Teldat Router

G.703 Interface

User Manual

INDEX

Chapter 1
Introduction

1. Description

The E1/G.703 interface is a serial interface incorporating the following standards:

G.703

G.703 is an ITU (formally CCITT) standard which describes a physical layer i.e. the physical and electrical signal characteristics transmitted between both ends of the communication. Two pairs of cables are usually used in the interface: one to transmit data and the other to receive it. These cables are generally either coaxial or twisted pair.

The standard defines three methods to transmit synchronism between both ends:

- **Codirectional**: This is the most common. This delivers the clocks in the same direction as the data. The clock information is recovered from the received data and forwarded with the sent data. As this information is included together with the data signal, additional cables are not required. The device cable is used.

- **Counterdirectional**: The clock information and the data are transmitted in opposite directions. This implies two additional pairs to transmit the clocks independently from the data.

- **Centralized clock**: The clock, both transmission as well as reception at both ends is received from a central clock generator. In the same way as the above case, this implies the use of two additional pairs to transmit the clocks independently from the data.

Although in principal, the G.703 standard was developed to operate at diverse speeds and formats, it is widely used in conjunction with another standard: G.704.

G.704

The G.704 defines the structure of the frame used to transmit data. In our case, the frame structure for 2.048 Mbps will be used.

The frame comprises of 256 bits (8,000 frames per second). These bits are grouped in 32 time divisions of 8 bits each.

In the first of these (channel 0) a word for frame synchronization is introduced in one out of every two frames, to recover the 8 KHz synchronization at reception. The frame not carrying this information contains signaling and alarm bits.

The rest of the timeslots are used for data transmission although channel 16 is recommended to transmit channel-signaling information (Primary, R2, etc.).

$\leftarrow$ 1 frame = 32 * 8 bits = 256 bits in 125 microsec. $\rightarrow$

0	1 $\leftarrow$	timeslots	$\rightarrow$ 31

Timeslot 0

Even Frames FAS	1	0	0	1	1	0	1	1
Odd Frames NFAS	S_i	1	A	S_{a4}	S_{a5}	S_{a6}	S_{a7}	S_{a8}
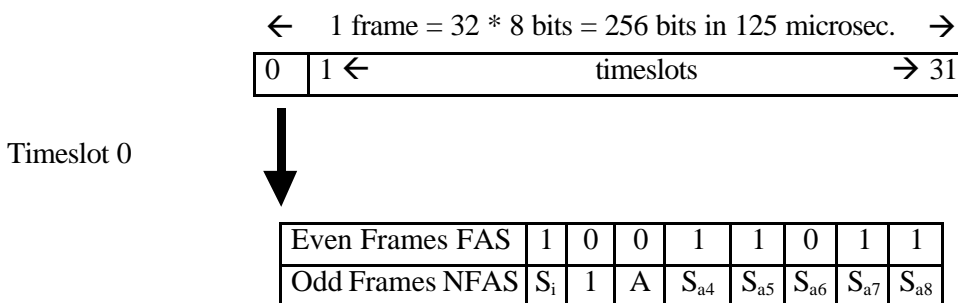
FAS	*Frame Alignment Signal*
NFAS	*Not Frame Alignment Signal*
A	*Alarm indication bit (RAI)*
Si	*International Signaling Bit*
SaX	*End-to-end Signaling Bits*

G.704 also defines an optional procedure VRC-4 vertical cyclic redundancy (also known as CRC-4 cyclic Redundancy check) to check the integrity of the data being received. In this case this forms a multiframe over timeslot 0 which consists of 16 frames over those inserted by the CRC complying with the following tables.

SubFrame	Frame		1	2	3	4	5	6	7	8
I	0	FAS	C_1	0	0	1	1	0	1	1
	1	NFAS	0	1	A	S_{a4}	S_{a5}	S_{a6}	S_{a7}	S_{a8}
	2	FAS	C_2	0	0	1	1	0	1	1
	3	NFAS	0	1	A	S_{a4}	S_{a5}	S_{a6}	S_{a7}	S_{a8}
	4	FAS	C_3	0	0	1	1	0	1	1
	5	NFAS	1	1	A	S_{a4}	S_{a5}	S_{a6}	S_{a7}	S_{a8}
	6	FAS	C_4	0	0	1	1	0	1	1
	7	NFAS	0	1	A	S_{a4}	S_{a5}	S_{a6}	S_{a7}	S_{a8}
II	8	FAS	C_1	0	0	1	1	0	1	1
	9	NFAS	1	1	A	S_{a4}	S_{a5}	S_{a6}	S_{a7}	S_{a8}
	10	FAS	C_2	0	0	1	1	0	1	1
	11	NFAS	1	1	A	S_{a4}	S_{a5}	S_{a6}	S_{a7}	S_{a8}
	12	FAS	C_3	0	0	1	1	0	1	1
	13	NFAS	E	1	A	S_{a4}	S_{a5}	S_{a6}	S_{a7}	S_{a8}
	14	FAS	C_4	0	0	1	1	0	1	1
	15	NFAS	E	1	A	S_{a4}	S_{a5}	S_{a6}	S_{a7}	S_{a8}

FAS	*Frame Alignment Signal*
NFAS	*Not Frame Alignment Signal*
C1 a C4	*CRC4 Bits*
E	*Received CRC4 with error indication*
A	*Remote alarm indicator (RAI)*
SaX	*Signaling Bits end-to-end*

G.706

The next step is the G.706 regulation. This defines the procedures to synchronize both ends based on the structure shown by G.704, e.g. synchronization loss detection or when synchronization exists as well as additional information on CRC4.

G.728

Complementary to the G.703 regulation and as we are working with synchronous networks, it is necessary to limit the phase fluctuation introduced (including slow fluctuation). For this purpose, we use the G.728 regulation that sets the limit for this type of network.

2. Installation

The board format is PMC Standard with 1 slot (card for 1 interface) or 2 slots (card for 4 interfaces).

The board is inserted in one of the free PCI slots in the device.

The board has connections for the physical connection as described below.

2.1. RJ45 Connector

This is normally used on unbalanced connections with an impedance of 120 Ohms.

The pins are as follows:

RJ45	Signal
4	Tx+
1	Rx+
2	Rx-
5	Tx-
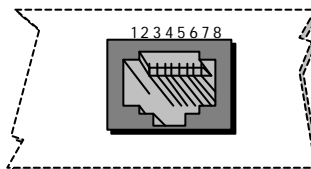
RJ45 connector contact numeration

The TX signals are considered outgoing and the RX incoming for the device.

