USER MANUAL

MODEL 2715RC

NetLink-E1: E1/Fractional E1 NTU Rack Mount Card

PATTON Electronics Co.

ISO 9001 CERTIFIED

An ISO-9001 Certified Company

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1.3 CE AND TELECOMMUNICATION APPROVALS

The CE symbol on your Patton Electronics equipment indicates that it is in compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the Union European (EU). A Certificate of Compliance is available by contacting Technical Support.

The Model 2715RC is in compliance with the Telecommunication technical requirements CRT-12; 2.048 Mbps digital unstructured leased line (D2048U) attachment requirements for terminal equipment interface.

The Model 2715RC also meets the Telecommunication technical requirements CTR-13; 2.048 Mbps digital structured leased lines (D2048S) attachment requirements for terminal equipment interface.

1.4 SERVICE

All warranty and nonwarranty repairs must be returned freight prepaid and insured to Patton Electronics. All returns must have a Return Materials Authorization number on the outside of the shipping container. This number may be obtained from Patton Electronics Technical Support: **(301) 975-1007**; **http://www.patton.com**; or, **support@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 2715RC. Technical Service hours: **8AM to 5PM EST, Monday through Friday.**

3.0 CONFIGURATION

Two cards make up a single Model 2715RC G.703 Converter - a front function card and a rear interface card. Each may require configuration depending upon the product application. This section describes the location and orientation of the Model 2715RC's configuration switches and jumpers, and provides descriptions for all settings.

3.1 FRONT CARD CONFIGURATION

The Model 2715RC front card has a single bank of eight DIP switches located on the top of the printed circuit board. Figure 1, below, shows the position of the switches on the board.

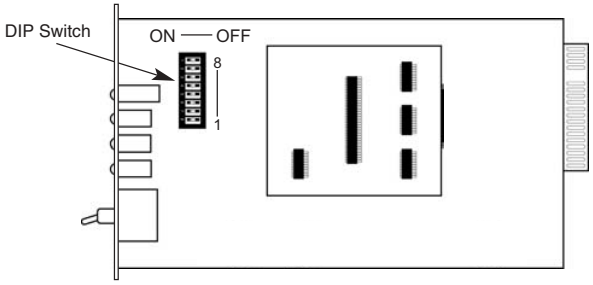

Figure 1. Model 2715RC board, showing DIP switch location

Changing the DIP Switch Settings

Figure 2 shows the orientation of the DIP switches with respect to the "ON" and "OFF" positions.

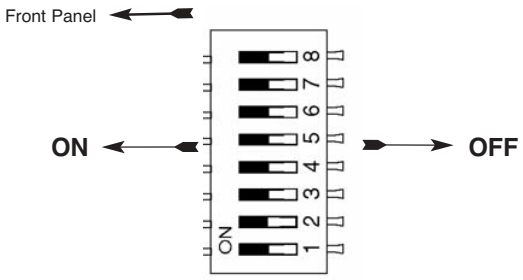

Figure 2. Close up of the configuration switches
NOTE: The ON position is oriented toward the front of the Model 2715RC.

DIP Switches S1 - S8

The configuration switches on S1 - S8 may be set to allow configuration for a wide range of applications. Default settings of S1 through S8 are shown in the table below. Descriptions of each switch follow the table.

SWITCH SET SUMMARY TABLE			
Position	**Function**	**Factory Default**	**Selected Option**
SW1	Line Coding	Off	HDB3
SW2	CAS Multiframe	Off	Disabled
SW3	CRC-4 MF/Clock Mode	Off	Disabled
SW4	Clock Mode	Off	Network
SW5	DTE Rate	Off	} 2.048 Mbps Clear Channel
SW6	DTE Rate	Off	
SW7	DTE Rate	Off	
SW8	DTE Rate	Off	

Switch SW1: Line Coding

Use Switch SW1 to control the Network Line Coding options. Set these options to be the same as the Line Coding given to you by your Service Provider. If you are using two Model 2715RCs together as short range modems, set both units identically, preferably to HDB3.

SW4	Line Framing & Coding
Off	HDB3
On	AMI

Line Coding Options:

High Density Bipolar 3 (HDB3): In HDB3 coding, the transmitter deliberately inserts a bipolar violation when excessive zeros in the data stream are detected. The receiver recognizes these special violations and decodes them as zeros. This method enables the network to meet minimum pulse density requirements. Use HDB3 unless AMI is required in your application .

