.
2. To function properly, the Model 1088 needs one **twisted** pair of metallic wire. This twisted pair must be **unconditioned**, dry, metallic wire, between 19 (.9mm) and 26 AWG (.4mm) (the higher number gauges will limit distance). Standard dial-up telephone circuits, or leased circuits that run through signal equalization equipment, or standard, flat modular telephone type cable, are *not acceptable*.

The RJ-45 connector on the Model 1088's twisted pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationships are shown in Figure 8.

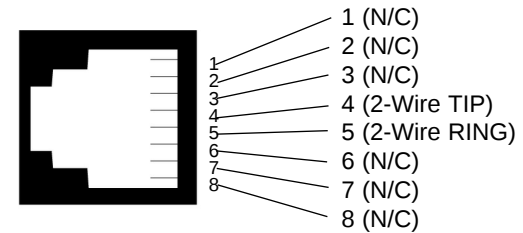


Figure 8. Model 1088 twisted pair line interface.

4.4 POWER CONNECTION

Universal AC Power (100-240VAC)

The Model 1088 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 1088 by means of a barrel jack on the rear panel. Many international power cords are available for the universal power supply (Please refer to Appendix B for country-specific power cords).

The Model 1088 powers up as soon as it is plugged into an AC outlet--there is no power switch.

120 VAC Power (US)

The 100-132 VAC adapter supplied with the U.S. version of the Model 1088 is a wall mount type and may be plugged into any approved 120 VAC wall jack.

230 VAC Power (International)

The 230 VAC adapter supplied with the International version of the Model 1088 is a wall mount type and may be plugged into any approved 230 VAC wall jack.

DC Power

The 36-60 VDC DC to DC adapter supplied with the DC version of the Model 1088 plugs in a DC source (nominal 48VDC) and plugs into the barrel power supply jack on the rear of the 1088/K. Please refer to Figure 9 to make the proper connection.



Figure 9. Connecting DC Power to the 48V-PSM DC Power Supply.

WARNING! There are no user-serviceable parts in the power supply section of the Model 1088. 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 1088 is properly configured and installed, it should operate transparently. This section describes power-up, reading the LED status monitors, and using the built-in loopback test modes.

5.1 POWER-UP

To apply power to the Model 1088, first be sure that you have read **Section 4.3**, and that the unit is connected to the appropriate power source.

5.2 LED STATUS MONITORS

The Model 1088 features six front panel LEDs that monitor power, the DTE signals, network connection and test modes. Figure 10 (below) shows the front panel location of each LED. Following Figure 10 is a description of each LED's function. See also APPENDIX E.

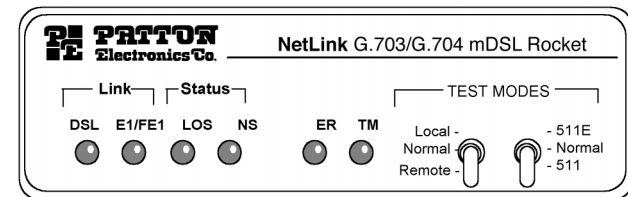


Figure 10. Model 1088/K Front Panel

- DSL Link** **(Active Green)** Solid green (On) indicates that the end to end DSL Framing Link is up, signifying that the link across the DSL span is active. The DSL Link LED is Off when the link is down.
- E1/FE1 Link** **(Active Green)** Solid green (On) indicates a valid E1 connection.
- LOS** **(Active Red)** The Loss of Sync indicates that the unit has lost 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.
- NS** **(Active Red)** The No Signal LED glows red to indicate that the local Model 1088 is not connected with the remote Model 1088.

- ER** **(Flashing Red)** - blinks ON/OFF after a 511/511E test has timed out. See Section 5.3.3 (Test Pattern Generator) for more information.
 - flashes once to indicate that a CRC error has occurred (during normal operation) or bit errors have occurred (during 511/511E tests).
 - Only at power up, blinks once every 200 ms if the DTE Rate is set to an unsupported settings
- TM** **(Active Yellow)** glows yellow to indicate that the Model 1088/K has been placed in Test Mode. The unit can be placed in test mode by the local user or by the remote user. The TM LED will flash for 400msec when a valid packet is received from the Model 1001MC.

