

How To Contact Your Local Black Box Representative

Italy

Black Box Italia S.P.A
Tel: 0227400280
Fax: 0227400219
www.blackbox.it

Germany

Black Box Deutschland
Tel: 0811/5541-0
Fax: 0811/5541-499
www.blackbox-deutschland.com

Switzerland

Datacom Black Box Services AG
Tel: 0554517070
Fax: 0554517075
www.black-box.xh

Netherlands

Black Box Datacom BV
Tel: 03032417799
Fax: 0302414746
www.blackbox.nl/

Belgium

Black Box
Tel: 027258550
Fax: 027259212
www.blackbox.be

France

Black Box Catalogue
Tel: 0145606700
Fax: 0145606747
www.blackbox.fr

Spain

Black Box Comunicaciones S.A.
Tel: 34 91 663 0200
Fax: 34 91 661 84 35
www.blackbox.es

Australia

Black Box Catalog Australia PTY LTD
Tel: 0398797100
Fax: 0398702955

Brazil

Black Box Do Brasil
Tel: (011) 5515-4000
Fax: (011) 5515-4002
www.blackbox.com.br

Canada

Black Box Canada Corp.
Tel: 0416-736-8000
Fax: 0416-736-7348
www.blackbox.com

Mexico

Black Box De Mexico S.A. de C.V
Tel: 05-420-0100
Fax: 05-420-0123
www.blackbox.com.mx

Japan

Black Box Catalog
Tel: 03-3820-5011
Fax: 03-3820-5010
www.blackbox.co.jp

U.S.A.

Black Box Corporation
Tel: 724-746-5500
Fax: 724-746-0746
www.blackbox.com

Chile

Black Box Chile
Tel: 00 562 223 8811
Fax: 00 562 225 1002
www.blackbox.cl



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G.703 Access Rack Card

TECHNICAL: (0118) 965 6000
SALES: (0118) 965 5100
FAX: (0118) 965 5001
ADDRESS: 464 Basingstoke Road, Reading, Berkshire RG2 0QN
WEB: www.blackbox.co.uk

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Appendix E: EIA-530 interface pin assignment

DB-25 Female Connector, Terminal Interface

Pin #	Signal
1	FG (Frame Ground)
2	TD (Transmit Data-A, DTE Source)
3	RD (Receive Data-A, DCE Source)
4	RTS (Request to Send-A, DTE Source)
5	CTS (Clear to Send-A, DCE Source)
6	DSR (Data Set Ready-A, DCE Source)
7	SGND (Signal Ground)
8	CD (Carrier Detect-A, DCE Source)
9	RC/ (Receiver Clock-B, DCE Source)
10	CD/ (Carrier Detect-B, DCE Source)
11	XTC/(External Transmitter Clock-B, DTE Source)
12	TC/(Transmitter Clock-B, DCE Source)
13	CTS/(Clear to Send-B, DCE Source)
14	TD/(Transmit Data-B, DTE Source)
15	TC (Transmitter Clock-A, DCE Source)
16	RD (Receive Data-B, DCE Source)
17	RC (Receiver Clock-A, DCE Source)
18	LL (Local Line Loop, DTE Source)
19	RTS/(Request to Send-B, DTE Source)
20	DTR (Data Terminal Ready-A, DTE Source)
22	DSR/ (Data Set Ready-B, DCE Source)
23	DTR/(Data Terminal Ready-B, DTE Source)
24	XTC (External Transmitter Clock-A, DTE Source)
25	TM (Test Mode)

Appendix D: V.35 interface pin assignment

M/34 Connector, Terminal Interface

Pin #	Signal
A	GND (Earth Ground/Shield)
B	SGND (Signal Ground)
D	CTS (DCE Source)
E	DSR (DCE Source, Always On)
F	CD (DCE Source)
L	LL (Local Loop, DTE Source)
M	TM (Test Mode Indicator, DCE Source)
N	RL (Remote Loop, DTE Source)
P	TD (Transmit Data +, DTE Source)
R	RD (Receive Data +, DCE Source)
S	TD/ (Transmit Data -, DTE Source)
T	RD/ (Receive Data -, DCE Source)
U	XTC (Transmit Clock +, DTE Source)
V	RC (Receiver Clock +, DCE Source)
W	XTC/ (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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1. Warranty Information

Black Box warrants all G.703 Access Rack Card components to be free from defects, and will—at our option—repair or replace the product should it fail within one year from the first date of shipment.

This warranty is limited to defects in workmanship or materials, and does not cover customer damage, abuse, or unauthorized modification. If this product fails or does not perform as warranted, your sole recourse shall be repair or replacement as described above. Under no condition shall **Black Box** 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. **Black Box** 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.

Radio and TV Interference

The G.703 Access Rack Card 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 G.703 Access Rack Card has been tested and found to comply with the limits for a Class A computing device in accordance with the 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 G.703 Access Rack Card does cause interference to radio or television reception, which can be determined by disconnecting the cables, the user is encouraged to try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna, and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

CE Notice

The CE symbol on your Black Box 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.

Appendix C: E1 Interface Pin Assignment

RJ-48C E1 (DS0) Network Interface
(Female Modular Jack)

Pin #	Signal
1	RX Data (TIP 1)
2	RX Data (RING1)
4	TX Data (TIP)
5	TX Data (RING)

Appendix B: G.703 Access Rack Card, Interface Pin Assignment

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)

2. General Information

Thank you for your purchase of this Black Box product. This product has been thoroughly inspected and tested and is warranted for One Year parts and labor.

Features

- Terminates E1/FE1 circuits over a 4-wire RJ-48C interface
- Connects to standard CPE serial and 10Base-T interfaces
- Common framed nx64 rates up to 1984 kbps (G.704)
- Unstructured rate of 2.048 Mbps (G.703)
- G.703 or G.704 framing (with or without CRC-4, CAS multiframe)
- Selectable AMI or HDB3 line coding
- Internal, external, network clocking
- Also operates as a high-speed point-to-point modem
- Conforms to ONP requirements CTR12 and CTR13 for connection to international telecom networks

Description

The G.703 Access Cards are single port E1/FE1 CSU/DSUs that provide high-speed WAN connectivity in a rack card package. Connecting to the serial WAN port of a switch, router or multiplexer, the G.703 Access Card provides E1 or FE1 access connection at data rates of 2.048 Mbps and nx64. The G.703 Access Card is an excellent choice when terminating leased line services, Frame Relay backbones, internet access as well as LAN-to-LAN services.

The G.703 Access Card provides digital access to local WAN services between two facilities over a dedicated 4-Wire circuit. WAN bandwidth, framing and coding options are programmed via internally accessible DIP switches, via a VT-100 type terminal using a Access Rack Control Card control card, or SNMP manageable through the RMU9700-SNMP. With a Access Rack Control Card, a terminal can manage addressable G.703 Access Cards using menu driven controls. The G.703 Access Card uses AMI and HDB3 line coding. G.703 Access Card also supports a full range of system and diagnostic features that make system setup easy.

The G.703 Access Card provides E1 terminations over a modular RJ-48C jack or dual 75 Ohm BNC connectors when using the DB15/Dual BNC card (X.21 interface). Power options include a single AC or DC or redundant AC/DC.

3. Configuration

The G.703 Access Card features configuration capability via hardware DIP switches, a software control port, or SNMP through the RMU9700-SNMP. This section describes all possible hardware and software switch configurations of the network connection.

Note The G.703 Access Card factory default is set to DIP switch control. Software control can be enabled either through the control port or SNMP management station. Performing a hardware reset sets the unit for dip switch control.

DIP switch configuration

The G.703 Access Card has three 8-bit DIP switches that allow configuration for a wide range of applications. The switches are accessed by removing the card from the chassis. Figure 1 shows the location of the DIP switches on the top of the printed circuit board.

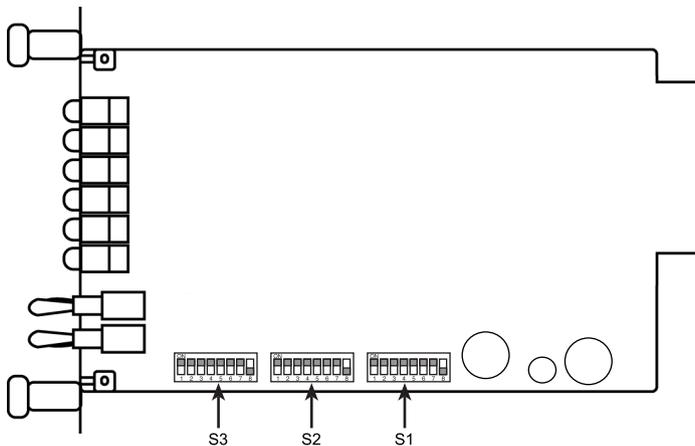


Figure 1. G.703 Access Card top view showing location of DIP switches

DIP Switches S1, S2, and S3 can be configured as either “On” or “Off”. Figure 2 shows the orientation of the DIP switches with respect to ON/OFF positions. Default position and descriptions for Switches S1, S2, and S3 are provided on the following pages.

