G.703 Interface

Teldat-Dm 746-I

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I Related Documents

Teldat-Dm 772-I Common Configurations for Interfaces

Chapter 1 Introduction

1.1 Description

The E1/T1/G.703 interface is a serial interface that comprises 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. Clock information is gathered from the data received and forwarded with the data sent. As this information is included together with the data signal, additional cables are not required. The device cable is used.
- **Counterdirectional**: Clock information and data are transmitted in opposite directions. This implies two additional pairs to transmit the clocks independently from the data.
- **Centralized clock**: Transmission and 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.

Even though 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.

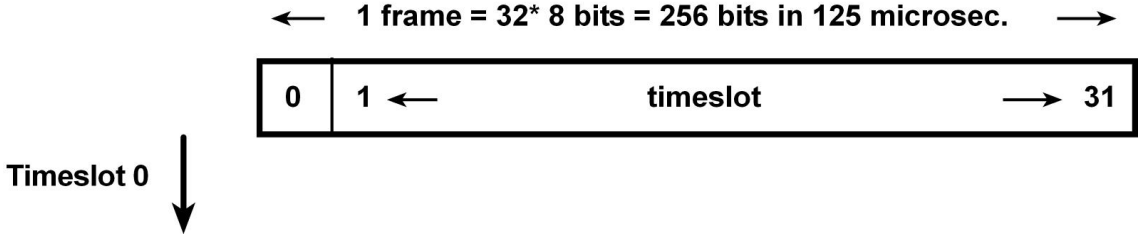
E1

For E1, a frame structure of 2.048 Mbps will be used.

The frame is made up 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.).



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 VRC-4 vertical cyclic redundancy (also known as CRC-4 cyclic Redundancy check) to check the integrity of the data being received. This forms a multiframe over timeslot 0, consisting of 16 frames over

those inserted by the CRC in accordance with the following tables.

Sub-Frame	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*

T1

For T1, a frame structure of 1.544 Mbps is used.

A frame is made up of 193 bits and – quite like E1 – is repeated 8,000 times per second. These bits are grouped in one F-bit (first bit) and 24 time divisions of 8 bits each.

The F-bit is useful for synchronization, frame alignment and performance monitoring purposes.

The rest of the timeslots are used for data transmission, although channel 24 is recommended to transmit channel-signaling information (Primary, R2, etc.).

There are two multi framing modes available: a so called superframe (SF, sometimes also called D4), consisting of 12 T1 frames; and the extended superframe (ESF) which is made up of 24 frames.

1 Multiframe Structures 12 / 24 frames multiframe

Frame No.	Superframe (SF/D4)			Extended Superframe (ESF)			
	MF No.	FAS	MFAS	MF No.	FAS	DL	CRC-6
1	1	1	-	1	-	*m*	-
2	2	-	0	2	-	-	e_1
3	3	0	-	3	-	*m*	-
4	4	-	0	4	0	-	-
5	5	1	-	5	-	*m*	-
6	6	-	1	6	-	-	e_2
7	7	0	-	7	-	*m*	-
8	8	-	1	8	0	-	-
9	9	1	-	9	-	*m*	-
10	10	-	1	10	-	-	e_3
11	11	0	-	11	-	*m*	-
12	12	-	0	12	1	-	-
13	1	1	-	13	-	*m*	-
14	2	-	0	14	-	-	e_4
15	3	0	-	15	-	*m*	-
16	4	-	0	16	0	-	-
17	5	1	-	17	-	*m*	-
18	6	-	1	18	-	-	e_5
19	7	0	-	19	-	*m*	-
20	8	-	1	20	1	-	-
21	9	1	-	21	-	*m*	-
22	10	-	1	22	-	-	e_6
23	11	0	-	23	-	*m*	-
24	12	-	0	24	1	-	-

MF: multiframe; FAS: frame alignment signal; MFAS multiframe alignment signal; DL: data link; CRC-6: cyclic redundancy check 6.

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/CRC6.

G.728

Complementary to the G.703 regulation, it limits the phase fluctuation introduced (including slow fluctuation) in synchronous networks.

1.2 Installation

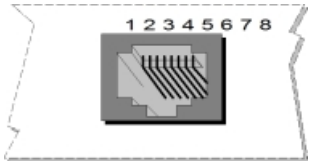
Refer to the board installation manual for detailed information on installation and maintenance.

E1/T1 physical connectors are described below for convenience.

1.2.1 RJ45 Connector

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

The pins are as follows:

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

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

1.2.2 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.

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

Chapter 2 Configuration

2.1 Accessing the interface configuration

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

```
Config>list devices

Interface            Connector     Type of interface
ethernet0/0          LAN1          Fast Ethernet interface
serial0/0            SERIAL0/WAN1  Auto Install Interface
serial0/1            SERIAL1/WAN2  X25
serial0/2            SERIAL2/WAN3  X25
bri0/0               BRI/ISDN1     ISDN Basic Rate Int
x25-node             ---           Router->Node
g703port3/0          SLOT3         G703 E1/T1
ppp1                 ---           Generic PPP
Config>
```

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

```
Config>network g703port3/0

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

2.2 Interface configuration commands

The G703 interface configuration commands are numerated and described in this section. All of them must be introduced at the G703 prompt corresponding to the interface (g703port3/0 config>).

Certain commands are common to all device interfaces. They are described in the common configuration manual (Teldat-Dm 772-I Common Configurations for Interfaces).

You must save the configuration and restart the router in order to activate the new configuration.

Command	**Function**
? (HELP)	Lists the available commands and their options.
AIS-RECEPTION	Configures the way the interface behaves on receiving the AIS signal.
AISMODE	Configures the AIS signal detection mode.
CAS-CUSTOM	Configures the R2 signaling parameters.
CAS-GROUP	Allows you to indicate which channels are going to be used for R2 signaling.
CLOCKSOURCE	Configures the clock mode.
EMULATE	Configures the emulation mode for interface signaling.
EQUALIZER	Configures the receiver equalizer sensitivity (haul-mode).
FRAMING	Configures the framing to be used in the interface.
IDLE-PATTERN	Configures the pattern to send in idle time-slots (hex value).
INPUT-BUFFERS	Configures the number of available input-buffers in the interface.
ISDN	Configures specific parameters related to ISDN signaling.
LINEBUILDOUT	Configures output line levels.
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 interface's current configuration.
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 given option.
PRI-GROUP	Allows you to indicate which channels will be used for Q931 signaling.

RAI-RECEPTION	Configures the way the interface behaves on receiving the RAI signal.
SHUTDOWN-INDICATION	Configures the signal sent to the remote end when the interface shuts down.
SUPERVISION	Configures the supervision parameters for the interfaces.
TDM-GROUP	Allows you to configure timeslot associations to create channel aggregation.
EXIT	Returns to the configuration menu.

2.2.1 ? (HELP)

Displays a list of the available commands and their options.

Syntax:

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

Example:

```
g703port3/0 config>?
  ais-reception          Set interface behavior on AIS alarm reception
  aismode                Set AIS Detection method
  cas-custom             Set specific r2 parameters
  cas-group              Set CAS channels and signaling
  clocksource            Set Clock Mode Internal (DCE) or Line (DTE)
  description            Enter interface description
  emulate                Set protocol emulation mode
  equalizer              Set Receive Equalizer Gain Limit (haul-mode)
  framing                Set Frame Format
  idle-pattern           Set pattern to send in idle channels (hex value)
  input-buffers           Set the number of rx buffers
  isdn                   ISDN specific parameters
  linebuiltdout          Set output voltage level for selected mode
  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
  rai-reception          Set interface behavior on RAI alarm reception
  shutdown-indication    Set shutdown indication option
  supervision            Set supervision params
  tdm-group              Set channel groups
  exit
g703port3/0 config>
```

2.2.2 AIS-RECEPTION

Configures the way an interface behaves when it receives an AIS alarm (Blue Alarm).

ENABLED	The AIS alarm forces the interface into a DOWN state.
IGNORED	The AIS alarm doesn't force any kind of status change in the interface *(Default value).*

Syntax:

```
g703port1/0 config>ais-reception ?
  enabled    Down interface
  ignored    None action
```

Example:

```
g703port3/0 config>ais-reception ignored
g703port3/0 config>
```

2.2.3 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 1s in 1024 bits are received. Finalizes AIS when 3 or more zeros are detected in 1024 bits (*Default value*).
IGNORE	Disables AIS alarm detection.

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
  ignore       Ignores AIS alarm reception
```

Example:

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

2.2.4 CAS-CUSTOM

Allows you to configure parameters relative to R2 signaling.

ABCD-BITS	ABCD bits assigned to the different line states.
ANI-DIGITS	Minimum and maximum number of caller digits.
ANSWER-SIGNAL	Register signal used to answer a call.
CATEGORY	Signal used to send the calling category in outgoing calls.
COUNTRY	Allows you to select a country to adapt the R2 parameters accordingly.
DNIS-DIGITS	Minimum and maximum number of calling digits.
DOUBLE-ANSWER	Activates a special response to reject collect calls.
DTMF	Register signaling is executed through DTMF digits.
EARLY-MEDIA	Audio is established before connecting the calls that go out through the interface so as to receive the altering tone in-band.
MFC	Register signaling is executed through MFC digits.
SKIP-CATEGORY-REQUEST	The ANI and the calling request category are ignored for incoming calls.
TIMERS	Configures the different R2 protocol timers.

Syntax:

```
g703port3/0 config>cas-custom
  abcd-bits        ABCD bits settings
  ani-digits       Requested number of ANI digits for each call
  answer-signal    Answer signal to use
  category         Category sent on outoing calls
  country          Set r2 specific country
  dnis-digits      Requested number of DNIS digits for each call
  double-answer    Use double answer to block incoming collect calls
  dtmf             Use DTMF register signaling
  early-media      Use early-media in calls going out through R2 interface
  mfc              Use MFC register signaling
  skip-category-request    Skip calling category and ANI on incoming calls
  timers           Set r2 timers
g703port3/0 config>
```

2.2.5 CAS-GROUP

Allows you to reserve timeslots to be used with channel assigned signaling (CAS).

You cannot configure different types of signaling for timeslots in the same interface. The types of CAS signaling supported here are: R2 digital, E&M immediate start, E&M wink start, E&M delay dial.

There are no timeslots selected by default.

Syntax:

```
g703port3/0 config>cas-group  ?
```

```
  timeslots            Select time-slots
    <values 1-31>         E1 timeslots
      e&m-delay-dial         E&M Delay Dial
      e&m-immediate-start    E&M Immediate Start
      e&m-wink-start         E&M Wink Start
      r2-digital             R2 Digital
```

Example:

```
g703port3/0 config>cas-group timeslots 1-31 r2-digital
g703port3/0 config>
```

2.2.6 CLOCKSOURCE

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

INTERNAL	The transmission clock is internally generated. The device behaves as the DCE, supplying the line clock.
LINE	The transmission clock is recovered from the line. The device behaves as the 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>
```

2.2.7 EMULATE

Configures the type of emulation to use when the interface is working in Primary mode (i.e., when a PRI-GROUP has been configured).

NETWORK	The device behaves as a network.
USER	The device behaves as a user.

Syntax:

```
g703port3/0 config>emulate ?
  network    PRI interface emulates network side
  user       PRI interface emulates user side
```

Example:

```
g703port3/0 config>emulate network
g703port3/0 config>
```

2.2.8 EQUALIZER

Allows you to configure the receiver's equalizer sensitivity (haul-mode).

LONG-HAUL	-43dB sensitivity. Greater receiver sensitivity *(Default value).*
SHORT-HAUL	-10dB sensitivity. Less receiver sensitivity.

Syntax:

```
g703port3/0 config>equalizer ?
  long-haul     -43 dB receiver, long-haul mode
  short-haul    -10 dB receiver, short-haul mode
```

Example:

```
g703port3/0 config>equalizer short-haul
g703port3/0 config>
```

2.2.9 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*).
ESF	T1 frame format extended superframe (ESF; F-bit plus 24 timeslots) with 24 frame multiframe with CRC-6.
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.**
SF	T1 frame format superframe (SF; F-bit plus 24 timeslots) with 12 frame multiframe.
SLC96	T1 frame format, similar to SF but modified by AT&T.
UNFRAMED-2048	There is no frame format and this is used at 2048 Kbps as the only data interface. It is also known as D2048U (E1).

Syntax:

```
g703port3/0 config>framing ?
  crc4              E1 Frame type with CRC-4
  esf               Extended Super Frame T1 Type
  no-crc4           E1 Frame type without CRC-4
  sf                Super Frame T1 Type
  slc96             AT&T Frame format
  unframed-2048     E1 Full Frame 2048 Kbps
```

Example:

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

2.2.10 IDLE-PATTERN

Configures the pattern to send in the idle time slots.

The default value depends on the type of link: D5 for E1 and 17 for T1 links.

Syntax:

```
g703port3/0 config> idle-pattern ?
  <hex 0..ff>    Hexadecimal value in the specified range
```

Example:

```
g703port3/0 config>idle-pattern 17
```

2.2.11 INPUT BUFFERS

Configures the number of input buffers available in the interface.

The default value is 512, with allowed figures ranging from 256 to 2048.

The last value to be selected in the device will always be a multiple of 32.

Syntax:

```
g703port3/0 config> input-buffers ?
  <256..2048>    Value in the specified range
```

Example:

```
g703port3/0 config>input-buffers 1024
```

2.2.12 ISDN

Configures parameters relative to call signaling when the interface configuration is common channel signaling (CCS).

Note

Keep in mind that subchapters refer to E1 interfaces with one synchronization timeslot (0), one signaling timeslot (16) and 30 data timeslots (1-15 and 17-31). For T1, there's no real timeslot 0 but the F-bit serving the same purpose can be taken as such. Signaling channel in T1 mode would be timeslot 24 and the 23 data channels in timeslots 1 through 23.

2.2.12.1 ISDN DISCPI-RELEASE

With this option enabled, the device always sends a RELEASE on receiving a DISCONNECT with in-band audio indication. This option is disabled by default and, in outgoing voice calls, if a DISCOUNT is received with in-band audio, the call is maintained to reproduce the indicated audio.

Syntax:

```
g703port3/0 config>isdn discpi-release
```

2.2.12.2 ISDN MGCP BACKHAUL

Activates the MGCP mode in the interface. This mode works as follows: if the MGCP application is executing, this interface registers through MGCP as 30 endpoints present in the device, one for each channel B (from 1 to 31, jumping over 16). In this situation, Q.931 signaling is sent to the MGCP server through the backhaul protocol over TCP. For it to operate correctly, **PRI-GROUP TIMESLOTS 1-31** must also be configured.

To disable this configuration, use the **NO SET GLOBAL MGCP BACKHAUL** command.

Syntax:

```
g703port3/0 config>isdn mgcp ?
  backhaul        Assign this interface to MGCP with backhaul signaling
  endpoint-id     MGCP endpoint identifier for this interface
```

Example:

```
g703port3/0 config>isdn mgcp backhaul
```

2.2.12.3 ISDN MGCP ENDPOINT-ID

Defines the initial part of the names of the thirty MGCP *endpoints* that this interface registered in the Call Agent. To obtain the full name, '/' is automatically added and so is the channel number. The BACKHAUL option must be enabled for *endpoints* to be registered. The default value for this identifier for a g703portX/Y interface is S0/SUX/DS1-Y, Y normally being 0. By adding '/' and the channel number, you obtain the value Call Agent *Cisco Unified Communications Manager* (CUCM) expects. For example, for the g703port3/0 interface, the identifier to configure is "S0/SU3/DS1-0". To mention a specific channel, the name of the last B channel *endpoint* would be "S0/SU3/DS1-0/31", automatically drawn from the identifier defined. The latter is the default value, meaning you don't have to configure it. Configuration is only necessary when the *endpoint* names expected by the Call Agent do not correspond to the default values

To disable this command, use **NO ISDN MGCP ENDPOINT-ID**.

Syntax:

```
g703port3/0 config>isdn mgcp endpoint-id <id>
```

Example:

```
g703port3/0 config>isdn mgcp endpoint-id PRI/SLOT3/PORT0
```

2.2.12.4 ISDN OVERLAP-DIAL

Allows dialing in outgoing calls to be executed through the overlap dial method, instead of sending it all.

Syntax:

```
g703port3/0 config>isdn overlap-dial
```

2.2.12.5 ISDN SUSPENDED-RELEASE

When this option is disabled, the device releases the call to receive a NOTIFY message (indicating suspended user). This indication is received on outgoing calls destined for a user of the Telephone Network (PSTN) when the recipient hangs up. In this case, there is no disconnecting because the PSTN user can terminate the call and retrieve it from another terminal. The public network has a timer to drop the call if the user does not return to pick up the phone.

This option is disabled by default and the call is kept until it is dropped by the caller or the network.

Syntax:

```
g703port3/0 config>isdn suspended-release
```

2.2.12.6 ISDN SWITCH-TYPE

Allows you to configure the type of signaling protocol.

PRIMARY-4ESS	AT&T Lucent 4ESS signaling type.
PRIMARY-5ESS	AT&T Lucent 5ESS signaling type.
PRIMARY-DMS100	Northern Telecom DMS-100 signaling type.
PRIMARY-NET5	Q931 signaling *(Default value).*
PRIMARY-NI	National ISDN-2 signaling type.
PRIMARY-QSIG	QSIG signaling.

Syntax:

```
g703port3/0 config>isdn switch-type ?
  primary-4ess      AT&T Lucent 4ESS switch type for the U.S
  primary-5ess      AT&T Lucent 5ESS switch type for the U.S.
  primary-dms100    Northern Telecom DMS-100 switch type for the U.S.
  primary-net5      ISDN european PRI switches
  primary-ni        National ISDN-2 Switch type for the U.S
  primary-qsig      QSIG interface
```

2.2.13 LINEBUILDOUT

Configures the line output levels according to the selected value.

For E1:

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

For T1:

0-to-133-ft	
133-to-266-ft	
266-to-399-ft	
399-to-533-ft	
533-to-655-ft	DSX-1 cable length selection
csu-0	
csu-7dot5	
csu-15	
csu-22dot5	CSU line build-out selection in dB

Syntax:

```
g703port3/0 config> linebuildout ?
  0-to-133-ft       DSX-1 (0ft to 133ft) (T1)
  120-ohm           Balanced lines (E1)
  133-to-266-ft     DSX-1 (133ft to 266ft) (T1)     (default T1)
  266-to-399-ft     DSX-1 (266ft to 399ft) (T1)
  399-to-533-ft     DSX-1 (399ft to 533ft) (T1)
```

```
  533-to-655-ft    DSX-1 (533ft to 655ft) (T1)
  75-ohm           Unbalanced lines (E1)          (default E1)
  csu-0            0dB CSU (T1)
  csu-15           -15dB CSU (T1)
  csu-22dot5       -22.5dB CSU (T1)
  csu-7dot5        -7.5dB CSU (T1)
```

Example:

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

2.2.14 LINECODE

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. A drawback, however, is the presence of 0s (which provoke loss in clock recovery). This line code is available in E1 and T1 mode.
HDB3	High Density Bipolar Order 3. While this is only valid for E1 interfaces, it is usually used there (*Default value*). In HDB3 encoding, pulses are alternatively inverted (just like 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 the one going to be introduced is even. Group 0000 is substituted for 000V when the number of information pulses between the previous V violation and the one 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.
B8ZS	Binary 8 Zero Suppression. This line code is valid only in T1 mode and was specified due to insufficiencies related to AMI with superframe format (D4). In order to avoid synchronization loss, only limited sequences of 0s or 1s may appear in a frame that gets compensated by apt bit modifications (0 to 1 or vice versa, depending on pulse violation). While these data modifications are not critical in voice scenarios, they can cause severe problems in data scenarios. The B8ZS line code was specified to avoid any interference with synchronization.

Syntax:

```
g703port3/0 config>linecode ?
  ami     Alternate mark inversion. Both T1/E1
  b8zs    Binary 8 Zero Suppression. T1 only
  hdb3    High density bipolar of order 3. E1 Only
```

Example:

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

Caution

The use of AMI in conjunction with T1 is highly discouraged as data corruption will likely happen due to enforcement of pulse density limitations. Standard ANSI T1.403 precisely defines maximum numbers of consecutive 0s or 1s allowed within a frame or even the whole bit stream over the line. These requirements must be met in order to avoid synchronization loss. Enforcement thereof, however, results in data manipulation according to these rules (meaning transparent data channels cannot be guaranteed).

Use B8ZS line coding instead, as it innately avoids interference with synchronization.

2.2.15 LINKTYPE

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)*
T1	Each T1 frame contains 1 F-bit for frame synchronization, monitoring, alarms and (optionally) also CRC, depending on the framing format used. Besides, there are 24 timeslots of 8 bits each (which make up a total frame length of 193 bits). For primary rate communication, timeslots 1-23 are available. The signaling channel (CCS) uses timeslot 24.

Syntax:

```
g703port3/0 config>linktype ?
  e1    32 channels (time-slots). 2048 Mbps
  t1    24 channels (time-slots). 1544 Mbps
```

Example:

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

Note

When switching between link types, several parameters can become invalid and are set to default values apt for the chosen mode. So don't forget to check all parameters after changing link type again!

2.2.16 LIST

Displays the interface configuration.

Example:

```
g703port3/0 config> list
Link type ........... E1
Frame format ........ CRC4
Line coding ......... HDB3
Clocking mode ....... LINE
AIS mode ............ G775
Load Impedance ...... 75-OHM
Line Build Output.... 75-OHM
Receive Equalizer ... LONG-HAUL
Idle Pattern ........ d5
Shutdown indication . NONE
RAI Reception ....... IGNORED
AIS Reception ....... IGNORED
MTU size ............ 2060
Input buffers ....... 512
Supervision interval. 0
Supervision fails ... 3
```

Example:

After configuring the link in T1 mode:

```
g703port3/0 config> list
Link type ........... T1
Frame format ........ ESF
```

```
Line coding ......... AMI
Clocking mode ....... LINE
AIS mode ............ G775
Load Impedance ...... 100-OHM
Line Build Output.... 0-to-133-FT
Receive Equalizer ... LONG-HAUL
Idle Pattern ........ 17
Shutdown indication . NONE
RAI Reception ....... IGNORED
AIS Reception ....... IGNORED
MTU size ............ 2060
Input buffers ....... 512
Supervision interval. 0
Supervision fails ... 3
```

2.2.17 LOADIMPEDANCE

Configures the line impedance value seen by the interface.

100-ohm	Balanced lines that use twisted pair (T1).
120-ohm	Balanced lines that use twisted pair (E1).
75-ohm	Unbalanced lines that use coaxial (E1) (*Default value*).

Syntax:

```
g703port3/0 config>loadimpedance ?
  100-ohm    Balanced lines (T1)
  120-ohm    Balanced lines (E1)
  75-ohm     Unbalanced lines (E1)
```

Example:

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

2.2.18 MTU

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

Example:

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

2.2.19 NO

Allows you to delete channel aggregation for primary use (PRI-GROUP), for CAS use (CAS-GROUP), or for aggregated use (TDM-GROUP).

It is also possible to set any parameter configured through the CAS-CUSTOM command to its default value.

Syntax:

```
g703port3/0 config>no ?
  cas-custom     Set specific r2 parameters
  cas-group      Delete CAS channels
  description    Remove interface description
  isdn           ISDN specific parameters
  pri-group      Delete ISDN-PRI channels
  shutdown       Change state to administratively up
  supervision    Set supervision params to default
  tdm-group      Delete channel groups
  update         Update a level indicator
```

Example 1:

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

```
g703port3/0 config>
```

Example 2:

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

Example 3:

```
g703port3/0 config>no description
g703port3/0 config>
```

2.2.20 PRI-GROUP

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

This command can indicate error situations if one of the selected timeslots belongs 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>
```

2.2.21 RAI-RECEPTION

Configures the way the interface behaves when it receives an AIS alarm (Yellow Alarm).

