USER MANUAL

MODEL 3088RC
RocketLink-G NTU
Rack Mount G.SHDSL
Modem Card

SALES OFFICE
(301) 975-1000
TECHNICAL SUPPORT
(301) 975-1007

1.0 WARRANTY INFORMATION

Patton Electronics warrants all Model 3088RC 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 the 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 performs 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 COMPLIANCE

> **Note** The compliance information in this document applies to Models 3088RC/C/IA and 3088RC/K/K only.

EMC Compliance:

- FCC Part 15, Class A

- EN55022, Class A

Low-Voltage Directive (Safety):

- UL 60950-1/CSA C22.2 N0. 60950-1 listed

- IEC/EN60950-1 2nd edition

- AS/NZS 60950-1

PSTN Regulatory:

- ACTA TIA/EIA/IS-968 A5

- This device is not intended nor approved for connection to the PSTN

1.2 FCC PART 68 (ACTA) STATEMENT

This equipment complies with Part 68 of FCC rules and the requirements adopted by ACTA. On the bottom side of this equipment is a label that contains—among other information—a product identifier in the format *US: AAAEQ##TXXXX*. If requested, this number must be provided to the telephone company.

The method used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by the ACTA.

If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of the equipment. If this happens the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

If trouble is experienced with this equipment, for repair or warranty information, please contact our company. If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.

1.3 RADIO AND TV INTERFERENCE (FCC PART 15)

This device 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 device has been tested and found to comply with the limits for a Class A computing device in accordance with specifications in Subpart B 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 device 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 equip-

ment into a different AC outlet (such that the computing equipment and receiver are on different branches).

1.4 INDUSTRY CANADA NOTICE

This equipment meets the applicable Industry Canada Terminal Equipment Technical Specifications. This is confirmed by the registration number. The abbreviation, IC, before the registration number signifies that registration was performed based on a Declaration of Conformity indicating that Industry Canada technical specifications were met. It does not imply that Industry Canada approved the equipment.

This Declaration of Conformity means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction. Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above condition may not prevent degradation of service in some situations. Repairs to some certified equipment should be made by an authorized maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment. Users should ensure for their own protection that the ground connections of the power utility, telephone lines and internal metallic water pipe system, are connected together. This protection may be particularly important in rural areas.

1.5 CE DECLARATION OF CONFORMITY

We certify that the apparatus identified in this document conforms to the requirements of Council Directive 1999/5/EC on the approximation of the laws of the member states relating to Radio and Telecommunication Terminal Equipment and the mutual recognition of their conformity.

The safety advice in the documentation accompanying this product shall be obeyed. The conformity to the above directive is indicated by the **CE** sign on the device.

1.6 AUTHORIZED EUROPEAN REPRESENTATIVE

D R M Green

European Compliance Services Limited.

Oakdene House, Oak Road

Watchfield,

Swindon, Wilts SN6 8TD, UK

1.7 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 Services at:

• Tel: **+1 (301) 975-1007**

• Email: **support@patton.com**

• URL: **http://www.patton.com**

> **Note** Packages received without an RMA number will not be accepted.

1.8 SAFETY WHEN WORKING WITH ELECTRICITY

WARNING

- Do not open the device when the power cord is connected. For systems without a power switch and without an external power adapter, line voltages are present within the device when the power cord is connected.

- For devices with an external power adapter, the power adapter shall be a listed *Limited Power Source* The mains outlet that is utilized to power the device shall be within 10 feet (3 meters) of the device, shall be easily accessible, and protected by a circuit breaker in compliance with local regulatory requirements.

- For AC powered devices, ensure that the power cable used meets all applicable standards for the country in which it is to be installed.

- For AC powered devices which have 3 conductor power plugs (L1, L2 & GND or Hot, Neutral & Safety/Protective Ground), the wall outlet (or socket) must have an earth ground.

- For DC powered devices, ensure that the interconnecting cables are rated for proper voltage, current, anticipated temperature, flammability, and mechanical serviceability.

- WAN, LAN & PSTN ports (connections) may have hazardous voltages present regardless of whether the device is powered ON or OFF. PSTN relates to interfaces such as telephone lines, FXS, FXO, DSL, xDSL, T1, E1, ISDN, Voice, etc. These are known as "hazardous network voltages" and to avoid electric shock use caution when working near these ports. When disconnecting cables for these ports, detach the far end connection first.

- Do not work on the device or connect or disconnect cables during periods of lightning activity.

WARNING

This device contains no user serviceable parts. This device can only be repaired by qualified service personnel.

WARNING

This device is NOT intended nor approved for connection to the PSTN. It is intended only for connection to customer premise equipment.

CAUTION

Electrostatic Discharge (ESD) can damage equipment and impair electrical circuitry. It occurs when electronic printed circuit cards are improperly handled and can result in complete or intermittent failures. Do the following to prevent ESD:

- Always follow ESD prevention procedures when removing and replacing cards.
- Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the clip to an unpainted surface of the chassis frame to safely channel unwanted ESD voltages to ground.
- To properly guard against ESD damage and shocks, the wrist strap and cord must operate effectively. If no wrist strap is available, ground yourself by touching the metal part of the chassis.

In accordance with the requirements of council directive 2002/96/EC on Waste of Electrical and Electronic Equipment (WEEE), ensure that at end-of-life you separate this product from other waste and scrap and deliver to the WEEE collection system in your country for recycling.

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 this product, please contact Patton Electronics Technical Support at: (301) 975-1007.

2.1 FEATURES

• Symmetrical high data rate DSL (G.SHDSL)

• Data rates up to 4.6Mbps in 64-kbps intervals

• Serial V.35 (DCE only) , X.21 (selectable DCE or DTE), Ethernet (RJ-45), or T1/E1 interface

• RS-232 console port for management and configuration

• Built-in testing and diagnostics

• RocketLink Plug 'n' Play for easy installations

• Interoperable with other Patton G.SHDSL modems

• CE marked

2.2 DESCRIPTION

The Patton Electronics Model 3088RC G.SHDSL RocketLink provides high speed 2-wire connectivity to ISPs, PTTs, and enterprise environ-ments using Symmetrical High-data-rate Digital Subscriber Line (G.SHDSL) technology.

As a symmetric DSL NTU, RocketLink DSL offers the same data rates in both directions over a single pair of regular twisted pair lines using TC-PAM modulation. Line connection is made with an RJ-45 jack. The Model 3088RC is designed to fit into Patton's 2U (3.5") high rack chassis. This chassis uses a mid-plane architecture which allows front cards to be plugged into different rear cards. For more information, refer to the Model 1001RP14 Manual for more information on the power supply options that are available.

The NTU features externally-accessible DIP switches, loopback diagnos-tics, SNMP/HTTP remote-management capabilities using RocketLink Plug 'n' Play, as well as in-band management.

2.3 SERIAL INTERFACE TYPES

The Model 3088RC versions listed below provide the following types of built-in serial interfaces:

- 3088RC/A/I provides a V.35 interface on an M/34 female connector

- 3088RC/C/AI provides a Ethernet interface on an RJ45 connector

- 3088RC/D/V/V provides a X.21 interface on a DB-15 female connector

- 3088RC/K/K provides a E1 interface on either an RJ48-C connector or dual BNC

3.0 CONFIGURATION

This section describes the location and orientation of the Model 3088RC's configuration switches and jumpers, and provides detailed instructions for all possible settings. Each 3088RC model has different configuration requirements, depending on the card's serial interface.

You can configure the 3088RC using either the software (CLI via a 1001CC port) or the hardware (via DIP switches).

3.1 ABOUT SOFTWARE (CLI) CONFIGURATION

To use software configuration you must set DIP switches S1 and S2 to the *ON* position, and set DIP Switch S3 to the management address, before powering-up the RocketLink-G. When DIP switches S1 and S2 are set to *ON*, the RocketLink-G will operate in software-configuration mode. When set for software-configuration mode the RocketLink-G will read any configuration data previously saved to FLASH memory during system power-up. If no configuration data was previously saved to FLASH, then the RocketLink-G will load the factory-default configuration from FLASH memory. After power-up, you may use console commands or the Embedded Operations Channel (EOC) to modify the configuration parameters.

3.2 ABOUT HARWARE (DIP SWITCH) CONFIGURATION

To use DIP-switch configuration you must first set the DIP switches to a position other than all *OFF* or all *ON* before powering-up the RocketLink-G. When all the DIP switches are set to any position other than all *OFF* or all *ON* the RocketLink-G will operate in hardware (DIP-switch)-configuration mode. In DIP-switch-configuration mode the RocketLink-G will read the DIP-switch settings during system startup and configure itself according to the switch settings.

Once you power-up the RocketLink-G in DIP-switch mode it will operate in DIP-switch mode until powered down. When operating in DIP-switch mode you cannot change any configuration settings:

• Changing the DIP switch settings while the device is running will not modify the operating configuration because the RocketLink-G only reads the DIP switches during system startup.

• If you attempt to modify the configuration by issuing console commands, the device will not execute your commands. Instead, the RocketLink-G will respond with a message indicating the device is operating in DIP-switch-configuration mode.

• If you attempt to modify any configuration parameters via the EOC (by changing (EOC variables), the RocketLink-G will not execute your changes.

3.3 CONFIGURING THE DIP SWITCHES (V.35, X.21, and Ethernet Models)

The Model 3088RC is equipped with three sets of DIP switches, which you can use to configure the RocketLink-G for a broad range of applications. This section describes switch locations and discusses the configuration options available.

Note By default, the RocketLink-G's DIP switches are all set to "ON" so the NTU can be configured via the console. If that is how you will be configuring the NTU, skip ahead to the section on configuring the console.. Otherwise, read the following sections to manually configure the DIP switch settings.
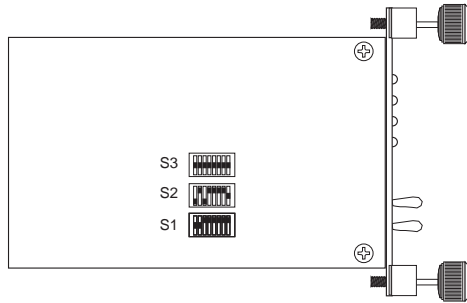
Figure 1. Location of DIP switches on Model 3088RC

The three sets of DIP switches on the Model 3088RC are referred to as S1, S2 and S3. DIP switch orientation with respect to ON and OFF positions is consistent for all switches.

The DIP switches S1 and S2 can be configured as either ON or OFF.