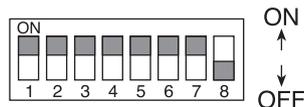


Figure 2. Close-up of DIP switches showing ON/OFF positions

Appendix A: G.703 Access Rack Card, G.703 Specifications

Network Data Rate:	2.048 Mbps
Network Connector:	RJ-48C/Dual Coax BNC (G.703 Access Rack Card)
Nominal Impedance:	75/120 ohm
Line Coding:	Selectable AMI or HDB3
Line Framing:	G.703 (Unframed)
Clocking:	Internal or network (Receive Recover)
Distance:	Maximum 1.8 km (6,000 ft.) on 24 AWG Cable
Configuration:	Three 8-position DIP switches
Humidity:	Up to 90% non-condensing
Temperature:	0 to 50°C
Dimensions:	9.0 x 5.3 x 2.0 cm (3.5"L x 2.1"W x 0.78"H)

One of two result codes will appear to the right of the **c Test Pattern** listing:

OK—Indicates that the received test pattern is error-free.

BE—Indicates that there are errors in the test pattern (to deliberately insert errors in the pattern, toggle **d Error Insertion** to ON).

- Using the HTTP/SNMP screens, select the appropriate test pattern.
- Toggle the front panel switch to either PAT or PAT/E (Test Pattern with Error Injection).

Note Hardware reset allows users to put the G.703 Access Card under switch control. You may force the unit to use the DIP switches as the default configuration source by turning off the unit, setting all the S3 DIP switches to the ON position, then powering on the unit. This will cause the unit to enter a special mode. Then turn off the unit and change the switch settings to the off position. When you turn the unit on again, the unit will be set up with the selected switch settings.

Switches S1-1 through S1-8

A detailed description of each switch (S1-1 through S1-8) setting follows Table 1.

Table 1: Switch set 1 summary table

Position	Function	Factory Default	Selected Option
S1-1	Line code	OFF	HDB3
S1-2	Clocking Mode	ON	Internal
S1-3	Clocking Mode	OFF	Internal
S1-4	Data Rate	OFF	2.048 Mbps Clear Channel
S1-5	Data Rate	OFF	
S1-6	Data Rate	OFF	
S1-7	Data Rate	OFF	
S1-8	Data Rate	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 given to you by your service provider. If you are using two CSU/DSUs together as short range modems, set both units to HDB3.

S1-1	Line Encoding
OFF	HDB3
ON	AMI

HDB3. In this line coding, the transmitter substitutes a deliberate 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. unless AMI is required in your application, HDB3 should be used whenever possible.

AMI. Alternate Mark Inversion defines a pulse as a “mark,” a binary one, as opposed to a zero. In an E1 network connection, signals are transmitted as a sequence of ones and zeros. Ones are sent as pulses, and zeros are sent as spaces, i.e., no pulse. Every other pulse is inverted from the previous pulse in polarity, so that the signal can be effectively transmitted. This means, however, that a long sequence of zeros in the data stream will cause problems, since the G.703 Access Card receiving 2.048 Mbps clock. If you must use AMI, you should ensure that the data terminal equipment connected to the unit provides a minimally acceptable pulse density. For this reason, there are advantages to using HDB3 instead.

S1-2 and S1-3 Clock Modes

Set switch S1-2 and S1-3 to determine the G.703 Access Card’s transmitter timing.

S1-2	S1-3	Clock mode
On	On	Network (Received Recovered)
On	Off	Internal
Off	On	External
Off	Off	Network (Received Recovered)

Network Clock. Transmitter timing is derived using the received line signal (received recovered) from the network.

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

External Clock. Transmitter timing is derived from DTE terminal timing.

Switch S1-4 through S1-8: DTE data rate

Use switches S1-4 through S1-8 to set the DTE data rate (see Table 2 on page 9).

— Set the front panel switch to ‘Remote’.

2. Perform a bit error rate test (BERT) using the internal V.52 generator (as described in section 5.3, “Bit error rate (V.52) diagnostics” on page 45), or using a separate BER Tester. If the BER test indicates a fault, and the Local Line Loopback test was successful for both NetLinks, you may have a problem with the twisted pair line connection.

CSU Loop

The G.703 Access Rack Card also responds to central office initiated loop commands. The G.703 Access Rack Card will implement the “loop up” command when it recognizes the pattern “10000” in the data stream for a minimum of 5 seconds. The “loop down” command is implemented by the pattern “100” in the data stream for a minimum of 5 seconds.

The G.703 Access Rack Card will respond to Universal Loopback Deactivate to clear all central office loops.

5.3 BIT ERROR RATE (V.52) DIAGNOSTICS

The G.703 Access Rack Card offers three V.52 Bit Error Rate (BER) test patterns. These test patterns may be invoked along with the LAL and RDL tests to evaluate the unit(s) and the communication links.

When a 511 or 2047 test is invoked, the G.703 Access Rack Card generates a pseudo-random bit pattern of 511 bits, 2047 bits or 220 bits, respectively, using a mathematical polynomial. The receiving G.703 Access Rack Card then decodes the received bits using the same polynomial. If the received bits match the agreed upon pseudo-random pattern, then the G.703 Access Rack Card(s) and the communication link(s) are functioning properly.

511	Initiates a built-in 511 bit pseudo-random pattern generator and detector.
2047	Initiates a built-in 2047 bit pseudo-random pattern generator and detector.

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

1. Activate the local loopback or remote loopback diagnostic.
2. Activate the test pattern. This may be done in one of following ways:
 - Enter **C** **Test Pattern** from the System Diagnostics/Statistics menu and toggle the <Spacebar> until the desired test pattern appears.

appear on the local terminal screen after having been passed to the remote G.703 Access Rack Card and looped back).

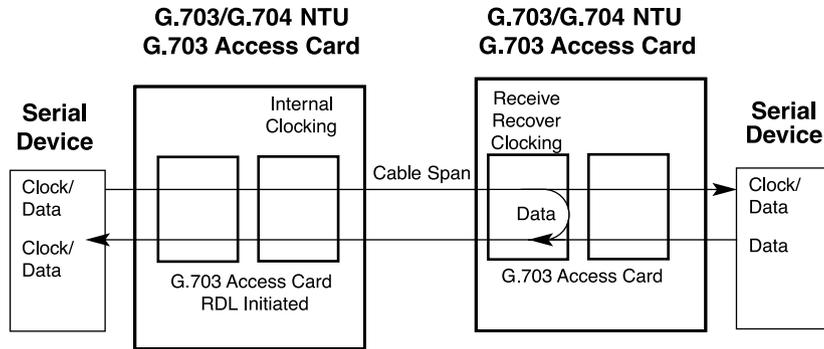


Figure 15. Remote loopback

There are two Remote Loops that can be initiated from the G.703 Access Rack Card unit:

- V.54 Loop
- CSU Loop

The user can select the type of loop that can be initiated from the System Diagnostics/Statistics screen or with Switch S2-1. Select “c” RDL Type and press the <spacebar> to toggle between the CSU loop and the V.54 loop. When a loopback is initiated this is the type of loop that the unit uses to loop up the remote unit.

Note The G.703 Access Rack Card will respond to both loops regardless of the state of the RDL Type.

To perform an RDL test, follow these steps:

1. Activate RDL. This may be done in one of the following ways:
 - Using the VT-100 management card, enter **b Remote Loop** from the System Diagnostics/Statistics menu and toggle the <Spacebar> until “RL” appears next to the **b Remote Loop** option.;
 - Activate RL from the HTTP browser screens when using the RMU9700-SNMP card
 - Activate the “RL” signal on the DTE. If you are not sure which lead is the “RL” signal, please refer to appendix D, “V.35 interface pin assignment” on page 50.

