Documentation

HiPath 4000 V5
System Components - Hardware

Service Documentation

A31003-H3150-S102-3-7620

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Service Manual HiPath 4000 V5 - System Components - Hardware - Contents

1 Important Information

> **Caution**
> The HiPath 4000 system may not be operated in a LAN in which a DC voltage is overlaid on the data lines, since there are still switches that connect directly without checking the supply voltage first. Depending on the transformer at the LAN interface, voltages of up to 500 V can be induced. Such peak voltages usually lead to destruction of the physical LAN controller's logic.

> **Caution**
> The HiPath 2000/3000/4000 PSU has adequate lightning protection at the 230-V port for up to 2 kV. Additional lightning protection is recommended upstream of the connecting line in high-risk areas. The lightning protection strip with part number **C39334-Z7052-C32** offers added protection of up to 4 kV.
> **The lightning protection strip is a mandatory requirement for Brazil.**

2 SHELF FRUs

This chapter describes the individual shelves and the procedures for removing, replacing and verifying them in a HiPath 4000 system.

2.1 CSPCI Shelf

The CSPCI shelf is the base cabinet of the HiPath 4000 V2.0 system and is available in two configurations (Duplex and Simplex Mono = basic configuration).

The CSPCI shelf provides switching unit (SWU) and Administration and Data Processor (ADP) functions.

The SWU provides:

- A common control unit that starts and controls the call processing functions and features of the system
- A switching network that controls the voice data highways that carry information through the system
- A service unit that provides ringing, tones, conference call switching, dual-tone multi frequency (DTMF) button signals, and public network dial tones for LTU boards

The ADP:

- Places the system into service
- Provides access to system administration, maintenance, and configuration management operations (Direct AMO Dialog, UBA, HSD or RDS)
- Provides a local maintenance terminal interface
- Provides various administrative reporting and security applications

The CSPCI shelf provides slots for:

- Up to three DSCXL processor boards (ADP, CC-A and CC-B)
- One drive holder for the hard disk and MO disk drive
- Two power supplies (ACPCI or DCPCI)
- One SF2X8 LAN switch board
- Two slots for fans
- Two connector modules RTM (Rear Transition Module) at the back of the shelf for peripheral expansion boxes
- One control board (at the back of the shelf) MCM (Management and Control Module)

2.1.1 CSPCI Shelf (Front View)

Figure 2-1 shows the front view of the CSPCI shelf (duplex).

Figure 2-1 CSPCI Shelf Duplex (Front View)

Table 2-1 shows the shelf locations on the CSPCI backplane.

Slot		Modules		
6		SF2X8		
5		DSCXL (CC-B)		
4				
3	FAN	HDMO/HDCF		FAN
2	•	DSCXL (CC-A)		•
1		DSCXL (ADP) •		
		PSU (1) •	PSU (2) redund.	

• -> The basic configuration of the module will be expanded to include:

2 x DSCXL:	S30810-Q2311-X	**SF2X8:**	S30810-Q2309-X
RTM:	S30810-Q2312-X (at the back)		

Table 2-1 CSPCI, Duplex configuration

> The factory setting for the CSPCI shelf's power supply coding is always set to ACPCI. To use DC power supplies (DCPCI), you must change the coding according to Figure 2-2.