5.3 TEST MODES

The Model 1088 offers two proprietary loopback test modes, 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 Overview

Figure 11 below shows the major elements used in the loop-back and pattern tests available in the Model 1088. Each block has several functions. Following Figure 11 are descriptions that show how the elements are used during Test Modes.

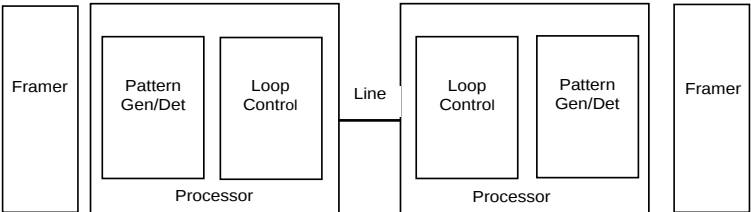


Figure 11: Block Diagram Model 1088

- Framer**

The framer is used to determine the status of the line. In normal operation the framer transmits and expects to receive framed packets from the far end. If the framer receives framed packets from the far end, the DSL Link LED will be active. If framed packets are not received, the DSL Link LED will be inactive. The restart procedure uses this information to determine if a valid connection is made (cable disconnect, poor cable quality, etc). In normal Data Mode, if the box receives 4 seconds of unframed packets it will restart the box and begin trying to re-establish a connection with the far end. The distinction between framed packets and unframed packets becomes important when we discuss the Pattern Generator.

- Pattern Gen/Det**

This part of the Processor generates and detects the 511/511E patterns. When transmitting 511 patterns, the information is unframed (because it originates after the framer) and is intended to be evaluated only by another Processor. If the units are in Data Mode and the pattern generator is enabled on one end of the link, the far end will begin receiving unframed packets and assume that the line has gone down. During test modes, we force the pattern generator to time out before it can cause the link to be killed.

- Loop Control**

This part of the Processor is used to control loop-backs. In a Local Loop, the data is looped back towards the local DTE (G.703/G.704). In a Remote Loop, the data is looped back to the line, but it is also allowed to pass through to the framer and to the remote DTE (G.703/G.704).

Restart Procedure and Time Outs

The restart procedure is in place to allow the units to re-establish a connection after the framer begins seeing unframed packets. The Test Model Timing Chart below shows the amount of time the framer must see consecutive unframed packets before the unit will restart and try to establish a new line connection. The reason that there are different Restart Times will become apparent after reading the rest of the document. The 511/511E Time Out shown refers to the amount of time the 511/511E pattern will be valid. At the end of this time the pattern will automatically turn itself off and the normal data path will be re-established. The ER led will flash indicating to the user that the test has timed out. The ER led will stop flashing once the 511/511E switch is placed into the normal position.

Test Mode Timing	
Item	Elapsed Time (seconds)
Start Up	50
Data Mode	4
511/511E Generator Enabled	60 (The generator will stop after 45 seconds.)
Remote End of an RDL	60
511/511E Time Out	45 (The pattern generator will automatically turn off after 45 seconds. The ER LED will flash until the user turns off the 511/511E switch.)

Symbol Indicators



This symbol designates the origination or the termination of a data path. The direction of the arrow connected distinguish the two data paths.



This symbol designates an invalid data path. If there is data present it should be ignored.

5.3.2 Loops and Patterns

The following section describes the Test Modes used in the Model 1088. At the bottom of each Test Mode, a figure is included to show the data path.

Local Loop

There are two different modes of operation for a Local Loop depending on the status of the units at the time that the Local Loop is initiated. If the units are not in linked (NS LED on) and the Local Loop is initiated, either by the front panel switch or the DTE interface, the unit will enter mode 1. If the units are linked, NS LED off, then the unit will enter a mode 2 Local Loop.