S1			S2	
Position	**Function**		**Position**	**Function**
S1-1	Data Rate		S2-1	Front Panel Switches
S1-2			S2-2	Line Probe
S1-3			S2-3	Annex
S1-4			S2-4	Clock Mode
S1-5			S2-5	
S1-6			S2-6	DTE Loops
S1-7			S2-7	DTE Interface Type
S1-8	TX Clock		S2-8	Reserved

S1-1 through S1-7: Data Rate

Switches S1-1 through S1-7 define both the DSL data rate and the serial data rate.

S1-1	S1-2	S1-3	S1-4	S1-5	S1-6	S1-7	Data Rate (kbps)
OFF	ON	ON	ON	ON	ON	ON	64
ON	OFF	ON	ON	ON	ON	ON	128
OFF	OFF	ON	ON	ON	ON	ON	192
ON	ON	OFF	ON	ON	ON	ON	256
OFF	ON	OFF	ON	ON	ON	ON	320
ON	OFF	OFF	ON	ON	ON	ON	384
OFF	OFF	OFF	ON	ON	ON	ON	448
ON	ON	ON	OFF	ON	ON	ON	512
OFF	ON	ON	OFF	ON	ON	ON	576
ON	OFF	ON	OFF	ON	ON	ON	640
OFF	OFF	ON	OFF	ON	ON	ON	704
ON	ON	OFF	OFF	ON	ON	ON	768
OFF	ON	OFF	OFF	ON	ON	ON	832
ON	OFF	OFF	OFF	ON	ON	ON	896
OFF	OFF	OFF	OFF	ON	ON	ON	960
ON	ON	ON	ON	OFF	ON	ON	1024
OFF	ON	ON	ON	OFF	ON	ON	1088
ON	OFF	ON	ON	OFF	ON	ON	1152
OFF	OFF	ON	ON	OFF	ON	ON	1216
ON	ON	OFF	ON	OFF	ON	ON	1280
OFF	ON	OFF	ON	OFF	ON	ON	1344
ON	OFF	OFF	ON	OFF	ON	ON	1408
OFF	OFF	OFF	ON	OFF	ON	ON	1472
ON	ON	ON	OFF	OFF	ON	ON	1536
OFF	ON	ON	OFF	OFF	ON	ON	1600
ON	OFF	ON	OFF	OFF	ON	ON	1664
OFF	OFF	ON	OFF	OFF	ON	ON	1728
ON	ON	OFF	OFF	OFF	ON	ON	1792
OFF	ON	OFF	OFF	OFF	ON	ON	1856
ON	OFF	OFF	OFF	OFF	ON	ON	1920
OFF	OFF	OFF	OFF	OFF	ON	ON	1984
ON	ON	ON	ON	ON	OFF	ON	2048
OFF	ON	ON	ON	ON	OFF	ON	2112
ON	OFF	ON	ON	ON	OFF	ON	2176

S1-1	S1-2	S1-3	S1-4	S1-5	S1-6	S1-7	Data Rate (kbps)
OFF	OFF	ON	ON	ON	OFF	ON	2240
ON	ON	OFF	ON	ON	OFF	ON	2304
OFF	ON	OFF	ON	ON	OFF	ON	2368
ON	OFF	OFF	ON	ON	OFF	ON	2432
OFF	OFF	OFF	ON	ON	OFF	ON	2496
ON	ON	ON	OFF	ON	OFF	ON	2560
OFF	ON	ON	OFF	ON	OFF	ON	2624
ON	OFF	ON	OFF	ON	OFF	ON	2688
OFF	OFF	ON	OFF	ON	OFF	ON	2752
ON	ON	OFF	OFF	ON	OFF	ON	2816
OFF	ON	OFF	OFF	ON	OFF	ON	2880
ON	OFF	OFF	OFF	ON	OFF	ON	2944
OFF	OFF	OFF	OFF	ON	OFF	ON	3008
ON	ON	ON	ON	OFF	OFF	ON	3072
OFF	ON	ON	ON	OFF	OFF	ON	3136
ON	OFF	ON	ON	OFF	OFF	ON	3200
OFF	OFF	ON	ON	OFF	OFF	ON	3264
ON	ON	OFF	ON	OFF	OFF	ON	3328
OFF	ON	OFF	ON	OFF	OFF	ON	3392
ON	OFF	OFF	ON	OFF	OFF	ON	3456
OFF	OFF	OFF	ON	OFF	OFF	ON	3520
ON	ON	ON	OFF	OFF	OFF	ON	3584
OFF	ON	ON	OFF	OFF	OFF	ON	3648
ON	OFF	ON	OFF	OFF	OFF	ON	3712
OFF	OFF	ON	OFF	OFF	OFF	ON	3776
ON	ON	OFF	OFF	OFF	OFF	ON	3840
OFF	ON	OFF	OFF	OFF	OFF	ON	3904
ON	OFF	OFF	OFF	OFF	OFF	ON	3968
OFF	OFF	OFF	OFF	OFF	OFF	ON	4032
ON	ON	ON	ON	ON	ON	OFF	4096
OFF	ON	ON	ON	ON	ON	OFF	4160
ON	OFF	ON	ON	ON	ON	OFF	4224
OFF	OFF	ON	ON	ON	ON	OFF	4288
ON	ON	OFF	ON	ON	ON	OFF	4352
OFF	ON	OFF	ON	ON	ON	OFF	4416
ON	OFF	OFF	ON	ON	ON	OFF	4480
OFF	OFF	OFF	ON	ON	ON	OFF	4544
ON	ON	ON	OFF	ON	ON	OFF	4608

S1-8: TX Clock

S1-8	Setting	Description
ON	Normal	TD sampled on falling edge of TX clock.
OFF	Inverted	TD sampled on rising edge of TX clock.

S2-1: Front Panel Switches

The 3088RC uses front panel switches to control test modes. They may be disabled so that the 3088RC ignores them.

S2-1	Front Panel Switches
ON	Disabled
OFF	Enabled

S2-2: Line Probe

Line probe is a mechanism that determines the highest rate (192K to 2304K) that the DSL link can reliably support. This takes place during training. The DSL rate will be set to the rate that line probe determines. Note that both the CO and CPE unit must have line probe enabled for it to take effect.

Line probe could be used to determine the best rate the line will support, and then the user could set the units for that rate and disable line probe so that the rate won't change without the user's knowledge.

S2-2	Line Probe
ON	Disabled
OFF	Enabled

S2-3: Annex A/B

Annex A is typically used in North American-like networks, whereas Annex B is typically used in European-like networks. The different annexes specify different PSD (power spectral density) masks because of the difference in T1 and E1 PSDs.

S2-3	Annex
ON	A
OFF	B

S2-4 through S2-5: Clock Mode

The RocketLink-G can operate in one of three clock modes: *internal*, *external*, or *receive-recover*.

S2-4	S2-5	Clock Mode	Description
ON	ON	Internal	The on-board oscillator in the 3088RC provides clock for both serial and DSL lines.
OFF	ON	External	3088RC uses the RX clock from the serial interface as the clock for the DSL link.
ON	OFF	Receive-Recover	3088RC uses the RX clock from the DSL line as the clock for the serial interface.
OFF	OFF		Reserved

X.21 operation. There are a few things to note about clock modes and X.21 operation.

— One X.21 modem must be set to *Receive-Recover.* The other X.21 modem must be set to either *Internal* or *External/Network* clock mode.

— The X.21 modem that is configured as *Receive-Recover* must be DCE.

— The X.21 modem that is configured as *Internal* must also be DCE, but if it is an *External/Network* clock, then the modem must be configured as DTE.

	CPE-Side Modem	CO-Side Modem	
	Receive-Recover	Internal	External/Network
Modem's X.21 Orientation	DCE	DCE	x
	DCE	x	DTE

Ethernet operation. The 3088RC/C/AI model does not recover clock from the Ethernet network because it is packet-based rather than TDM. Therefore, the external clock mode is not valid.

S2-6: DTE Loops

The V.35 interface provides two pins, one to request an LAL and the other to request an RDL. If DTE loops are enabled, the 3088RC/A/I will start a local loopback or a remote loopback when these pins are asserted. If DTE loops are disabled, these requests will be ignored.

S2-6	Setting
ON	Enabled
OFF	Disabled

S2-7: DTE Interface Type

The DTE interface type needs to be set based on the rear module. Set to E1 if using the /K model. Set to normal if using any other model.

S2-7	DTE Interface Type
ON	E1
OFF	Normal

S3-1 through S3-8: Management Address

Each rack card in a chassis must have a unique management address. The 1001CC and 1001MC use this address to activate and deactivate the rack card's management interface. This is necessary because all rack cards in a chassis communicate over the same bus, so only one card can be active at a time.

This address can be set to any value between 0 and 255. Set S3 to the binary representation of the number (ON=0 and OFF=1). S3-8 is the most significant bit.

3.4 ABOUT SYSTEM RESET MODE

To enter system reset mode, switch all DIP switches to the OFF position and power cycle the unit. You can use a VT100 emulator configured for 19200 bps/1 stop bit/ no parity/ XON-XOFF flow control to access the console. Upon restart, you will see the message "Reset Mode". The 3088RC automatically communicates through the 1001CC in reset mode, and does not wait for its address.

System reset mode provides two functions: software upgrades and configuration reset to factory defaults.

Software Upgrades

The software is upgraded by waiting for the Reset Mode message. Then, the user can send an Intel HEX file supplied by Patton. After the VT100 emulator has finished sending this file, the 3088RC will respond with a mes-sage stating how many errors were detected. The user may then set the DIP switches to the desired configuration and power cycle the unit to run the upgraded software.

Configuration Reset to Factory Defaults

To recover from a forgotten password, the user may reset the unit to its factory configuration. After seeing the Reset Mode message, the user should type the '*' key. This will result in a ':' prompt. At the prompt, the user should enter the command reset. This will restore the unit to the fac-tory configuration. The unit can then be restarted with the settings in place.

3.5 CONFIGURING THROUGH THE CONSOLE

The 3088RC offers a console command line interface. To access the console, use a VT100 emulator configured to 9600 bps, 1 stop bit, no parity, and XON-XOFF flow control. Use the 1001CC to access the con-sole. Type CTRL+B <address> <enter> to activate the console. Log into the unit using the default password. No username will be needed.

> **Note**   Log in with the default password ***superuser***.

You can configure the following variables through the console:

- **Password**: The password used to login to the console.

- **Circuit ID**: The circuit ID communicated to other units via EOC. EOC (Embedded Operations Channel) is an out-of-band channel specified in the G.991.2 standard for SHDSL. We use standard EOC messages for our remote loopback. The 3088RC also supports proprietary EOC messages that allow a 3096RC to configure it.