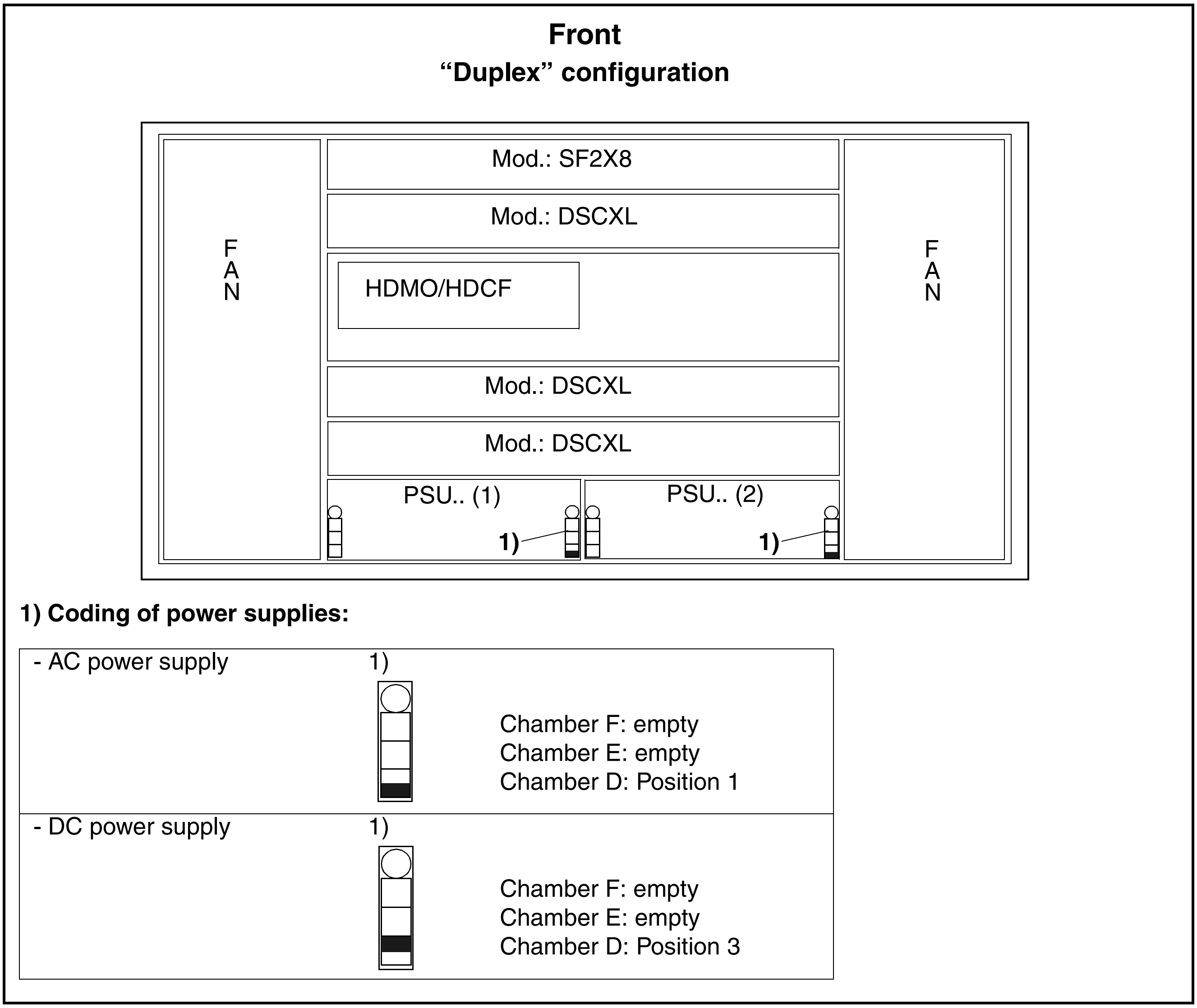


Figure 2-2 Coding for power supply configurations ACPCI/DCPCI

2.1.2 CSPCI Shelf (Back View)

Figure 2-3 shows the back view of the CSPCI shelf (mono).

Modules:

- RTM (Rear Transition Module)
- MCM (Management and Control Module)

Figure 2-3 CSPCI Shelf Mono (Back View)

2.1.3 Removing the CSPCI Backplane

> This procedure removes the system from service.

> **Attention: Static Sensitive Devices**
> Observe all precautions for electrostatic discharge.

To remove the CSPCI backplane:

1. Turn off the power supply to the CSPCI shelf.
2. Remove the shelf power supply units (ACPCI or DCPCI).
3. Note the slot number of each board and drive in the shelf.
4. Unscrew the screws from each of the boards and remove all the boards from the shelf.

5. Remove the ESD wrist strap.
6. At the back of the shelf, label any unlabeled cables to identify the matching connector locations.
7. Disconnect all cables.
8. At the back of the shelf remove the screws that hold the backplane in place.
9. Remove the backplane from the shelf.

2.1.4 Replacing the CSPCI Backplane

To replace the CSPCI backplane:

1. Install and secure the backplane with screws onto the shelf.
2. At the back of the shelf, reconnect all cables.
3. Slide each board into the appropriate slot until you seat them all firmly into the backplane connectors.
4. Reinstall the shelf power supplies.
5. Turn on the system.

2.1.5 Verifying the CSPCI Shelf

To verify the CSPCI shelf, perform the verification procedures of the boards.

2.2 L80XF Shelf

The L80XF shelf is the expansion shelf for AC-powered, non-redundant HiPath 4000 systems. The L80XF shelf is available in two variants:

- I.M. —this type uses 60-pin SIVAPAC MDF cables that directly connect to the back of peripheral module plugs
- U.S.—this type uses 50-pin Champ cables that connect to additional Champ plugs

The L80XF shelf provides slots for:

- One LTUCA board
- 16 Peripheral card
- One AC-to-DC shelf power supply (LPC80)
- One DC-to-DC shelf power supply (PSUP)
- One special slot to access a limited number of highways Connectors

Figure 2-4 shows the connectors on the L80XF backplane.

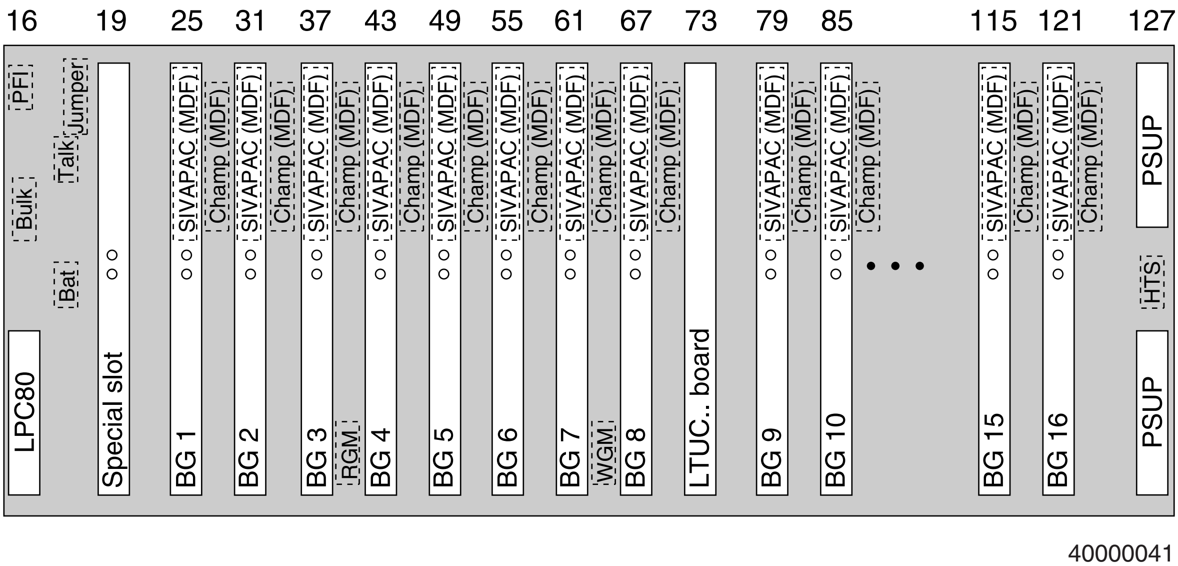


Figure 2-4 L80XF Backplane

Table 2-2 describes the connectors at the back of the HiPath 4000 L80XF shelf.