Alternate Mark Inversion (AMI): AMI coding does not inherently account for ones density. To meet this requirement, the user should ensure that the data inherently meets pulse density requirements.

Switch SW2: CAS Multiframe

CAS multiframe uses Timeslot 16 (TS16) to send multiframe (MF) alignment data. In CAS MF, a multiframe is defined as 16 frames, where a frame consists of 32 64kb/s timeslots, numbered 0 to 31. TS16 of the first frame in the MF contains the CAS MF alignment word in the upper four bits. The alignment word is always 0000 (binary). The 2715RC does not perform any signaling in TS16 other than to insert the MF alignment word, in order to maintain MF alignment. When CAS MF is disabled, the unit transmits user data in TS16; therefore, up to 31 channels are available for user data. When it is enabled, TS16 is not available to the user. In this case, the user can use up to 30 channels for data. CAS MF can be used with CRC-4 MF or by itself. When enabled, both units must employ CAS MF; if one unit is set for CAS MF, and the other is not, the one using CAS MF will detect a loss of sync.

SW2	Option
Off	Disabled
On	Enable

Switch SW3 & SW4: CRC-4 Multiframe/External Clock Mode

In framed mode, SW3 is used for CRC-4 MF. CRC-4 Multiframe uses Time Slot zero to carry CRC-4 information. It operates independently of CAS MF. When CRC-4 is enabled, the unit monitors the incoming data stream for CRC-4 errors. It transmits CRC-4 error counts to the transmitting unit. Excessive errors may cause loss of frame or loss of sync. If CRC-4 MF is used, both units must be set for set for CRC-4 MF. Otherwise, the one using CRC-4 MF will detect loss of sync.

In unframed mode, SW3 is used along with SW4 to determine the clock mode. In unframed mode, the model 2715RC can be set to Network, internal, or external clock mode.

In framed mode SW4 is used alone to determine the 2715RC transmitter timing. In framed mode, the Model 2715RC can be set to Network or Internal Clock Mode.

The following charts represent both cases.

MULTIFRAME(G.704)

SW3	CRC-4 MF
On	On
Off	Off

SW4	Clock Mode
Off	Network
On	Internal

UNFRAMED (G.703)

SW3	SW4	Clock Mode
Off	Off	Network (Default)
Off	On	Internal
On	On	External
On	Off	Network

CLOCK MODES

Network Clock Transmitter timing is derived from the received line signal.

Internal Clock Transmitter clock is derived from an internal source clock.

External Clock Transmitter timing is derived from the local DTE device.

Note: When using the 2715RC as a high-speed short range modem, one unit of the link must be configured in either internal or external clock, and the other end must be configured for network clock mode.

Switches SW5, SW6, SW7, and SW8

Use Switches SW5, SW6, SW7, and SW8 to set the DTE data rate.

SW5	SW6	SW7	SW8	Speed
Off	Off	Off	Off	Clear Channel (2.048Mbps)[1]
On	Off	Off	Off	64kbps
Off	On	Off	Off	128kbps
On	On	Off	Off	192kbps
Off	Off	On	Off	256kbps
On	Off	On	Off	384kbps
Off	On	On	Off	512kbps
On	On	On	Off	640kbps
Off	Off	Off	On	768kbps
On	Off	Off	On	1024kbps
Off	On	Off	On	1280kbps
On	On	Off	On	1536kbps
Off	Off	On	On	1600kbps
On	Off	On	On	1920kbps
Off	On	On	On	1984kbps[2]
On	On	On	On	Invalid

[1]**NOTE:** When the data rate is set to 2.048Mb/s, then the unit is in G.703 mode, and it transmits user data on all 32 timeslots. There is no framing information; therefore, the CAS MF (SW2) is ignored and SW3 defaulted to clock mode. In all other rate settings, the unit employs G.704 framing; TS0 is reserved for signaling.

[2]**NOTE:** When not in clear channel and CAS multiframe is On (SW2 = On), the setting for 1984 kbps is defaulted to 1920kbps.

3.2 CONFIGURING THE 1000RCM13448C REAR CARD

The Model 1000RCM13448C M/34/RJ48C Ohm rear card has two configuration jumpers (JB3 and JB4) that may be used to connect Signal Ground to Frame Ground on each interface (M/34 or RJ-48C). Figure 4 (below) shows the locations of the jumpers on the 120 Ohm rear card.