2.2. Coaxial connector

This is normally used in balanced connections with an impedance of 75 Ohm.

The connector format used is DIN BNC 5.6/1.6 screw-on.

The transmission connector is located on the left and the reception on the right when looking at the rear of the board.

Chapter 2
Configuration

1. Accessing the interface configuration

To access the interface Configuration menu, you first need to enter the general configuration menu and from there access the G.703 interface.

```
Config>list devices

 Interface       Con     Type of interface          CSR      CSR2     int
 ethernet0/0     LAN1    Fast Ethernet interface   FA200E00           27
 serial0/0       WAN1    AT COM                    FA200A00 FA203C00   5E
 serial0/1       WAN2    X25                       FA200A20 FA203D00   5D
 serial0/2       WAN3    X25                       FA200A60 FA203F00   5B
 bri0/0          ISDN1   ISDN Basic Rate Int       FA200A40 FA203E00   5C
 x25-node        ---     Router->Node                     0            0
 g703port3/0     SLOT 3  G703 E1/T1                F0000000           22
 ppp1            ---     Generic PPP                      0            0
 ppp2            ---     Generic PPP                      0            0
 fr1             ---     Generic FR                       0            0
 fr2             ---     Generic FR                       0            0
Config>
```

In this example, the G.703 interface appears as g703port3/0, as a result:

```
Config>network g703port3/0

-- T1E1 / G703 Configuration --
g703port3/0 config>
```

2. Interface configuration commands

The G703 interface configuration commands are numerated and described in this section. All the interface configuration commands must be introduced at the G703 prompt corresponding to the interface (`g703port3/0 config>`).
You must save the configuration and restart the router in order to activate the new configuration.

Command	Function
? (HELP)	Lists the available commands or their options.
AISMODE	Configures the AIS signal detection mode.
CLOCKSOURCE	Configures the clock mode.
FRAMING	Configures the framing to be used in the interface.
LINECODE	Configures the codification type to be used over the interface.
LINKTYPE	Configures the link type to be used in the interface.
LIST	Displays the current configuration for the interface.
LOADIMPEDANCE	Configures the load impedance value seen by the interface.
MTU	Establishes the maximum frame size supported by the interface.
NO	Configures the default value for a determined option.
PRI-GROUP	Permits you to indicate which channels will be used as switched.
SHUTDOWN	Permits you to configure the interface administrative state.
TDM-GROUP	Permits you to configure timeslot associations to create channel aggregation.
EXIT	Returns to the configuration menu.

2.1. ? (HELP)

Displays a list of the available commands or their options.

Syntax:

```
g703port3/0 config>?
```

Example:

```
g703port3/0 config>?
  aismode           Set AIS Detection method
  clocksource       Set Clock Mode Internal (DCE) or Line (DTE)
  framing           Set Frame Format
  linecode          Set Line Coding Format
  linktype          Set Link Type
  list              Display Interface Configuration
  loadimpedance     Set Load Impedance value
  mtu               Set the maximum transfer unit
  no
  pri-group         Set ISDN-PRI channels
  shutdown          Change state to administratively down
  tdm-group         Set channel groups
  exit
g703port3/0 config>
```

2.2. AISMODE

Configures the type of detection used for the AIS signal.

ETS300233   Detects AIS when less than 3 zeros in 512 bits are received. Finalizes AIS when 3 or more zeros are detected in 512 bits.

G775   Detects AIS when all 1's in 1024 bits are received. Finalizes AIS when 3 or more zeros are detected in 1024 bits. (*Default value*).

Syntax:

```
g703port3/0 config>aismode ?
  ets300233    ON: less 3 zeros in 512 bits, OFF: 3 or more zeros in 512 bits
  g775         ON: all ones in 1024 bits, OFF: 3 or more zeros in 1024 bits
```

Example:

```
g703port3/0 config>aismode g775
g703port3/0 config>
```

2.3. CLOCKSOURCE

Permits you to configure the transmission clock mode in the interface.

INTERNAL   The transmission clock is internally generated. The device behaves as DCE, providing the line clock.

LINE   The transmission clock is recovered from the line. The device behaves as DTE, using the line clock. (*Default value*).

Syntax:

```
g703port3/0 config>clocksource ?
  internal    Transmit Clock is internally generated
  line        Transmit Clock is line recovered
```

Example:

```
g703port3/0 config>clocksource internal
g703port3/0 config>
```

2.4. FRAMING

Configures the frame mode used in the interface.

CRC4   E1 frame format (32 timeslots) with CRC-4. Creates a multiframe (16 frames) over Timeslot 1 where synchronization, alarms and the CRC-4 are transmitted. This is also known as PCM31C. (*Default value*).

NO-CRC4   E1 frame format (32 timeslots) without CRC-4.

                      Uses Timeslot 0 for synchronization (alignment) and alarm transmission. This is also known as PCM31.

UNFRAMED-2048   There is no frame format and this is used at 2048 Kbps as the only data interface. This is also known as D2048U.

Syntax:

```
g703port3/0 config>framing ?
  crc4            E1 Frame type with CRC-4
  no-crc4         E1 Frame type without CRC-4
  unframed-2048   E1 Full Frame 2048 Kbps
```

Example:

```
g703port3/0 config>framing crc4
g703port3/0 config>
```

2.5. <u>LINECODE</u>

Configures the type of line code going to be used.

AMI   Alternate mark inversion. AMI is a type of ternary signaling where one logical 1 is transmitted as 0 volts while one 0 is transmitted as a pulse with alternating polarity. The advantage here is that this eliminates the component containing the transmitted signal. Drawbacks however are the presence of 0's which provoke loss in clock recovery.

HDB3   High Density Bipolar Order 3. This is usually used in E1 interfaces (*Default value*).

In HDB3 encoding, the pulses are alternatively inverted as in the AMI code. However when more than 3 consecutive zeros appear, these are divided into groups of 4 and substituted for BOOV or 000V bits.

B indicates a pulse with a distinct symbol from the previous information pulse (information pulse is understood to mean all the pulses existing in the binary signal). Therefore B maintains the alternating pulse rule or bipolar rule with the rest of the information pulses.

V indicates a pulse with the same symbol as the preceding pulse, therefore violating the bipolar rule.

Group 0000 is substituted for BOOV when the number of information pulses between the previous V violation and that going to be introduced is even.