Location	Connector Description
PF1	A power fail signal (PFPS) connector between the PSDSC and the processor card. In a DC-powered system, the signals may serve as alarm input from an external power supply.
BAT	A two-pin mate-N-Lok connector for an optional battery. This interface is used when a backplane is replaced. **Note:** This is not used in the U.S.
Bulk	A two-pin mate-N-Lok connector for an external power supply connection. **Note:** This is not used in the U.S.
Talk	A two-pin mate-N-Lok connector for an external power supply connection. **Note:** This is not used in the U.S.
Jumper	A 10-pin mini connector is used to jump the ringing signal and corresponding synchronization signal from the power supply to the slots. **Note:** The jumper must be removed in systems with a PSAFE power supply and an external ringer module or an enhanced ringer board.
SIVAPAC (MDF)	Sixteen Champ or SIVAPAC MDF connectors
RGM	A 10-pin mini connector is used to jump the ringing signal and corresponding synchronization signal from the power supply to the slots.
WGM	A connector for a WG module. A 10-pin Mini connector is provided.
HTS	A 3-pin mate-N-Lok connector to supply optional Hicom Trading adapters with +5 V and GND. Since the MDF champ connector does not have a power pin, the adapter is only used in the North American (NA) market.

Table 2-2 L80XF Shelf Connectors (Back View)

2.2.1 Removing the L80XF Backplane

> **DANGER**
> Use extreme caution when working on the L80XF shelf. Live voltages are present at the back of the other shelves in the cabinet. Observe all applicable electrical safety precautions for working with high voltages.
> Do not wear an ESD strap when working at the back of the L80XF.

> **Attention: Static Sensitive Devices**
> Observe all precautions for electrostatic discharge.

To remove the L80XF backplane:

1. Remove power on the shelf.
2. Remove the shelf power supplies (LPC80 and PSUP).
3. Note the slot number of each board in the shelf.
4. Using the board extractor, unseat and remove all the boards from the shelf.
5. Remove the ESD wrist strap.
6. At the back of the L80XF shelf, label any unlabeled cables to identify the matching connector locations.
7. Disconnect all cables.
8. At the back of the shelf, remove the screws that secure the backplane to the shelf.
9. Remove the backplane from the shelf.

2.2.2 Replacing the L80XF Backplane

To replace the L80XF backplane

1. Install and secure the backplane onto the shelf with screws.
2. Install the shelf power supplies into the shelf until it is seated into the connectors.
3. Tighten the screws on the clamps to secure the DC-to-DC shelf power supplies to the shelf.
4. Slide each board into the appropriate slot until you seat them all firmly into the backplane connectors.
5. Reconnect all the cables.
6. Turn on the L80X shelf.

2.2.3 Verifying the L80XF Shelf

To verify the L80XF shelf:

1. Verify that the green LED on the shelf power supplies in the L80XF shelf are lit.
2. Perform the verification procedures associated with removal and replacement of each board in the L80XF shelf.

3. Display the status of the L80XF shelf as follows:
   a) Type **`DIS-SDSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
STATUS	ALL
LINK	<blank>
TYPE	UNIT
PID	BP&LTG

2.3 LTUW Shelf

The LTUW shelf is the new version of the LTUE shelf. It functions as an interface between the system and the external environment using champ connectors. The LTUW shelf is only used in a HiPath 4000, AC and DC-powered, redundant system.

The LTUW shelf provides slots for:

- Two DC-to-DC shelf power supply units (PSUPs)
- 16 peripheral slots, up to 24 ports in narrowband
- A special slot for RG or peripheral signaling interface unit (SIU)
- One LTUCA board

2.3.1 Connectors

Figure 2-4 shows the connectors on the LTUW backplane.

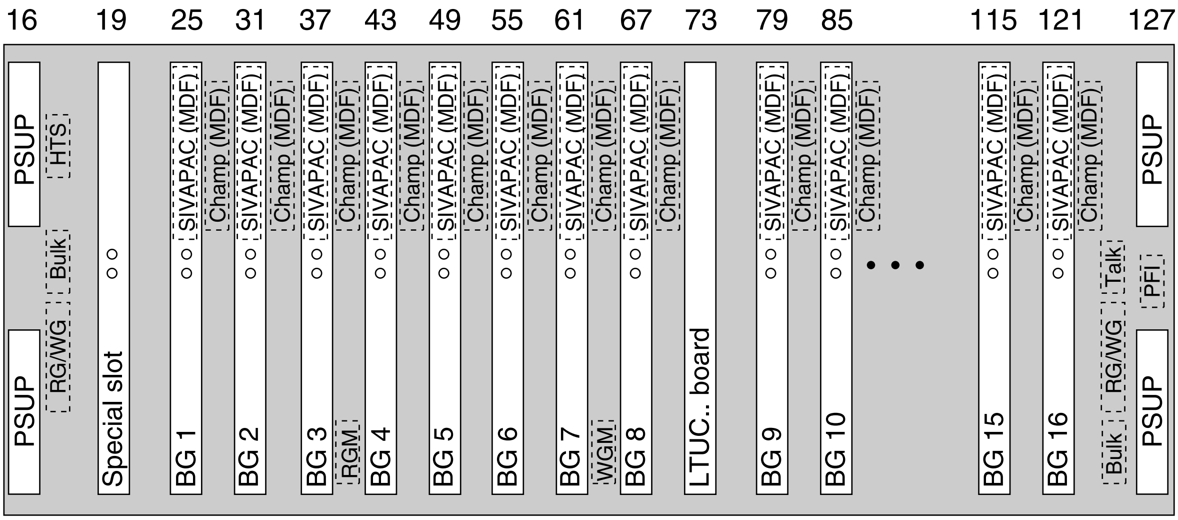


Figure 2-5 LTUW Backplane

Table 2-3 describes the connectors on the LTUWF backplane.