- **Clock Mode:** The following options are available:

    — Internal: The internal oscillator in the 3088RC provides the clock to both the serial/T1/E1 and DSL interfaces.

    — External: The serial interface provides the clock for the DSL interface (V.35, X.21). It must be set to *DTE* for the X.21 inter-face. (This mode is invalid for the Ethernet model).

    — Receive Recover: The 3088RC recovers the clock from the DSL interface and provides it to the serial/E1 interface.

- **Data Rate**: Both the serial/E1 and DSL data rates are set by specifying the number of 64k timeslots.

- **Annex**: Either G.991.2 Annex A or Annex B.

- **DTE Interface Type**: Either E1 or a normal serial interface.

- **DSL Error Monitor Max Interval Errors**: The number of errors allowed in an interval before considering the interval errored. A value of '0' disables the DSL error monitor.

- **DSL Error Monitor Interval Time**: The length in seconds of an interval.

- **DSL Error Monitor Interval Count**: The number of errored intervals allowed before restarting the DSL link.

- **DSL Error Monitor Total Intervals**: The number of intervals to inspect before disabling the error monitor.

- **DSL Error Monitor Startup Delay**: The length in seconds to wait after the DSL link is established before starting the error monitor.

- **Test Modes**: Loopbacks (LAL or RDL) and PRBS (pseudo-random binary sequence) BER tests (511 or 511 with errors)

- **Line Probe**: Enable or disable Line Probe for rate adaptive applications.

The following status information is available through the command line interface:

- **LEDs**: Which software controlled LEDs are currently on.

- **FPSW Settings**: What the front panel switches are set to (if the unit is populated with them).

- **Configuration Mode**: Whether the 3088RC is configured by DIP switches or software.

- **DSL Link State**: *In Progress*, *Success*, *Deactivated*, or *Idle*.

- **DSL Sync State**: *Out of Sync*, *Acquiring Sync*, *In Sync*, or *Losing Sync*.

   Note **DSL Link State vs. DSL Sync State**—The DSL link state describes whether the DSL is training (in progress), linked (success), deactivated (we don't have an option to deactivate the modem, so the user should not see this), or idle.

   The DSL sync state describes whether no sync words have

21

been found (out of sync), there are no sync word errors (in sync), or whether we are transitioning from out of sync to in sync (acquiring sync) or vice versa (losing sync). Typically, when the link is training, the sync state goes from out of sync to acquiring sync to in sync.

- **DSL Actual Rate**: The actual rate at which the DSL link is running (minus DSL overhead).

- **DSL Line Condition**: *Good* or *Poor*.

- **Noise Margin Ratio**: the maximum tolerable increase in external noise power that still allows for BER of less than $1x\ 10^{-7}$.

- **DSL Error Counters**: The following error counters are available:

  — CRC

  — LOSW (Loss of Sync Word)

  — TX FIFO Full

  — TX FIFO Empty

  — TX FIFO Slip

  — TX Stuff

  — RX FIFO Full

  — RX FIFO Empty

  — RX FIFO Slip

Console Help Commands

The following commands are provided to help the user find the correct command:

- **help:** Lists all the commands that the console recognizes.

- **system help:** Lists all the commands that start with **system** that the console recognizes.

- **system set help:** Lists all the commands that start with **system set** that the console recognizes.

- **system show help:** Lists all the commands that start with **system show** that the console recognizes.

- **dsl help:** Lists all the commands that start with **dsl** that the console recognizes.

- **dsl set help:** Lists all the commands that start with **dsl set** that the console recognizes.

- **dsl show help:** Lists all the commands that start with **dsl show** that the console recognizes.

- **dsl show errcntr help:** Lists all the commands that start with **dsl show errcntr** that the console recognizes.

System Configuration Commands

The following commands allow the user to configure the system:

- **system set password <password>:** Sets the system password.

- **system set circuitid <circuitid>:** Sets the circuit ID.

- **system set clockmode <internallexternallreceiverecover>:** Sets the clock mode. Internal clock mode means the 3088RC provides the clock to both the DSL and the serial interface. External clock mode means the 3088RC uses the serial transmit clock as its DSL transmit clock. Receive recover clock mode means that the 3088RC uses the DSL receive clock as its DSL transmit clock and as the serial receive clock.

    Note   **X.21 External Clock Mode**—The X.21 interface expects the DCE to provide the clock used for both transmitting data and for sampling receive data. When the 3088RC/D/V is set as a DCE, it may be used in internal or receive recover clock modes. The DSL generates a clock that is provided to the X.21 interface.

    When the 3088RC/D/V is a DTE, it may be used in external clock mode. The X.21 interface needs to provide the clock. This clock is used by the DSL to sample the serial data and also to update the receive data.

    The 3088RC is set for either DCE or DTE by flipping the daughter-card. The 3088RC is a DCE if DCE points toward the front of the 3088RC.

- **system set dteif <normalle1>:** Set to E1 if the rear card is Model 3088RC/K/K. Set to normal for all other models.

- **system set fpsw <enabledldisabled>:** Enable or disable initiating test modes using the front panel switches.

The following commands allow the user to view the current system configuration:

- **system show config:** Shows the configuration of the entire system, including DSL and serial/T1/E1 lines.

Any changes to the system configuration or the DSL configuration will be lost on the next power cycle unless the changes are saved. The command **system save config** is used to save the changes.

System Status Commands

The following commands show system status:

- **system show status**: Shows the following system status information: LEDs, DSL test mode, front panel switch settings, DSL link state, and configuration mode.

DSL Configuration Commands

The following commands are used to configure the DSL:

- **dsl set timeslots <1−72>:** Sets the number of timeslots. The data rate is calculated by the equation: *data-rate = #timeslots x 64k*.

- **dsl set annex <alb>:** Set the annex.

- **dsl set lineprobe <enabledldisabled>:** Enable or disable line probe.

- **dsl set link <enabledldisabled>:** Enable or disable the DSL port. When disabled, a DSL link cannot be established.

- **dsl set loopback <offllallrdl>:** Start or stop loopbacks.

- **dsl set pattern <offl511l511e>**: Start or stop PRBS generator and BER meter.

- **DSL Error Monitor**

Startup Delay	Interval 1	Interval 2	...	Interval totint
?startdelay$\Rightarrow$	?inttime $\Rightarrow$	?inttime $\Rightarrow$	?inttime $\Rightarrow$	?inttime $\Rightarrow$

The DSL error monitor inspects intervals to see if they have met the error threshold (*maxint*). If the error monitor finds a certain number (*intcnt*) of intervals that meet or exceed the error threshold, it will restart the DSL link. The error monitor will wait (*startdelay*) seconds after the DSL link comes up before it begins monitoring errors. After the startup delay, it will

check the number of errors that have occurred during each (*inttime*) seconds to see if they meet the error threshold. The error monitor inspects (*totint*) intervals before it stops.

> **Note** Setting **maxint** to *0* disables the error monitor and setting **totint** to *0* causes the error monitor to run continuously.

The following commands configure the error monitor:

- **dsl set errmon maxint <maxint>:** Sets the number of errors allowed in an interval causes it to be considered an errored interval. If this is set to '0', then the error monitor is disabled.

- **dsl set errmon inttime <inttime>:** Sets the length of each interval.

- **dsl set errmon intcnt <intcnt>**: Sets the number of errored intervals that causes the DSL link to restart.

- **dsl set errmon totint <totint>**: Sets the number of intervals to inspect for errors before disabling the error monitor. If this is set to '0', then the error monitor will run continuously.

- **dsl set errmon startdelay <startdelay>:** Sets the number of seconds to wait after the DSL link comes up before the error monitor starts inspecting intervals.

Changing the data rate (**dsl set timeslots**), the clock mode (**system set clockmode**), the Annex (**dsl set annex**), or Line Probe (**dsl set lineprobe**), or the DSL error monitor settings will not take effect on the DSL link until the link restarts. The **dsl start** command restarts the DSL link.

DSL Status Command

The **dsl show status** command shows the following DSL status information: link state, sync state, link speed, error counters, line condition, noise margin, and test mode status.

DSL Clear Errcntrs Command

The **dsl clear errcntrs** command clears the error counters.

3.6 CONFIGURING THE V.35 REAR CARD

The V.35 interface card is configured by setting the configuration straps and dip switches located on the PC board.

Model 1001RCM13445 & 1001RCM134TB Strap Settings

Figure 2 shows the strap location for the Model 1001RCM134XX (M/34) rear card. This strap determines whether Signal Ground and Frame Ground will be connected.
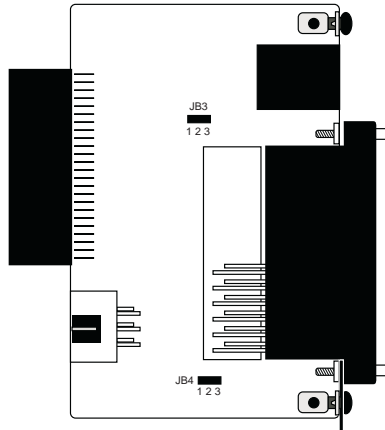

Figure 2. 1001RCM134XX strap locations

The table below provides an overview of interface strap functions for the rear interface cards. Following the table overview are detailed descriptions of each strap's function.

Strap	Function	Position 1&2	Position 2&3
JB3	DTE Shield (Pin A) & FRGND	Connected	Open*
JB4	FRGND & SGND (Pin B)	Connected	Open*

* Indicates default setting

DTE Shield (M/34 Pin A) & FRGND (JB3). In the connected position, this strap links M/34 pin A & frame ground. In the open position, pin A is disconnected from frame ground.

JB3	Description
Position 1&2	DTE Shield (Pin A) and FRGND Connected
Position 2&3	DTE Shield (Pin A) and FRGND Not Connected

SGND & FRGND (JB4). In the connected position, this strap links Signal Ground and frame ground through a 100 ohm resistor. In the open position, signal ground is disconnected from frame ground.

JB4	Description
Position 1&2	SGND and FRGND Connected
Position 2&3	SGND and FRGND Not Connected

3.7 CONFIGURING THE X.21 REAR CARD

The X.21 interface card is configured by setting the configuration straps located on the PC board.