Group 0000 is substituted for 000V when the number of information pulses between the previous V violation and that going to be introduced is odd. Therefore the bipolar rule is maintained for the information pulses, i.e. both for the B and the V pulses.

Syntax:

```
g703port3/0 config>linecode ?
  ami     Alternate mark inversion. Both T1/E1
  hdb3    High density bipolar of order 3. E1 Only
```

Example:

```
g703port3/0 config>linecode hdb3
g703port3/0 config>
```

2.6. <u>LINKTYPE</u>

Configures the link type

E1   Each E1 frame contains 32 timeslots of 8 bits each with a length of 256 bits. 30 out of the 32 slots are used as B channels (primary) or as Data channels. Timeslot 0 is reserved for frame synchronization, optional CRC-4, monitoring and alarms. Timeslot 16 is reserved for the D channel (signaling through the CCS common channel), in cases where a PRI-GROUP is configured and if it cannot be used for data.

(Default value)

Syntax:

```
g703port3/0 config>linktype ?
  e1    32 channels (time-slots). 2048 Mbps
```

Example:

```
g703port3/0 config>linktype e1
g703port3/0 config>
```

2.7. <u>LIST</u>

Displays the interface configuration.

Example:

```
g703port3/0 config>list
Link type ......... E1
Frame format ...... CRC4
Line coding ....... HDB3
Clocking mode ..... INTERNAL
AIS mode .......... G775
Load Impedance .... 120-OHM
MTU size .......... 2060
g703port3/0 config>
```

2.8. <u>LOADIMPEDANCE</u>

Configures the line impedance value seen by the interface.

> **120-ohm**   Unbalanced lines which use twisted pair.
>
> **75-ohm**   Balanced lines which use coaxial. (*Default value*).

Syntax:

```
g703port3/0 config>loadimpedance ?
  120-ohm    Unbalanced lines
  75-ohm     Balanced lines
```

Example:

```
g703port3/0 config>loadimpedance 120-ohm
g703port3/0 config>
```

2.9. <u>MTU</u>

Configures the maximum frame size supported in the interface. This is common to all connections established over the said interface. *(2060 → Default value).*

Example:

```
g703port3/0 config>mtu 2048
g703port3/0 config>
```

2.10. <u>NO</u>

Permits you to delete channel aggregation both for primary use (PRI-GROUP) as well as for aggregated use (TDM-GROUP).

This additionally allows you to administratively enable the interface (SHUTDOWN.)

Syntax:

```
g703port3/0 config>no ?
  pri-group    Delete ISDN-PRI channels
  shutdown     Change state to administratively up
  tdm-group    Delete channel groups
```

Example 1:

```
g703port3/0 config>no tdm-group 1
g703port3/0 config>
```

Example 2:

```
g703port3/0 config>no shutdown
g703port3/0 config>
```

2.11. PRI-GROUP

Permits you to reserve timeslots to be used for ISDN primary signaling.

This command can indicate error situations if one of the selected timeslots pertains to a TDM-GROUP.

By default, no group is selected.

Example:

```
g703port3/0 config>pri-group timeslots 1-15,17-31
Channel 1 assigned in a TDM group (1)
g703port3/0 config>
```

2.12. SHUTDOWN

Configures the interface as disabled. This command is equivalent to the disable device command.

Example:

```
g703port3/0 config>shutdown
```

2.13. TDM-GROUP

Permits you to create channel aggregation (n x 64 Kbps).

This command can indicate error situations if one of the selected timeslots pertains to another TDM-GROUP or is assigned to the PRI-GROUP. By default no aggregation created.

Example:

```
g703port3/0 config>tdm-group 1 timeslots 1-8
g703port3/0 config>tdm-group 2 timeslots 17-25
g703port3/0 config>tdm-group 3 timeslots 9-16
g703port3/0 config>tdm-group 4 timeslots 26-31
```
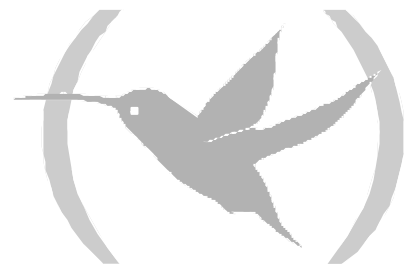
2.14. EXIT

Exits to the previous menu.

Example:

```
g703port3/0 config>exit
Config>
```

Chapter 3
Monitoring

1. Accessing interface monitoring

In order to access the G.703 interface Monitoring menu, you need to firstly enter the general monitoring menu and subsequently the G.703 interface.

```
*P 3
+CONFIGURATION

Teldat's Router, ATLAS 2 8  S/N: 403/00555
P.C.B.=43  Mask=0502  Microcode=0000  CLK=49152 KHz  BUSCLK=49152 KHz
Boot ROM release:
 BIOS CODE VERSION: 01.07.00C  Mar 10 2003 11:05:34
  gzip  Mar  5 2003 15:34:47
  io1  Mar  7 2003 10:34:48
  io2  Mar  5 2003 15:34:17
  io3  Mar 10 2003 11:05:07
 START FROM FLASH   Watchdog timer Enabled
Software release: 10.0.4 Apr  9 2003 08:36:20
Compiled by   INTEGRATOR on   INTEGRATOR
Hostname:                    Active user:
Date: Wednesday, 04/09/03    Time: 10:51:59

Num  Name      Protocol
0    IP        DOD-IP
3    ARP       Address Resolution Protocol
6    DHCP      Dynamic Host Configuration Protocol
11   SNMP      SNMP

11 interfaces:
Conn    Interface       MAC/Data-Link          Hardware             Status
LAN1    ethernet0/0     Ethernet/IEEE 802.3    Fast Ethernet Interface Up
WAN1    serial0/0       Async serial line      AT commands inteface    Down
WAN2    serial0/1       X25                    SCC Serial Line- X25    Down
WAN3    serial0/2       X25                    SCC Serial Line- X25    Down
ISDN1   bri0/0          BRI Net                ISDN Basic Rate Int     Up
---     x25-node        internal               Router->Node            Up
SLOT 3 g703port3/0      PRI/E1 Net             G.703 (E1/T1)           Up
---     ppp1            PPP                    Generic PPP             Down
---     ppp2            PPP                    Generic PPP             Down
---     fr1             Frame Relay            Generic FR              Up
---     fr2             Frame Relay            Generic FR              Up
+
```

In this example the G.703 interface appears as g703port3/0, as a result:

```
+NETWORK G703PORT3/0

-- T1E1 / G703 Monitorization --
g703port3/0 +
```

2. Interface monitoring commands

The G703 monitoring commands are numerated and described. Use these commands to obtain information on the G703 interface.