Table 2: DTE data rate settings

SW-4	SW-5	SW-6	SW-7	SW-8	Speed
On	On	On	On	On	64 kbps
Off	On	On	On	On	128 kbps
On	Off	On	On	On	192 kbps
Off	Off	On	On	On	256 kbps
On	On	Off	On	On	320 kbps
Off	On	Off	On	On	384 kbps
On	Off	Off	On	On	448 kbps
Off	Off	Off	On	On	512 kbps
On	On	On	Off	On	576 kbps
Off	On	On	Off	On	640 kbps
On	Off	On	Off	On	704 kbps
Off	Off	On	Off	On	768 kbps
On	On	Off	Off	On	832 kbps
Off	On	Off	Off	On	896 kbps
On	Off	Off	Off	On	960 kbps
Off	Off	Off	Off	On	1024 kbps
On	On	On	On	Off	1088 kbps
Off	On	On	On	Off	1152 kbps
On	Off	On	On	Off	1216 kbps
Off	Off	On	On	Off	1280 kbps
On	On	Off	On	Off	1344 kbps
Off	On	Off	On	Off	1408 kbps
On	Off	Off	On	Off	1472 kbps
Off	Off	Off	On	Off	1536 kbps
On	On	On	Off	Off	1600 kbps
Off	On	On	Off	Off	1664 kbps
On	Off	On	Off	Off	1728 kbps
Off	Off	On	Off	Off	1792 kbps
On	On	Off	Off	Off	1856 kbps
Off	On	Off	Off	Off	1920 kbps
On	Off	Off	Off	Off	1984 kbps
Off	Off	Off	Off	Off	Clear Channel 2048 kbps

Note When the data rate is set to 2.048 Mbps, the unit is forced into G.703 mode, and it transmits user data on all 32 timeslots. There is no framing information; therefore, the CRC4 MF (SW2-2) switch is ignored. In all other rate settings, the unit employs G.704 framing; TS0 is reserved for signaling.

Table 3: Switch set 2 summary table

Position	Function	Factory Default	Selected Option
S2-1	CAS MF	Off	Disabled
S2-2	CRC-4 multiframe	Off	Disabled
S2-3	RDL Type	Off	V.54
S2-4	RDL Response	On	Disabled
S2-5	TM from DTE	On	Disabled
S2-6	Front Panel Switch	Off	Enabled
S2-7	NMS/VT-100 Switch	Off	NMS
S2-8	Line build out	Off	120 ohms

Switches S2-1 through S2-8

Switch S2-1: CAS Multiframe

CAS multiframe uses timeslot 16 (TS16) to send multiframe (MF) alignment data. In CAS MF, a MF is defined as 16 frames, where a frame consists of 32 64-kbps 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 G.703 Access Card does not perform any signaling in TS16 other than to insert the MF alignment word, in order to maintain MF alignment. When CAS MF 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.

Switch S2-2: CRC-4 Multiframe

In framed mode, S2-2 is used for CRC-4 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. When using timeslot zero (TS0), 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.

S2-2	Option
Off	CRC-4 Disabled
On	CRC-4 Enabled

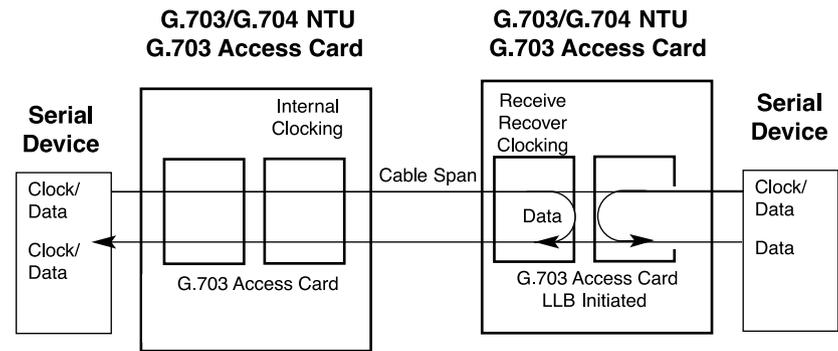


Figure 14. Local loopback

To perform a LL test, follow these steps:

1. Activate LL. This may be done in one of the following ways:
 - If using a VT-100 management card, enter **c Local Loop** from the System Diagnostics/Statistics menu and toggle the <Spacebar> until “LL” appears next to the **c Local Loop** option.
 - Activate LL from the HTTP browser screens when using the RMU9700-SNMP card
 - Activate the “LL” signal on the DTE. If you are not sure which lead is the “LL” signal, refer to Appendix D on page 50.
 - Toggle the front panel switch to the “Local” position.
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, “Bit error rate (V.52) diagnostics” on page 45. 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 G.703 Access Rack Card.

Operating Remote Digital Loopback (RL)

The Remote Digital Loopback (RL) test checks the performance of both the local and remote G.703 Access Rack Card, as well as the communication link between them. Any characters sent to the remote G.703 Access Rack Card in this test mode will be returned back to the originating device (i.e. characters typed on the keyboard of the local terminal will

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/CSU loopback, the TST LED will stay on. These are the test modes: <ul style="list-style-type: none"> • V.54/CSU Loopback & V.52 Patterns • Local Loopback
PWR	The power indicator LED will remain lit while the unit is powered. It turns off when the unit is not powered.

5.2 LOOP (V.54 & TELCO) DIAGNOSTICS

The G.703 Access Rack Card offers three V.54 loop diagnostics and is compatible with two Telco loop diagnostics. Use these diagnostics to test the CSU/DSU and any communication links. These tests can be activated via the software control port (see “System Diagnostics” on page 31), via signals on the serial port interface or the front panel switch.

Operating Local Loopback (LL)

The Local Loopback (LL) test checks the operation of the local G.703 Access Rack Card, and is performed separately on each unit. Any data sent to the local G.703 Access Rack Card 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).

Switch S2-3: Remote Digital Loopback Type

The user can set this switch to select the type of remote loop that will be initiated by the G.703 Access Card. If set to V.54, the G.703 Access Card will initiate a V.54 loop when Remote Loop is selected by the front panel switches. If set to CSU, the G.703 Access Card will initiate a CSU loop when Remote Loop is selected by the front panel switches.

S2-3	RDL Type
Off	Initiate a V.54 RDL loop when selected
On	Initiate a CSU loopback when selected

Switch S2-4: RDL Response

V.54 and CSU Loopbacks are special in-band loopback facility that sends a pseudo-random pattern over the data stream. This is useful for campus applications when you need to put a remote unit in loopback. The unit responds to the V.54 loopback command, and the whole process takes only a few seconds to complete. When V.54 Loopback is disabled, the unit will not be able to send or respond to V.54 or CSU loopback commands. The duration of the loopback is limited by the loopback timeout setting.

S2-4	Option
Off	RDL Response Enabled
On	RDL Response Disabled

Switch S2-5: Test mode request from DTE

Use Switch S2-5 to allow G.703 Access Card to enter loopback tests when the DTE raises the appropriate loop request pin.

S2-5	Setting
Off	Response to DTE Loopback Request Enabled
On	Response to DTE Loopback Request Disabled

Switch S2-6: Front Panel Switches

As the front panel switches may be inadvertently toggled, or in the event that the end-user may not need to use the switches, the installer may disable the front panel switches. Set switch S2-6 to determine whether the front-panel toggle switches are enabled or disabled.

S2-6	Option
Off	Front Panel Switches Enabled
On	Front Panel Switches Disabled

Switch S2-7: VT-100 or NMS Selection

Switch S2-7 selects the configuration mode that the G.703 Access Rack Card uses. When VT-100 is selected, configuration and status can be setup through a VT-100 terminal using a Access Rack Control Card. When NMS (network management station) is selected, configuration and status can be setup and maintained through SNMP using a RMU9700-SNMP. Please refer to the RMU9700-SNMP user manual when using this mode.

Note DIP switch configuration can be used regardless of the setting of this switch. The DIP switches are enabled through the VT-100 screens, NMS, or by performing a hardware reset.

S2-7 Management Selection

Off	NMS control
On	VT-100 control

Switch S2-8: Impedance

Switch S2-8 is used to select the line build out for the G.703 Access Card. When using the DB15/Dual BNC card (dual BNC) rear card, set S2-8 to OFF. When using a 120 ohm cable with RJ-45 connectors, set S2-8 to ON.

S2-8	Setting
75 ohm	On
120 ohm	Off

5. Operation

5.1 LED DESCRIPTIONS

The G.703 Access Rack Card is equipped with nine LED indicators that monitor the status of communication. Figure 13 shows the location of the LEDs on the G.703 Access Rack Card Series front panel.