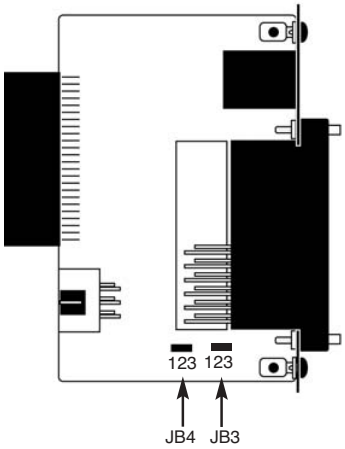

Figure 7. 1000RCM13448C strap locations

Figure 7 shows the strap location for the Model 1000RCM13448C (M/34/RJ-48C) rear card.

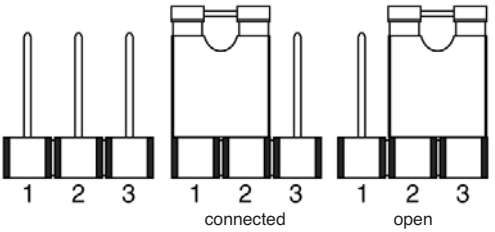

Figure 5. Orientation of Interface Card Straps

FRGND & V.35 PIN A (FRGND) (JB3)

In the connected position, this strap links Frame Ground of the 2715RC and Pin A (Frame Ground) of the V.35 connector. In the open position, signal ground is disconnected from frame ground.

JB3
Position 1&2 = FRGND and V.35 Pin A Connected *(default)*
Position 2&3 = FRGND and V.35 Pin A 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
Position 1&2 = SGND and FRGND Connected *(default)*
Position 2&3 = SGND and FRGND Not Connected

4.0 INSTALLATION

This section describes the functions of the Model 1001R14 rack chassis, tells how to install front and rear Model 2715RC cards into the chassis, and provides diagrams for wiring the interface connections correctly.

4.1 THE MODEL 1001R14 RACK CHASSIS

The Model 1001R14 Rack Chassis (Figure 6, below) has fouteen device 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.

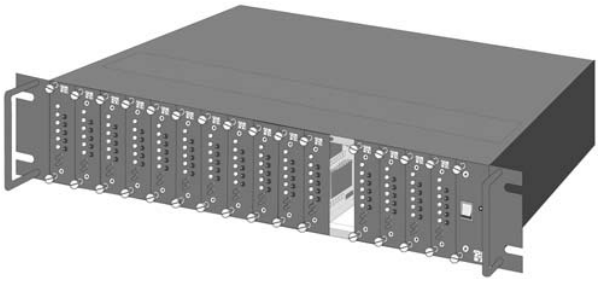

Figure 6. Model 1001R14 Rack Chassis with power supply

4.1.1 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. 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.

The Power Supply On and Off

When plugged in, a red front panel + 12V LED will glow. Since the Model 1001R14 is a "hot swappable" rack, *it is not necessary for any cards to be installed before installing the power supply*.

NOTE: Please refer to the Model 1001R14 Series User Manual *AC and DC Rack Mount Power Supplie*s for fuse and power card replacement information.

4.2 INSTALLING THE MODEL 2715RC INTO THE CHASSIS

The Model 2715RC 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 2715RC 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 2715RC.

4.3 V.35 TERMINAL CONNECTION

The M/34 female connector of the Model 1000RCM13448C rear card is configured as DCE (see the wiring diagram in **Appendix C**). To connect to a V.35 DTE device, use a *straight-through* M/34 cable.

4.4 CONNECTING THE NETWORK AND THE V.35 INTERFACES

Figure 4, below, shows the position of the RJ-48C network and V.35 connector on the rear of the Model 1000RCM13448C panel.

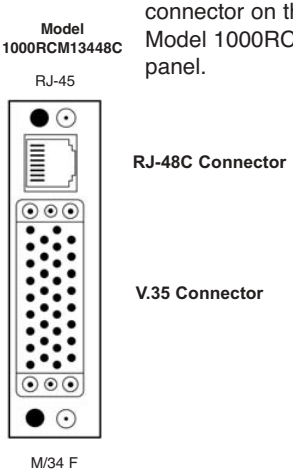

Figure 4. Model 1000RCM13448C interface card

4.4.1 Network Interface Connection

The Network Line Interface is an eight position keyed modular jack configured as a RJ-48C. This interface will need to be configured to match the line parameters (i.e. framing, line coding, etc.) supplied by the central office.