Command	Function
? (HELP)	Displays the available commands or their options.
CLEAR	Deletes the statistics.
LIST	Displays different interface aspects.
LOOP	Implements loops over the physical interface.
PRBS	Pseudo-random test sequence for Transmission/Reception over the interface.
EXIT	Return to the GWCON (+) prompt.

2.1. ? (HELP)

Displays a list of available commands or their options.

Syntax:

```
g703port3/0 +?
```

Example:

```
g703port3/0 +?
CLEAR
LIST
LOOP
PRBS
EXIT
g703port3/0 +
```

2.2. CLEAR

Use the **CLEAR** command to delete statistics.

Syntax:

```
g703port3/0 +CLEAR ?
ALL
CONNECTION
INTERFACE
PHYSICAL
```

a) CLEAR ALL

Permits you to delete statistics for all current connections and those for the interface.

Example:

```
g703port3/0 +CLEAR ALL
Multichannel Controller statistics cleared
Conection Id:9 TS:9 TsMap:0001FE00 statistics cleared
Conection Id:26 TS:26 TsMap:FC000000 statistics cleared
Conection Id:1 TS:1 TsMap:000001FE statistics cleared
Conection Id:17 TS:17 TsMap:03FE0000 statistics cleared
Physical statistics cleared
g703port3/0 +
```

b) CLEAR CONNECTION

Permits you to delete statistics for a connection established over the interface or all of them simultaneously.

Example 1:

```
g703port3/0 +CLEAR CONNECTION
Connection id (0->all)[0]? 9
Conection Id:9 TS:9 TsMap:0001FE00 statistics cleared
g703port3/0 +
```

Example 2:

```
g703port3/0 +CLEAR CONNECTION 26
Conection Id:26 TS:26 TsMap:FC000000 statistics cleared
g703port3/0 +
```

Example 3:

```
g703port3/0 +CLEAR CONNECTION
Connection id (0->all)[0]?
Conection Id:9 TS:9 TsMap:0001FE00 statistics cleared
Conection Id:26 TS:26 TsMap:FC000000 statistics cleared
Conection Id:1 TS:1 TsMap:000001FE statistics cleared
Conection Id:17 TS:17 TsMap:03FE0000 statistics cleared
g703port3/0 +
```

c) CLEAR INTERFACE

Permits you to delete the interface statistics.

Example:

```
g703port3/0 +CLEAR INTERFACE
Multichannel Controller statistics cleared
g703port3/0 +
```

d) CLEAR PHYSICAL

Permits you to delete the interface statistics at the physical layer.

Example:

```
g703port3/0 +CLEAR PHYSICAL
Physical statistics cleared
g703port3/0 +
```

2.3. EXIT

Returns to the + prompt.

Syntax:

```
g703port3/0 +EXIT
```

Example:

```
g703port3/0 +EXIT
+
```

2.4. LIST

Use the **LIST** command to display information on the G703 interface, the established connections and the physical layer.

Syntax:

```
g703port3/0 +LIST ?
ALL
BIT-RATE
CONNECTION
INTERFACE
PHYSICAL
```

a) LIST ALL

Displays the statistics for the controller, the established connections and the interface at the physical layer.

Displays the statistics for the connections and the interface.

b) LIST BIT-RATE

Displays the effective rate for all the channels configured over the interface.

Syntax:

```
g703port3/0 +LIST BIT-RATE
```

Example:

```
LINE g703port3/0 +list bit


                               Interface G703/0
 ------------------------------------------------------------------------------
 Current trx rate (bps)  =    2042360    Current rcv rate (bps)   =     41552
g703port3/0 +
```


c) LIST CONNECTION

Displays detailed information on the statistics for connections established over the interface.

Syntax:

```
g703port3/0 +LIST CONNECTION
```

Example:

```
g703port3/0 +LIST CONNECTION
Connection id (0->all)[0]? 1

Conection Id:1 TS:1 TsMap:000001FE statistics
-------------------------------------------------
Tx frames
    Successful .......... 19
    Dropped ............. 0
    Errored ............. 0
    Pending ............. 4
Rx frames
    Successful .......... 23
    Dropped ............. 0
    Errored ............. 0
       Short Frames ..... 0
       CRC .............. 0
       Imcompletes ...... 0
       Long Frames ...... 0
       Receive Aborts ... 0
       Overflow ......... 0

g703port3/0 +
```

ID   Connection identifier number. This is only significant at the local layer and normally coincides with the base interval except in cases of Unframed where this is always 1.

TS	Connection Time Slot base, this is normally the first one in cases where the connection is made up of a group of timeslots.
TsMap	Timeslot or interval map involved in the connection. This is a value at the bit layer i.e., this indicates that the timeslots being used in this example are from 1 to 8.
Tx Frames	
Successful	The number of frames that have been successfully transmitted at the local layer ("*Local layer*" simply means that the frames have been transmitted, not that they have successfully arrived at the next device).
Dropped	Transmission petitions executed by the upper layers that have been rejected.
Errored	The number of frames whose transmission has been requested and for various reasons this has not occurred.
Pending	The number of frames whose transmission has been requested but not confirmed as yet. These frames are queued in the output device but have not yet been transmitted.
Rx Frames	
Successful	Number of frames successfully received.
Dropped	Number of frames dropped at reception due to lack of buffers.
Errored	Number of frames received with errors. The detected errors are described below.
Short Frames	Frames containing less than 32 bits between the start and end flag.
CRC	Frames with CRC error.
Imcompletes	Frames whose contents are not divisible by 8 i.e. do not contain an integer number of bytes.
Long Frames	Frames whose content surpasses the MTU value defined by the interface.
Receive Aborts	Received frames which terminate with an Abort flag (0x7F).
Overflows	Dropped frames due to unavailability of internal buffer in the controller.

d) LIST INTERFACE

Displays detailed information on the controller statistics at a global level i.e. includes all the connections which are active or which have been released.

