USER MANUAL

MODEL 2073RC
64k/G.703 Access Converter
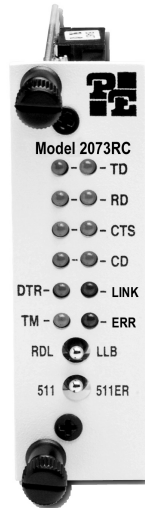
Model 2073RC

TD
RD
CTS
CD
DTR – LINK
TM – ERR
RDL LLB
511 511ER

PATTON Electronics Co.

CONTENTS

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1.0 WARRANTY INFORMATION

Patton Electronics warrants all Model 2073RC 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.

> **Note** Conformity documents of all Patton products can be viewed online at www.patton.com under the appropriate product page.

1.1 RADIO AND TV INTERFERENCE

The Model 2073RC 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 2073RC 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 Model 2073RC 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.

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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 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.

Patton Electronics' technical staff is also available to answer any questions that might arise concerning the installation or use of your Model 2073RC. Technical Service hours: **8 AM to 5 PM EST (8:00 to 17:00 UTC-5), Monday through Friday**.

2.0 GENERAL INFORMATION

Thank you for purchasing this Patton Electronics product. This product has been thoroughly inspected and tested and is warranted for one year for parts and labor. If questions arise during installation or use of this product, contact Patton Electronics Technical Support at **+1 (301) 975-1007**.

2.1 FEATURES

• Bi-directionally converts X.21, V.35 or 10 Base-T to co-directional G.703

• LED indicators monitor Data, Network, and Diagnostic signals

• Internal, external (V.35 only), or network clocking options

• Test Mode controlled by switch, or by local DTE (V.35 version only)

• Complies with CCITT/ITU G.823 Jitter Control Specifications

• Built-in surge protection and transformer isolation

• Point-to-point distance up to 5250 ft (1600m) on 24 AWG twisted pair

• 120-ohm (twisted pair) network termination

2.2 DESCRIPTION

The Patton Model 2073RC interface converter allow a synchronous V.35, X.21 or ethernet device to communicate bi-directionally over the G.703 co-directional PCM network. Supporting internal, external DTE timing or G.703 network generated timing, the Model 2073RC is perfect for networking applications that require speeds of 64 kbps. The modular rear cards style of interchangeable interface modules for the 2073RC allow various physical and electrical interfaces to connect to the 64K synchronous G.703 network.

A 120-ohm twisted pair telephone port provides the interface for the G.703 network. Additionally, 75-ohm terminations can be made using the Patton Model 460 (G.703 balun).

Diagnostics include Local Loopback, V.54 RDL testing, and 511/51E built-in BER patterns. Synchronous clock jitter is attenuated in accordance with the G.823.

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3.0 CONFIGURATION

The 2073RC features configuration capability via hardware DIP switches. This section describes all possible hardware switch configuration. Figure 1 shows the location of the DIP switches on the top of the printed circuit board
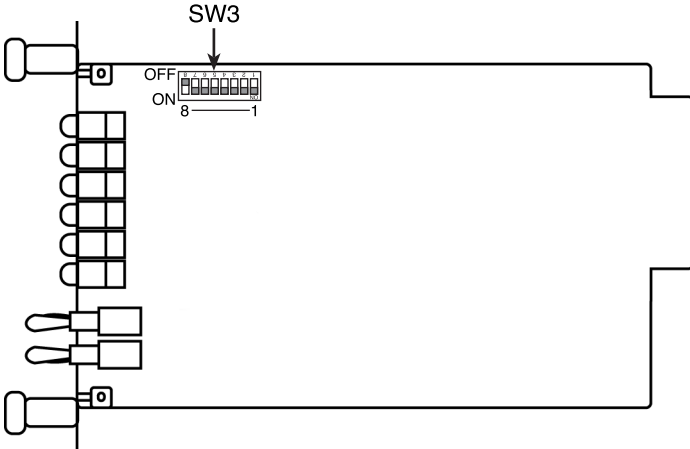
Figure 1. Model 2073RC top view showing location of DIP switches