ENABLED	The RAI alarm forces the interface to switch to a DOWN state.
IGNORED	The RAI alarm doesn't force any kind of status change in the interface *(Default value).*

Syntax:

```
g703port1/0 config>rai-reception ?
  enabled    Down interface
  ignored    None action
```

Example:

```
g703port3/0 config>rai-reception enabled
g703port1/0 config>
```

2.2.22 SHUTDOWN-INDICATION

Allows you to define the signal transmitted to the remote end when the interface is administratively declared as "DOWN" (same as if the "shutdown" command had been executed over said interface), or when it's a WRR secondary and its state passes to disabled.

NONE	The interface operates normally at the physical layer, sending data signals *(default value).*
TX-AIS	Transmits the "AIS" alarm to the remote end ("Blue Alarm").
TX-OFF	Disables the transmission of the signal to the remote end, which detects the loss of signal ("Loss of signal").

Syntax:

```
g703port3/0 config>shutdown-indication ?
  none      Transmits signal
  tx-ais    Transmits AIS signal to remote (Blue Alarm)
  tx-off    Does not transmit signal to remote. Remote detects RLOS
```

Example:

```
g703port3/0 config> shutdown-indication tx-off
g703port3/0 config>
```

This command is available under license.

2.2.23 SUPERVISION

Configures interface supervision. By supervision, we mean knowing if this is operative with a view to executing calls or establishing links. For this to be operative, all the logical layers involved in the establishment of communications must be operative. For permanent communications, this simply requires the physical layer to be operative. However, switched communications (calls) require the physical layer and the additional logical layers to be operative for calls to be executed. In cases of Q.931 signaling, it's essential that both the physical and link layers (LAPD) are operative.

The g703 interface is active (up) if it's operative and DOWN if not.

Syntax:

```
g703port1/0 config>supervision ?
  fails       Number of failed activation trials to set down this ifc
  interval    How often supervision is done in seconds when ifc is up
```

2.2.23.1 SUPERVISION FAILS

If, during a supervision task, the link is found not to be operative, this command tries to reactivate it a configured number of times. This value is configured through this parameter. Once this number of retries has been completed, the interface is considered non operative and remains DOWN. The range of values admitted go from 1 to 5.

Default is set to 3.

Example:

```
g703port1/0 config>supervision fail 2
g703port1/0 config>
```

2.2.23.2 SUPERVISION INTERVAL

Configures the interval when the interface is checked to see if it's operative. This checking is executed when the interface is active (UP). This is configured in seconds and admits values between 0 and 65535. A 0 value means the interface only supervises the physical layer; higher values mean that all the layers required to establish calls are checked.

By default, the supervision interval value is 0.

Example:

```
g703port1/0 config>supervision interval 60
g703port1/0 config>
```

2.2.24 TDM-GROUP

Allows 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. No aggregation is created by default.

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
```

2.2.25 EXIT

Exits to the previous menu.

Example:

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

Chapter 3 Monitoring

3.1 Accessing interface monitoring

In order to access the G.703 interface monitoring menu, first you need to enter the general monitoring menu and then the G.703 interface.

```
*P 3
+configuration

Teldat's Router, ATLAS 2 156  S/N: 403/00464
P.C.B.=42  Mask=0502  Microcode=0000  CLK=65536 KHz  BUSCLK=32768 KHz PCICLK=32768 KHz
ID: AT-8F32R L2.156

Boot ROM release:
 BIOS CODE VERSION: 01.09.08   May 23 2006 15:37:04
  gzip  May 23 2006 13:13:52
  io1  May 23 2006 15:36:54
  io2  May 23 2006 13:13:23
  io3  May 23 2006 15:36:54
 START FROM FLASH L1    Watchdog timer Enabled

Software release: 10.7.0- NV Oct 30 2006 10:33:56
Compiled by    INTEGRATOR on    INTEGRATOR2000

Hostname:                    Active user:
Date:    Monday, 10/30/06    Time: 16:23:34
Router uptime: 17m10s

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

8 interfaces:
Connector     Interface            MAC/Data-Link        Status
LAN1          ethernet0/0          Ethernet/IEEE 802.3  Up
SERIAL0/WAN1  serial0/0            Auto Install         Down
SERIAL1/WAN2  serial0/1            X25                  Down
SERIAL2/WAN3  serial0/2            X25                  Down
BRI/ISDN1     bri0/0               BRI Net              Testing
---           x25-node             internal             Up
SLOT3         g703port3/0          PRI/E1 Net           Down
---           ppp1                 PPP                  Down

SNMP OperStatus:
Interface       OperStatus
ethernet0/0     Up
serial0/0       Down
serial0/1       Down
serial0/2       Down
bri0/0          Down
x25-node        Up
g703port3/0     Down
ppp1            Lower layer down
+
```

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

```
+network g703port3/0

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

3.2 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 and their options.
CLEAR	Deletes the statistics.
ESTABLISH	Executes outgoing calls in the Primary interface.
LIST	Displays different interface aspects.
LOOP	Implements loops over the physical interface.
PRBS	Pseudo-random test sequence for Transmission/Reception over the interface.
PHY-REGISTERS	Physical device (Framer) registers options.
RELEASE	Releases calls established in the Primary interface.
SIGNALING	Accesses the Signaling interface monitoring menu (Primary or R2).
TRANSMIT-SIGNAL	Controls the physical layer's transmit signal status.
EXIT	Returns to the GWCON (+) prompt.

3.2.1 ? (HELP)

Displays a list of available commands and their options.

Syntax:

```
g703port3/0 +?
```

Example:

```
g703port3/0 +?
  clear            Clear statistics
  establish        Establish a call
  list             List g703 information
  loop             Interface loop control
  phy-registers    Physical device (Framer) registers options
  prbs             Pseudo-random binary sequence
  release          Release a call
  signaling        Access to the signaling menu
  transmit-signal  Transmission signal control
  exit
g703port3/0 +
```

3.2.2 CLEAR

Deletes statistics.