Syntax:

```
g703port3/0 +LIST INTERFACE
```

Example:

```
g703port3/0 +LIST INTERFACE
Multichannel Controller statistics
-----------------------------------------------

Physical device ......... MUNICH32X_WITH_FALC56
Physical status ........ Connected
Physical loop .......... None

Established connections . 2
Used timeslots .......... FC01FE00

Tx frames .............. 12466
Tx frames with errors ... 0
```

```
Tx frames dropped ....... 0
Rx frames .............. 12466
Rx frames with errors ... 0
Rx frames dropped ....... 0

g703port3/0 +
```

Physical Device	Name of the physical device used.
Physical Status	Status of the physical layer connection (Connected or No Carrier).
Physical Loop	Status of the loops at the physical layer (Local, Remote or None).
Established connections	Number of currently established connections in use on the interface.
Used timeslots	Intervals used for all currently established connections. This is a value at the bit layer i.e. this indicates that the timeslots used in this example are from 9 to 16 and from 26 to 31.
Tx Frames	
Successful	The number of frames that have been successfully transmitted at the local layer for all the interface. ("*Local layer*" simply means that the frames have been transmitted, not that they have successfully arrived at the next device).
Dropped	Transmission petitions executed by the upper layers that have been rejected.
Errored	The number of frames whose transmission has been requested and for various reasons this has not occurred.
Rx Frames	
Successful	Number of frames successfully received.
Dropped	Number of frames dropped at reception due to lack of buffers.
Errored	Number of frames received with errors.

e) LIST PHYSICAL

Displays detailed information on the interface statistics at the physical layer.

Syntax:

```
g703port3/0 +LIST PHYSICAL
```

Example:

```
g703port3/0 +LIST PHYSICAL
Physical device statistics
---------------------------------------------
Loss of Signal ......... OFF
Out of Frame ........... OFF
RAI Reception .......... OFF
AIS Reception .......... OFF
Code Violations ........ 0
CRC4 Errors ............ 0
E-Bit Errors ........... 0
FAS Word Errors ........ 2
Slip Event ............. CLEAR
Errored Second ......... CLEAR


Current status ..................... Up
Current status last (days/hh:mm:ss) .. 0/00:17:02
Status Changes ..................... 1 (Up 1 / Down 0)
Time measured in the last interval ... 124 sc
Valid  stored intervals ............. 1
```

```
Statistics measured                         current    previous       total
-----------------------------------------   ---------- ---------- ------------
(ES)   Errored seconds                  =        0          1            1
(SES)  Severely errored seconds         =        0          1            1
(SEFS) Severely errored framing seconds =        0          1            1
(UAS)  Unavailable seconds              =        0          0            0
(CSS)  Controlled slip seconds          =        0          1            1
(PCV)  Path coding violations (CRC4)    =        0          0            0
(FEBE) Far End Block Errors             =        0          0            0
(LES)  Line errored seconds             =        0          1            1
(BES)  Bursty errored seconds           =        0          0            0
(DM)   Degraded minutes                 =        0          0            0
(LCV)  Line code violations  (HDB3)     =        0          0            0

g703port3/0 +
```

Loss of Signal	Indicates signal presence or absence in the physical interface. (Red Alarm).
Out of Frame	Indicates frame alignment presence or absence over the physical interface.
RAI Reception	Indicates presence or absence of the "Remote Alarm Indication - Yellow Alarm" signal sent from the remote end.
AIS Reception	Indicates presence or absence of the "Alarm Indication Signal – Blue Alarm" signal, also known as "All unframed ones" sent from the remote end.
Code Violations	Error counter for code violations on line (HDB3 or AMI). Also known as LVC – Line Code Violations.
CRC-4 Errors	When the selected frame mode is CRC-4, this indicates the number of multiframe CRC-4 errors detected. Also known as PCV – Pulse code violations.
E-Bit Errors	When the selected frame mode is CRC-4, this indicates the number of E bit errors in the multiframe. The remote end activates the E Bit when reception error rate is above the threshold and so informs the other end. Also known as FEBE – Far End Block Errors.
FAS Word Errors	Error counter in the alignment word.
SLIP Event	Indicates if the interface is receiving the correct clock (CLEAR) or above the tolerance threshold level (SET). The tolerance threshold is a mask that appears in the ITU-T G.728 recommendation.
	The device is designed to support tolerance between the clock received from the line and the internal clock generated towards the device (2.048 Mbps).
	The line clock varies due to jitter, however the clock internally generated towards the device is always fixed.
	When the difference surpasses the threshold level the frames are repeated in reception (negative slip) or the frames are lost (positive slip).
Errored Second	Indicates if the last statistics second for an **active** connection has an error. This does not increase if there is no physical connection in the interface.

This provides information on the connections status over time:

Current status	Indicates if the physical interface is active (UP) or inactive (DOWN).

| | **Current status last** | Indicates the length of time the interface has been in the indicated status. |
| | **Status Changes** | Status changes counters from device start time. |

In the same way, the statistics stored by the time intervals complying with the RFC 1406 are displayed. The statistics are stored for 24 hours in periods of 15 minutes.

| | **Time measured** | Indicates the time stored for the last time interval i.e. the real duration of the current interval. |
| | **Valid Stored** | The number of stored 15 minute periods. |

The displayed statistics are indicated in following table:

NM	Name	Meaning
ES	Errored Seconds	For an E1-CRC link: When there is one or more Path Code Violations (PCV), one or more Out of Frame (OOF, FAS), one or more Slips (CS) or one or more Alarm Indication Signal (AIS) in a period of one second. This value does not increase during unavailable periods (UnAvailable Seconds – UAS).
SES	Severely Errored Seconds	For an E1-CRC link: Second during which there are more than 832 Path Code Violations (PCV) or one or more Out of Frame (OOF-FAS). This value does not increase during unavailable periods (UnAvailable Seconds – UAS).
SEFS	Severely Errored Framing Seconds	Seconds during which one or more Out of Frame (OOF-FAS) have been detected or when Alarm Indication Signal (AIS) has been detected.
UAS	Unavailable Seconds	Seconds during which the E1 interface is unavailable.
CSS	Controlled Sleep Seconds	Seconds during which one or more Slips have been detected.
PCV	Pulse Code Violations	Code violation error counter. For an E1-CRC link corresponding to the number of CRC4 errors.
FEBE	Far End Block Errors	E bits number counter (CRC4 error indication bit) which have been received.
LES	Line Errored Seconds	Seconds during which one or more code violations have been detected (LCV).
BES	Bursty Errored Seconds	Seconds during which between 1 and 320 PCV have been detected, without SES existing and without detecting AIS. The CS parameter is not included in this time.
DM	Degraded Minutes	Degraded minutes, where the estimated error rate is greater than 10^{-3}. The available seconds are computed, eliminating the SES and grouping them in periods of 60 seconds.
LCV	Line Code Violations	For an E1-CRC LCV interface this consists in bipolar code violation (BPV-HDB3) error detection or an excessive number of zeros (EXZ).