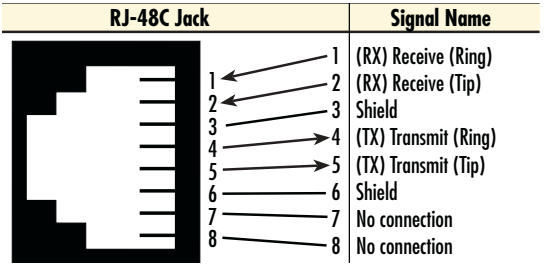

Figure 5. Model 2715RC twisted pair line interface.

Notice! Any modular twisted pair cable connected to the rear card must be shielded cable, and the outer shield must be properly terminated to a shielded modular plug on both ends of the cable.

5.0 OPERATION

Once you have configured each Model 2715RC and connected the cables, you are ready to operate the units. Section 5.0 describes the power-up procedure, LED status indicators and the built-in loopback test modes.

5.1 POWER-UP

There is no power switch on the Model 2715RC: Power is automatically applied to the Model 2715RC when its card-edge connector makes contact with the chassis' mid-plane socket, and when the chassis' power supply is turned on. *Note: The Model 2715RC is a "hot swappable" card—it will not be damaged by plugging it in or removing it while the rack is powered up.*

5.2 LED STATUS MONITORS

The Model 2715RC features four front panel LEDs that monitor and power, data, alarm and testing conditions. Figure 8 (below) shows the front panel location of each LED. Following Figure 8 is a description of each LED's function.

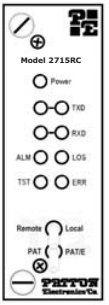

Figure 8. Model 2715RC front panel, showing LED indicators.

TXD When the unit sends a one, the green TXD LED is turned on. When it sends a zero, the yellow TXD LED is turned on.

RXD When the unit receives a one, the green RXD LED is turned on. When it receives a zero, the yellow RXD LED is turned on.

LOS The Loss of Sync LED lights when the unit loses synchronization with the incoming signal. This may happen when there is a framing mismatch or a loss of signal. In unframed mode, the LOS LED monitors the status of the transmit clock.

ALM The alarm LED indicates the presence of a AIS or RAI, or Out of Frame condition. The ALM LED will blink on every half-second. Alarms may occur due to:

- Loss of Synchronization
- Loss of Frame
- AIS
- RAI

ERR The error LED indicates various error conditions, including framing bit errors, excessive zeros, controlled slips, severe errors, or bit errors (when sending V.52 test patterns). 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.

TST The test indicator LED blinks with a specific pattern depending on the type of test mode. When the unit is in local analog loop, the LED will blink on briefly. When the unit is in remote loop, the TST LED will blink off briefly. When the unit is sending a test pattern or is putting the remote unit into V.54 loopback, the TST LED will stay on. These are the test modes:

- V.54 Loopback & V.52 Patterns
- D4 Line Loop (CO initiated)
- ESF Line Loop (CO Initiated)
- ESF Payload Loop (CO Initiated)

PWR The power indicator LED will remain lit while the unit is powered. It turns off when the unit is not powered.

5.3 LOOP (V.54) DIAGNOSTICS

The Model 2715RC offers three V.54 loop diagnostics and is compatible with two Telco loop diagnostics. Use these diagnostics to test the NTU and any communication links. These tests can be activated via the switches on the fron panel or via signals on the serial port interface.

5.3.1 Operating Local Loopback (LL)

The Local Loopback (LL) test checks the operation of the local Model 2715RC, and is performed separately on each unit. Any data sent to the local Model 2715RC 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).

To perform a LL test, follow these steps:

1. Activate LL. This may be done in one of two ways:

   a. Activate the “LL” signal on the DTE. If you are not sure which lead is the “LL” signal, please refer to Appendix D.

   b. Move the toggle switch on the front panel to “Local”.

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 as described in **Section 5.3**. If the BER test equipment indicates no faults, but the data terminal indicates a fault, follow the manufacturer’s checkout procedures for the data terminal. Also, check the interface cable between the terminal and the Model 2715RC.

5.3.2 Operating Remote Digital Loopback (RL)

The Remote Digital Loopback (RL) test checks the performance of both the local and remote Model 2715RC, as well as the communication link between them. Any characters sent to the remote Model 2715RC 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 Model 2715RC and looped back).