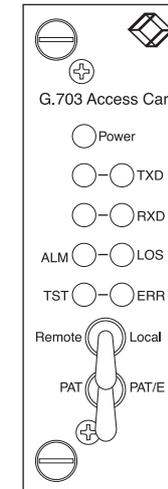


Figure 13. G.703 Access Rack Card front panel, showing LED indicators

TXD	When the unit sends a one, the TXD LED is green. When it sends a zero, the TXD LED is yellow. Moreover, the TXD LED is active only in active DS0 channels. In inactive channels, the TXD LED is off.
RXD	When the unit receives a one, the RXD LED is green. When it receives a zero, the RXD LED is yellow. Moreover, the RXD LED is active only in active DS0 channels. In inactive channels, the RXD LED is off.
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 Blue or Yellow Alarm, or Out of Frame condition. The ALM LED will blink on every half-second. Alarms may occur due to: <ul style="list-style-type: none"> • Loss of Synchronization • Loss of Frame • AIS (Blue Alarm) • RAI (Yellow Alarm)

Note Pin-out requirements for null modem applications vary between equipment manufacturers. If you have any questions about a specific installation, please contact Black Box Technical Support.

4.3 CONNECTING THE E1 INTERFACE

The Network Line Interface is an eight position keyed modular jack configured as a RJ-48C (see Figure 12). This interface will need to be configured to match the line parameters (i.e. framing, line coding, etc.) supplied by the central office.

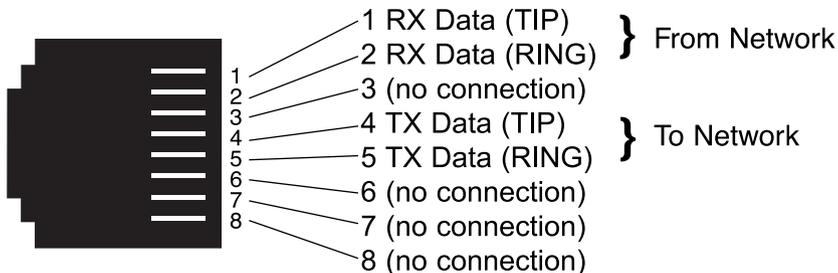


Figure 12. G.703 Access Rack Card twisted pair line interface

Note If the G.703 Access Rack Card 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. See Appendix C on page 49 for interface pin assignments.

4.4 CONNECTING DUAL-COAX BNC (75 OHM)

In addition to the 120 ohm twisted pair connection, the G.703 Access Rack Card, with X.21 interface, is equipped with dual female BNCs (TX and RX) for connection to a 75 ohm dual coax G.703 network interface.

Switches S3-1 through S3-8

Switch S3: DIP switch or NMS (network management system)/VT-100 control

The G.703 Access Card can be configured and managed via DIP switches or NMS/VT-100 through a Model RMU9700-SNMP card or Access Rack Control Card, respectively (refer to the RMU9700-SNMP or Access Rack Control Card user manuals when using this mode). Switch S3 selects control and management mode for the G.703 Access Card.

Table 4: DIP switch S3 settings

S3-1 to S3-8	Management selection
All Off	DIP switch control (factory default)
All On	Hardware reset

Hardware reset. The G.703 Access Card is set at the factory for DIP switch control. If the user has changed control to NMS/VT-100, and then needs to revert to DIP switch control, use the following procedure:

1. Pull the G.703 Access Card out of the rack. Make a note of the DIP S1, S2, and S3 settings.
2. Set S3 switches to the ON position.
3. Install the card into the rack and power up the unit.
4. Pull the card out again and change the switches to the desired settings. The unit is now under DIP switch control.
5. Install the card back into the rack.

NMS/VT-100 Control. When switches S3-1 to S3-8 are set to a setting other than the ones shown in Table 4, the G.703 Access Card enters NMS/VT-100 control. While under NMS/VT-100 control, each of the G.703 Access cards housed in a rack must have an address. Table 5 and Figure 3 show examples of address settings. The table follows the hexadecimal system, where switch S3-1 is the least significant bit (LSB), and S3-8 is the most significant bit (MSB). A switch in the On position represents binary zero, and Off represents binary one (see Figure 3).

Table 5: Examples of the address settings

Hex Address (Decimal Address)	S3-8	S3-7	S3-6	S3-5	S3-4	S3-3	S3-2	S3-1
0x01 (1)	ON	OFF						
0x02 (2)	ON	ON	ON	ON	ON	ON	OFF	ON

Table 5: Examples of the address settings

Hex Address (Decimal Address)	S3-8	S3-7	S3-6	S3-5	S3-4	S3-3	S3-2	S3-1
0x10(16)	ON	ON	ON	OFF	ON	ON	ON	ON
0xB5(181)	OFF	ON	OFF	OFF	ON	OFF	ON	OFF

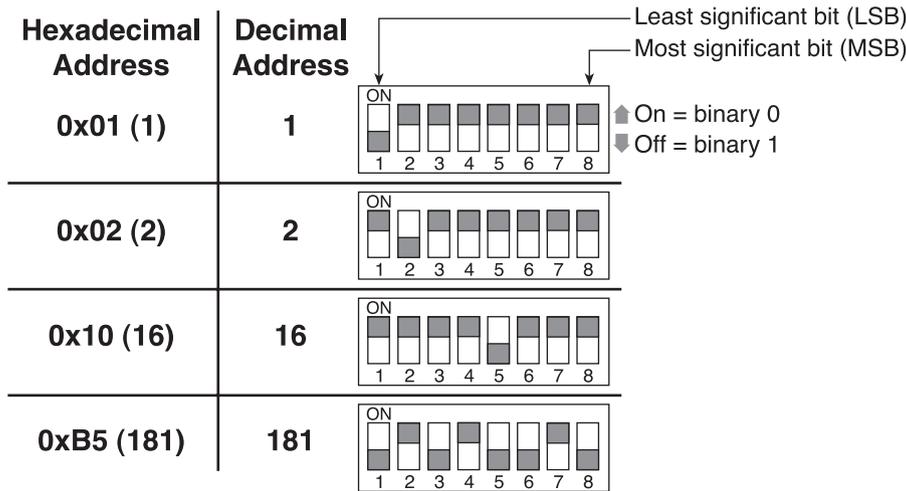


Figure 3. Sample DIP switch settings

Setting the card address. Table 5 and Figure 3 show examples of how to set a card address using switches S3-1 through S3-8. The addresses are listed in their hexadecimal (hex) and corresponding decimal values.

Note Refer to the Rack Chassis Series User Manual AC and DC Rack Mount Power Supplies for fuse and power card replacement information.

Installing the G.703 Access Rack Card into the chassis

The G.703 Access Rack Card 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 G.703 Access Rack Card 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 Rack Chassis chassis allows "hot swapping" of cards, it is not necessary to power down the rack when you install or remove a G.703 Access Rack Card.

4.1 CONNECTING TO A DTE DEVICE

The serial port on most rear interface cards are hard-wired as "DCE" (Data Circuit Terminating 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 of the shortest possible length--we recommend 6 feet or less. When purchasing or constructing an interface cable, refer to the pin diagrams in Appendix C on page 49, Appendix D on page 50, and Appendix E on page 51 as guides.

4.2 CONNECTING TO A DCE DEVICE

The rear interface cards on most interface modules are hard wired as "DCE". Therefore, you must use a null modem cable when connecting to a modem or other DCE device. When purchasing or constructing a null modem interface cable, use the pin diagrams in Appendix D on page 50 and Appendix E on page 51 as a guide.

4. Installation

This section describes the functions of the rack chassis, tells how to install front and rear G.703 Access Rack Cards into the chassis, and how to connect to the twisted pair interface and the serial interface.

The Rack Chassis

The Rack Chassis (see Figure 11) has 14 or 16 device card slots, plus a single power supply or dual redundant power supplies. Measuring only 3.5" high, the Rack Chassis is designed to occupy only 2U in a 19" rack. Sturdy front handles allow the Rack Chassis to be extracted and transported conveniently.



Figure 11. Rack Chassis Rack Chassis with power supply

The Rack Power Supply

The power supply included in the Rack Chassis 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 Rack Chassis rack. Voltage setting changes and fuse replacement should only be performed by qualified service personnel. Contact Black Box Technical support for more information.

Powering up your rack chassis

The power supplies that come with your rack chassis 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.