Location	Connector Description
RG/WG	Two 2X5 pin Mini connectors used to share the ring generator and WG signals between two shelves. The signal RINGREF is necessary to achieve balanced ringing.
Bulk	Two input power connectors for DC-to-DC power supplies (PSUP) bulk
Talk	A two-pin mate-N-Lok connector for talk power on analog telephones
HTS	A 3-pin mate-N-Lok connector to supply optional Hicom Trading adapters with +5 V and GND. Since the MDF champ connector does not have a power pin, the adapter is only used in the North American (NA) market.
RGM	A 10-pin Mini connector for a ringer module.
WGM	A 10-pin Mini connector for a WG module.
PF1	A power fail signal (PFPS) connector between the PSDSC and the processor card. In a DC-powered system, the signals may serve as alarm input from an external power supply.

Table 2-3 LTUW Shelf Connectors

2.3.2 Removing the LTUW Backplane

> **DANGER**
> Use extreme caution when working on the LTUW shelf. Live voltages are present at the back of the other shelves in the cabinet. Observe all applicable electrical safety precautions for working with high voltages.
> Do not wear an ESD strap when working at the back of the LTUW.

> **Attention: Static Sensitive Devices**
> Observe all precautions for electrostatic discharge.

To remove the LTUW backplane as follows:

1. Turn off the power supply to the shelf.
2. Note the slot number of each board in the shelf.
3. Using the board extractor, unseat and remove all the boards from the shelf.
4. Remove the DC-to-DC shelf power supply units.
5. Remove the ESD wrist strap.
6. At the back of the LTUW shelf, label any unlabeled cables to identify the matching connector locations.
7. Disconnect all cables.
8. At the back of the shelf, remove the screws that secure the backplane to the shelf.
9. Remove the backplane from the shelf.

2.3.3 Replacing the LTUW Backplane

To replace the LTUW backplane:

1. Install and secure the backplane onto the shelf with screws.
2. Install the DC-to-DC shelf power supplies into the shelf until it is seated into the connectors.
3. Tighten the screws on the clamps to secure the DC-to-DC shelf power supplies to the shelf.
4. Slide each board into the appropriate slot until you seat them all firmly into the backplane connectors.
5. Reconnect all the cables.
6. Turn on the LTUW shelf:

2.3.4 Verifying the LTUW Shelf

To verify the LTUW shelf:

1. Verify that the green LEDs on the DC-to-DC shelf power supply units in the LTUW shelf are lit.
2. Perform the verification procedures associated with removal and replacement of each board in the LTUW shelf.
3. Display the status of the LTUW shelf as follows:
   a) Type **`DIS-SDSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
STATUS	ALL
LINK	<blank>
TYPE	UNIT
PID	BP&LTG

2.4 IPDA Shelf

HiPath 4000 facilitates the distribution of access points over an IP network. These access points are shelves (AP 3300 IP or AP 3700-9/3700-13 IP), which accommodate standard HiPath 4000 interface modules. The stations at the access points are treated in exactly the same way as if they were directly connected to a HiPath 4000 system as before. All IP-distributed components are administered as a **single** system over one HiPath 4000 system connection point.

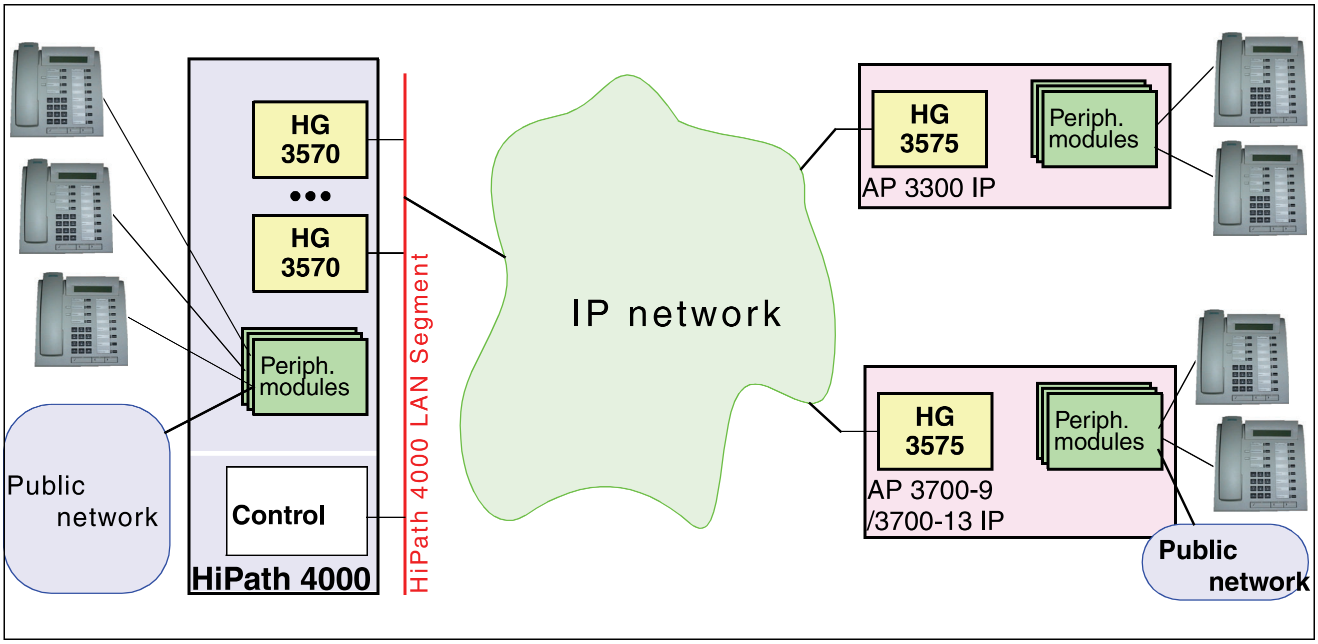


Figure 2-6 System architecture overview

2.4.1 Equipment

Depending on the system configuration, an access point can consist of a basic box and an expansion box.

