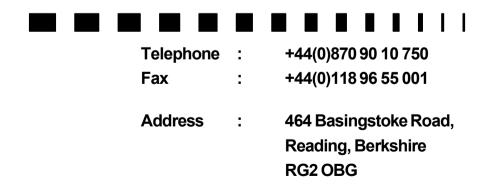**BLACK BOX**®
NETWORK SERVICES

EasiLink G.703 Multi-Mode:
MTU9100ST-MM
MTU9100ST-MM-DC

EasiLink G.703 Single-Mode:
MTU9100ST-SM
MTU9100ST-SM-DC

EasiLink G.703

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Introduction

The BlackBox EasiLink G.703 is a derivative of the highly successful EasiLink FX-1. The EasiLink G.703 has been engineered to reduce cost and increase functionality in this expanding sector of the market for G.703-over-fibre interface converters. The EasiLink G.703 range of Fibre Optic link systems from Black Box Network Services is designed to enable the connection of data and voice systems over longer distances than is possible using conventional copper cable. They are also applicable to environments where noise immunity is of importance. The multi-mode fibre versions have a range of up to three kilometres and are suitable for campus and large building applications. The single mode versions have a range of up to 20 kilometres and are suited to service provider and private network applications.

All models have both 75-ohm un-balanced and 120-ohm balanced G.703 interface on board so the equipment to be attached may also be of either type. The default configuration is 75-ohm operation. Both single mode and multimode fibre connectors are of the ST type. Other types fibre connection requirements may be achieved by the use of adapters or patch cables.

Installation

On unpacking the EasiLink G.703 you should find the unit, a management control cable, and this manual. All units have an integral power supply. Mains powered units have an IEC connector and are delivered with a mains lead with a fused plug. DC powered units are available as an option. If there are any questions please refer to your supplier.

Connection of equipment with a 75-ohm un-balanced G.703 / E1 interface

If the unit is being used with a piece of equipment with a 75-ohm un-balanced G.703 interface then it should be connected using the two B.N.C. connectors on the rear panel of the EasiLink G.703. These are labelled as "Rx" and "Tx". The equipment you are attaching to the EasiLink G.703 may be labelled with transmit and receive. The EasiLink G.703 "RX" port should be connected to the receive side of the attached equipment. The EasiLink G.703 "TX" port transmits carrier and this should be connected to the out-bound port of the attached equipment. Switches two and three on the SW1 switch bank should be in the down/on position.

G.703 75-ohm Cable Schedule

Connections should be made using 75-ohm co-axial cables with B.N.C. connectors. The co-ax cables required are two off, 75-ohm co-ax cables, of 5mm diameter, which must be terminated in male B.N.C. connectors. The maximum cable attenuation must be 6db at 1024kHz. The attenuation characteristics should follow the "root f" law. Cable type RG59, or 2002, or equivalent, should meet this specification.

Connection of equipment with a 120-ohm balanced G.703 / E1 interface.

If the unit is being used with a piece of equipment with a 120-ohm balanced G.703 interface then it should be connected using the RJ45 connector on the rear panel of the EasiLink G.703. This is labelled as RJ45. Units are shipped with the interface set up for 75-ohm operation. To enable the 120-ohm balanced operation set the middle two switches (switches two and three) of the SW1 switch bank to the up/off position. The pin out for the RJ-45 is as defined for ONP/CTR-12 and is given in the specification section.

Clock settings

The EasiLink G.703 operates only in 'transparent' mode. In transparent mode the recovered receive clock from the G.703 interface is used as the transmit clock on the fibre interface, and the recovered clock from the fibre interface is used as the transmit clock for the G.703 interface. A common application is for two EasiLink G.703 units to be used to interconnect two G.703 devices, such as a pair of PBXs, that are synchronised to a common carrier network. Both G.703 D.T.E.s will supply clock (master mode) for their transmit signals and this will be preserved through the fibre link. Any clock slippage or drift will be corrected by the slip buffers on the D.T.E.s G.703 receive side, as it would in a normal, non-extended, copper link scenario.

Switch functions and default settings

Switch Bank SW1		Default
Switch 1	Optional ground for RJ45 Receive Shield	Up/Off
Switch 2	Enable 75-ohm operation on Tx on BNC	On/Down

Status Indicators

There are five LED status indicators on the front panel of the EasiLink G.703. These are labelled "Loop Back", "Fibre Error", "Fibre", "Net" and "Power". The "Loop Back" LED will illuminate when the loop-back condition is selected. The "Fibre Error" LED will illuminate if errors are received over the fibre. The "Fibre" LED will illuminate when fibre data is received from the equipment at the far end of the fibre. The "Net" indicator is illuminated when the EasiLink G.703 is receiving good G.703 from the attached equipment. "Loop Back" function is selected / enabled via the async management control interface.