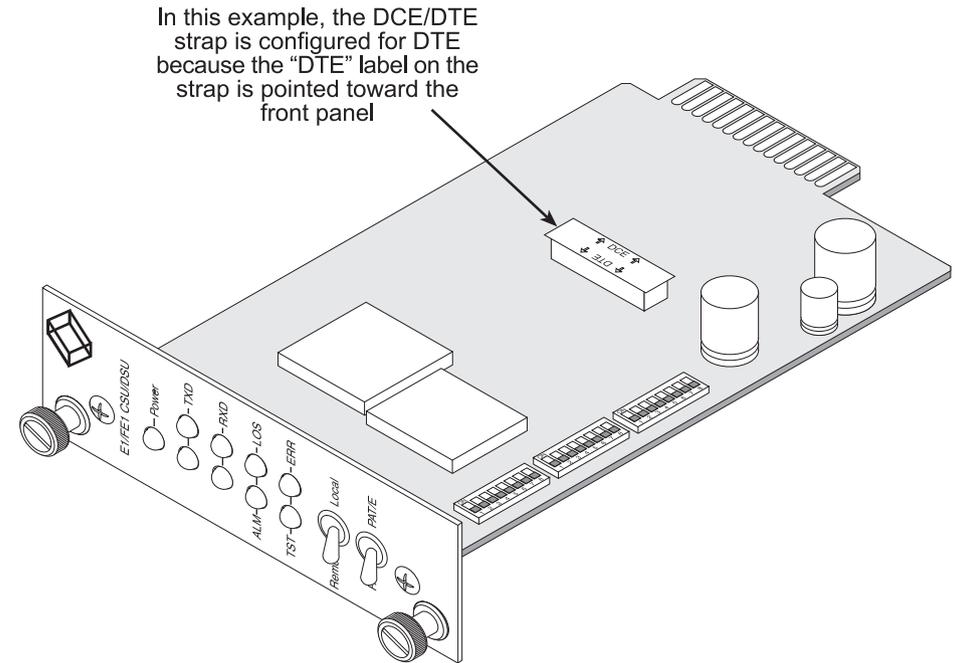


Figure 4. DCE/DTE selector strap location

DCE/DTE selector (X.21 version only)

The X.21 version of the G.703 Access Card can be set up as a DCE (default) or DTE device by using a DCE/DTE selector strap (see Figure 4). The information in Table 6 describes configuring the DCE/DTE strap.

Table 6: DCE/DTE selector settings

Setting	Description
DCE	To set a rack card as a <i>DCE</i> device, install the DCE/DTE selector with the DCE arrows pointing toward the front panel.
DTE	To set a rack card as a <i>DTE</i> device, install the DCE/DTE selector with the DTE arrows pointing toward the front panel.

Configuring the rear interface card

The G.703 Access Card comes with one of five interface card options: DB-25/RJ-48C, M/34/RJ-48C, DB-15/RJ-48C, DB15/Dual BNC, or RJ-45/100Base-T RJ-48C. Each of these options supports one DTE inter-

face connection and one 4-wire line connection. Figure 5 illustrates the interface options for the G.703 Access Card.

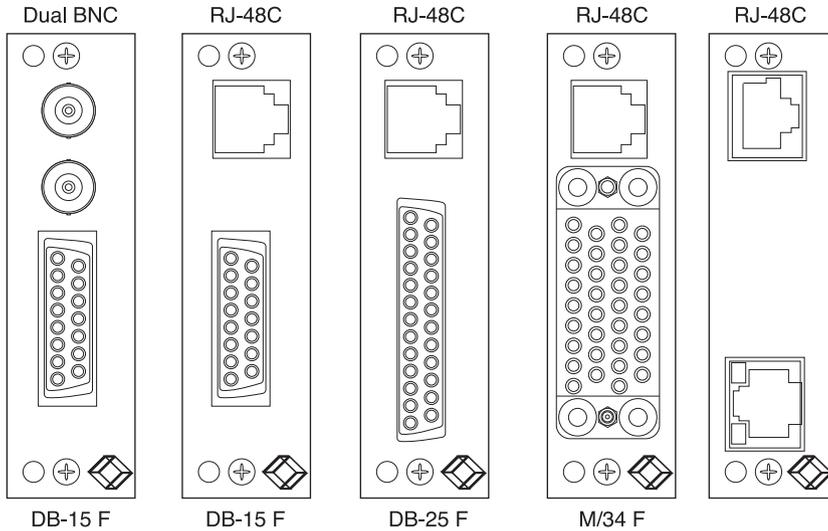


Figure 5. G.703 Access interface card options

Note The G.703 Access function card is paired with a specially designed rear card and must not be swapped with other Black Box rear cards.

Prior to installation, you will need to examine the rear card you have selected 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 6 shows the orientation of these straps. Each strap can either be on pegs 1 and 2, or on pegs 2 and 3.

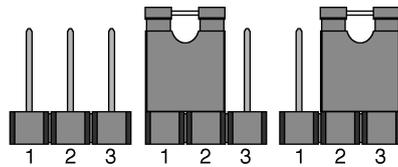


Figure 6. Orientation of Interface Card Straps

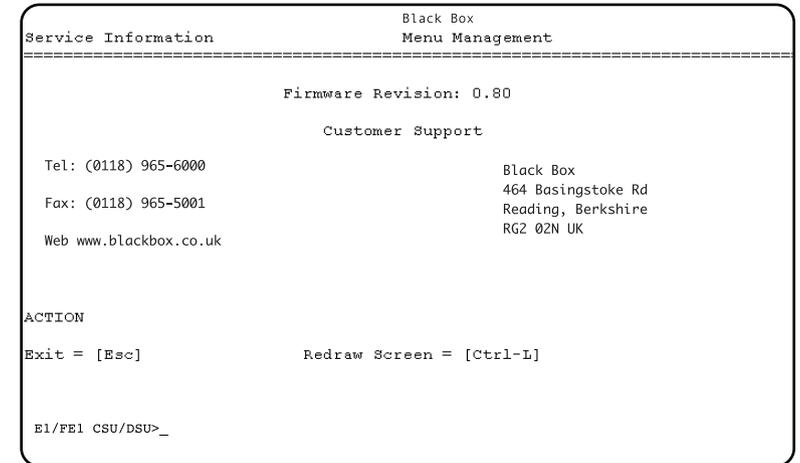
The following sections describe the strap locations and possible settings for each rear card.

f Set to Default Configuration

You may set the G.703 Access Card to its factory default configuration, except for the header lines and the password, by executing the Set to Default Configuration command.

g Service Information

If you need to contact us for help, you can view the Service Information screen. Here is what it looks like:



d Loop Timeout

The Loop Timeout setting can be set to one of the following:

- 00:05 = five minutes
- 00:10 = ten minutes
- 00:15 = fifteen minutes
- 00:30 = thirty minutes (default setting)
- 00:45 = forty-five minutes
- 01:00 = one hour
- 01:30 = 90 minutes
- 02:00 = two hours
- 03:00 = three hours

NEVER = forever—the unit will remain in loopback without user intervention.

e Tx Data Clock: Internal Tx Clock (default)

Options: **Internal Tx Clock** or **External Tx Clock**

Switch S2-7 selects the clock that is used to accept the Transmit Data from the DTE interface. Standard DTE interfaces will transmit data with respect to the External Clock. In some cases a DTE interface will transmit with respect to the Transmit clock sent out from the G.703 Access Card. Please review the information provided with your DTE equipment for more information on its' operation. In most cases when there are errors on the line only in the direction of the transmit data, S2-7 can be changed to solve the problem.

S2-7	Tx Clock Select
Off	Transmit data accept with respect to the transmit clock from the G.703 Access Card
On	Transmit data accept with respect to the external clock from the DTE

Model DB-25 Rear Card Strap Settings

Figure 7 shows strap locations for the DB-25 Rear Cards. These straps determine various grounding characteristics for the terminal interface and twisted pair lines. JB3 and JB4 are user configurable.

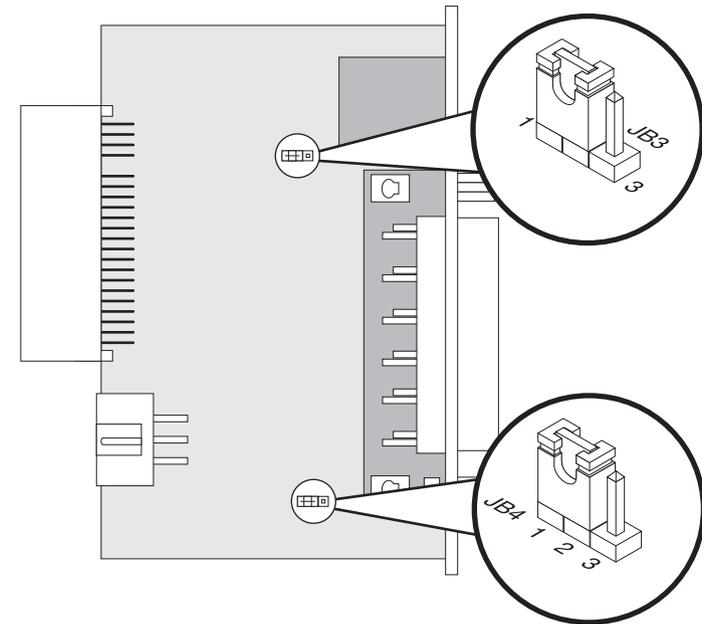


Figure 7. DB-25 Rear Cards strap locations.