The shelf slots in the basic box are assigned to the following hardware components:

- Slot 1- 5: Peripheral modules
- Slot 6: Central control board NCUI2 (AP3700-9)/CBSAP (H3701BB)
- Slot 7 - 10: Peripheral modules
- Up to three power supply units LUNA 2
- REALS (**Re**lays and **AL**UM for **S**APP), used in H3701BB (HiPath 3000) only
- CompactPCI cassette (Survivability Server), used in AP 3700-9 (HiPath 4000) only

The shelf slots in the basic box are assigned to the following hardware components:

- Slot 1 -6: Peripheral modules
- Slot 7: Central control board LTUCA (AP3700-13)/not populated in H3701BB
- Slot 8 - 14: Peripheral modules
- Up to four power supply units LUNA 2

2.5 AP 3700-9 Shelf (IPDA)

Part number: S30805-G5412-X

The AP 3700-9 is a peripheral shelf with an NCUI control board that can be installed as a standalone system or in a 19" cabinet system. The AP 3700-9 can be populated with up to nine peripheral modules.

> In addition, a separate CompactPCI cassette can be installed in the shelf as a Survivability server. (This option is not yet available.)

The AP 3700-9 is also used in HiPath 3000, where it is called “H3800BB”.

Figure 2-7 shows a front view of AP 3700-9.

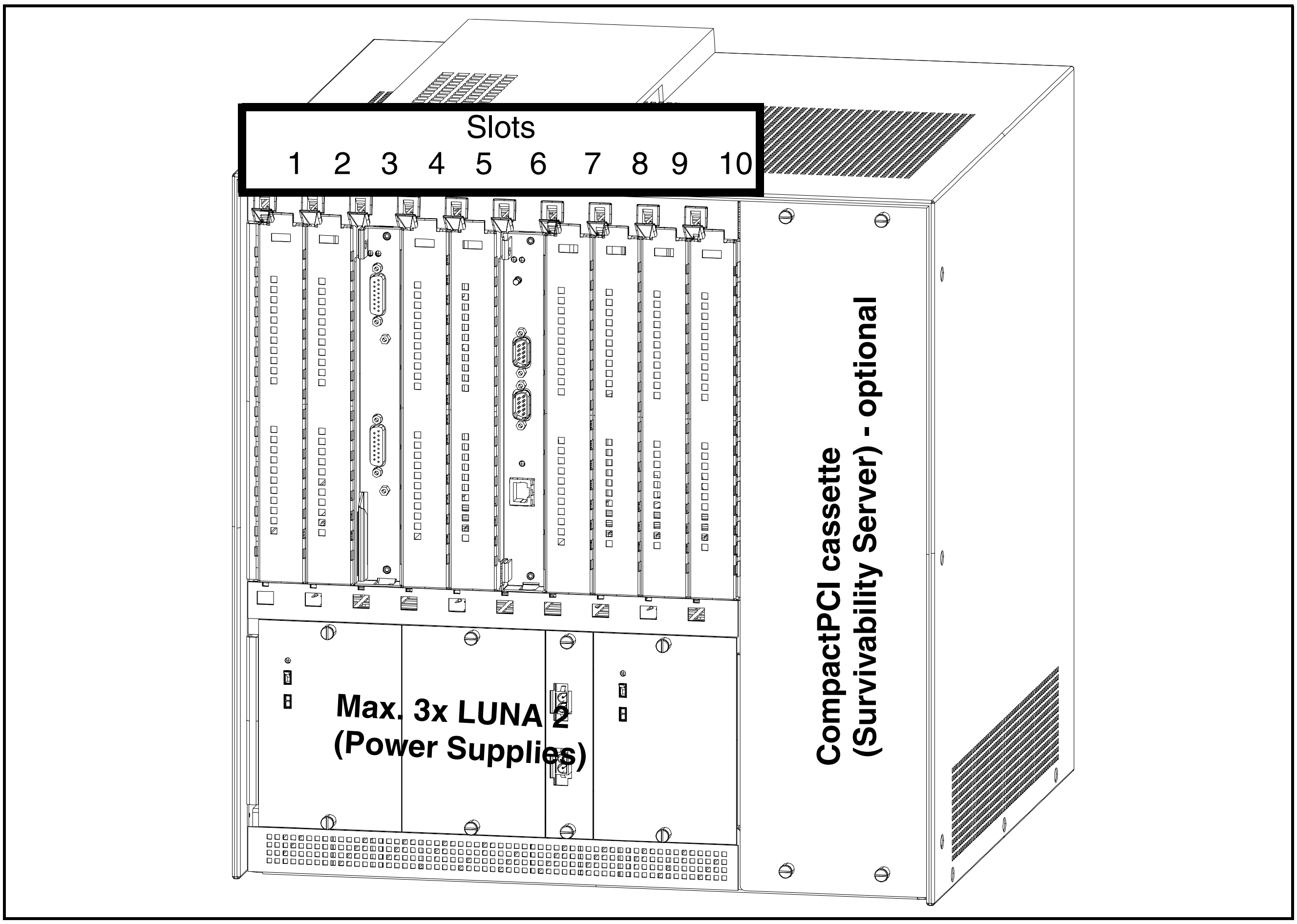


Figure 2-7 AP 3700-9 Front View

2.5.1 Shelf Population (Front)

- Slot 1 - 5: Peripheral modules
- Slot 6: Central control board NCUI (AP3700-9)/CBSAP (H3800BB)
- Slot 7 - 10: Peripheral modules
- Up to three power supply units LUNA 2
- REALS (**Re**lays and **AL**UM for **S**APP), used in H3800BB (HiPath 3000) only
- CompactPCI cassette (Survivability Server), used in AP 3700-9 (HiPath 4000)