Figure 2 shows the orientation of the DIP switches with respect to ON/OFF positions.
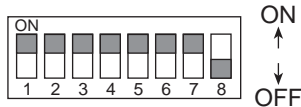
Figure 2. Close-up of DIP switches showing ON/OFF positions

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DIP SW3-8	Not Used
DIP SW3-7	Not Used
DIP SW3-6	**ON = DTE TM Lines Disabled**
	OFF = DTE TM Lines Enabled
DIP SW3-5	ON = FP TM Switches Disabled
	OFF = FP TM Switches Enabled
DIP SW3-4	**ON = V54 RX Disabled**
	OFF = V54 RX Lines Enabled
DIP SW3-3	Not Used
DIP SW3-2 DIP SW3-1	<u>SW3-2</u> <u>SW3-1</u> **OFF** **OFF** **= Internal (Generated by 2073RC)** OFF ON = External (From DTE) ON OFF = Network (Normal) ON ON = Network (Campus)

Note   0 = ON, 1 = OFF

Note   **Boldface** type indicates a factory-default setting.

3.1 CONFIGURING THE FRONT INTERFACE CARD

Switches SW3-2 and SW3-1: Clocking Mode

Use Switch SW3 to set the system clock for the Model 2073RC. When using two Model 2073RC together in a point-to-point application as short range modems, set one unit for either Internal or External transmit clock and the other unit to Network clock. When connecting directly to the G.703 network, set the unit to Network clock.

SW3-2	SW3-1	Clocking Description
OFF	OFF	Internal (Generated by 2073RC)
OFF	ON	External (From DTE)
ON	OFF	Network (Normal)
ON	ON	Network (Campus)

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Switches SW3-5: Front panel switch enabled/disabled

Use Switch SW3-5 to enable or disable the Model 2073RC Test Mode (Local Loop, Remote Digital Loop, and 511/511E patterns).

ON	Front Panel Test Mode Switches Disabled
OFF	Front panel Test Mode Switches Enabled

Switch SW3-6: Response to DTE Request for Local and Remote Loop

Use Switch SW3-6 to enable the Model 2073RC to enter Local Loopback mode when pin interface (V.35 only) is raised. In the On position, the Local Loopback may only be enabled manually by Switch SW3-6.

SW3-6	Activation Description
On	Disabled Model 2073RC ignores DTE requests to enter Local Loopback
Off	Enabled Model 2073RC enters Local Loopback when the appropriate interface pin is raised (see appendix for interface pinout)

Switch SW3-4 Response to Remote digital (RDL) Loopback

Use Switch SW3-4 to enable or disable response to Remote digital Loopback by the local 2073RC when a RDL request is sent by a remote device.

SW3-4	Description
ON	RDL Response Disabled
OFF	RDL Response Enabled

Switch SW3-3 Terminal (DTE) data sampled using the 2073RC Transmit clock or External Clock (provided by V.35 DTEs only)

Use Switch SW3-3 to sample data from DTE using the 2073RC Transmit clock (TC) or External Clock (XC))—normally Transmit clock (from 2073RC) is used.

ON	TD Sampled with XC Source,
OFF	TD Sampled with TC Source

3.2 CONFIGURING THE REAR INTERFACE CARD

Your Model 2073RC comes with one of the following rear cards:

• The Model 1001RCM13448C (M/34/ RJ-48C)

• The Model 1001RCM11548C (DB-15/RJ-48C)

• The Model IM2RC/IA (RJ-45/10Base-T RJ-48C)

Each of these options supports one DTE interface connection and one 4-wire line connection. Figure 3 illustrates the interface options for the Model 2073RC Series.