2.5. LOOP

Use the **LOOP** command to activate or deactivate loops in the physical interface.

Syntax:

```
g703port3/0 + loop ?
LOCAL
REMOTE
```

a) *LOOP LOCAL*

Activates or deactivates the local loop. All locally sent data is received.

The AIS signal is sent towards the remote end.

Examples:

```
g703port3/0 +LOOP LOCAL ENABLE
Local Loop Activated
g703port3/0 +LOOP LOCAL DISABLE
Local Loop Deactivated
g703port3/0 +
```

b) *LOOP REMOTE*

Activate or deactivates the remote loop. All data received by the interface is returned to the remote end.

Data received from the remote end is not sent to the local interface. An AIS signal is internally generated.

Examples:

```
g703port3/0 +LOOP REMOTE ENABLE
Remote Loop Activated
g703port3/0 +LOOP REMOTE DISABLE
Remote Loop Deactivated
g703port3/0 +
```

2.6. PRBS

Use the **PRBS** *(Pseudo-random binary sequence)* to activate or deactivate the transmission / reception of a pseudo-random test sequence in the physical interface.

Syntax:

```
g703port3/0 + PRBS ?
RECEIVE
TRANSMIT
STATUS
```

a) *PRBS RECEIVE*

Activates or deactivates test sequence reception in the interface.

In cases where detection of data received from the remote end is activated, this is not sent to the local interface. An AIS signal is internally generated.

Examples:

```
g703port3/0 +PRBS RECEIVE ENABLE
Pseudo-Random Binary Sequence Receive Activated
g703port3/0 +PRBS RECEIVE DISABLE
Pseudo-Random Binary Sequence Receive Deactivated
g703port3/0 +
```

Note: The PRBS detector monitors the incoming data sequence complying with the ITU-T O.151 norm. Synchronization is reached in 400 milliseconds from signal detection with a 99.9% probability with an error rate below 10^{-1}. A signal containing all 1's or all 0's in framed or unframed format can provoke synchronism activation.

b) *PRBS TRANSMIT*

Activates or deactivates test sequence transmission in the interface.

This always uses all available channels i.e. the generated test sequence is transmitted in framed (31*64 Kbps) or unframed (32*64 Kbps) mode depending on the interface configuration.

There are two types of sequence transmitted.

A-(2exp15-1) The sequence sent is 2^{15}-1 with a maximum restriction of 14 zeros, complying with ITU-T 0.151.

B-(2exp20-1) The sequence sent is 2^{20}-1 with a maximum restriction of 14 zeros, complying with ITU-T 0.151.

Example 1:

```
g703port3/0 +PRBS TRANSMIT ?
A-(2exp15-1)
B-(2exp20-1)
DISABLE
g703port3/0 +PRBS TRANSMIT A
Pseudo-Random Binary Sequence Transmit Activated
```

Example 2:

```
g703port3/0 +PRBS TRANSMIT B
Pseudo-Random Binary Sequence Transmit Activated
g703port3/0 +PRBS TRANSMIT DISABLE
Pseudo-Random Binary Sequence Transmit Deactivated
g703port3/0 +
```

c) PRBS STATUS

Displays information on the test sequence measurements in the interface.

Example:

```
g703port3/0 +PRBS STATUS
Transmit .......... Enabled
Receive  .......... Enabled
Synchronized ...... Yes
Bit errors ........ 60 (47 sc.)
g703port3/0 +
```

Note: The error bits counter starts from 0 in each sequence activation petition and is updated once per second. You can reset the counter once the sequence has started through 2 commands, requesting reception activation once more (`PRBS RECEIVE ENABLE`) or by deleting the physical layer statistics (`CLEAR PHYSICAL`).

---

3. Locating malfunctions

3.1. Alarms and statistics

The alarms and statistics indicated by the interface are very useful when determining possible errors or malfunctions in the connection. The following table provides a guide to identify faults.

ALARM	Action
Loss of Signal	• Check the cable integrity and that it is correctly connected • If you are using a coaxial cable, make sure the terminals are not crossed • If you are using a twisted pair, make sure that the pins are correctly connected

Out of Frame	• Check that the interface configuration is correct. You may need to modify the configuration through the following commands:
	
	    o clocksource (line/internal)
	
	    o framing (crc4 / no-crc4 / unframed)
	
	• Consult your supplier on the characteristics of the interface they have provided

RAI Reception	• Transmission towards the remote end is problematic • If you are using a coaxial cable, make sure that the transmission pair is correctly connected • If you are using a twisted pair, make sure that the pins are correctly connected
AIS Reception	• The remote end is sending all 1's. It's possible you have nothing configured to transmit over your interface and it is configured in unframed mode. You may need to modify the configuration with the following command: o framing unframed
Code Violations	• Make sure you are using a suitable code. You may need to modify the configuration with the following command: o linecode (hdb3/ami)
CRC-4 Errors	• The other end is not using the same type of framing. You may need to modify the configuration with the following command: o framing (crc4 / no-crc4)
E-Bit Errors	• The other end is detecting CRC4 errors. It's possible that this is not enabled in the interface. Modify the configuration with the following command: o framing crc4

SLIP Event	• If this indicator constantly remains on SET, then there is a problem when recovering the line clock. This could be due to:
	
	  o The remote device is incorrectly generating the transmission clock
	
	  o The Jitter on the line is above the specifications
	
	  o The local device has internal problems when recovering the clock due to a hardware problem

3.2. Loops and Test Sequences

Executing loops over the interface as well as transmission and reception of a test sequence can help determine where errors are located.

When executing a remote loop or during test sequence reception, the interface is declared DOWN, independently to the physical layer.

If you are going to execute tests and there are circuits configured over the interface, we recommend these be disabled before carrying out tests.

Interfaces ppp1, ppp2, fr1 and fr2 are disabled in this example.