Figure 2-8 shows the back view of the AP 3700-9 populated with patch panels

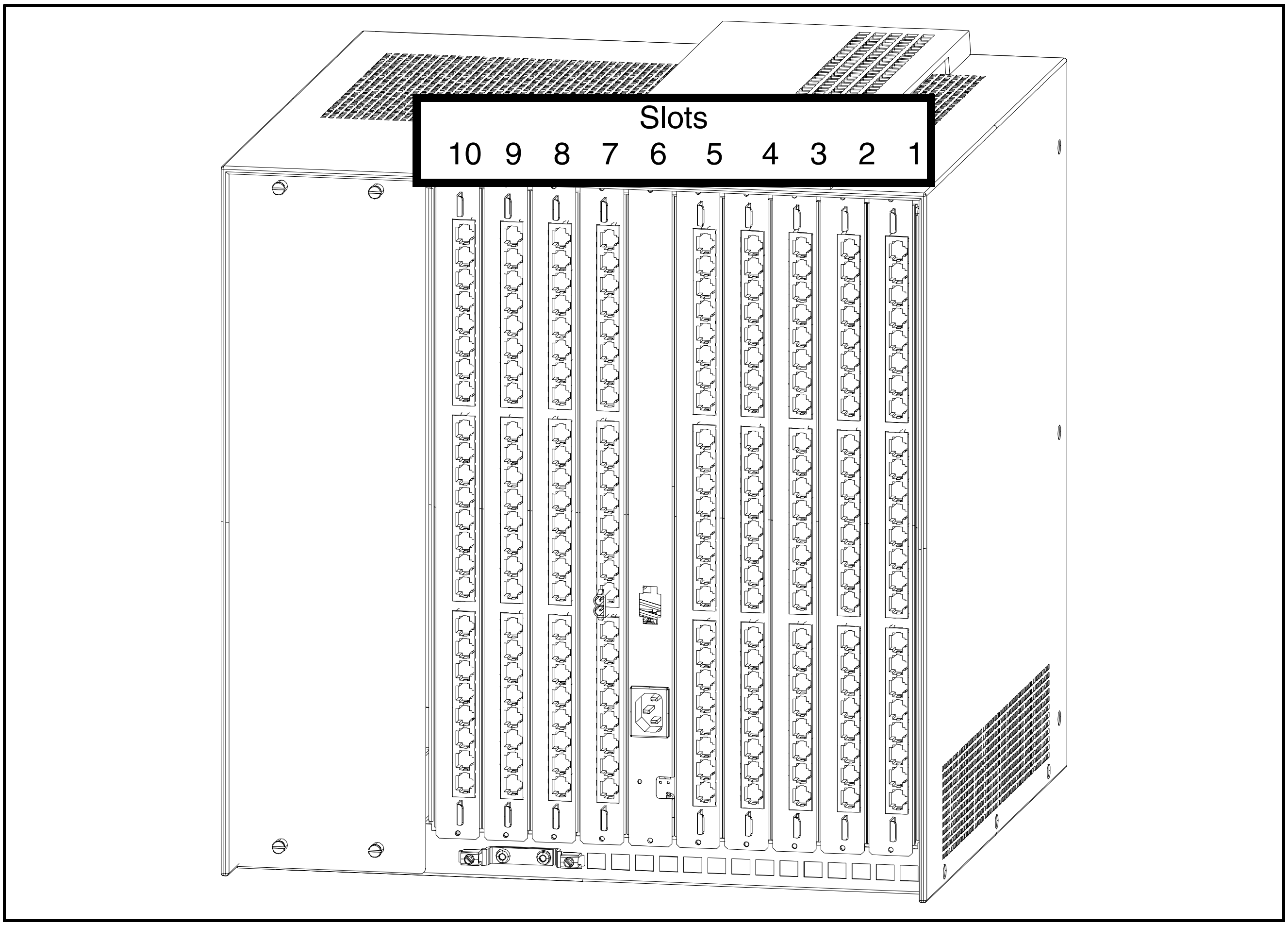


Figure 2-8 AP 3700-9 (Back View) Populated with Patch Panels

2.5.2 Shelf Population (Back) with Patch Panels

- Slot 10 -7: Patch panels (8, 20 and 24-port RJ-45 connector/CHAMP plug)

- Slot 6: Power supply connection board (DC at the top/AC at the bottom)
- Slot 5 -1: Patch panels (8, 20 and 24-port RJ-45 connector/CHAMP plug)
- Cable clip for earth connection