> **Note** The 2073RC Series function card is paired with a specially designed rear card and must not be swapped with other Patton rear cards.
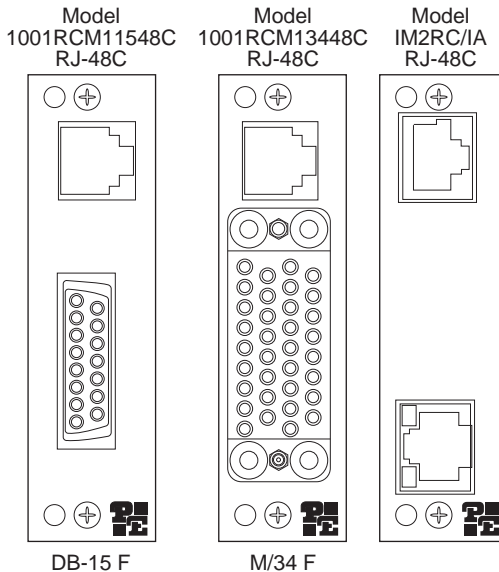
Figure 3. Model 2073RC Series interface card options

Prior to installation, you will need to examine the rear card and make sure it is properly configured for your application.

Each rear card is configured by setting straps located on the PC board. To configure the rear cards, you must set the configuration straps.

Figure 4 shows the orientation of these straps. Each strap can either be on pegs 1 and 2,or on pegs 2 and 3.

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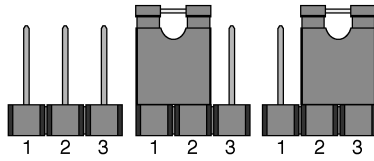
Figure 4. Orientation of Interface Card Straps

The following sections describe the strap locations and possible settings for each rear card.

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Model 1001RCM13448C Strap Settings

Figure 5 shows the strap location for the Model 1001RCM13448C (M/34) rear card. This strap determines whether Signal Ground and Frame Ground will be connected.

Figure 5. 1001RCM13448C strap locations.

Table 1 provides an overview of interface strap functions for the rear interface cards. Following the table overview are detailed descriptions of each strap's function.

Table 1: Interface Card Strap Summary

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			

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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 (see Table 2).

Table 2: JB3 strap settings

Position	Description
1 & 2	DTE Shield (Pin A) and FRGND Connection
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 (see Table 3).

Table 3: JB4 strap settings

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

Model 1001RCM11548C Strap Settings

Figure 6 on page 14 shows strap locations for the Model 1001RCM11548C (DB-15) rear cards. These straps determine various grounding characteristics for the terminal interface and twisted pair lines. JB3 and JB4 are user configurable.
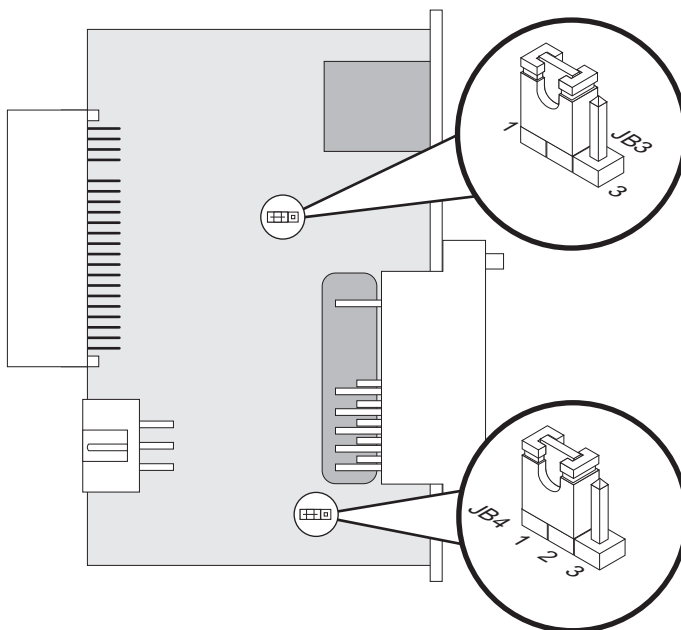
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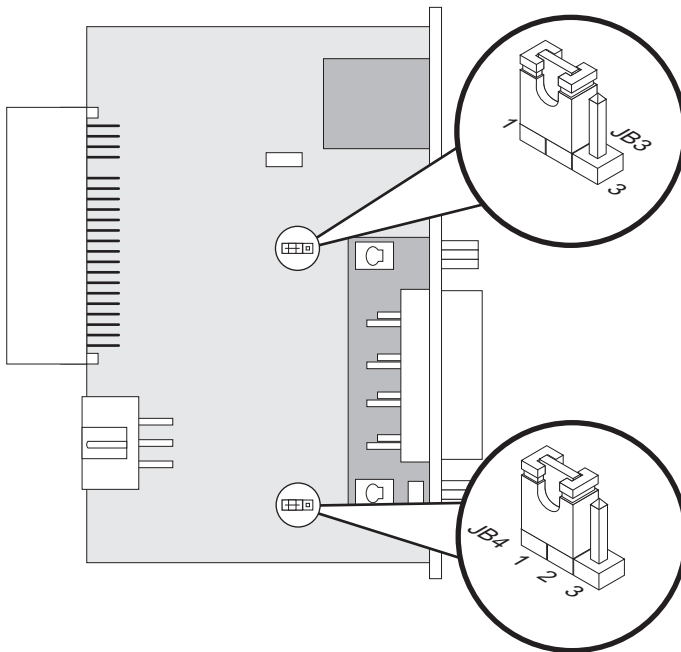
Figure 6. 1001RCM11548C strap locations.