A Mode 1 Local Loop is shown in Figure 12. When the Local Loop is initiated, either by the front panel switch or the DTE interface, the loop will be activated within the local Processor. The data present at the local DTE interface will be looped back to the local DTE by the Loop Control block within the Processor. Any data present on the line or at the far end DTE interface is invalid. The remote unit will remain in the StartUP mode, NS LED on, DSL Link LED stays off, until the local unit is taken out of the Local Loop mode. After the Local Loop is deselected, the units will both be in StartUP mode and the link will be established.

A mode 2 Local Loop is shown in Figure 13. When the Local Loop is initiated, either by the front panel switch or the DTE interface, two separate loop paths will be started. In the first path, data presented to the local DTE interface will be looped back to the local DTE within the framer. In the second path, data presented at the far end DTE will be transmitted to the local DTE and then looped back within the local DTE Loop Control block with the Processor. After the Local Loop is deselected, the units will be placed back into DataMode and the normal data paths will be re-established.

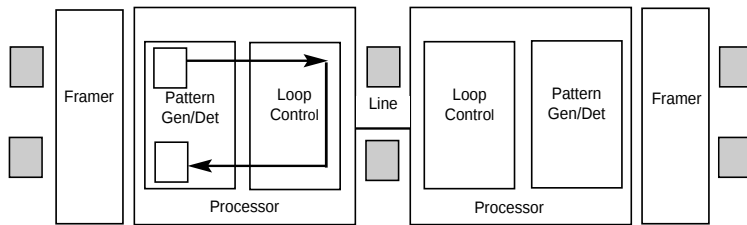


Figure 12. Block Diagram Local Loop Mode 1

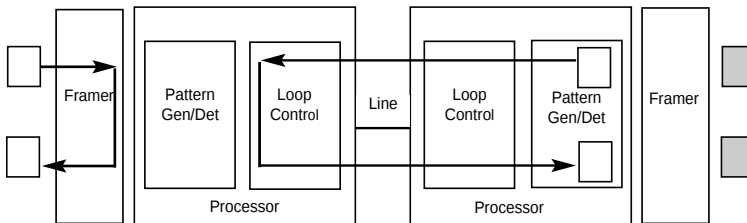


Figure 13. Block Diagram Local Loop Mode 2

Local Loop with 511/511E

When the unit is placed into a Mode 1. Local Loop and the 511/511E pattern generator is activated, the local pattern generator begins sending out a 511/511E pattern to the Loop Control block. The Loop Control block will loop this data back to the 511/511E pattern detector block, which will evaluate the data for errors. Because the 511/511E pattern generator is contained within the Processor the data is unframed so the framer will begin seeing unframed packets. The framer receives this unframed data and can not distinguish this information from a line disconnection (this would cause the units' Restart procedure to start). What we have done to allow this mode to work is to add time outs for the pattern generators. When the 511/511E is initiated, the line restart procedure is changed to one minute. The 511/511E pattern will timeout after 45 seconds. So if the 511/511E is turned on during a local loop, the restart procedure is set to one minute, but the 511/511E pattern will time out after 45 seconds, allowing the framer to begin seeing framed packets (and not restart the box).

Local Loop with 511/511E (continued)

After the 511/511E pattern times out, the ER led will begin flashing. It will remain this way until the pattern generator switch is turned off. Note that the data at the local DTE and the remote DTE are not valid. Because the data is unframed there is no way for the framer to send this data out to the DTE. This is an important distinction because other Patton units will send out the 511 pattern.

When the unit is placed into a Mode 2 Local Loop, the 511/511E pattern generator on the local unit is unavailable for transmission. Figure 15 displays the 511/511E pattern generator, showing that data path connections are not available. The 511/511E pattern generator is still available on the remote unit. For more information on the proper operation of this pattern generator please refer to the "Remote Digital Loop with 511/511E" section.