Figure 2-9 shows the back view of the AP 3700-9 without patch panels

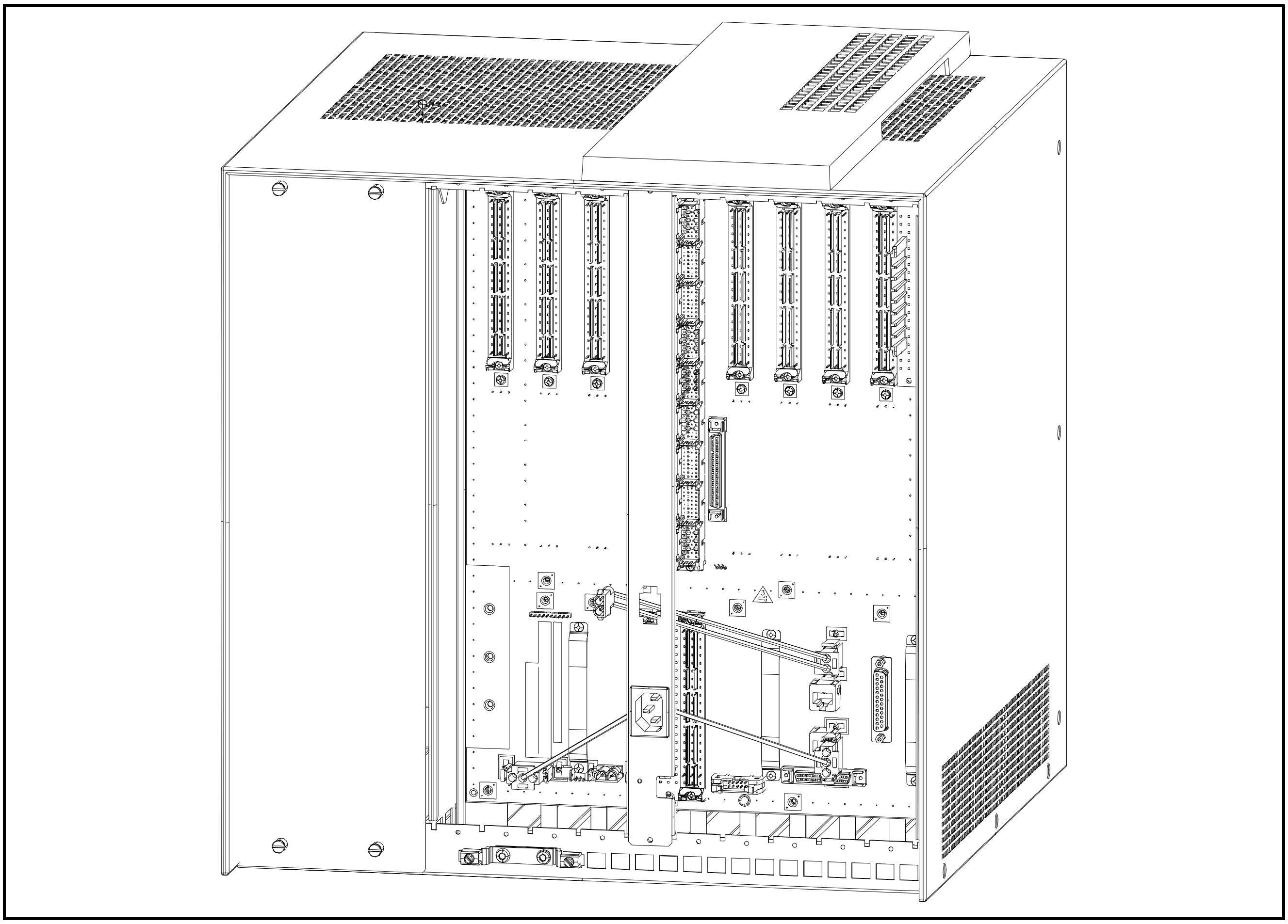


Figure 2-9 AP 3700-9 (Back View) without Patch Panels

2.5.3 Shelf Population (Back) without Patch Panels

- SIVAPAC cables on the backplane for connection to external patch panels or to a main distribution frame (MDF)
- Power supply connection board (DC at the top/AC at the bottom)
- Cable clip for earth connection