Model 1001RCM11545 & 1001RCM115TB Strap Settings

Figure 3 shows strap locations for the Model 1001RCM115XX (DB-15) rear cards. These straps determine various grounding characteristics for the terminal interface and twisted pair lines. JB3 and JB4 are user configurable.
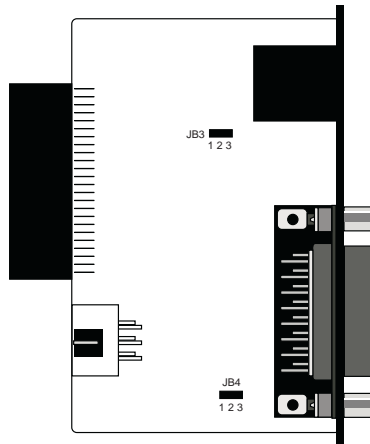

Figure 3. 1001RCM115XX strap locations

The table below provides an overview of interface strap functions for the rear interface cards. Following the table overview are detailed descriptions of each strap's function.

Strap	Function	Position 1&2	Position 2&3
JB3	DTE Shield (Pin1) & FRGND	Connected	Open*
JB4	FRGND & SGND (Pin 8)	Connected	Open*

* Indicates default setting

DTE Shield (DB-15 Pin 1) & FRGND (JB3). In the connected position, this strap links DB-15 pin 1 & frame ground. In the open position, pin 1 is disconnected from frame ground.

JB3	Description
Position 1&2	DTE Shield (Pin 1) and FRGND Connected
Position 2&3	DTE Shield (Pin 1) and FRGND Not Connected

SGND & FRGND (JB4). In the connected position, this strap links DB-15 pin 8 (Signal Ground) and frame ground through a 100 ohm resistor. In the open position, pin 8 is connected directly to frame ground.

JB4	Description
Position 1&2	SGND (Pin 8) and FRGND Connected through a 100-ohm resistor
Position 2&3	SGND (Pin 8) and FRGND Directly Connected

3.8 CONFIGURING THE E1 REAR CARD

The E1 rear card features configuration capability via hardware switches and jumpers. Sections 4.1 and 4.2 describe all switch and jumper configurations for the 3088RC/K model. Section 4.3 describes the configuration required for your mDSL modem.

DIP Switch Configuration

The E1 card has eight internal DIP switches (S1-1 through S1-8). The DIP switches can be configured as either "On" or "Off."

Switch S1-1 : Line Coding. Use Switch S1-1 to control the Network Line Coding options. Set these options to be the same as the Line Coding that has been provided by your Service Provider.

S1-1	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 S1-2 : 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.

S1-2	Option
Off	On
Disabled	Enabled

> **Note** When the data rate is set to 2048 Kbps, K Module transmits user data on all 32 timeslots, ignoring framing information. In this case, Switch S1-2 will be ignored.

Switch S1-3 : Clear Channel Mode. When S1-3 is at Off position, the K Module is running in G.703 clear channel mode. When S1-3 is at On position, the K Module is running in G.704 framed mode. When the K Module is set to framed mode, channel 0 will be used to pass G.704 framing information which results in a maximum bandwidth of 1984kbps for user data.

S1-3	Option
Off	On
Clear Channel Mode (G.703)	Framed Mode (G.704)

Switch S1-4 Through S1-8 : Reserved. Reserved for future use and should be set to OFF.

Jumper Configuration

The 3088RC/K model has four jumpers (two position headers): JP4, JP5, JP6, and JP7. These jumpers are used to select input and output imped-ance matching between the module and external line. See Appendix E for jumper locations.

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

1. For a 75 ohm connection (coax) install JP4 - JP7 (**default**).

2. For a 120 ohm connection (RJ-48C) remove JP4 - JP7.

Making Interface Connections

The 3088RC/K model may be connected to G.703/G.704 ports using a single 120 ohm RJ-48C or a dual 75 ohm coax (BNC). The 3088RC/K model rear panels and the location of these connectors are show below.
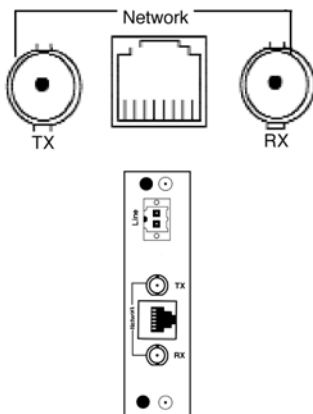

Figure 4. K Module Rear Panels, Showing Location of Connectors

Connect Twisted Pair (120 ohm) to G.703/G.704 Network . The 3088RC/K model 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 connections. The connector pinout and signals are shown in Figure 5.

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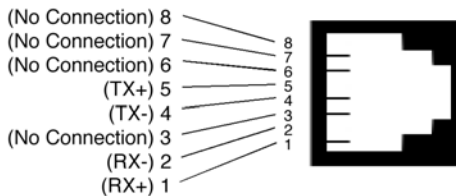

Figure 5. 120 ohm RJ-48C G.703/G.704 Interface

RJ-48C Cable (8-Wire)

3088RC/K SIGNAL	PIN#	G.703/G.704 NETWORK SIGNAL
RX+	1------------------------TX+	
RX-	2------------------------TX-	
TX+	5------------------------RX+	
TX-	4------------------------RX	
Shield	3------------------------Shield	
Shield	6------------------------Shield	

Connect Dual Coaxial Cable (75 ohm) to G.703/G.704 Network. The 3088RC/K model 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, use the diagram below to make the proper connections. The connector pinout and signals are shown in Figure 6.
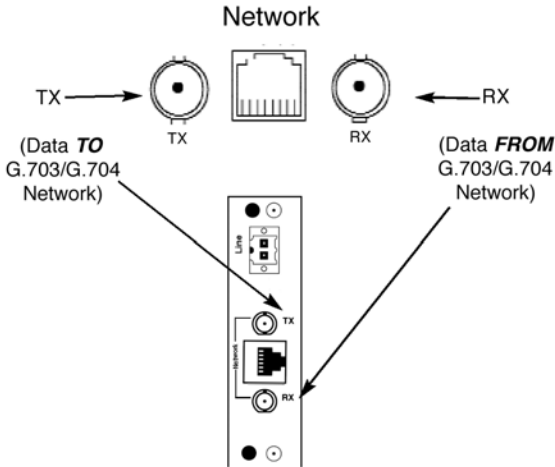

Figure 6. 75 ohm Dual Coaxial G.703 Interface

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

3.9 CONNECTING THE ETHERNET REAR CARD

The Model 3088RC/C/AI module plugs into Patton's1092ARC and 3088RC modems to provide Ethernet LAN extension. The 3088RC/C/AI has no switches or jumpers and does not need to be configured. However, factors such as the type of medium, throughput across the link and clocking mode must be determined by the settings of the baseband modems. Please refer to your baseband modem (i.e. 1092, and 1095) to make the following settings.

1. **Bit Rate:** The DTE rate setting of your base unit corresponds to the throughput of your 3088RC/C/AI bridge module. Use higher speeds to allow maximum throughput to your extended LAN. Use lower speeds to limit the access of your extended LAN.

   Note   The 3088RC/C/AI only supports synchronous speeds.

2. **Clocking Mode:** Set the clocking modes on the base units so that one unit is configured for Internal clocking mode and the other unit is set for Receive Recover clocking mode.

BASE UNIT CLOCK MODES	
Unit "A"	Unit "B"
Internal Clock Setting	Receive Recover Clock Setting

NOTE: Unit "A" and Unit "B" are arbitrarily chosen. It does not matter which unit is "A", and which is "B".

3. When using the 3088RC/C/AI, DISABLE, the "Enable Loop from DTE" Switch on the front function card (1092ARC or 3088RC).

4. All other base unit settings depend upon your application and on the application medium (twisted pair or coaxial cable)

Connecting the Interface Driver Board

This package contains an interface driver board that allows you to configure your front function card for ethernet operation. Figure 7 shows the Interface Driver Board connected to a Model 3088RC front function card.
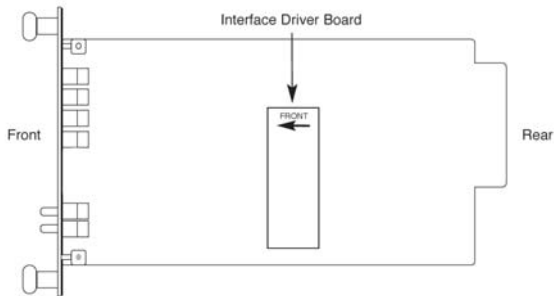

Figure 7. Driver Board mounted on Model 3088RC

Follow the instructions below to connect the interface driver board to the front function card:

1. With the function card (such as 3088RC, shown above) pulled out of the NetLink rack or clusterbox chassis, locate the driver board to be replaced on the top of the base unit front card.

2. Lift the old interface board gently off of the printed circuit board.

3. Position the 3088RC/C/AI driver board on top of the function card's pc board with the sockets oriented toward the male pins. Please be sure the label marked FRONT is pointed toward the front of the function card (toward the LEDs).

4. Push the Interface Driver Board gently onto the socket and re-install the function card into the rack or cluster system.

Connecting to the 10Base-T Ethernet Port

The Model 3088RC/C/AI provides line side connections through a terminal block or through a RJ-45 connector. Figure 8 below, shows the rear panel options and the locations of the connectors.
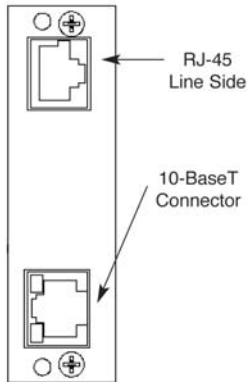

Figure 8. 3088RC/C/AI Ethernet Port

The RJ-45 Ethernet port on Model 3088RC/C/AI is designed to connect directly to a 10BaseT network. Figure 9 shows the 10BaseT RJ-45 port pin description. You may make connections up to 330 feet using Type 4 or 5 cable.
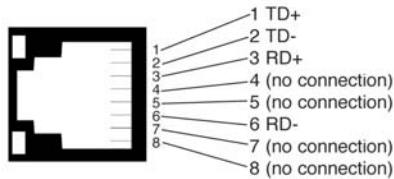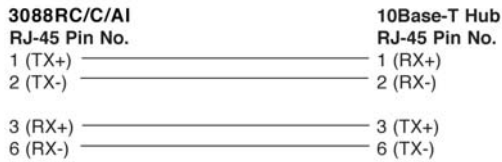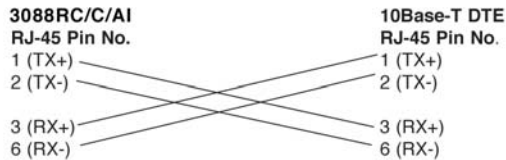