Example :

```
Config>list devices

 Interface       Con     Type of interface           CSR       CSR2    int
 ethernet0/0     LAN1    Fast Ethernet interface    FA200E00            27
 serial0/0       WAN1    AT COM                     FA200A00  FA203C00  5E
 serial0/1       WAN2    X25                        FA200A20  FA203D00  5D
 serial0/2       WAN3    X25                        FA200A60  FA203F00  5B
 bri0/0          ISDN1   ISDN Basic Rate Int        FA200A40  FA203E00  5C
 x25-node        ---     Router->Node                      0            0
 g703port3/0     SLOT 3  G703 E1/T1                 F0000000            22
 ppp1            ---     Generic PPP                       0            0
 ppp2            ---     Generic PPP                       0            0
 fr1             ---     Generic FR                       0            0
 fr2             ---     Generic FR                       0            0
Config>disable device ppp1
Config>disable device ppp2
Config>disable device fr1
Config>disable device fr2
Config>list devices

 Interface       Con     Type of interface           CSR       CSR2    int
 ethernet0/0     LAN1    Fast Ethernet interface    FA200E00            27
 serial0/0       WAN1    AT COM                     FA200A00  FA203C00  5E
 serial0/1       WAN2    X25                        FA200A20  FA203D00  5D
 serial0/2       WAN3    X25                        FA200A60  FA203F00  5B
 bri0/0          ISDN1   ISDN Basic Rate Int        FA200A40  FA203E00  5C
 x25-node        ---     Router->Node                      0            0
 g703port3/0     SLOT 3  G703 E1/T1                 F0000000            22
 ppp1            ---     Generic PPP                       0            0 Dsb
 ppp2            ---     Generic PPP                       0            0 Dsb
 fr1             ---     Generic FR                       0            0 Dsb
 fr2             ---     Generic FR                       0            0 Dsb
Config>save
Save configuration [n]? y

Saving configuration...OK on Flash (not saved in SmartCard)
Config>
*restart
Are you sure to restart the system(Yes/No)? y
Restarting. Please wait ................................................
APP DATA DUMP..................................................................
Running application
Flash configuration read
Initializing




Teldat                 (c)2001-2003

Router model ATLAS 2 8 CPU MPC860      S/N: 403/00555
1 LAN, 3 WAN Lines, 1 ISDN Line, 1 G703 Line



*
```

Enabled the required test, e.g. test sequence transmission / reception on the interface.

```
*p 3
+configuration

Teldat's Router, ATLAS 2 8  S/N: 403/00555
P.C.B.=43  Mask=0502  Microcode=0000  CLK=49152 KHz  BUSCLK=49152 KHz
Boot ROM release:
 BIOS CODE VERSION: 01.07.00C  Mar 10 2003 11:05:34
  gzip  Mar  5 2003 15:34:47
  io1  Mar  7 2003 10:34:48
  io2  Mar  5 2003 15:34:17
  io3  Mar 10 2003 11:05:07
 START FROM FLASH   Watchdog timer Enabled
Software release: 10.0.4 Apr 15 2003 06:26:16
Compiled by    INTEGRATOR on  INTEGRATOR
Hostname:                   Active user:
Date:   Tuesday, 04/15/03    Time: 07:27:33


Num  Name       Protocol
0    IP         DOD-IP
3    ARP        Address Resolution Protocol
6    DHCP       Dynamic Host Configuration Protocol
11   SNMP       SNMP


11 interfaces:
Conn    Interface        MAC/Data-Link          Hardware             Status
LAN1    ethernet0/0      Ethernet/IEEE 802.3    Fast Ethernet Interface Up
WAN1    serial0/0        Async serial line      AT commands inteface   Down
WAN2    serial0/1        X25                    SCC Serial Line- X25   Down
WAN3    serial0/2        X25                    SCC Serial Line- X25   Down
ISDN1   bri0/0           BRI Net                ISDN Basic Rate Int    Up
---     x25-node         internal               Router->Node           Up
SLOT 3  g703port3/0      PRI/E1 Net             G.703 (E1/T1)          Down
---     ppp1             PPP                    Generic PPP            Disabled
---     ppp2             PPP                    Generic PPP            Disabled
---     fr1              Frame Relay            Generic FR             Disabled
---     fr2              Frame Relay            Generic FR             Disabled
+
+network g703port3/0
g703port3/0 +prbs transmit a
Pseudo-Random Binary Sequence Transmit Activated
g703port3/0 +prbs receive enable
Pseudo-Random Binary Sequence Receive Activated
g703port3/0 +prbs status
Transmit ......... Enabled
Receive  ......... Enabled
Synchronized ...... No
```

Enable the test sequence transmission / reception at the remote end. Check that this synchronizes. If errors initially appear, you can delete them in order to restart the count.

```
g703port3/0 +prbs status
Transmit ......... Enabled
Receive  ......... Enabled
Synchronized ...... Yes
Bit errors ........ 15 (5 sc.)
g703port3/0 +clear phy
Physical statistics cleared
g703port3/0 +prbs status
Transmit ......... Enabled
Receive  ......... Enabled
Synchronized ...... Yes
Bit errors ........ 0 (1 sc.)
```

Should errors at reception persist, these can be monitored:

```
g703port3/0 +prbs status
Transmit .......... Enabled
Receive  .......... Enabled
Synchronized ...... Yes
Bit errors ........ 76 (915 sc.)
```

Once the tests have finished, enable the configured interfaces:

```
*p 4
Config>enable device ppp1
Config>enable device ppp2
Config>enable device fr1
Config>enable device fr2
Config>save
Save configuration [n]? y

Saving configuration...OK on Flash (not saved in SmartCard)
Config>
*restart
```

Chapter 4
Events

1. Introduction

Events monitoring is a very useful tool for diagnosing and locating possible problems in a connection.

In order to activate the G.703 interface events:

From monitoring:

```
*PROCESS 3

+EVENT

-- ELS Monitor --
ELS>ENABLE TRACE SUBSYSTEM G703 ALL
ELS>
```

From configuration:

```
*PROCESS 4


Config>EVENT

-- ELS Config --
ELS config>ENABLE TRACE SUBSYSTEM ADSL ALL
ELS config>
```

So that these are stored in the configuration, the user must save the configuration and if he/she wishes restart the device.