Table 4 provides an overview of interface strap functions for the rear interface cards. Following the table overview are detailed descriptions of each strap's function.

Table 4: Interface Card Strap Summary

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 (see Table 5).

Table 5: JB3 strap settings

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

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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 (see Table 6).

Table 6: JB4 strap settings

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

Model IM2RC/IA (10Base-T Ethernet Rear Card)

There are no jumpers to set in the Model IM2RC/IA, for more information, refer to the Model IM2RC/IA user manual

The Model IM2RC/IA provides line side connections through an RJ-45 connector. Figure 7 shows rear panel options and connectors locations. Descriptions of the 10Base-T connector LEDs follow Figure 7.
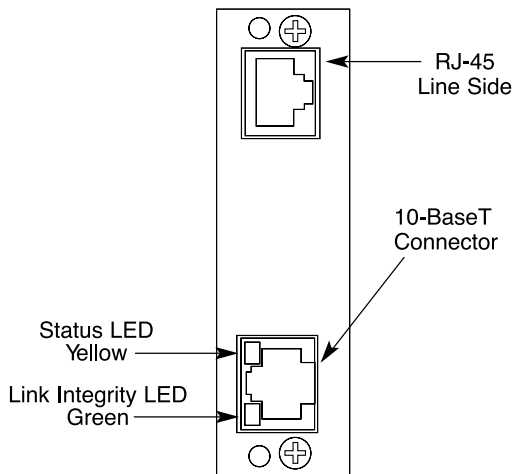
Figure 7. IM2RC/A, rear panel options

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

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- 4 pulses = IMRC2/IAbuffer 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.

The RJ-45 Ethernet port on Ethernet Bridge Module is designed to connect directly to a 10Base-T network. Figure 8 shows the 10Base-T RJ-45 port pin description. You may make connections up to 330 feet using Type 4 or 5 cable.

1 (no connection)
2 (no connection)
3 (4-Wire ARX-)
4 (2-Wire TIP)/(4-Wire TX+)
5 (2-Wire RING)/(4-Wire TX-)
6 (4-Wire ARX+)
7 (no connection)
8 (no connection)
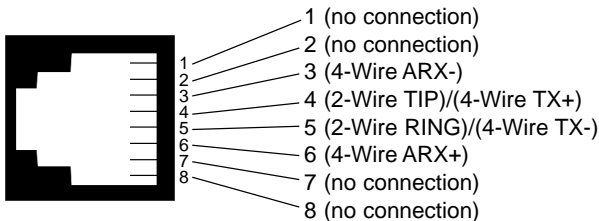
Figure 8. Model IMRC2/IA Ethernet Connector Pinout

Connecting to the network. The Line Interface is an 8-position keyed modular jack configured as an RJ-48C (see. Figure 9). This interface will connect to a 64 kbps/G.703, co-directional network running AMI line coding.