Figure 9. Model 3088RC Ethernet Connector Pinout

Connecting the 10Base-T Ethernet Port to a Hub . The Model
3088RC/C/AI 10Base-T interface is configured as DTE (Data Terminal
Equipment), just like a 10Base-T network interface card in a PC. There-
fore, it "expects" to connect to a 10Base-T Hub using a straight-through
RJ-45 cable. Use the diagram below to construct a cable to connect the
3088RC/C/AI to a 10Base-T Hub.

```
3088RC/C/AI                        10Base-T Hub
RJ-45 Pin No.                      RJ-45 Pin No.
1 (TX+) ──────────────────────────  1 (RX+)
2 (TX-) ──────────────────────────  2 (RX-)

3 (RX+) ──────────────────────────  3 (TX+)
6 (RX-) ──────────────────────────  6 (TX-)
```

Connecting the 10Base-T Ethernet Port to a PC (DTE). The Model
3088RC/C/AI 10Base-T interface is configured as DTE (Data Terminal
Equipment). If you wish to connect the 3088RC/C/AI to another DTE
device such as a 10Base-T network interface card in a PC, you must
construct a 10Base-T crossover cable as shown in the diagram below.

```
3088RC/C/AI                        10Base-T DTE
RJ-45 Pin No.                      RJ-45 Pin No.
1 (TX+) ─┐                     ┌─  1 (TX+)
2 (TX-) ─┼─┐                 ┌─┼─  2 (TX-)
         │ │                 │ │
3 (RX+) ─┘ │                 │ └─  3 (RX+)
6 (RX-) ───┘                 └───  6 (RX-)
```

Connecting the Line Interface. The Model 3088RC/C/AI is to be used
with Patton function card access products (i.e. 1092ARC) There are two
essential requirements for connecting the line interface on Model
3088RC/C/AI:

1. These units work in pairs with one 3088RC/C/AI connected to
   another 3088RC/C/AI (or IM1/I) over 2 or 4-Wire Twisted pair (2 or
   4-Wire operation is determined by the front function card).

2. To function properly, the Model 3088RC/C/AI needs one or two
   twisted pairs of metallic wire (two or four wire). The twisted pairs
   must be unconditioned, dry, metallic wire, between 19 (.9mm) and
   26 AWG (.4mm) (Appendix B describes cable requirements) . Stan-
   dard dial-up telephone circuits, or leased circuits that run through

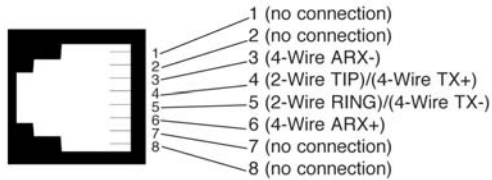signal equalization equipment, or standard, flat modular telephone type cable, are not acceptable.

Figure 10. RJ-45 Line Interface

Note Two-Wire Modems use RJ-45 pins 4 and 5 and 4-Wire Modems use RJ-45 pins 3, 4, 5 and 6, as shown above. Please see the Function Card User Manual for more details.

LED Status Monitors

The Model 3088RC/C/AI features two LEDs that monitor general operating status and the 10Base-T twisted pair link integrity. Figure 11 shows the LEDs located directly beneath the RJ-45 jack.
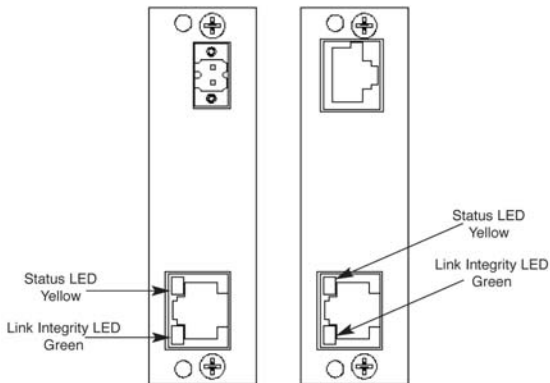
Figure 11. 3088RC Rear Panel, LED Locations

Status. Blinks yellow from one to eleven times to indicate system status. Each pulse pattern is separated by a 2 second "off" period. Greater pulse patterns have higher priority (buffer saturation has greater priority than an empty MAC table). Valid system statuses are:

- 1 pulse = system status ok

- 2 pulses = No MAC entries in the MAC address table

- 3 pulses = Clear to send (CTS) or Carrier Detect (DCD) from base unit are not asserted

- 4 pulses = IMRC2/IA buffer is saturated

- 5 pulses = WAN receive frame(s) too large

- 6 pulses = WAN receive frame(s) not Octet aligned

- 7 pulses = WAN receive frame(s) aborted

- 8 pulses = Detected WAN receive frame(s) with bad CRC

- 9 pulses = Detected LAN receive frame(s) too large

- 10 pulses = Detected LAN receive frame(s) not Octet aligned

- 11 pulses = Detected LAN receive frame(s) with bad CRC

After a status code is displayed eight times and the associated condition is removed, the status code will no longer appear.

Link. Glows green to indicate good link integrity on the 10Base-T twisted pair line.

3.10 CONNECTING THE 10/100 ETHERNET REAR CARD

The Model 3088RC/C/AI-100B module plugs into Patton's 3088RC modem to provide Ethernet LAN extension. The 3088RC/C/AI-100B has a jumper that needs to be configured. The jumper at J7 should be factory installed on pins 1 and 2. Factors such as the type of medium, through-put across the link and clocking mode must be determined by the settings of the 3088 standalone modem. Please refer to your 3088 standalone modem to make the following settings.

1. **Bit Rate:** The DTE rate setting of your base unit corresponds to the throughput of your 3088RC/C/AI-100B bridge module. Use higher speeds to allow maximum throughput to your extended LAN. Use lower speeds to limit the access of your extended LAN.

   Note The 3088RC/C/AI-100B only supports synchronous speeds.

2. **Clocking Mode:** Set the clocking modes on the base units so that one unit is configured for Internal clocking mode and the other unit is set for Receive Recover clocking mode.

BASE UNIT CLOCK MODES	
Unit "A"	Unit "B"
Internal Clock Setting	Receive Recover Clock Setting

NOTE: Unit "A" and Unit "B" are arbitrarily chosen. It does not matter which unit is "A", and which is "B".

3. When using the 3088RC/C/AI-100B, DISABLE, the "Enable Loop from DTE" Switch on the front function card.

4. All other base unit settings depend upon your application and on the application medium (twisted pair).

Connecting the Interface Driver Board

This package contains an interface driver board that allows you to configure your front function card for ethernet operation. Figure 12 shows the Interface Driver Board connected to a Model 3088RC front function card.
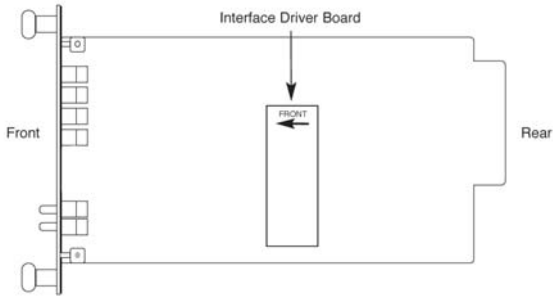

Figure 12. Driver Board mounted on Model 3088RC

Follow the instructions below to connect the interface driver board to the front function card:

1. With the function card pulled out of the NetLink rack or clusterbox chassis, locate the driver board to be replaced on the top of the base unit front card.

2. Lift the old interface board gently off of the printed circuit board.

3. Position the 3088RC/C/AI-100B driver board on top of the function card's pc board with the sockets oriented toward the male pins. Please be sure the label marked FRONT is pointed toward the front of the function card (toward the LEDs).

4. Push the Interface Driver Board gently onto the socket and re-install the function card into the rack or cluster system.

Connecting to the 10/100BaseTX Ethernet Port

The Model 3088RC/C/AI-100B provides line side connections through a terminal block or through a RJ-45 connector. Figure 13 below, shows the rear panel options and the locations of the connectors.
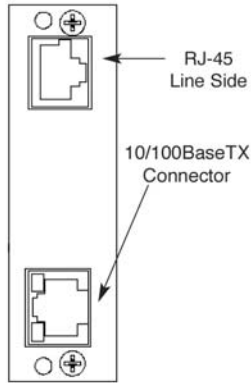

Figure 13. 3088RC/C/AI-100B Ethernet Port

The RJ-45 Ethernet port on Model 3088RC/C/AI-100B is designed to connect directly to a 10/100BaseTX network. Figure 14 shows the 10/100BaseTX RJ-45 port pin description. You may make connections up to 330 feet using CAT5 cable.
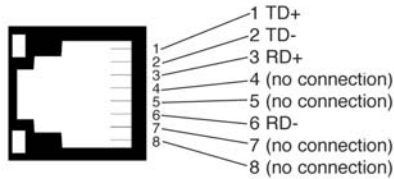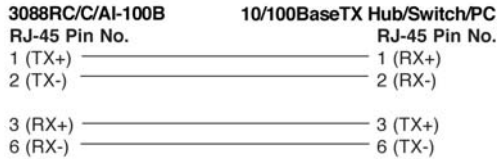

Figure 14. Model 3088RC Ethernet Connector Pinout

Connecting the 10/100BaseTX Ethernet Port to a Hub. The Model 3088RC/C/AI-100B 10/100BaseTX interface is auto-sensing, meaning that it can connect to either a 10/100BaseTX switch, hub or a PC. Use a straight-through or cross-over cable to connect the 10/100BaseTX port. Refer to the wiring diagram below.


```
3088RC/C/AI-100B                    10/100BaseTX Hub/Switch/PC
RJ-45 Pin No.                       RJ-45 Pin No.
1 (TX+) ——————————————————————————— 1 (RX+)
2 (TX-) ——————————————————————————— 2 (RX-)

3 (RX+) ——————————————————————————— 3 (TX+)
6 (RX-) ——————————————————————————— 6 (TX-)
```

Connecting the Line Interface. The Model 3088RC/C/AI-100B is to be used with Patton function card access products.There are two essential requirements for connecting the line interface on Model 3088RC/C/AI-100B:

1. These units work in pairs with one 3088RC/C/AI-100B connected to another 3088RC/C/AI-100B (or 3088/I standalone modem) over 2-wire twisted pair.