Loop back functions

The EasiLink G.703 has an internal loop back function controlled through the management interface. This function loops back both the fibre interface and the G.703 interface simultaneously. In situations where the installer does not have access to a terminal connection the loop back effect can be achieved by connecting a cable loop back to either the fibre interface or the G.703 interface. If the fibre interface is looped then the G.703 data will traverse the EasiLink G.703 electronics in both directions, including the fibre transducers. Similarly, if the G.703 interface is looped then the fibre data will traverse the EasiLink G.703 electronics in both directions, including the G.703 line interface unit.

CE Mark

Electromagnetic Compatibility

This device complies with the following standards in accordance with the European Directives 89/336/EEC and amending directives 91/263/EEC, 92/31/EEC, 93/68/EEC

> Immunity EN 50082-1 06/92

> Emission EN 55022 class B 08/87

Safety

In accordance with European Low Voltage Directives 73/23/EEC, 93/68/EEC and Telecommunication Terminal Equipment Directive 91/263/EEC amending directive 93/68/EEC, this device complies with the following standards: EN 60950:1992 + A5 and EN 41003 08/93

The ports on this unit have the following safety status:

> DTE (X.21 / V.35) = SELV

> Network Interfaces (G.703) = SELV   (SELV = Safety Extra Low Voltage)

These definitions are classified as per standard EN 60950:1992 + A5.

DTE Port

This product is approved to EN 55022, connection of unapproved cables or equipment may affect EMC product performance. Interconnection circuits must comply with the requirements of EN 60950:1992 + A5 for SELV circuits.

Management functions

The EasiLink G.703 is delivered with a 1.5 metre RJ45 to DB9 management cable. This cable is designed to plug into the RJ45 management port on the **front** of the EasiLink G.703. It should not be plugged into the network RJ45 on the rear of the unit. The DB9 is designed to plug into the COM port of a PC or laptop computer. The management is supported by an async command line protocol, 8-bit, no parity, one stop bit at 9600 baud, supported by most standard terminal emulation packages e.g. HyperTerminal supplied with Microsoft Windows.

Commands

Commands may be equipped with options, which need to be typed after the command name.

<Command> [<opt # 1> <opt # 2> . . . . <opt # n>]

Each option is to be delimited by one (or more) white space (not tabs). The command line is then delimited by a carriage return.

Unrecognized commands, or no command will result in the error message 'Command not found'.

Commands with illegal, or unrecognized options will result in the error message 'Syntax error'.

All commands are case insensitive, however, they are written in capitals in this document for clarity. It is usual to use lower case in practice. **The command line is limited to 22 characters, including the command itself and spaces.**

Command prompts

There are three command prompts. Each reflects a different system status:

'Changed>'   The system configuration has not been updated since the last changes to the working configuration. Also the system configuration may not have been saved to the nonvolatile storage since the last system update.

'Unsaved>'   The system configuration has been updated since the last changes to the working configuration, but has not been saved to the nonvolatile storage.

'>'   The system configuration has been updated since the last working configuration change and the system configuration has been saved since the last update.

Command set

1. UPDATE – Update system configuration

Syntax: UPDATE

Description: Transfers the working configuration to the system.

2. STATUS – display configuration and status information

Syntax: STATUS [<cycle timer>]

Description: Displays the working and system configurations, and the system status information. If the 'cycle timer' option is present, the cycle mode is entered and the status command will be executed periodically.

'Cycle timer' >= 0 and <= 120 seconds. If the status command is executed with a cycle timer of '0', or it is omitted, the status will be display immediately and the cycle mode will be terminated.

3. READ – read configuration from non-volatile storage

Syntax: READ

Description: Overwrites system and working configurations from non-volatile storage.

4. SAVE - save configuration to non-volatile storage

Syntax: SAVE

Description: Saves the current system configuration in nonvolatile storage. Failure to use this command will result in the loss of any new configuration if the unit is powered off.

5. LBACK - enable / disable loop-back mode

Syntax: LBACK <ON / OFF>

Description: Loop-back test mode control. Serial TxD I/P is looped back onto RxD O/P. Network RxD I/P is looped back onto TxD O/P. If TS0 is selected for serial transmission then clear channel mode is assumed, otherwise G.704 framing is adopted.