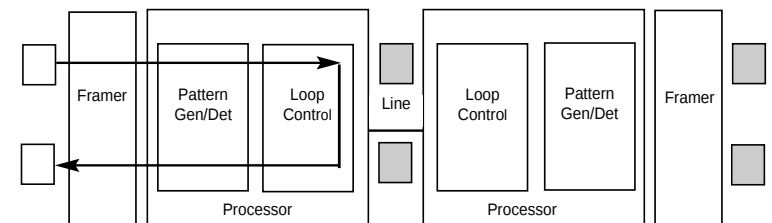


Figure 14. Block Diagram Local Loop Mode 1 with 511/511E

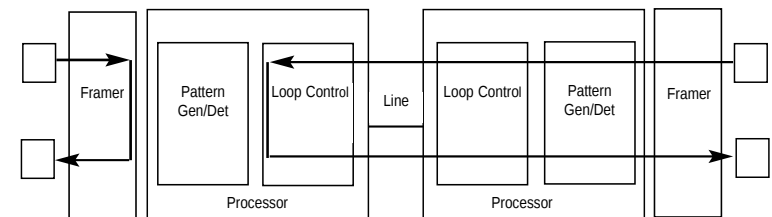


Figure 15. Block Diagram Local Loop Mode 2 with 511/511E

Remote Digital Loop

The Remote Loop uses the EOC channel (an out-of-band signaling channel) to establish the remote link. Upon the RDL switch being thrown or DTE initiation, a RDL_ON Request signal is sent to the remote unit. The Remote unit then responds with an RDL Acknowledge command and the link is established. Data originates at the local DTE and is looped at the Remote PROCESSOR back to the Local DTE. Note that the data is also passed through to the Remote DTE and is not squelched. When a Remote unit enters RDL, it changes its' Restart timeout to one minute (the reason will be explain in the RDL with 511/511E section). If the line is disconnected, the local unit will Restart (NS led activated) after 4 - 6 seconds, but the Remote unit will wait for one minute before it Restarts. Note that the transmit data at the Remote DTE is ignored. When the switch is thrown or the DTE removes the RDL request, the local unit will transmit an RDL_OFF Request to the Remote unit. The local unit will keep its' TM led active until this request has been completely sent out. If the switch is thrown again before the completion of the termination phase the switch will be ignored until it is placed back into the normal position.

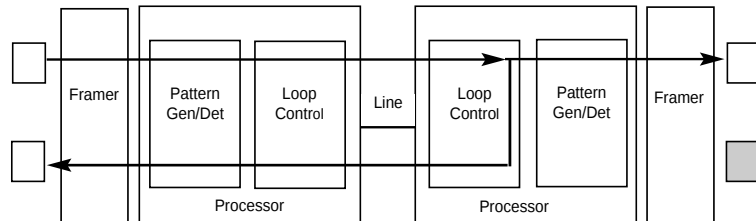


Figure 16. Block Diagram Remote Loop

Remote Digital Loop with 511/511E

The Remote Digital Loop with 511/511E is shown above. After RDL is established the Remote units' Restart Timer is set to one minute. This has been done because when the 511/511E generator is started on the local unit, the Remote framer begins seeing unframed packets. The Remote unit can not distinguish the 511/511E pattern from the line being disconnected so the Restart Timer has been lengthened to allow the pattern generator to function. Once the 511/511E test is started, the Local unit changes its' Restart Timer to one minute. The pattern originates within the Processor and is sent to the Remote unit. It is then looped back to the Local unit where it is evaluated for errors. After 45 seconds, the Pattern Generator will timeout and stops sending the pattern. The ER led will begin blinking until the user turns off the 511/511E switch.