2. To function properly, the Model 3088RC/C/AI-100B needs one twisted pair of metallic wire (two wire). The twisted pairs must be unconditioned, dry, metallic wire, between 19 (.9mm) and 26 AWG (.4mm) (Appendix B describes cable requirements). Standard dial-up telephone circuits, or leased circuits that run through signal equalization equipment, or standard, flat modular telephone type cable, are not acceptable.
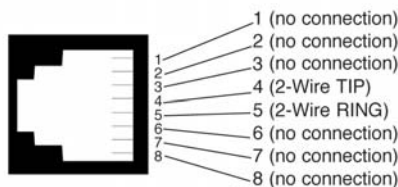


```
1 (no connection)
2 (no connection)
3 (no connection)
4 (2-Wire TIP)
5 (2-Wire RING)
6 (no connection)
7 (no connection)
8 (no connection)
```

Figure 15. RJ-45 Line InterfaceTwo-Wire Modems use RJ-45 pins 4 and 5 and 4-Wire Modems use RJ-45 pins 3, 4, 5 and 6, as shown above. Please see the Function Card User Manual for more details.

LED Status Monitors

The Model 3088RC/C/IA-100B features two LEDs that monitor general operating status and the 10/100BaseTX twisted pair link integrity. Figure 16 shows the LEDs located directly beneath the RJ-45 jack.
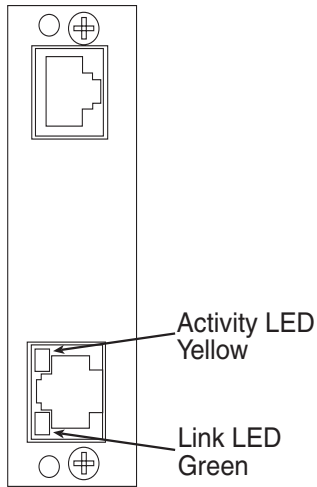
Activity LED
Yellow

Link LED
Green

Figure 16. 3088RC/C/IA-100B Rear Panel, LED Locations

4.0 INSTALLATION

This section describes the functions of the Model 1001R14 rack chassis, tells how to install front and rear Model 3088RC Series cards into the chassis, and how to connect to the twisted pair interface and the serial interface.

4.1 THE MODEL 1001R14 RACK CHASSIS

The Model 1001R14 Rack Chassis (Figure 17) has fourteen short range modem card slots, plus its own power supply. Measuring only 3.5" high, the Model 1001R14 is designed to occupy only 2U in a 19" rack. Sturdy front handles allow the Model 1001R14 to be extracted and transported conveniently.
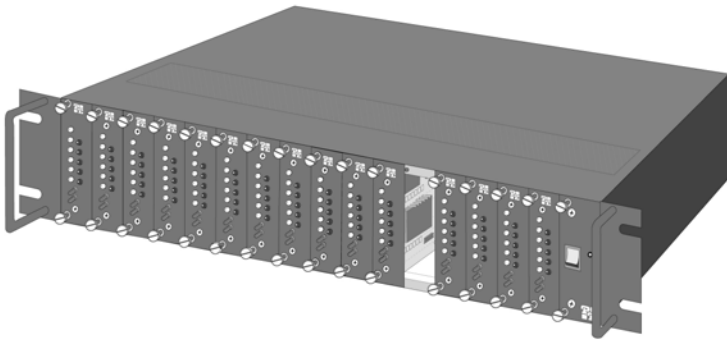

Figure 17. Model 1001R14 Rack Chassis with power supply

The Rack Power Supply

The power supply included in the Model 1001R14 rack uses the same mid-plane architecture as the modem cards. The front card of the power supply slides in from the front, and the rear card slides in from the rear. They plug into one another in the middle of the rack. The front card is then secured by thumb screws and the rear card by conventional metal screws.

⚠ **WARNING**

There are no user-serviceable parts in the power supply section of the Model 3088RC Series. Voltage setting changes and fuse replacement should only be performed by qualified service personnel. Contact Patton Electronics Technical support at (301) 975-1007 for more information.

Powering Up Your 1001R14 Rack

> **Note** The power supplies that come with your 1001R14 rack system are equipped with a power entry connector on the rear card. The power supplies are Hot-Swappable, so you are not required to remove the cards from the rack while applying power to the system.

When a power cable is connected between the unit, and an appropriate power source, a green LED on the front panel will glow to indicate that the unit is working properly. Since the Model 1001R14 is a "hot swappable" rack, it is not necessary for any cards to be installed before applying power. The power may be removed at any time without harming the installed cards.

> **Note** Please refer to the Model 1001RP14 Series User Manual *AC & DC Rack Mount Power Supplies* for fuse and power card replacement information.

4.2 INSTALLING MODEL 3088RC SERIES INTO THE CHASSIS

The Model 3088RC Series is comprised of a front card and a rear card. The two cards meet inside the rack chassis and plug into each other by way of mating 50 pin card edge connectors. Use the following steps as a guideline for installing each Model 3088RC Series into the rack chassis:

1. Slide the rear card into the back of the chassis along the metal rails provided.

2. Secure the rear card using the metal screws provided.

3. Slide the front card into the front of the chassis. It should meet the rear card when it's almost all the way into the chassis.

4. Push the front card gently into the card-edge receptacle of the rear card. It should "click" into place.

5. Secure the front card using the thumb screws.

4.3 CONNECTING THE TWISTED PAIR INTERFACE

The Model 3088RC supports communication between two DTE devices as follows:

⚠️ **CAUTION**

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

Using 24 AWG (0.5 mm) wire up to:

• 32,000 feet (9.7 km) at 192 kbps

• 18,500 feet (5.6 km) at 2.312 Mbps

Using 26 AWG (0.4 mm) wire up to:

• 23,000 feet (7 km) at 192 kbps

• 13,200 feet (4 km) at 2.312 Mbps

Two things are essential:

1. These units work in pairs. Both units at the end of the twisted pair DSL span must be set for the same DTE rate—one unit set as CO, the other as CP.

2. To function properly, the Model 3088RC needs one twisted pair of metallic wire. This twisted pair must be unconditioned, dry, metallic wire, between 19 (0.9mm) and 26 AWG (0.4mm) (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 3088RC's twisted pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationships are shown in Figure 18.
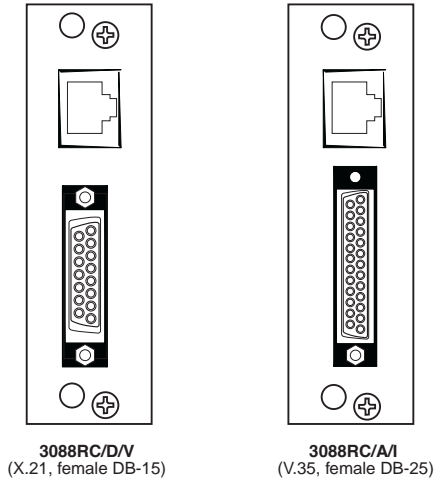

3088RC/D/V
(X.21, female DB-15)

3088RC/A/I
(V.35, female DB-25)

Figure 18. Model 3088RC V.35/X.21 interfaces

4.4 CONNECTING THE MODEL 3088RC/A/I (V.35) SERIAL INTER-FACE

Model 3088RC/A/I supports V.35 serial port connections. This section describes how to connect the serial ports to your V.35 equipment.

⚠ **CAUTION**

The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.

Connecting the Model 3088RC/A/I (V.35) to a "DTE" device

The Model 3088RC/A/I provides a V.35 DCE (data circuit terminating equipment) interface on a M/34 connector. As a DCE, this interface is designed to connect to DTE equipment, such as a router. When connecting the V.35 interface of the Model 3088RC/A/I to your DTE device, use a V.35 straight-through cable. Appendix B.2 on page 61 describes pin assignments and signal sources for the Model 3088RC/A/I V.35 interface.
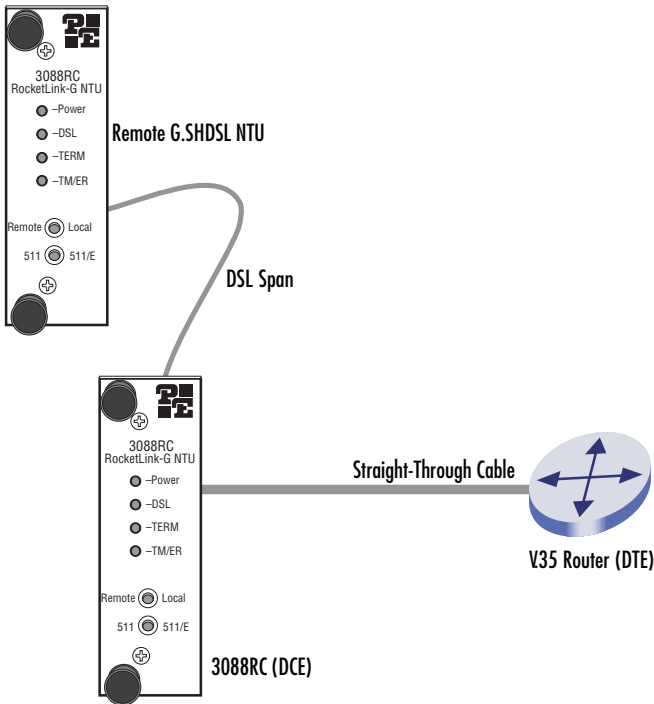

Figure 19. Connecting the Model 3088RC/A/I to V.35 Serial DTE

Connecting the Model 3088RC/A/I (V.35) to a "DCE" device

The Model 3088RC/A/I provides a V.35 DCE (data circuit terminating equipment) interface on a M/34 connector. As a DCE, this interface is designed to connect to DTE equipment, such as a router. However, connecting the 3088RC/A/I to another DCE device, such as a multiplexer or G.703 E1 NTU, requires a tailcircuit cable. When connecting the V.35 interface of the Model 3088RC/A/I to your DCE device, use a V.35 tail circuit cable. Some applications may also require the installation of a tail-circuit buffer to account for small differences in clock frequency between the 3088RC/A/I and the V.35 DCE (multiplexer).
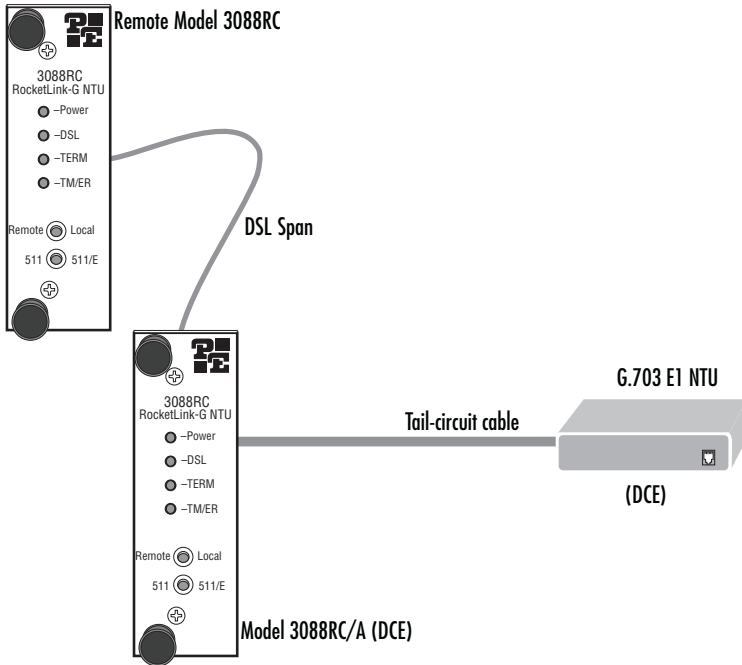

Figure 20. Connecting the Model 3088RC/A/I to V.35 Serial DCE

4.5 CONNECTING THE MODEL 3088RC/D/V (X.21) SERIAL INTER-FACE

Model 3088RC/D/V supports X.21 serial port connections. This section describes how to connect the serial ports to your X.21 equipment.