1 RX data (TIP) ⎫ From network
2 RX data (RING) ⎬
3 (no connection)
4 TX data (TIP) ⎫ To network
5 TX data (RING) ⎬
6 (no connection)
7 (no connection)
8 (no connection)

Figure 9. 64 kbps Network Interface

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Note   If the 2073RC is being used for private short-range modem applications, the twisted-pair cable connected to its port will need to be a cross-over cable.

4.0 INSTALLATION

This section describes the functions of the Model 1001R14 rack chassis, tells how to install front and rear Model 2073RC 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 (see Figure 10) has 14 or 16 device card slots, plus a single power supply or dual redundant power supplies. 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 10. Model 1001R14 Rack Chassis with power supply
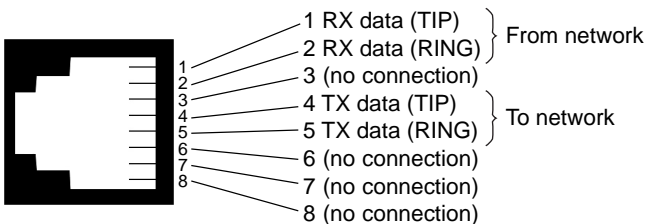
The Rack Power Supply

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 1001R14 rack. Voltage setting changes and fuse replacement should only be performed by qualified service personnel. Contact Patton Electronics Technical support at +1 (301) 975-1007, via our web site at www.patton.com, or by E-mail at support@patton.com, for more information.**

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Powering up your 1001R14 rack

The power supplies that come with your 1001R14 rack system are equipped with a power entry connector on the rear power supply 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.

> **Note** Please refer to the Model 1001R14 Series User Manual AC and DC Rack Mount Power Supplies for fuse and power card replacement information.

4.2 INSTALLING THE MODEL 2073RC INTO THE CHASSIS

The Model 2073RC 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 2073RC 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 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.

> **Note** Since the Model 1001R14 chassis allows "hot swapping" of cards, *it is not necessary to power down the rack* when you install or remove a Model 2073RC.

4.3 CONNECTING TO A DTE DEVICE

The serial port on most rear interface cards are hard-wired as "DCE" (Data Communications Equipment). The interfaces are designed to plug into a DTE such as a terminal, PC or host computer. When making the connection to your DTE device, use a "straight through" cable. When purchasing or constructing an interface cable, refer to the pin diagrams in Appendix B on page 25 as guides.

4.4 CONNECTING TO A DCE DEVICE

The rear interface cards on most interface modules are hard wired as "DCE". Therefore, you must use a tail circuit cable when connecting to a modem or other DCE device. When purchasing or constructing a tail circuit interface cable, use the pin diagrams in Appendix B on page 25 as a guide.

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Note   Pin-out requirements for tail circuit applications vary between equipment manufacturers. If you have any questions about a specific installation, please contact Patton Electronics Technical Support.

4.5 CONNECTING TO A G.703/64 KBPS NETWORK

The Network Line Interface is an 8-position keyed modular jack config-ured as an RJ-48C (see Figure 11).

1 RX data (TIP)
2 RX data (RING)   } From network
3 (no connection)
4 TX data (TIP)
5 TX data (RING)   } To network
6 (no connection)
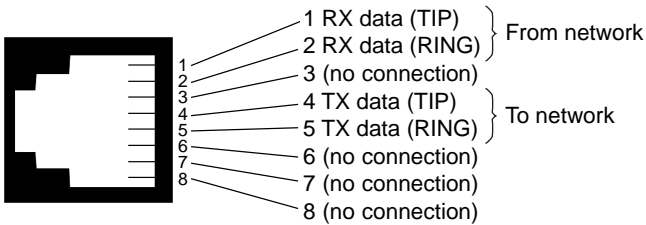7 (no connection)
8 (no connection)

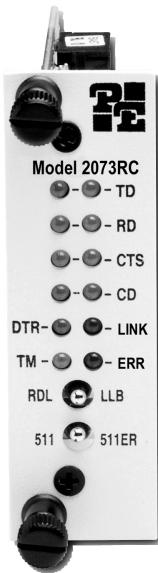**Figure 11.** NetLink-E1 twisted-pair interface

Note   If the 2073RC is being used for private short-range modem applications, the twisted-pair cable connected to its port will need to be a cross-over cable.