Table 7 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 7: Interface Card Strap Summary

Strap	Function	Position 1&2	Position 2&3
JB3	DTE Shield (Pin1) & FRGND	Connected*	Open
JB4	FRGND & SGND	Connected*	Open
* Indicates default setting			

DTE Shield (DB-25 Pin 1) & FRGND (JB3). In the connected position, this strap links DB-25 pin 1 & frame ground. In the open position, pin 1 is disconnected from frame ground (see Table 8)

Table 8: JB3 strap settings

Position	Description
1 & 2	SGND (Pin 7) and FRGND Connected through a 100 ohm resistor
2 & 3	DTE Shield (Pin 1) and FRGND Not Connected

SGND & FRGND (JB4). In the connected position, this strap links DB-25 pin 7 (signal ground) and frame ground through a 100-ohm resistor. In the open position, pin 7 is connected directly to frame ground (see Table 9)

Table 9: JB4 strap settings

Position	Description
1 & 2	SGND (Pin 7) and FRGND Connected through a 100 ohm resistor
2 & 3	SGND (Pin 7) and FRGND Directly Connected

Current DIP Switch Settings. The switch settings are displayed here to facilitate troubleshooting your unit without opening up the unit first.

Switch 1:On
2:On
3:On
4:Off
5:On
6:Off
7:Off
8:Off

Unit Options

The Unit Options screen looks like this (factory default):

```

Black Box
Unit Information                               Menu Management
=====
a Header Line 1: Patton Electronics             Error Indications
b Header Line 2: Menu Management               -----
c Password:                                     Fifo Slips:      0x00
d Loop Timeout: 00:30 (hh:mm)                 Clk Slips:      0x00
e Tx Data Clock: Int Tx Clock

f Set to Default Configuration
g Service Information
h Clear Errors:

ACTION

Select Item = [Highlighted Letter]   Accept Selection = [Enter]
Change Options = [Space Bar]         Exit = [Esc]
                                       Redraw Screen = [Ctrl-L]

E1/FE1 CSU/DSU>_
    
```

c Header Line 1 and

b Header Line 2

Headers 1 and 2 are provided for easy identification of your unit after installation. You may want to give each unit a unique name via the header lines to help distinguish one unit from another. You can enter a header up to 40 letters long. Two lines provide 80 letters for your use. That's a lot of flexibility!

c Password

The Password facility provides security by allowing only those who know the correct password to configure the unit via the control port. You can still configure the unit via the DIP switches. The password can be up to 16 characters long, with no restriction on the combination of characters you can use, so be sure to remember the password. The password is case sensitive. If you lose your password, you will lose the ability to access the unit via the control port.

will initiate a CSU loop when Remote Loop is selected by the front panel switches.

S2-3	RDL Type
Off	Initiate a V.54 RDL loop when selected
On	Initiate a CSU loopback when selected

d Test Pattern: Idle (default)

Options: **Idle** or **Sending**

To send a pattern, press the 'c' key and press <spacebar> to send the test pattern. The "OK" message indicates the received test pattern is error-free. The "BE" message indicates errors in the received pattern. You may also hear a beep (from your terminal) once a second as long as the unit detects a bit error in the pattern.

Idle Indicates that G.703 Access Card is not sending a pattern.

Sending Indicates that G.703 Access Card is sending a pattern.

e Error Insertion Off (default)

Options: **On**, **Off**

You may inject intentional errors into the test pattern by turning Error Insertion ON. The Error (ERR) LED will blink once per second.

f Selected Pattern

Options: **QRSS**, **511**, or **2047**

Use this option to select the test pattern used to test the link.

NI status

The network interface (NI) status is shown in the middle of the Diagnostics/Statistics screen. The brackets are empty when the link is operating normally. Only one error message is provided.

```

NI STATUS
[EXZ] [  ]
[FE ] [SE ]
[LOS] [OOF]
[  ] [  ]
    
```

Receiver Carrier Loss [RCL]. Occurs when 255 consecutive zeros have been detected at the network interface. RCL clears when a pulse is detected.

```

Rx Level, dB
[    < -22.5]
    
```

M/34 Rear Card Strap Settings

Figure 8 shows the strap location for the M/34 rear card. This strap determines whether signal ground and frame ground will be connected.

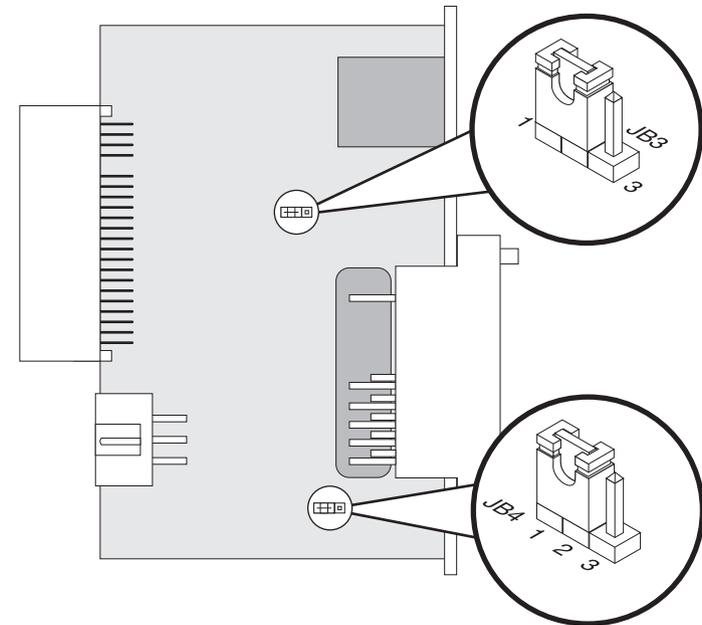


Figure 8. M/34 Rack Card strap locations.

Table 10 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 10: 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			

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 11).

Table 11: 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 12).

Table 12: JB4 strap settings

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

DB-15 Rear Card Strap Settings

Figure 9 on page 21 shows strap locations for the DB-15 rear cards. These straps determine various grounding characteristics for the terminal interface and twisted pair lines. JB3 and JB4 are user configurable.

TM The G.703 Access Card has successfully negotiated the Remote Loopback test and is in control of the remote unit. You may send a test pattern at this point by pressing:

d <spacebar>

TxTr The G.703 Access Card is sending a Terminate Loopback message to the remote unit. If the remote unit does not respond, the local unit will return to the Idle state.

Tx1s If the remote G.703 Access Card responds to the local CSU/DSUs terminate loopback request, the local unit then sends an all ones pattern before returning to the Idle state

TxP The G.703 Access Card is sending a test pattern while in Test Mode

IdIP The G.703 Access Card is sending a test pattern in place of data. The G.703 Access Card is not in test mode.

The G.703 Access Card receiving a RL can be in one of the following states:

RxPr The G.703 Access Card is receiving a preparatory pattern.

Sack The G.703 Access Card, upon receiving a preparatory pattern, sends an acknowledgement message.

RL The G.703 Access Card is in remote loopback mode.

RxTr The G.703 Access Card is receiving a terminate loopback message.

WE1s The G.703 Access Card is waiting for a sequence of all ones and will time out if it does not receive it.

IdleP The G.703 Access Card is sending a QRSS, 511 or 2047 pattern.

Off The G.703 Access Card is in local loopback.

c RDL Type: V.54 (default)

Options: **V.54** or **CSU**

The user can set this switch to select the type of remote loop that will be initiated by the G.703 Access Card. If set to V.54, the G.703 Access Card will initiate a V.54 loop when Remote Loop is selected by the front panel switches. If set to CSU, the G.703 Access Card

The System Diagnostics/Statistics options and functions are described below.

c Local Loop Idle (default)

The Local Loop is a bi-lateral loopback in which the data from the local DTE and the data from the remote unit are looped back to their respective sources. Activate this loop to test the each of the DTE's connection to the G.703 Access Card.

The Local Loop test has four states:

- Idle** No user-controlled loopbacks are active.
- LL** The G.703 Access Card is in local loopback mode.
- Off** The G.703 Access Card is in remote loopback mode or sending a pattern. Local loopback is disabled.
- LocP** The G.703 Access Card is in local loopback mode, and is sending a test pattern.

b Remote Loop Idle (default)

The Remote Digital Loopback (RDL) test checks the performance of both the local and remote CSU/DSUs, as well as the communication link between them. Data from the local DTE is sent across the entire communication circuit and looped back to the local DTE.