> ⚠️ **CAUTION**
>
> **The interconnecting cables shall be acceptable for external use and shall be rated for the proper application with respect to voltage, current, anticipated temperature, flammability, and mechanical serviceability.**

Connecting the Model 3088RC/D/V (X.21) to a "DCE" or "DTE" device

The Model 3088RC/D/V provides an X.21 interface on a DB-15 female connector. The X.21 interface default configuration is DCE for connection to DTE (data terminal equipment) such as a router. However, the X.21 interface on the Model 3088RC/D/V may be configured as DTE (data terminal equipment) for connection to DCE such as a modem or multiplexer. When connecting the X.21 interface of the Model 3088RC/D/V to your DTE or DCE device, use an X.21 straight-through cable.
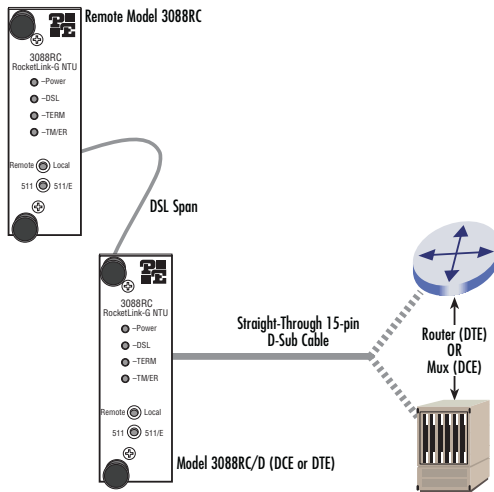

Figure 21. Connecting the Model 3088RC/D/V to X.21 DTE or DCE

The DCE/DTE strap is located on the daughter board. The arrows on the top of the strap indicate the configuration of the X.21 port (for example, if the DCE arrows are pointing toward the front of the rack card, the unit is configured as a DCE). Similarly, if the DTE arrows are pointing toward the front of the rack card, the unit is configured as a DTE.

49

4.6 CONNECTING THE 3088RC/K/K (E1) INTERFACE

The Model 3088RC/K/K is a rear-mountable G.703/G.704 interface card that works with the Patton Model 3088RC function card. The two cards meet inside the rack chassis and plug into each other by way of mating 50 pin card edge connectors. Use the following steps as a guideline for installing each Model 3088RC/K/K and its function card mate into the rack chassis:

1. Slide the rear card into the back of the chassis along the metal rails provided.

2. Secure the rear card using the metal screws provided.

3. Slide the front card into the front of the chassis. It should meet the rear card when it's almost all the way into the chassis.

4. Push the front card gently into the card-edge receptacle of the rear card. It should "click" into place.

5. Secure the front card using the thumb screws.

4.7 CONNECTING THE 3088RC/C/AI (ETHERNET) INTERFACE

The Model 3088RC/C/AI is a rear-mountable ethernet interface card. The two cards meet inside the rack chassis and plug into each other by way of mating 50 pin card edge connectors. Use the following steps as a guideline for installing each Model 3088RC/C/AI and its function card mate into the rack chassis:

1. Slide the 3088RC/C/AI rear card into the back of the chassis along the metal rails provided.

2. Secure the 3088RC/C/AI rear card using the metal screws provided.

3. Slide the front function card into the front of the chassis. It should meet the 3088RC/C/AI rear card when it is almost all the way into the chassis.

4. Push the front card gently into the card-edge receptacle of the rear card. It should "click" into place.

5. Secure the front card using the thumb screws.

5.0 OPERATION

Once the Model 3088RC is properly configured and installed, it should operate transparently. These sections describes functions of the LED status indicators, and the use of the built-in loopback test modes.

5.1 LED STATUS INDICATORS

The Model 3088RC features four front panel LEDs that monitor the operation of the rack card. Figure 22 shows the front panel location of each LED. Table 1 describes each LED's function.
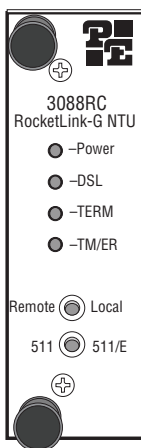

Figure 22. The Model 3088RC Series' front panel LEDs

Table 1: Model 3088RC front panel LED descriptiont

LED	Color	Description
Power	Green	Flashing = POST Solid = Power is on
DSL	Green	Flashing = Training Solid = DSL Link
TERM	Yellow	Solid = Serial port is active
TM/ER	Green	Solid = Test mode is active Blinking = Test mode error

51

5.2 TEST MODES

The 3088RC offers test modes in the form of loopbacks, PRBS pattern generators, and combinations of both (see Figure 22 on page 51). Figure 23 is a block diagram of the Model 3088RC with respect to test modes.
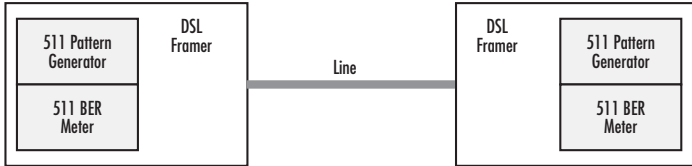

Figure 23. 3088RC Block Diagram

Loopbacks

The 3088RC supports both Local Analog Loopbacks (LAL) and Remote Digital Loopbacks (RDL). These can be initiated either from the optional front panel switches or by the console command dsl set loopback <off|lal|rdl>. The data path for the LAL is shown in Figure 24.
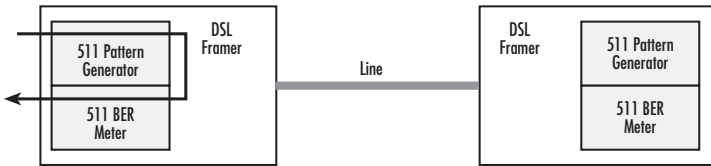

Figure 24. Local Analog Loopback Diagram

The data received from the serial interface is looped back before going out on the DSL line. Note that this loopback occurs after the pattern generator/BER meter. This means that running a 511 pattern in conjunction with an LAL should result in no error detected by the meter. The data path for the RDL is shown in Figure 25.
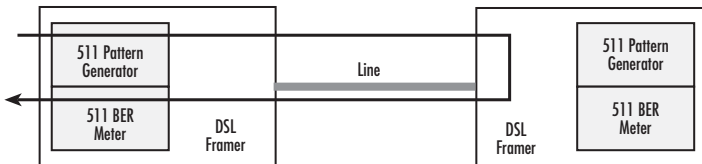

Figure 25. Remote Digital Loopback Diagram

The RDL causes the remote unit to loop the data received from the DSL line back to the DSL line.

52

Patterns

The 3088RC can generate and detect 511 and 511 with Error patterns. These can be initiated either by the optional front panel switches or by the console command dsl set pattern <off|511|511e>. When the pattern is started, the DSL framer uses its internal 511 pattern generator for its DSL TX data instead of the data received from the serial interface. Also, the framer's internal BER Meter tries to detect a 511 pattern in the DSL RX Data.

Because the BER Meter always runs when the pattern generator runs, the meter will detect errors if either the pattern is not either looped back or the remote unit is not transmitting a 511 pattern.

One point to note is that the way errors are generated in the 511E pattern generates CRC errors. This can cause the DSL error monitor to restart the link if the thresholds are set low enough.

5.3 REMOTE CONSOLE OPERATION

The PC user (near-end) may configure and verify status of the remote 3088RC (far-end) via a Remote Console session. The PC user must log onto the 3088RC (near-end) unit to establish a remote console session. Once done, the remote 3088RC (far-end) appears as a unit which is locally connected through the RS-232 console port. All commands are transmitted over the G.SHDSL link in the EOC channel.
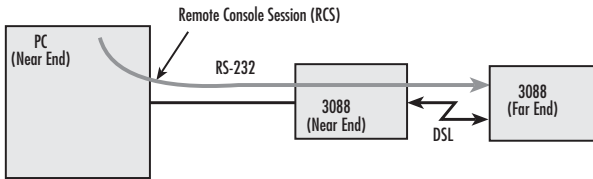

Figure 26. Remote control session Diagram

Establishing a Remote Console Session

How to Connect . The following steps are to establish a connection to the remote 3088RC (far-end) via Remote Console Session (RCS):

1. Configure a terminal emulation program (e.g., Hyperterminal) on PC (near-end) for 9600 bps, 8 data bits, no parity, 1 stop bit, no flow control. Connect it to the 1001CC in the same chassis as the 3088RC (near-end).

2. At the password prompt, log in to the near-end Model 3088RC.

3. Ensure that a DSL link is established. You can verify an established DSL link by using the system show status command or by checking that the DSL LED is solid green. Upon executing the show status command, the dsl link state is shown as success if the DSL link is established.

4. At the command prompt, enter the command remote console.

5. Wait for the message *Console: Remote console connection established.*

   — If a DSL link is not established, or for some other reason the 3088RC (far-end) does not respond in a reasonable amount of time, the following message appears: Console: Remote console timed out trying to con-nect. Enter the command remote console again.

   — If 3088RC (Far End) already has an active remote console session open, you will see the message *Console: Remote console connection request rejected*. This can also happen if the remote 3088RC (far-end) has an established remote console session with the local 3088RC (near-end) which has timed out.

6. Enter the password at the password prompt for the remote console session.

   Note   The passwords for a local console session of the 3088RC (near-end) and the remote console session of the 3088RC (far-end) should be different for the purpose of security.

7. You should now be logged into the remote 3088RC (far-end) via the remote console session. The communication with the remote 3088RC (far-end) is essentially the same as having a local console connection.

   Note   The local or remote 3088RC may be CO or CPE, as long as there is one of each. Either the CO or CPE unit may accept a remote console connection.