2. Events

G703.001

Level: Unusual external error, UE-ERROR

Short Syntax:

G703.001 LOS Red Alrm set *ifc_name*

Long Syntax:

G703.001 Loss of Signal (Red Alarm) Set on interface *ifc_name*

Description:

Loss of Signal Alarm Set

G703.002

Level: Per packet trace, P-TRACE

Short Syntax:

G703.002 LOS Red Alrm clr *ifc_name*

Long Syntax:

G703.002 Loss of Signal (Red Alarm) Clear on interface *ifc_name*

Description:

Loss of Signal Alarm Clear

G703.003

Level: Unusual external error, UE-ERROR

Short Syntax:

G703.003 OOF Alrm set *ifc_name*

Long Syntax:

G703.003 Out Of Frame Alarm Set on interface *ifc_name*

Description:

Out Of Frame Alarm Set

G703.004

Level: Per packet trace, P-TRACE

Short Syntax:

G703.004 OOF Alrm clr *ifc_name*

Long Syntax:

G703.004 Out Of Frame Alarm Clear on interface *ifc_name*

Description:

Out Of Frame Alarm Clear

G703.005

Level: Unusual external error, UE-ERROR

Short Syntax:

G703.005 RAI Yellow Alrm set *ifc_name*

Long Syntax:

G703.005 Remote Alarm Indication (Yellow Alarm) Set on interface *ifc_name*

Description:

Remote Alarm Indication Set

G703.006

Level: Per packet trace, P-TRACE

Short Syntax:

G703.006 RAI Yellow Alrm clr *ifc_name*

Long Syntax:

G703.006 Remote Alarm Indication (Yellow Alarm) Clear on interface *ifc_name*

Description:

Remote Alarm Indication Clear

G703.007

Level: Unusual external error, UE-ERROR

Short Syntax:

G703.007 AIS Blue Alrm set *ifc_name*

Long Syntax:

G703.007 Remote Alarm Indication (Blue Alarm) Set on interface *ifc_name*

Description:

Remote Alarm Indication Set

G703.008

Level: Per packet trace, P-TRACE

Short Syntax:

G703.008 AIS Blue Alrm clr *ifc_name*

Long Syntax:

G703.008 Remote Alarm Indication (Blue Alarm) Clear on interface *ifc_name*

Description:

Remote Alarm Indication Clear

G703.009

Level: Unusual internal error, UI-ERROR

Short Syntax:

G703.009 Opn fld ch *index* tsmp *list ifc_name*

Long Syntax:

G703.009 Open Fail for channel *index* with time slot map *list* on interface *ifc_name*

Description:

Open Fail

G703.010

Level: Per packet trace, P-TRACE

Short Syntax:

G703.010 Opn cnx ch *index* tsmp *list ifc_name*

Long Syntax:

G703.010 Open Success for channel *index* with time slot map *list* on interface *ifc_name*

Description:

Open Success

G703.011

Level: Unusual internal error, UI-ERROR

Short Syntax:

G703.011 Cls fld ch *index* tsmp *list ifc_name*

Long Syntax:

G703.011 Close Fail for channel *index* with time slot map *list* on interface *ifc_name*

Description:

Close Fail

G703.012

Level: Per packet trace, P-TRACE

Short Syntax:

G703.012 Cls cnx ch *index* tsmp *list ifc_name*

Long Syntax:

G703.012 Close Success for channel *index* with time slot map *list* on interface *ifc_name*

Description:

Close Success

G703.013

Level: Per packet trace, P-TRACE

Short Syntax:

G703.013 Tx ch *index* len *value ifc_name*

Long Syntax:

G703.013 Frame transmitted channel *index* length *value* on interface *ifc_name*

Description:

A frame was transmitted.

G703.014

Level: Unusual internal error, UI-ERROR

Short Syntax:

G703.014 Tx err ch *index ifc_name*

Long Syntax:

G703.014 Frame transmitted with error channel *index* on interface *ifc_name*

Description:

A frame was transmitted with error.

G703.015

Level: Unusual internal error, UI-ERROR

Short Syntax:

G703.015 Tx drp ch *index* len *value ifc_name*

Long Syntax:

G703.015 Frame transmitted dropped channel *index* length *value* on interface *ifc_name*

Description:

A frame in the transmit path was dropped.

G703.016

Level: Per packet trace, P-TRACE

Short Syntax:

G703.016 Rx ch *index* len *value ifc_name*

Long Syntax:

G703.016 Frame received channel *index* length *value* on interface *ifc_name*

Description:

A frame was received.

G703.017

Level: Unusual external error, UE-ERROR

Short Syntax:

G703.017 Rx err:shrt ch *index* len *value ifc_name*

Long Syntax:

G703.017 Frame received short channel *index* length *value* on interface *ifc_name*

Description:

A short frame was received

G703.018

Level: Unusual external error, UE-ERROR

Short Syntax:

G703.018 Rx err:crc ch *index* len *value ifc_name*

Long Syntax:

G703.018 Frame received with crc error channel *index* length *value* on interface *ifc_name*

Description:

A frame was received with crc error

G703.019

Level: Unusual external error, UE-ERROR

Short Syntax:

G703.019 Rx err:incm ch *index* len *value ifc_name*

Long Syntax:

G703.019 Incomplete frame received channel *index* length *value* on interface *ifc_name*

Description:

An incomplete frame was received

G703.020

Level: Unusual internal error, UI-ERROR

Short Syntax:

G703.020 Rx err:lng ch *index* len *value ifc_name*

Long Syntax:

G703.020 Long frame received channel *index* length *value* on interface *ifc_name*

Description:

A long frame was received. Check interface MTU

G703.021

Level: Unusual external error, UE-ERROR

Short Syntax:

G703.021 Rx err:abrt ch *index* len *value ifc_name*

Long Syntax:

G703.021 Aborted frame received channel *index* length *value* on interface *ifc_name*

Description:

An aborted frame was received

G703.022

Level: Unusual internal error, UI-ERROR

Short Syntax:

G703.022 Rx err:ovfl ch *index ifc_name*

Long Syntax:

G703.022 Reception overflow channel *index* on interface *ifc_name*

Description:

Overflow on reception path

G703.023

Level: Unusual external error, UE-ERROR

Short Syntax:

G703.023 Rx err:drp ch *index* len *value ifc_name*

Long Syntax:

G703.023 Drop frame received channel *index* length *value* on interface *ifc_name*

Description:

A frame received was dropped

G703.024

Level: Per packet trace, P-TRACE

Short Syntax:

G703.024 Cnx at *address* for *owner ifc_name*

Long Syntax:

G703.024 Create connection at *address* for *owner* on interface *ifc_name*

Description:

A connection was created

G703.025

Level: Per packet trace, P-TRACE

Short Syntax:

G703.025 Dcx at *address* for *owner ifc_name*

Long Syntax:

G703.025 Release connection at *address* for *owner* on interface *ifc_name*

Description:

A connection was released