Option	Description	Notes
'OFF'	Normal operation	
'ON'	G703 and Fibre loop-back	1.

1.   Cleared by power cycle re-set

6. NAME - set system name

Syntax: NAME <system name>

Description: Sets system name. Max length is 16 characters and can include most characters (including white space).

Management Command

A command has been devised to streamline the communications when the EasiLink G.703 management is connected to an automated processor based proxy management system. The command includes the status and configuration information.

SOT	IDENT	Revisions				Flags	Settings	Name	EOT	CSUM
'$'	ppp'/ppp	1	2	3	4	ff	ss	nn..nn	':'	cc

The string is ASCII encoded, with start and end markers, and validated with an 8bit checksum.

SOT – Start-Of-Text.

Dollar sign '$'.

IDENT – Product identification number.

IDENT		
Identification	'/'	version
RO (Read Only)		

Revisions – System revisions.

Revisions			
Software issue	Software version	CPLD issue	CPLD version
RO			

Flags – Read only system status flags.

Flags							
7	6	5	4	3	2	1	0
CMDerr						Unsaved	Changed
RO							

Changed – Changes have been made, but not updated. (Local flag only)

Unsaved – Changes have been updated, but not saved to EEPROM. (Local flag only)

Settings -ss: System flags.

Flags							
7	6	5	4	3	2	1	0
		LBACK	Relay	FIERR	FLOI	GAOS	GLOI
RO		R/W	RO				

GLOI	G703 Loss of input
GAOS	G703 Receiving all one's
FLOI	Fibre Loss of input
FIERR	Fibre locked but receiving errors
Relay	Current relay status
LBACK	Loop-back enable (bit 5 = 1 = loop back enabled, bit 5 = 0 = loop back disabled).
	Note that the loop-back status (bit 5) is re-set to zero on power cycling the unit.

Name - System name.

Name
R/W

Name characters need to be in hexadecimal encode ASCII format. This is required to allow any ASCII characters to be used in the name. The name length can vary from 1 to 16 characters. The name must be terminated with an ASCII encoded NULL ('00').

E.G. If the name is to be 'JOHN' then the name string will be '4A4F484E00'

EOT - End-Of-Text.

Full colon ':'.

CSUM - String check sum

The check sum is an 8bit, unsigned addition of each transmitted character. This also includes the SOT and EOT characters.

Specifications

On Board Master Clock

Operating Frequency: 2.048 MHz +/- 50 PPM @ 25 deg. C

Network Interface Signals Specification

The Network Interface conforms to ITU specification G.703 / G.704 and ETSI Open Network Provision for digital unstructured / structured leased line (D2048U / D2048S).

<u>Transmit.</u>

Output Pulse amplitude	2.37 V into 75R $\pm$ 10%
	3.00 V into 120R $\pm$ 10 %
Return Loss	Min 8 dB - Max 14 dB

<u>Receive.</u>

Sensitivity Below (0dB = 2.4 V)	- 10dB
Loss of Signal Threshold	0.3V
Return Loss	18 dB
Allowable consecutive Zeros before LOS	190 bits.

Mechanical

The network signals are offered up to the network on two 75R Coax sockets or an RJ45.

Pin on RJ45	Function
1 and 2	Rx pair from network
3	Shield reference point
4 and 5	Transmit pair to network
6	Shield reference point

Note that the Receive Shield reference point is taken to ground via switch one of the SW1 switch bank. Moving switch one to the down/on position connects Receive Shield to ground.

Environmental

The EasiLink G.703 is designed to operate under the following conditions.

Ambient temperature in the range of 5 to 45 degrees Celsius.
Relative humidity of 10 to 90 percent (non-condensing).
Atmospheric pressure 86kPa to 106kPa.
Power Options: 90 - 260VAC, 50/60Hz, 100mA or 36 - 72 V DC, 200mA

SAFETY WARNINGS

Check that the input voltage marked on the rear of the unit is suitable for the intended installation. If in any doubt, consult your supplier.

Mains powered units:- In the event of a problem the unit must be disconnected from the mains by isolation at the mains socket. The unit must be connected only to an easily accessible mains outlet.

DC powered units:- In the event of a problem the unit must be disconnected from the DC supply by removing the DC input connector on the rear of the unit.

The unit contains no user serviceable parts. All servicing must be carried out by qualified personnel only.