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5.0 OPERATION

Once the 2073RC is installed and configured properly it is ready to place into operation. This section describes the function of the LED indicators, and the use of the loopback and pattern test modes.

5.1 LED DESCRIPTIONS

The 2073RC is equipped with 12 LED indicators that monitor the status of communication.

Model 2073RC

TD	When the unit sends a one, the TXD LED is green. When it sends a zero, the TXD LED is yellow.
RD	When the unit receives a one, the RXD LED is green. When it receives a zero, the RXD LED is yellow.
CTS	Glows green to indicate that the clear-to-send signal from the 2073RC is active. Yellow indicates inactive CTS.
CD	Glows green to indicate that the a carrier from the remote modem is being received.
DTR	Glows green to indicate that the DTE attached to the 2073RC is active.
Link	The Link LED lights when the unit is synchronized with the incoming 64k/G.703 network signal.
TM	The Test Mode indicator will turn on when the unit enters local or remote loopbacks. It will also turn on when test patterns 511 or 511ER are activated.
ERR	The error LED indicates various error conditions, when sending a test pattern, the LED will remain lit if the unit does not receive the identical pattern. When it receives the correct pattern, the LED will turn off. If error insertion is on, the LED will blink once a second if everything is operating properly.

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Loop (V.54 & Telco) Diagnostics

The 2073RC offers two loop diagnostics for diagnosing the 2073RC and any communication links. These tests can be activated via signals on the serial port interface or the front panel switch.

Operating Local Loopback (LLB)

The Local Loopback (LLB) test checks the operation of the local 2073RC and is performed separately on each unit. Any data sent to the local 2073RC in this test mode will be echoed (returned) back to the user device (i.e.,characters typed on the keyboard of a terminal will appear on the terminal screen).
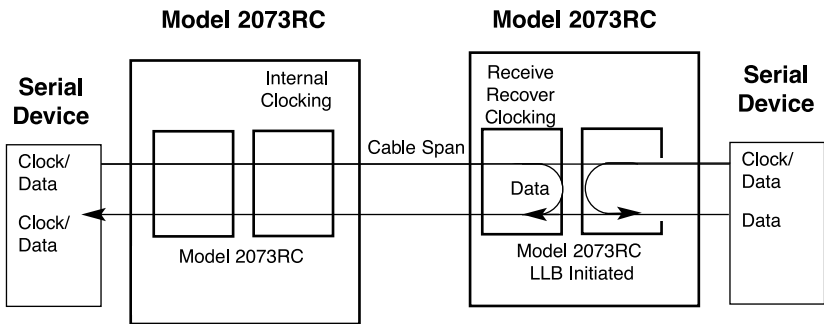
Figure 12. Local loopback

To perform a LL test, follow these steps:

1. The Local Loop can be initiated from the 2073RC unit either by activating the LL signal on the DTE (if you are not sure which lead is the RDL signal, please refer to the Appendix,) or by toggling the top front panel switch towards the label "LLB". The Yellow TM (Test mode) LED will turn on to indicate a successful Local loop condition.

2. Verify that the data terminal equipment is operating properly and can be used for a test.

3. Perform a V.52 BER (bit error rate) test bit error rate (V.52) diagnostics.If the BER test equipment indicates no faults, but the data terminal indicates a fault, follow the manufacturer's checkout procedures for the data terminal. Also, check the interface cable between the terminal and the 2073RC.