   Note   With a remote console session open, a user at PC (far-end) is blocked from using the local console. Upon typing anything, the 3088RC (far-end) sends a message to the PC (far-end) stating *Console: Remote console connection is open*.

Figure 27 is a screenshot of opening a typical remote console session:

Figure 27. Opening a typical remote console session

How to Disconnect . The remote console session ends under any of the following conditions:

• The user enters the command **logout**

• A timeout period of 5 minutes elapses since the user has entered a command to the console.

• The DSL link drops.

The response upon logging out of the remote console session with the command **logout** is *Console: Remote console connection lost*. The following is what is displayed upon a user's logging out of a remote console session after logging in.

```
> remote console
>
Console: Remote console connection established.

password: ******
> logout
Console: Remote console connection lost.
```

>

The timeout period is a fixed, non-configurable parameter of 5 minutes. If the remote 3088RC (far-end) has received no command within 5 minutes, it automatically terminates the RCS. Once the RCS is terminated, the PC (far-end) can establish a local console session if desired. However if the PC (near-end) wishes to re-establish a RCS, it is able to do so whether or not the PC (far-end) is in an active local session, because the RCS has priority over a local console session. If the PC (near-end) establishes an RCS while the PC (far-end) is on a local session, the PC (far-end) is kicked off.

Differences in Local and Remote Control Session Behavior

Since the remote console session communication occurs over the G.SHDSL link's EOC channel, some commands via the RCS have unusual effects.

- **system upgrade**: Do not issue this command via an RCS. A system upgrade must be done via the local console connection. If you should accidentally issue this command over an RCS, the remote 3088RC (far-end) waits indefinitely for input (which is the system upgrade image) from the local console port of the 3088RC (far-end). If this command is entered, 3088RC (Far End) will have to be power-cycled.

⚠️ **CAUTION**

Do not attempt a software upgrade of the remote unit over the Remote Control Session.
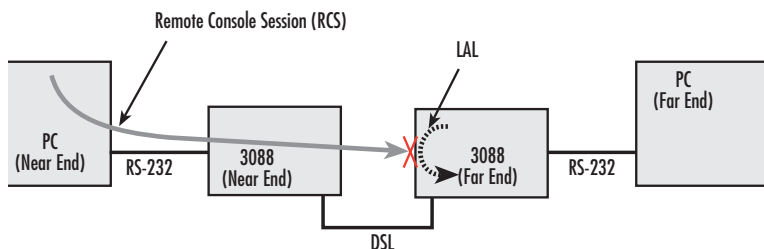

Figure 28. Remote control session with LAL diagram

- **dsl set loopback lal**: Do not issue this command over the RCS to the far-end 3088RC. If the far-end goes into LAL, the near-end and far-end 3088RC NTUs can no longer communicate over the RCS.

CAUTION

Do not issue this command to a far-end unit. If you were to do so, the near-end 3088RC would no longer be able to communicate with the far-end 3088RC.

5.4 SOFTWARE UPGRADE

The Model 3088RC is software upgradeable through the console port. Software images will be available in Intel Hex file format.

The software upgrade feature is available either by powering up the Model 3088RC with all DIP switches set to the *OFF* position, or by entering the **system upgrade** command on the command line interface. The software upgrade takes approximately 5 minutes to complete. The 3088RC will print '.' to the screen while the software upgrade is in process. When the software upgrade completes, it will print a message stating that it is complete and the number of errors, if any, that occurred.

Errors may occur during the software upgrade if the image is corrupt or if there is a disruption in the console port connection. The Model 3088RC will print a message to the console port if it encounters any errors. In the event of an error, the portions of the old image may have been overwritten, and the unit may not be able to boot into operational mode. However, the unit may still boot into the software upgrade, so a new software image can still be loaded to bring the unit back to an operational state.

Here is the software upgrade procedure:

1. Remove all cards from the rack except for the card that you intend to upgrade.

2. Obtain the software image Hex file for the 3088RC.

3. Turn off the Model 3088RC.

4. Make a note of the current DIP switch settings, then set all DIP switches to the *OFF* position.

5. Turn on the Model 3088RC.

6. Configure HyperTerminal for 19200 bps, 8 bits, 1 stop bit, no parity, XON-XOFF.

7. Open Model 3088RC Console (via HyperTerminal or other terminal emulation program).

```
>>Transfer
>>Send Text File...
>>Set "Files of Type:" to "All files (*.*)"
>>Select 033252Z.hex
```

8. When the transfer completes, turn off the Model 3088RC.

9. Set the DIP switches for the proper configuration.

10. Turn on the Model 3088RC. It now operates with the upgraded software.

5.5 RESET CONFIGURATION TO FACTORY DEFAULT

The configuration can be reset to factory defaults from the software reset mode. This allows a user to recover from a forgotten password. To reset to the configuration, follow these steps:

1. Power down the unit.

2. Set all DIP switches to the OFF position.

3. Connect a PC to the Console port.

4. Open a VT100 terminal emulator (such as HyperTerminal). Configure the emulator for 19200 bps, 1 stop bit, no parity, X-ON X-OFF flow control.

   Note   The 3088RC will not wait for its address to be selected when in software reset mode. It will automatically accept data from the 1001CC.

5. Power up the unit. The terminal should display the following message: Reset Mode.

6. Type the '*' key. You will see a ':' prompt.

7. Type the command reset.

8. When the command completes, the unit has been reset to factory configuration.

9. Set the DIP switches to the desired configuration. Power cycle the unit to begin using the new configuration.

APPENDIX A

SPECIFICATIONS

A.1 CLOCKING MODES

Internal, external (V.35 only), or receive recovered

A.2 DTE RATE

All 64k steps from 64 to 4608 kbps

A.3 SERIAL INTERFACE

V.35 (Model 3088RC/A/I), DCE orientation;

X.21 (Model 3088RC/D/V), DCE or DTE orientation depending on orientation of daughter board mounted on the mother board.

E1 (Model 3088RC/K/K) presents G.703/G.704 interface. Either 75 Ohms (unbalanced) or 120 Ohms (balanced). Pins 1 & 2 are Receive. Pins 4 & 5 are Transmit.

A.4 SERIAL CONNECTOR

D-Sub-25 Female (Model 3088RC/A/I)

D-Sub-15 Female (Model 3088RC/D/V)

Dual BNC and RJ48C (Model 3088RC/K/K), strap selectable

A.5 DIAGNOSTICS

V.52 compliant (511/511E) pattern generator and detector with error injection mode controlled by front-panel switch. Local and Remote Loopback control either by a front-panel switch or from the DTE interface.

A.6 STATUS LEDS

- Power (Green): The Power LED glows solid during normal operation. At startup, during the POST, the LED blinks once every second.

- DSL (Green): The DSL LED glows solid when a DSL link is established. While the DSL link is training, it blinks once every second.

- Term (Yellow): The Term LED glows solid when a serial port is active.

- TM/ER (Green): The Test Mode/Error (TM/ER) LED is used to indicate that a test mode is in progress or an error has been detected. It blinks once every second while a test mode is starting. It glows solid while a

test mode is in progress. It blinks once if an error is detected either during a test mode, or in normal DSL operation.

A.7 CONFIGURATION

Configuration is done with either externally accessible DIP switches, CLI or through the EOC (Embedded Operations Channel) from a Model 3096RC G.SHDSL concentration card.

A.8 TRANSMISSION LINE

Single Twisted Pair

A.9 LINE CODING

TC-PAM (Trellis Coded Pulse Amplitude Modulation)

A.10 LINE RATES (DSL LINE)

All nx64 rates from 64 kbps up to 4.6 Mbps

A.11 LINE INTERFACE

Transformer coupled, 2500 VRMS isolation

A.12 G.SHDSL PHYSICAL CONNECTION

RJ-45, 2-wire polarity insensitive pins 4 and 5

A.13 ENVIRONMENT

Operating temp: 32–122°F (0–50°C)

Humidity: 5–95% non-condensing

Altitude: 0–15,000 feet (0–4,600 meters)

APPENDIX B

MODEL 3088RC INTERFACE PIN ASSIGNMENTS

B.1 RJ-11 NON-SHIELDED DSL PORT

Single twisted-pair (TP) for full-duplex transmission. The signals are polarity insensitive.

Pin #	Signal
1	
2	Tip
3	Ring
4	

B.2 V.35 INTERFACE

(M/34F Female Connector: DCE Configuration)

Pin #	Signal
B	SGND (Signal Ground)
C	RTS (Request to Send)
D	CTS (Clear to Send)
E	DSR (Data Set Ready)
F	CD (Carrier Detect)
H	DTR (Data Terminal Ready)
L	LLB (Local Line Loop)
M	TM (Test Mode)
N	RDL (Remote Digital Loop)
P	TD (Transmit Data)
R	RD (Receive Data)
S	TD/ (Transmit Data-B)
T	RD/ (Receive Data-B)
U	XTC (External Transmit Clock)
V	RC (Receive Timing)
W	XTC/ (External Transmit Clock)
X	RC/ (Receive Timing)
Y	TC (Transmit Clock-A)
AA	TC/ (Transmit Clock-B)

B.3 E1 INTERFACE

RJ-48C female connector

Pin #	Signal
1	Receive (Ring)
2	Receive (Tip)
3	Shield
4	Transmit (Ring)
5	Transmit (Tip)
6	Shield
7	No connection
8	No connection

B.4 X.21 INTERFACE

D-sub-15 female connector (DTE/DCE orientation)

Pin #	Signal
1	Frame Ground
2	T - Transmit Data-A (DTE Source)
3	C - Control-A (DTE Source)
4	R - Receive Data-A (DCE Source)
5	I - Indication-A (DCE Source)
6	S - Signal Element Timing-A (DCE Source)
7	BT - Byte Timing-A (DCE Source)
8	SGND - Signal Ground
9	T/ - Transmit Data-B (DTE Source)
10	C/ - Control-B (DTE Source)
11	R/ - Receive Data-B (DCE Source)
12	I/ Indication-B (DCE Source)
13	S/ Signal Element Timing-B (DCE Source)
14	BT/ - Byte Timing-B (DCE Source)

B.5 RS-232 CONSOLE INTERFACE

RJ-45 non-shielded connector (EIA-561)

Pin #	Signal
1	DSR (out)
2	CD (out)
3	DTR (in)
4	Signal Ground
5	RD (out)
6	TD (in)
7	CTS (out)
8	RTS (in)

B.6 ETHERNET INTERFACE

RJ-45 non-shielded connector

Pin #	Signal
1	TD+
2	TD-
3	RD+
4	No connection
5	No connection
6	RD-
7	No connection
8	No connection

NOTES

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____