Syntax:

```
g703port3/0 +clear ?
  all           Displays all information
  connection    Connection information
  interface     Controller statistics
  physical      Physical layer information
```

3.2.2.1 CLEAR ALL

Allows you to delete statistics for all current connections and for those of 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 +
```

3.2.2.2 CLEAR CONNECTION

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

Syntax:

```
g703port3/0 +clear connection ?
  <0..65535>    Value in the specified range
```

Example 1:

```
g703port3/0 +clear connection 26
Conection Id:26 TS:26 TsMap:FC000000 statistics cleared
g703port3/0 +
```

Example 2:

```
g703port3/0 +clear connection 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 +
```

3.2.2.3 CLEAR INTERFACE

Allows you to delete interface statistics.

Example:

```
g703port3/0 +clear interface
Multichannel Controller statistics cleared
g703port3/0 +
```

3.2.2.4 CLEAR PHYSICAL

Allows you to delete interface statistics at the physical layer.

Example:

```
g703port3/0 +clear physical
Physical statistics cleared
g703port3/0 +
```

3.2.3 ESTABLISH

Allows you to execute outgoing calls. This, for example, can be very useful to carry out test calls and check that the primary access to which the router is connected is operating correctly.

In order to execute an outgoing call, the Generic FR or Generic PPP user interface and the associated call profile must be correctly configured. On executing this command, the name identifying the user interface is requested as a parameter. Consequently, the call establishes just as if it had been requested by the user interface itself. Therefore, this command is also useful to force the activity of a user interface and to check it is operating correctly.

When a call has been established, the behavior is normal. E.g. if the profile used for the call has a release time of 30 seconds due to absence of data, the call is released as soon as this times out without data. The rest of the profile parameters that can affect the call are also respected.

Note

If the call profile you are using is not allowed to execute outgoing calls, it is not possible to force an outgoing call through the ESTABLISH call command.

Syntax:

```
g703port3/0 +establish <user_ifc_name>
```

Example:

```
g703port3/0 +establish ppp1
g703port3/0 +
```

We are assuming the PPP1 interface is a correctly configured Generic PPP acting as the ISDN PRI user.

3.2.4 LIST

Displays information on the G703 interface, the established connections and the physical layer.

Syntax:

```
g703port3/0 +list ?
  all           Displays all information
  bit-rate      Effective rate for all channels
  cdr           Call detailed record information
  connection    Connection information
  interface     Controller statistics
  mgcp          MGCP status
  physical      Physical layer information
```

3.2.4.1 LIST ALL

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

Displays the MGCP status and the statistics for the connections and the interface.

3.2.4.2 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-rate

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

3.2.4.3 LIST CDR ACTIVE

Shows a register with the active calls.

Syntax:

```
g703port3/0 +list cdr active
```

3.2.4.4 LIST CDR RELEASED

Shows a register with the calls released.

Syntax:

```
g703port3/0 +list cdr released
```

3.2.4.5 LIST CONNECTION

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

Syntax:

```
g703port3/0 +list connection
```

Example:

```
g703port3/0 +list connection 1

Conection Id:1 TS:1 TsMap:000001FE statistics
-----------------------------------------------
Configuration
    Max Length .......... 2048
    Transparent ......... 0
    Request 56Kbps ...... 0
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 matches the base interval (except for 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 used in this example range from 1 to 8.
Configuration	
Max Length	Maximum frame length configured for this channel or set of channels.
Transparent	Indicates whether the channel has been established in transparent (1) or HDLC (0) mode.
	Request56Kbps. Indicates if the channel has been established at 64Kbps (0) or 56 Kbps (1).
Tx Frames	
Successful	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	Number of frames whose transmission has been requested but, for various reasons, not carried out.
Pending	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 ending with an Abort flag (0x7F).
Overflows	Frames dropped due to internal buffer unavailability in the controller.

3.2.4.6 LIST INTERFACE

Displays detailed information on the controller statistics at a global level (i.e., includes all the connections that are active or 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	Loop status 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 range from 9 to 16 and from 26 to 31.
Tx Frames	
Successful	Number of frames that have been successfully transmitted at the local layer for the entire 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	Number of frames whose transmission has been requested but, for various reasons, not carried out.
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.

3.2.4.7 LIST MGCP

Indicates the MGCP mode status. This first displays the **Backhaul** text following by one of the following options:

Q.931 is TCP backhauled if the interface is in MGCP mode and the Q.931 signaling is sent and received through the backhaul link with the Call Agent.

Fallback mode. Local Q.931 if the MGCP is configured, the fallback enabled and there is no connectivity with a Call Agent. Consequently, Q.931 signaling is locally generated.

Not configured for this interface if the MGCP mode is not configured in the interface.

Syntax:

```
g703port3/0 +list mgcp
```

3.2.4.8 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
Transmit Signal           ON
Code Violations ......... 0
CRC4 Errors ............. 0
E-Bit Errors ............ 0
FAS Word Errors ......... 2
Slip Event .............. CLEAR
Errored Second .......... CLEAR

Hardware version ..................... 00.00
Hardware base address ................ f0010000
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.
Transmit Signal	Indicates the signal status in transmission. This is related to the SHUTDOWN-INDICATION configuration command and the TRANSMIT-SIGNAL monitoring command. When its state is ON, the interface transmits signals normally. In an AIS state, the device sends an AIS signal (blue alarm). In a OFF state, the device doesn’t send any signal through the interface.
Code Violations	Error counter for code violations on the line (HDB3 or AMI). Also known as LVC – Line Code Violations.
CRC 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. This applies to E1-CRC interfaces. IN the case of T1-ESF interfaces, this is CRC-6 Errors with same meaning.
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 the reception error rate exceeds the threshold (informing the other end). Also known as FEBE – Far End Block Errors (E1 only).
FAS Word Errors	Error counter in the alignment word.
SLIP Event	Indicates if the interface is receiving the correct clock (CLEAR) or one that exceeds 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 that is internally generated is always fixed. When the difference exceeds the threshold level, frames are either repeated in reception (negative slip) or 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.

Information is provided on the device hardware:

Version	Device hardware version executing physical interface functions.
Base Address	Device access address in the memory map.

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	Counters related to status changes from the moment the device starts.

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 in15-minute periods.

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 15-minute periods stored.

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) events. 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) events have been detected, or when an 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, it contains the number of CRC4 errors. For a T1-ESF case, the number of CRC-6 errors.
FEBE	Far End Block Errors	E bits number counter (CRC4 error indication bit) which

		have been received (E1 only).
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).

3.2.5 LOOP

Activates or deactivates loops in the physical interface.