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Operating Remote Digital Loopback (RDL)

The Remote Digital Loopback (RDL) test checks the performance of both the local and remote 2073RC as well as a point-to-pointcommunication link between them. Any characters sent to the remote 2073RC in this test mode will be returned back to the originating device (i.e,characters typed on the keyboard of the local terminal will appear on the local terminal screen after having been passed to the remote 2073RC and looped back).
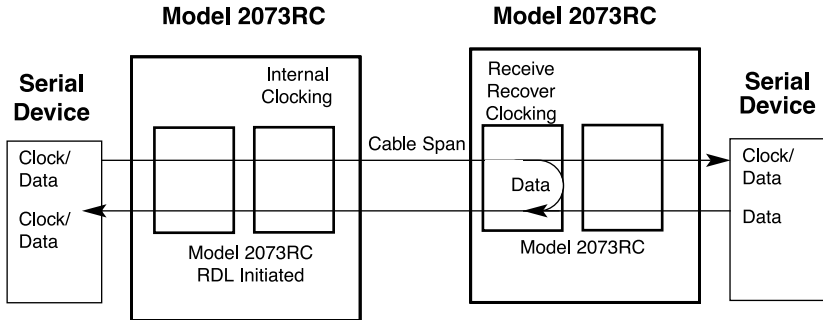

Figure 13. Remote loopback

1. The Remote Loop (V.54) can be initiated from the 2073RC unit: either by activating the RDL signal on the DTE (if you are not sure which lead is the RDL signal, refer to Appendix B "Interface Pin Assignment" on page 25) or by toggling the top front panel switch towards the label "RDL". The Yellow TM (Test mode) LED will turn on to indicate a successful RDL.

2. Perform a bit error rate test (BERT) using the internal V.52 generator (as described in section "Bit Error Rate (V.52) Diagnostics", turn the Bit error rate (V.52) diagnostics on or using a separate BER Tester.If the BER test indicates a fault, and the Remote Line Loopback test was successful for both 2073RC you may have a problem with the twisted pair line connection.

Bit Error Rate (V.52) Diagnostics

The 2073RC offers V.52 Bit Error Rate (BER) test patterns that can be invoked along with the LLB and RDL tests to evaluate the unit(s) and the communication links. When a 511 test is invoked, the 2073RC generates a pseudo-random bit pattern of 511 bits, using a mathematical polyno-mial.The receiving 2073RC then decodes the received bits using the same polynomial.If the received bits match the agreed upon pseudo-ran-dom pattern, the 2073RC and the communications link are functioning properly. 511 or 511/E is initiated by setting the bottom front panel switch towards the label '511' or 511E" respectively. The Yellow TM (Test mode) LED will turn on to indicate activation of the 511 or 511E test modes.

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MODEL 2073RC SPECIFICATIONS

A.1 TRANSMISSION FORMAT
Synchronous 64k/G.703 co-directional

A.2 TRANSMISSION LINE
Four-Wire unconditioned twisted pair

A.3 CLOCKING
Internal, External (V.35 only), or Network

A.4 INTERFACE MODULES
ITU/T V.35, ITU/T X.21, 10Base-T

A.5 LINE RATES
256 kbps

A.6 DTE RATES
64 kbps

A.7 DIAGNOSTICS
V.54 test modes for LAL and RDL; V:52 511/511E BERT pattern generator and detector.

A.8 LED STATUS INDICATORS
TD, RD, CTS, CD, DTR, Link, Error Test Mode

A.9 CONNECTORS
RJ-45 on line side; DB-25 female, M/34 female,RJ-45 female or DB-15 female depending upon which serial interface   module is installed.

A.10 TEMPERATURE RANGE
32–122°F (0–50°C)

A.11 ALTITUDE
0–15,000 feet (0–4572 m)

A.12 HUMIDITY
up to 90% non-condensing

A.13 DIMENSIONS
3.5L x 2.1W x 0.78H in. (9.0L x 5.3W x 2.0H mm)

A.14 WEIGHT
1 lb. (0.45 kg)

APPENDIX B
INTERFACE PIN ASSIGNMENT

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)

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X.21 Interface
(DB-15 Female Connector)
(DTE /DCE Configuration)

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

Notes

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