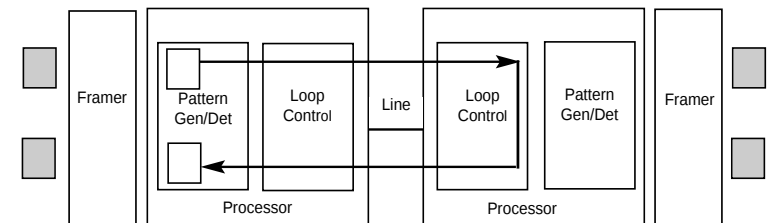


Figure 17. Block Remote Loop with 511/511E

Data Mode with 511/511E Pattern Generators

When the units enter DataMode it is possible to turn on the 511/511E pattern generators on both ends of the link. Once a 511/511E pattern is selected on one end of the link, the pattern generator will begin transmitting unframed 511/511E through the line to the Remote end. A possible problem with this test can occur due to the Restart procedure. Once the Local 511/511E is turned on, the Remote unit begins receiving an unframed 511 pattern. If the Remote unit does not turn on the 511/511E-pattern generator within 4 seconds, the Remote unit will Restart and enter the StartUp mode. Note that once the 511/511E-pattern generator is started the Restart timer is changed to one minute (only on the unit which has the pattern enabled). If both units enable the 511/511E pattern within 4 seconds of each other, both units will be transmitting and receiving the 511/511E pattern. Both framers are now receiving unframed data and will restart after one minute. The 511/511E pattern generators will TimeOut after 45 seconds re-enabling the normal data path. The ER led will begin flashing until the user terminates the test.

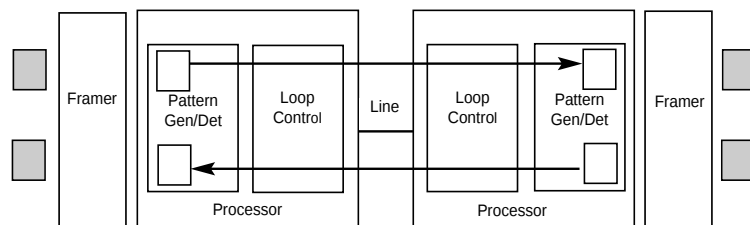


Figure 18. Block Diagram DataMode with 511/511E

5.3.3 Using the V.52 (BER) Test Pattern Generator

To use the V.52 BER tests in conjunction with the Remote Digital Loopback tests (or with Local Line Loopback tests), follow these instructions:

1. Locate the "511/511E" toggle switch on the front panel of the 1088 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 sporadically.
2. If the above test indicates no errors are present, 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 glow. A successful "511/E" test will confirm that the link is in place, and that the Model 1088's built-in "511" generator and detector are working properly.

NOTE: The above V.52 BER tests can be used independently of the Remote Digital Loopback tests. This requires two operators: (1) to initiate and monitor the tests at the local Model 1088, and (2) to do the same at the remote Model 1088. In this case, the test pattern sent by each Model 1088 will not be looped back, but will be transmitted down the line to the other Model 1088. While one operator initiates test, the other monitors for errors.

APPENDIX A

PATTON ELECTRONICS G.703 SDSL MODEM SPECIFICATIONS

Clocking Modes:	Network (G.703)
DTE Rate:	All 64k steps from 64 to 2048 kbps
Diagnostics:	V52 compliant (511/511E) pattern generator and detector with error injection mode. Remote Loopback (toward DSL line) and local loopback (toward G.703 network) control by a single front panel switch
LED Status:	The following LEDs are displayed on the front panel: DSL Link (Green Active) - DSL Link Active E1 Link (Green Active) - Valid G.703/G.704 connection LOS (Red Active) - E1 loss of framing NS (Red Active) - No signal DSL Link ER (Flashing Red) - CRC error during normal operation, bit error during pattern generation test TM (Active Yellow) - Test Mode Enabled
Configuration:	Externally accessible dip switches or SNMP managed through 1095RC
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, CTR13
Transmission Line:	Single Twisted Pair
Line Coding:	CAP (Carrierless Amplitude and Phase Modulation)
Line Rates (DSL line):	144, 272, 400, 528, 784, 1040, 1552, 2064,
Line Interface:	Transformer coupled, 1500 VAC isolation
mDSL Physical Connection:	RJ-45, 2 wire, polarity insensitive pins 4 and 5
G.703/G.704 Specific Interface:	Female Dual Coaxial 75 ohm or Female RJ-45 120 ohm
Line rate:	2.048 Mbps
Line coding:	AMI or HDB3 (selectable) HDB3 is the default
Line Framing:	G.703 (unframed) or G.704/G.732 (framed)
Isolation:	1500 Vrms
Physical Connection:	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 1088/K FACTORY REPLACEMENT PARTS AND ACCESSORIES