Syntax:

```
g703port3/0 + loop ?
  local     Activate or deactivates the local loop
  remote    Activate or deactivates the remote loop
```

3.2.5.1 LOOP LOCAL

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

It has a timer option so that the time period can be limited (time different to 0), or be regarded as continuous (time equal to 0).

The AIS signal is sent towards the remote end.

Example:

```
g703port3/0 +loop local enable ?
  <0..65535>    Time in sc (0 -> Continuous)
g703port3/0 +loop local enable 0
Local Loop Activated
g703port3/0 +loop local disable
Local Loop Deactivated
g703port3/0 +
```

3.2.5.2 LOOP REMOTE

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

It has a timer option so that the time period can be limited (time different to 0), or be regarded as continuous (time equal to 0).

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

Example:

```
g703port3/0 +loop remote enable ?
  <0..65535>    Time in sc (0 -> Continuous)
g703port3/0 +loop remote enable 0
Remote Loop Activated
g703port3/0 +loop remote disable
Remote Loop Deactivated
g703port3/0 +
```

3.2.6 PHY-REGISTERS

Performs framer register operations: list or modify values.

Syntax:

```
g703port3/0 + phy-registers ?
  list    List phyter registers and status
  set     Set phyter registers
```

3.2.6.1 PHY-REGISTERS LIST

Displays the framer register content.

Example:

```
g703port3/0 + phy-registers list
 RG +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +A +B +C +D +E +F
 -- -----------------------------------------------
 00 00 12 03 0D 60 14 80 04 00 00 00 00 00 00 C0
 10 80 0F 00 00 00 00 40 40 03 FF 00 01 00 00 00
 20 00 00 00 00 00 00 00 00 FF 00 00 00 00 00 E8 E8
 30 04 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 40 00 00 00 00 00 00 00 00 00 00 00 00 00 00 11
 50 FF FF FF FF FF FF FF FF FF FF FF FF 00 00 00 00
 60 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 70 06 07 80 00 00 17 00 00 01 18 00 10 00 5E 20 00
 80 FF FF FF FE 00 00 00 00 00 00 00 00 00 00 00 00
 90 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 80
 A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 80
 B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 C0 00 7E 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 D0 1B 40 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 E0 00 00 00 FF EF EF EF DF F7 C8 00 00 00 00 00 00
 F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 DE
```

3.2.6.2 PHY-REGISTERS SET

Modifies the value of one Framer register.

Example:

```
g703port3/0 + phy-registers set
Hex Register: [0]? 78
Hex Value   : [0]? c1
```

Note

This command is provided for debugging purposes only. Wrongful use could affect the router's stability.

3.2.7 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     Activate or deactivate reception test
  status      Displays information on the test sequence
  transmit    Activate or deactivate transmit test
```

3.2.7.1 PRBS RECEIVE

Activates or deactivates test sequence reception in the interface.

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

Example:

```
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, in accordance with the ITU-T O.151 standard. Synchronization is reached in 400 milliseconds from signal detection with a 99.9% probability and an error rate below 10^{-1}. A signal containing all 1s or all 0s in framed or unframed format can cause synchronism.

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

Syntax:

```
g703port3/0 prbs transmit ?
  a          2exp15-1
  b          2exp20-1-->Falc56, QRSS-->DS2156
  disable    Deactivate transmit test
```

Example:

```
g703port3/0 + prbs transmit a
Pseudo-Random Binary Sequence Transmit Activated
g703port3/0 + prbs transmit b
Pseudo-Random Binary Sequence Transmit Activated
g703port3/0 + prbs transmit disable
Pseudo-Random Binary Sequence Transmit Deactivated
g703port3/0 +
```

3.2.7.3 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).

3.2.8 RELEASE

Releases any call established in the ISDN PRI interface. It makes no difference whether the call you wish to release has been executed through a Generic FR or a Generic PPP interface on its own initiative or whether it has been forced through the ESTABLISH call command. The call is released in either case.

Note

When a call has been released, the user interface can re-establish as soon as necessary (e.g. when there is outgoing traffic).

On executing this command, the name identifying the user interface responsible for the current call is requested as a parameter. Consequently, the call is released in exactly the same way as if it had been executed on the initiative of the user interface itself.

Syntax:

```
g703port3/0 +release <user_ifc_name>
```

Example:

```
g703port3/0 +release ppp1
g703port3/0 +
```

We are assuming the PPP1 interface is a correctly configured Generic PPP, acting as the ISDN PRI user.

3.2.9 SIGNALING

Accesses the signaling interface monitoring menu (Primary or R2).

Syntax:

```
g703port3/0 +signaling
```

Example:

```
G703port3/0 +signaling
g703port3/0 Q931 +
```

The options available in this submenu are as follows:

```
g703port3/0 Q931 + ?
  list    List Q931 information
  exit
```

3.2.9.1 LIST

Displays the different types of information.

Syntax:

```
g703port3/0 Q931 +list <option>
```

Example:

```
g703port3/0 Q931 +list ?
ccs-layer2    List LAPD statistics
ccs-layer3    List Q931 parameters
channels      List R2 statistics
```

3.2.9.1.1 LIST CHANNELS

Lists the R2 channels and their status, both for the line signaling level and register.

This command is only available if the signaling used in the interface is MFC/R2.

Example:

```
g703port3/0 R2 +list chanels
 CH    Rx ABCD    Tx ABCD    R2 PHASE         R2 STATE
-------------------------------------------------------------
  1       0000       1001       SEIZE-ACK        SEIZE-ACK
  2       0000       1001       SEIZE-ACK        SEIZE-ACK
  3       0000       1001       SEIZE-ACK        SEIZE-ACK
  4       0000       1001       SEIZE-ACK        SEIZE-ACK

g703port2/0 R2 +
```

3.2.9.1.2 LIST CCS-LAYER2

Lists layer 2 statistics.

This command is only available if the signaling used in the interface is Q931.

Example:

```
g703port3/0 Q931 +list ccs-layer2
I Frames   : transmitted  =        0    received  =        0
RR Frames  : transmitted  =        0    received  =        0
RNR Frames : transmitted  =        0    received  =        0
REJ Frames : transmitted  =        0    received  =        0
FRMR Frames: transmitted  =        0    received  =        0
UI Frames  : transmitted  =        0    received  =        0
g703port2/0 Q931 +
```

3.2.9.1.3 LIST CCS-LAYER3

Lists layer 3 statistics.