The G.703 Access Card Initiating a RL can be in one of the following states:

- Idle** No user-controlled loopbacks are active.
- TxPr** The G.703 Access Card is sending the preparatory phase pattern lasting for approximately 2–5 seconds.
- WtAk** The G.703 Access Card is waiting for an acknowledgement from the remote unit. If the remote unit does not respond, the WtAk message will remain on the screen.
- RxAk** The G.703 Access Card has received an acknowledgement from the remote unit.
- Tout** The G.703 Access Card is waiting before entering the Remote Loopback test mode.

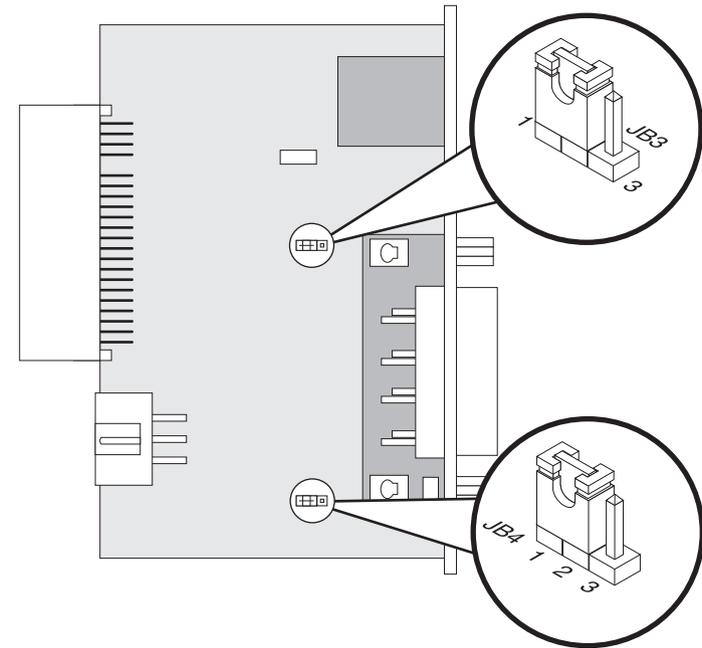


Figure 9. DB-Rear Card strap locations.

Table 13 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 13: 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 14).

Table 14: JB3 strap settings

Position	Description
1 & 2	DTE Shield (Pin 1) and FRGND Connected
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 (see Table 15).

Table 15: 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

DB15/Dual BNC Rear Card Strap Settings

Figure 10 shows strap locations for the DB-15/Dual BNC rear cards. These straps determine various grounding characteristics for the terminal interface and twisted pair lines. JB3 and JB4 are user configurable.

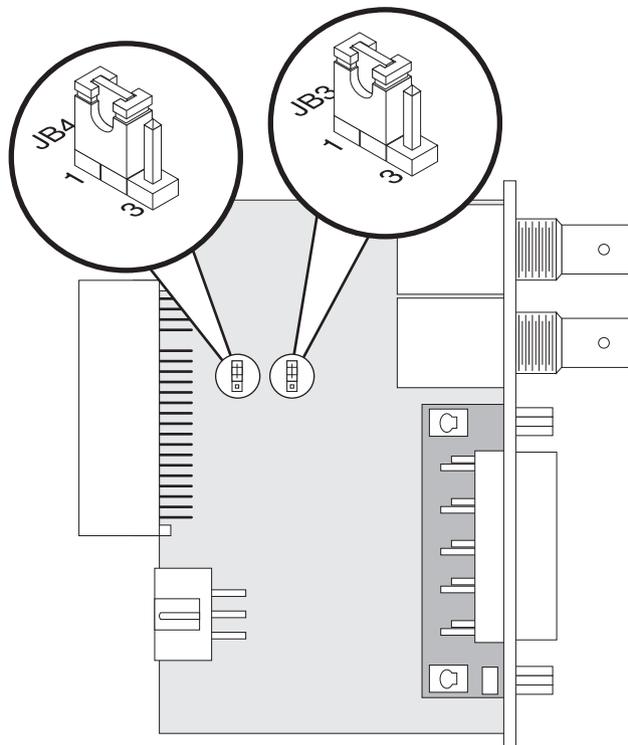


Figure 10. DB15/Dual BNC rear card strap locations.

Front Panel Switches: enabled (*default*)

Options: **enabled, disabled**

As the front panel switches may be inadvertently toggled, or in the event that the end-user may not need to use the switches, the installer may disable the front panel switches. Set switch S2-6 to determine whether the front-panel toggle switches are enabled or disabled.

S2-6	Option
On	Front panel switches enabled
Off	Front panel switches disabled

System Diagnostics

The System Diagnostics/Statistics screen looks like this:

```

Black Box
Unit Information                               Menu Management
=====
Header Line 1: Patton Electronics             Error Indications
Header Line 2: Menu Management              -----
Password:                                     Fifo Slips:      0x00
Loop Timeout: 00:30 (hh:mm)                 Clk Slips:      0x00
Tx Data Clock: Int Tx Clock

Set to Default Configuration
Service Information
Clear Errors:

ACTION
Select Item = [Highlighted Letter]   Accept Selection = [Enter]
Change Options = [Space Bar]         Exit = [Esc]
                                       Redraw Screen = [Ctrl-L]

E1/FE1 CSU/DSU>_
    
```

Note This screen is updated once per second.

make changes through the control port, no changes will take place or be saved to permanent memory until you Save Changes (Main Menu option “d” + [Enter]). When you make changes through the switches, all changes are made immediately.

Note If you do not have a terminal, you may force the unit to use the DIP switches as the default configuration source by turning off the unit, setting all the DIP switches to the ON position, then powering on the unit. This will cause the unit to enter a special mode. Then turn off the unit and change the switch settings to the desired settings. When you turn the unit on again, the unit will be set up with the selected switch settings.

n **DS0 Channel Configuration Menu** [Bandwidth/# Channels = 2,048k/na] (default).

The Channel Configuration Menu has a sub-menu that looks like this:

```

=====
Display Bandwidth Allocation          Black Box
Menu Management
=====
a: 1 On      i: 9 On      q: 17 On     y: 25 On
b: 2 On      j: 10 On     r: 18 On     z: 26 On
c: 3 On      k: 11 On     s: 19 On     1: 27 On
d: 4 On      l: 12 On     t: 20 On     2: 28 On
e: 5 On      m: 13 On     u: 21 On     3: 29 On
f: 6 On      n: 14 On     v: 22 On     4: 30 On
g: 7 On      o: 15 On     w: 23 On     5: 31 On
h: 8 On      p: 16 On     x: 24 On

Bandwidth Selected: 1,984k          Total Channels: 31

ACTION

Select Item = [Highlighted Letter]      Redraw Screen = [Ctrl-L]
Change Options = [Space Bar]           Exit = [Esc]

E1/FE1 CSU/DSU>_
    
```

You may configure the G.703 Access Card to operate with any combination of active and inactive DS0 channels in this screen. When you execute the Save Changes command, the selected settings will be saved to permanent memory, and the system will be updated to operate with the new channel settings.

Note In Unframed format, the Bandwidth Selected will display “2.048k,” and the Total Channels will display “na.” When using the DIP switches to set the bandwidth, the starting channel is always channel 1 or 0.

Table 16: 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			

VT-100 Software Configuration

This section describes the VT-100 configuration using a Access Rack Control Card. For information on configuration using SNMP through the RMU9700-SNMP, please refer to the RMU9700-SNMP user manual.

The G.703 Access Rack Card features a VT-100 menu-driven system that may be used for local configuration and management. Cards are configured and managed by setting a separate address for each card using hardware switches and then accessing each card using a rack mounted Access Rack Control Card. The software management system is described below. For more information on the Access Rack Control Card, refer to the Access Rack Control Card user manual.

Note The Access Rack Control Card uses an internal bus to communicate with the G.703 Access Card. When using software configuration, the rear card for the G.703 Access Card should be configured with FRGND and SGND connected. Refer to section “Configuring the rear interface card” on page 15 for more information on configuring your rear card.