<u>Patton Electronics Model #</u>	<u>Description</u>
1088/K.....	G.703 mDSL Rocket (CAP)
080551	120V Power Supply
080552	230V Power Supply
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")
07M1088/K.....	User Manual

APPENDIX C

PATTON ELECTRONICS MODEL 1088 TRANSMISSION DISTANCE CHART

Transmission Distance - Patton NetLink mDSL Model 1088								
No Cross Talk								
Line Rate	DTE Rates	26 AWG (0.4mm)			24 AWG (0.5mm)			
kbps		feet	miles	km	feet	miles	km	
144	64, 128	21400	4.0	6.6	30700	5.8	9.4	
272	192, 256	20300	3.8	6.2	30600	5.8	9.4	
400	320, 384	18600	3.5	5.7	29100	5.5	9	
528	448, 512	17400	3.3	5.4	26100	4.9	8.0	
784	576, 640, 704, 768	15800	3.0	4.9	22600	4.3	7.0	
1040	832, 896, 960, 1024	15500	2.9	4.8	22100	4.2	6.8	
1552	1088 - 1536	13600	2.6	4.2	19200	3.6	5.9	
2064	1600 - 2048	12200	2.3	3.8	17200	3.3	5.3	
Cross Talk (49 adjacent CAP pairs)								
Line Rate	DTE Rates	26 AWG (0.4mm)			24 AWG (0.5mm)			
kbps		feet	miles	km	feet	miles	km	
144	64, 128	16992	3.2	5.2	25000	4.7	7.7	
272	192, 256	15088	2.9	4.6	22000	4.2	6.8	
400	320, 384	13264	2.6	4.2	20000	3.8	6.2	
528	448, 512	12300	2.3	3.8	18000	3.4	5.5	
784	576, 640, 704, 768	10216	1.9	3.1	14000	2.6	4.3	
1040	832, 896, 960, 1024	8417	1.6	2.6	12000	2.3	3.7	
1552	1088 - 1536	7107	1.3	2.2	10000	1.9	3.1	
2064	1600 - 2048	5920	1.1	1.8	8000	1.5	2.5	

APPENDIX D

MODEL 1088/K LED DESCRIPTIONS

E1/FE1 LOS DSL Link NS ER TM E1/FE1 LOS DSL Link NS ER TM													
Power ON	G*	R*	off	ON	off	off	G*	R*	off	ON	off	off	
DSL Link	G*	R*	G*	off	off	off	G*	R*	G	off	off	off	
Link Brk	G*	R*	off	off	off	off	G*	R*	off	off	off	off	
Brk+ 10s	G*	R*	off	ON	off	off	G*	R*	off	ON	off	off	
RDL	G*	R*	G*	off	off	ON	G*	R*	G	off	off	ON	
RDL+511	G*	R*	off	off	off	ON	G*	R*	off	off	off	ON	
With DTE Connected							With DTE Connected						
Mark	G*	R*	G*	off	off	off	G*	R*	G	off	off	off	
Space	G*	R*	G*	off	off	off	G*	R*	G	off	off	off	
Data	G*	R*	G*	off	off	off	G*	R*	G	off	off	off	

Link Brk = DSL Link Broken
 Brk+10s = 10 Seconds following Link Break
 G=GREEN
 O=ORANGE
 ON= ON
 off= OFF
 G*=Green if a valid 10Base-T connection is detected.
 R*=Red if a loss of sync on the E1 signal is detected.