To perform an RDL test, follow these steps:

1. Activate RDL. This may be done in two ways:

   a. Activate the “RL” signal on the DTE. If you are not sure which lead is the “RL” signal, please refer to Appendix D.

   b. Move the toggle switch on the front panel to “Remote”.

2. Perform a bit error rate test (BERT) using the internal V.52 generator (as described in **Section 5.3**), or using a separate BER Tester. If the BER test indicates a fault, and the Local Line Loopback test was successful for both converters, you may have a problem with the twisted pair line connection.

5.4 BIT ERROR RATE (V.52) DIAGNOSTICS

The Model 2715RC offers a QRSS V.52 Bit Error Rate (BER) test pattern. This test pattern may be invoked along with the LAL and RDL tests to evaluate the unit(s) and the communication links.

When a QRSS test is invoked, the Model 2715RC generates a pseudo-random bit pattern of 2^{20} bits, respectively, using a mathematical polynomial. The receiving unit then decodes the received bits using the same polynomial. If the received bits match the agreed upon pseudo-random pattern, then the Model 2715RC and the communication link(s) are functioning properly.

To perform a V.52 test, follow these steps:

1. Activate the local loopback or remote loopback diagnostic (**See Section 5.3**).

2. Locate the “PAT / PAT/E” toggle switch on the front panel of the 2715RC and move it to the left. This activates the V.52 BER test mode and transmits a “QRSS” test pattern into the loop. If any errors are present, the local modem’s red “ERR” LED will blink sporadically.

3. If the above test indicates no errors are present, move the V.52 toggle switch to the right, activating the “PAT/E” test with errors present. If the test is working properly, the local modem's red “ERR” LED will blink. A successful “PAT/E” test will confirm that the link is in place, and that the Model 2715RC’s built-in “QRSS” generator and detector are working properly.

APPENDIX A

SPECIFICATIONS

Network Data Rate:	2.048 Mbps
Network Connector:	RJ-48C
Nominal Impedance:	120 ohm (75 ohm available when using Patton Model 460 Balun)
DTE Interface:	V.35 (DCE Orientation) on female M/34
Line Coding:	Selectable AMI or HDB3
Line Framing:	G.703 (Unframed) or G.704/G.732 (Framed)
CAS Multiframing:	Selectable On or Off
CRC-4 Multiframing:	Selectable On or Off
Clocking:	Internal, Network (Receive Recover), or external
DTE Data Rates:	64, 128, 192, 256, 384, 512, 640, 768, 1024, 1280, 1536, 1600, 1920, 1984, 2048 kbps
Time Slot Rate:	64 kbps
DS0 Start Position:	Channel 1 or Channel 0
DS0 Mapping Position:	Contiguous
Diagnostics:	V.54 Loopback; V.52 Patterns: QRSS
Indicators:	Power, Transmit Data, Receive Data, Alarm, Loss of Sync, Test Mode, Error
Management:	8-Position DIP Switch
Humidity:	Up to 90% non-condensing
Temperature:	0 to 50º C
Dimensions:	12.2 x 5.3 x 1.3 cm (4.8 x 2.1 x .5 in), / lb (.11kg)

Model 2715RC Distance Table - Km (Miles)		
Data Rates	**Wire Gauge**	
(kbps)	**.7mm (22)**	**.5mm (24)**
2048	1.2 (.76)	1.5 (.95)

APPENDIX C

PATTON MODEL 2715RC

INTERFACE PIN ASSIGNMENTS

M/34 Connector, Terminal Interface

Pin #	Signal
A	GND (Earth Ground/Shield)
B	SGND (Signal Ground)
D	CTS (DCE Source)
E	DSR (DCE Source, Always On)
F	CD (DCE Source)
L	LL (Local Loop, DTE Source)
M	TM (Test Mode Indicator (DCE Source)
N	RL (Remote Loop, DTE Source)
P	TD (Transmit Data +, DTE Source)
R	RD (Receive Data +, DCE Source)
S	TD/ (Transmit Data -, DTE Source)
T	RD/ (Receive Data -, DCE Source)
U	SCTE (Transmit Clock+, DTE Source)
V	RC (Receiver Clock +, DCE Source)
W	SCTE/ (Transmit Clock-, DTE Source)
X	RC/ (Receiver Clock -, DCE Source)
Y	TC (Transmitter Clock +, DCE Source)
AA	TC/ (Transmitter Clock -, DCE Source)

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Vice President

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