Accessing the Menu System

1. Set the card address as described in section “Setting the card address.” on page 14.
2. Set S2-7 to the ON position to select VT-100 control.
3. Power up the terminal and set its RS-232 port as follows:
 - 9600 Baud
 - 8 data bits, 1 stop bit, no parity
 - Local echo off
 - ANSI or VT-100 emulation

4. Here is an example of a terminal emulator setup session. In normal font are the various parameter types. In **bold type** are the values that should be used for best results. Your terminal program's setup screen may differ from this one:

```
Baud rate: 9600   Parity: None   Data Length: 8   Stop Bits: 1
Default terminal type: VT-100
Local Echo:                               Off
Add Line Feeds after CRs:                 Off
Received Backspace Destructive:          On
Backspace key sends:                     BS
XON/XOFF software flow control:          On
CTS/RTS hardware flow control:           Off
DSR/DTR hardware flow control:           Off
```

5. Install the G.703 Access Card and the Access Rack Control Card into the rack system (see section 4, "Installation" on page 38, to install the G.703 Access Card; see the Access Rack Control Card User Manual to install the Access Rack Control card and to connect the RS-232 port).
6. After your G.703 Access Card units are installed and you have set up your Access Rack Control Card and VT-100 terminal as described above, you are ready to access the G.703 Access cards. This is done by selecting the address for a card using the command "Ctrl-b" address <CR>. For example, if your G.703 Access Card has an address of "64", type the following:
- Ctrl b** (Hold down the Ctrl key and depress the 'b' character)
064 (Type in the address '64')
<CR> (Depress the 'Enter/Carriage Return' key)

f CRC-4 Setting: Disabled (*default*)

Options: **Enabled, Disabled**

CRC-4 Multiframe: CRC-4 Multiframe uses TS0 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 CRC-4 MF; otherwise, the one using CRC-4 MF will detect a loss of sync.

g CAS MF Setting: Disabled (*default*)

Options: **Enabled, Disabled**

CAS MF: CAS multiframe uses Timeslot 16 (TS16) to send multiframe (MF) alignment data. In CAS MF, a MF is defined as 16 frames, where a frame consists of 32 64 kbps 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 2715 does not perform any signaling in TS16 other than to insert the MF alignment word, in order to maintain MF alignment. When CAS MF 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

i V.54 Loops: Enabled (*default*)

Options: **Enabled, Disabled**

This is a special in-band loopback facility that sends a special pseudo-random pattern over the data stream. This is the only loopback that the unit can initiate. This is useful for campus applications when you need to put a remote unit in loopback. The unit responds to the V.54 loopback command, and the whole process takes only a few seconds to complete. When V.54 Loopback is disabled, the unit will not be able to send or respond to V.54 loopback commands. The duration of the loopback is limited by the loopback timeout setting. While V.54 is being activated, user data is overwritten.

j Default Config Source: Switch (*default*)

Options: **EEPROM, Switch**

The G.703 Access Card can be initialized via the configuration in the on-board permanent memory (EEPROM) or via the internal DIP switches (switch). Once the unit is powered up, you may change the settings through the control port or the DIP switches. When you

b Line Coding: HDB3 (*default*)Options: **AMI, HDB3**

HDB3: In this line coding, the transmitter substitutes a deliberate 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. Unless AMI is required in your application, HDB3 should be used whenever possible.

AMI: Alternate Mark Inversion defines a pulse as a “mark,” a binary one, as opposed to a zero. In a E1 network connection, signals are transmitted as a sequence of ones and zeros. Ones are sent as pulses, and zeros are sent as spaces, i.e., no pulse. Every other pulse is inverted from the previous pulse in polarity, so that the signal can be effectively transmitted. This means, however, that a long sequence of zeros in the data stream will cause problems, since the G.703 Access Card receiving the signal relies on the signal to recover the 2.048 Mbps clock. If you must use AMI, you should ensure that the data terminal equipment connected to the unit provides a minimally acceptable pulse density. For this reason, there are advantages to using HDB3 instead.

d Clocking: Network (*default*)Options: **Network, Internal, External**

Network: This is the most commonly used setting when connecting to a carrier's network. In this mode, the unit recovers the clock from the received signal and uses it to transmit data. In this way the unit remains synchronized to a master clock. In campus applications, one of the units must be set to Internal clock, and the other end is set to Network clock. At all times, there must be only one clock source. Otherwise, clock slips and framing errors and bit errors may occur.

Internal: This is commonly used in campus applications, where the unit is not connected to the public telephone network directly. In this mode, the unit uses the on-board oscillator as the transmit clock source.

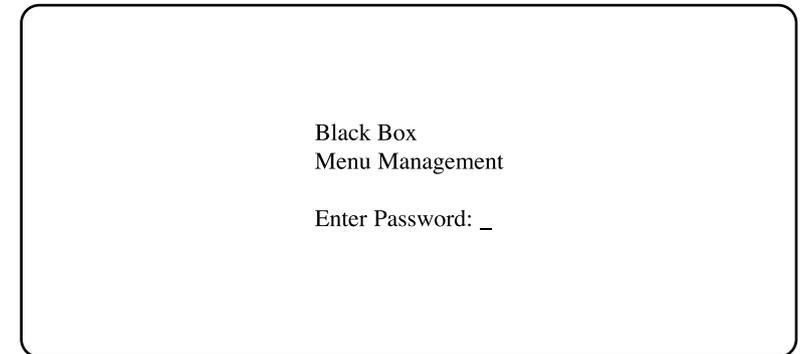
External: In this mode, the unit requires a clock signal from the DTE via the external clock pin on the DTE interface connector. Most applications will use Network or Internal clock modes.

e Line Build Out: 120 ohm (*default*)Options: **120 ohm, 75 ohm**

120 ohm: Use with 120 ohm RJ-48C connector.

75 ohm: Use with the DB15/Dual BNC card rear card. (Dual BNC connectors)

The password prompt will be displayed as shown below.



Note The password is case sensitive. Type the password and press <Enter>. The factory default password for the unit is:

blackbox

Note If the entry is incorrect, the password screen will clear and prompt you again for the correct password. The password you enter will not be shown. For security, asterisks will be displayed for each letter you type. The maximum length of the password, which can include any character the terminal can generate, is 16 characters.

7. The G.703 Access Card will then display the Main Menu screen.

Introduction to Main Menu

After entering the password, you may access all of the system's functions and parameters. The Main Menu looks like this:

```

Main Menu                                     Black Box
                                           Menu Management
=====
a System Configuration
b System Diagnostics/Statistics
c Unit Options

d Save Changes
e Logoff

**NOTE** Unsaved changes will be lost after this session.

ACTION
Select Item = [Highlighted Letter]          Go to Sub-menu = [Enter]
Redraw Screen = [Ctrl-L]

E1/FE1 CSU/DSU>_

```

1. To make a selection, key the highlighted letter that corresponds to a menu selection.
2. To execute the selection, type [Enter/CR].
3. To toggle between options on a highlighted selection, Press [space].
4. Select **d** Save Changes from Main Menu after making modifications to any G.703 Access Card parameter. Otherwise, changes will be lost when the G.703 Access Card is turned off.

The Main Menu options are briefly described below:

- c** **System Configuration** options allow you to change various aspects of the G.703 Access Card operation, e.g., framing, line coding, and aggregate bandwidth.
- b** **System Diagnostics/Statistics** options allow you to monitor the network performance, initiate V.54 loops, local loops, and send test patterns. Network performance parameters are updated once a second, giving you the ability to quickly determine if there is a problem.
- c** **Unit Options** enable you to customize the G.703 Access Card for your location. You can change the default header names to give

each unit a unique name and password. Also, you can reset the unit to its default settings without the manual. It also has a service information screen in case you need technical assistance from Black Box.

- d** **Save Changes.** Once you have configured the unit to your satisfaction, you can save the changes permanently by executing the Save Changes command. This will update the unit's configuration and save all the parameters to permanent memory.
- e** **Logoff.** For security, log off the control menu by executing the Logoff command. This will blank the screen until an [Enter] key is pressed.

System Configuration

The System Configuration menu looks like this:

```

System Configuration                         Black Box
                                           Menu Management
=====
a Line Format:                               G.703
b Line Coding:                               HDB3
  TS Channel Rate:                           64kbps
c Clocking:                                  Internal
e Line Build Out (dB):                       120 ohm, normal
f CRC-4 Setting:                             Disabled
g CAS MF Setting:                            Disabled
h Test modes from DTE:                       Enabled
i V.54 Loop:                                 Enabled
j Default Config Source:                     EEPROM
k DSO Channel Configuration Menu             [ Bandwidth/# Channels = 2,048k/na
]
o Front Panel Switches                       Enabled

ACTION
Select Item = [Highlighted Letter]          Go to Sub-menu =
[Enter]
Select Option = [Space Bar]                 Exit = [Esc]
Redraw Screen = [Ctrl-L]

```

The System Configuration options are described below:

- c** **Line Format:** G.703 (*default*)

Options: **G.703**, **G.704**

G.703: G.703 is unframed, 2.048 Mbps. In this case, the DTE rate is equal to the line rate at the network interface (NI). CAS MF and CRC-4 are disabled.

G.704: G.704 reserves TS0 for signaling and frame alignment. Maximum data rate depends on whether CAS MF is enabled or not.