This command is only available if the signaling used in the interface is Q931.

Example:

```
g703port3/0 Q931 +list ccs-layer3
list ccs-layer3
Switchtype: EuroISDN
Type: CPE
Q931 RX: 0
Q931 TX: 0
Q921 RX: 0
Q921 TX: 0
Q921 Outstanding: 0
Window Length: 0/0
Sentrej: 0
SolicitFbit: 0
Retrans: 0
Busy: 0
Overlap Dial: 0
T200 Timer: 1000
T203 Timer: 10000
T305 Timer: 30000
T308 Timer: 4000
T313 Timer: 4000
N200 Counter: 3
```

3.2.9.2 EXIT

Returns to the previous menu.

Example:

```
g703port3/0 Q931 +exit
g703port3/0 +
```

3.2.10 TRANSMIT-SIGNAL

The physical layer transmission signal can be activated or deactivated with this command. This is useful to simulate the connection or disconnection of a cable for testing purposes.

Syntax:

```
g703port1/0 +transmit-signal ?
  off    Signal disabled
  on     Signal enabled
```

Example:

```
g703port1/0 +transmit-signal off
```

```
PHY Transmit Signal Deactivated
```

Command history:

Release	Modification
11.01.09	The "*transmit-signal*" command was introduced as of version 11.01.09.

3.2.11 EXIT

Returns to the + prompt.

Syntax:

```
g703port3/0 +exit
```

Example:

```
g703port3/0 +exit
+
```

3.3 Locating malfunctions

3.3.1 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: - clocksource (line/internal) - framing (crc4 / no-crc4 / unframed) • Gather from your dealers the characteristics of the interface they have provided
RAI Reception	• Transmission towards the remote end is problematic • Your interface is administratively in down (shutdown) and has the shutdown-indication option configured (tx-off or tx-ais) • 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 1s. You may have nothing configured to transmit over your interface, or it may be configured in unframed mode. If necessary, modify the configuration with the following command: - framing unframed
Code Violations	• Make sure you are using a suitable code. You may need to modify the configuration with the following command: - 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: - framing (crc4 / no-crc4)
E-Bit Errors	• The other end is detecting CRC4 errors. This may not be enabled in the interface. Modify the configuration with the following command:

	- framing crc4
SLIP Event	• If this indicator constantly remains on SET, then there is a problem when recovering the line clock. This could be caused by the following: - The remote device is incorrectly generating the transmission clock - The jitter on the line exceeds the specifications - The local device has internal problems when recovering the clock due to a hardware problem

3.3.2 Loops and Test Sequences

Executing loops over the interface, as well as transmitting and receiving 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 (regardless of the physical layer).

If you are going to execute tests and there are circuits configured over the interface, we recommend disabling them before carrying out tests (shutdown command over the interface).

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

Example:

```
*p 5
config$list devices

Interface            Connector     Type of interface
ethernet0/0          LAN1          Fast Ethernet interface
serial0/0            SERIAL0/WAN1  Auto Install Interface
serial0/1            SERIAL1/WAN2  X25
serial0/2            SERIAL2/WAN3  X25
bri0/0               BRI/ISDN1     ISDN Basic Rate Int
x25-node             ---           Router->Node
g703port3/0          SLOT3         G703 E1/T1
ppp1                 ---           Generic PPP
ppp2                 ---           Generic PPP
fr1                  ---           Generic FR
fr2                  ---           Generic FR
Config$net ppp1

-- Generic PPP User Configuration --
ppp1 config$shutdown
ppp1 config$exit
Config$net ppp2

-- Generic PPP User Configuration --
ppp2 config$shutdown
ppp2 config$exit
Config$net fr1

-- Generic FR User Configuration --
fr1 config$shutdown
fr1 config$exit
Config$net fr2

-- Generic FR User Configuration --
fr2 config$shutdown
fr2 config$exit
config$
```

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

```
*p 3
+configuration
```

```
Teldat's Router, ATLAS 2 156  S/N: 403/00464
P.C.B.=42  Mask=0502  Microcode=0000  CLK=65536 KHz  BUSCLK=32768 KHz PCICLK=32768 KHz
ID: AT-8F32R L2.156

Boot ROM release:
 BIOS CODE VERSION: 01.09.08   May 23 2006 15:37:04
  gzip  May 23 2006 13:13:52
  io1  May 23 2006 15:36:54
  io2  May 23 2006 13:13:23
  io3  May 23 2006 15:36:54
 START FROM FLASH L1    Watchdog timer Enabled
Software release: 10.7.0-Alfa NV Oct 30 2006 10:33:56
Compiled by    INTEGRATOR on    INTEGRATOR20000

Hostname:                    Active user:
Date:    Monday, 10/30/06     Time: 16:53:44
Router uptime: 47m19s

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

11 interfaces:
Conn   Interface       MAC/Data-Link         Status
LAN1   ethernet0/0     Ethernet/IEEE 802.3   Up
WAN1   serial0/0       Async serial line     Down
WAN2   serial0/1       X25                   Down
WAN3   serial0/2       X25                   Down
ISDN1  bri0/0          BRI Net               Up
---    x25-node        internal              Up
SLOT 3 g703port3/0     PRI/E1                Down

                 --- ppp1 PPP Disabled
                 --- ppp2 PPP Disabled
                 --- fr1 Frame Relay Disabled
                 --- fr2 Frame Relay Disabled

SNMP OperStatus:
Interface       OperStatus
ethernet0/0     Up
serial0/0       Down
serial0/1       Down
serial0/2       Down
bri0/0          Down
x25-node        Up
g703port3/0     Down
ppp1            Down
ppp2            Down
fr1             Down
fr2             Down
+
+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 5
Config$net ppp1

-- Generic PPP User Configuration --
ppp1 config$no shutdown
ppp1 config$exit
Config$net ppp2

-- Generic PPP User Configuration --
ppp2 config$no shutdown
ppp2 config$exit
Config$net fr1

-- Generic FR User Configuration --
fr1 config$no shutdown
fr1 config$exit
Config$net fr2

-- Generic FR User Configuration --
fr2 config$no shutdown
fr2 config$exit
config$*
```