Figure 2-10 shows the AP 3700-9 backplane connections

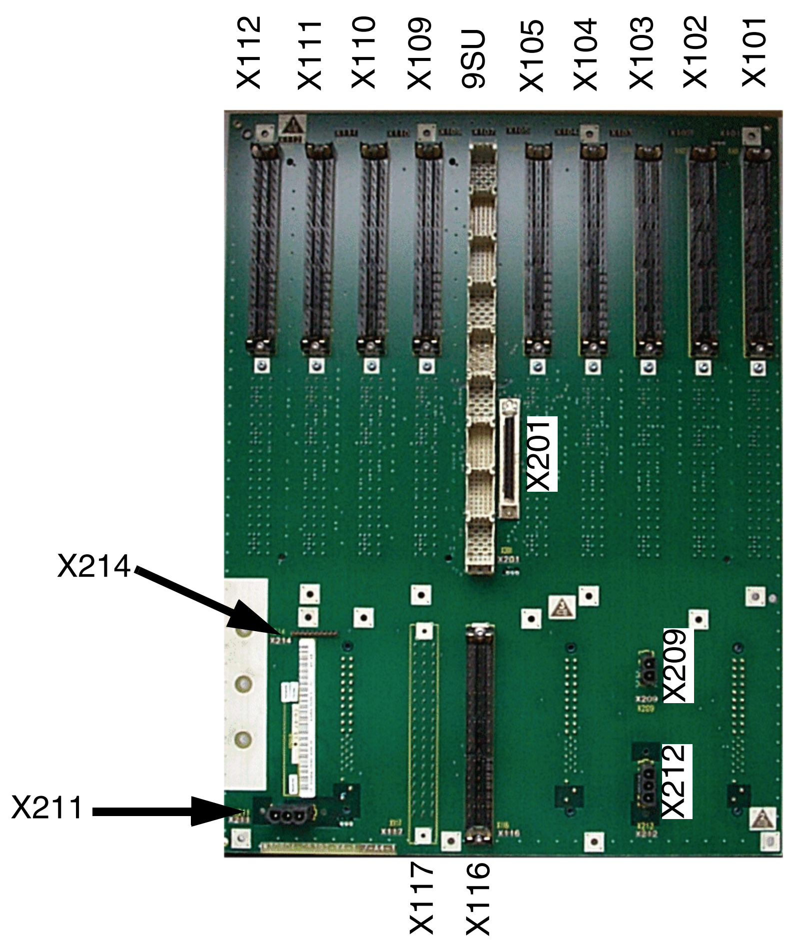


Figure 2-10 AP 3700-9 Backplane Connections

2.5.4 AP 3700-9 Backplane Connections

- Connector X101 - X105: SIVAPAC connector for peripheral connections
- Connector 9SU: SIPAC connector for external signalling (e.g. reference clock)
- Connector X109 - X112: SIVAPAC connector for peripheral connections
- Connector 116/117: SIVAPAC connector (REALS, ALUM)
- Connector 201: DB68mini (for expansion box)
- Connector 209: DC connection

- Connector 211/212: AC connection

2.6 AP 3700-13 Shelf (HHS Hicom Host System)

Part number: S30805-G5413-X

The AP 3700-13 is a peripheral shelf with an LTUCA-control board that can be installed as a standalone system or in a 19" cabinet system. The AP 3700-13 can be populated with up to 13 peripheral modules.

The AP 3700-13 is also used in HiPath 3000, where it is called “H3800EB”.

Figure 2-11 shows the front view of AP 3700-13

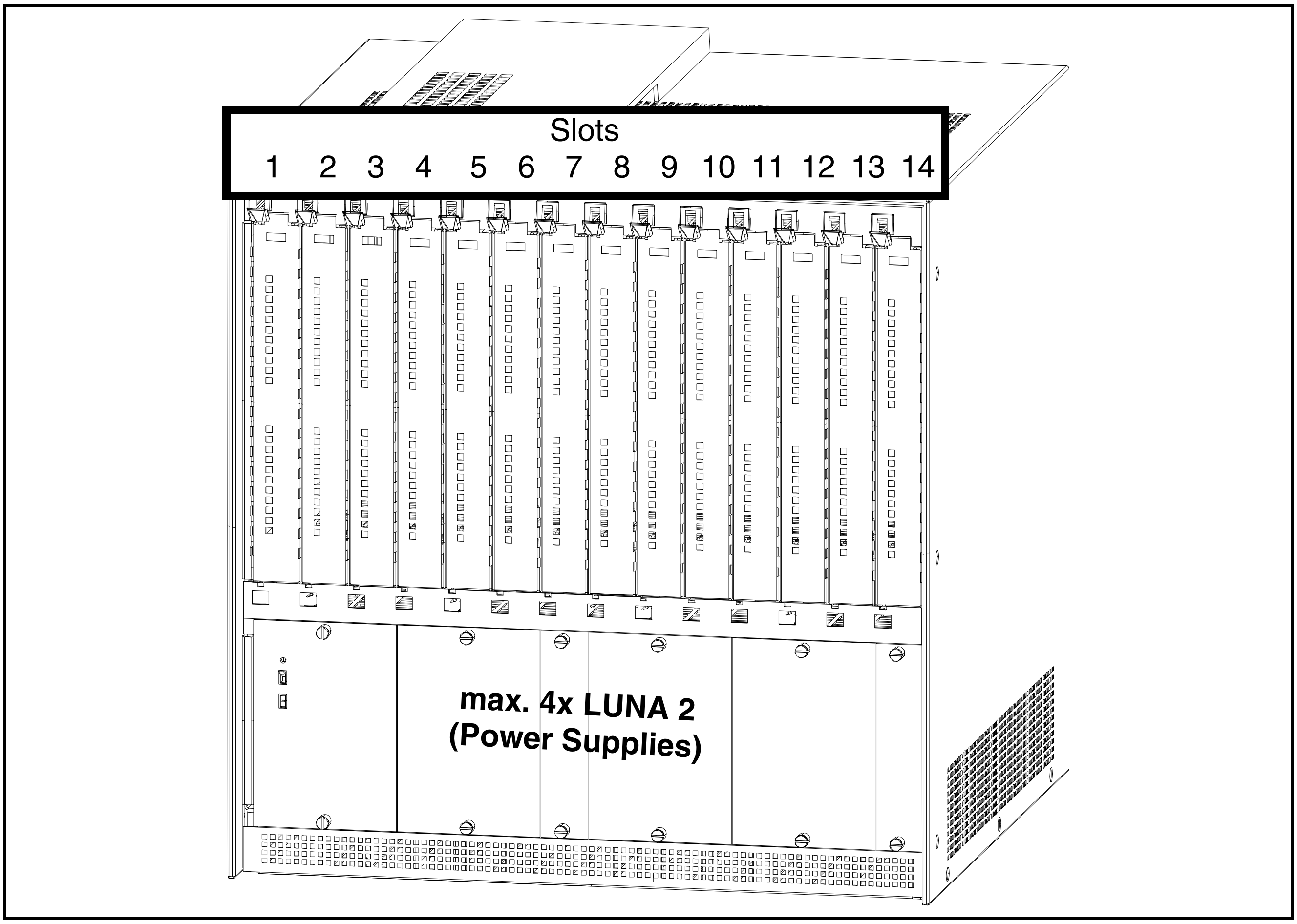


Figure 2-11 AP 3700-13 Front View

2.6.1 Shelf Population (Front)

- Slot 1 -6: Peripheral modules

- Slot 7: Central control board LTUCA (AP3700-13)/not populated in H3800BB
- Slot 8- 14: Peripheral modules
- Up to four power supply units LUNA 2

Figure 2-12 shows the back view of AP 3700-13 populated with patch panels

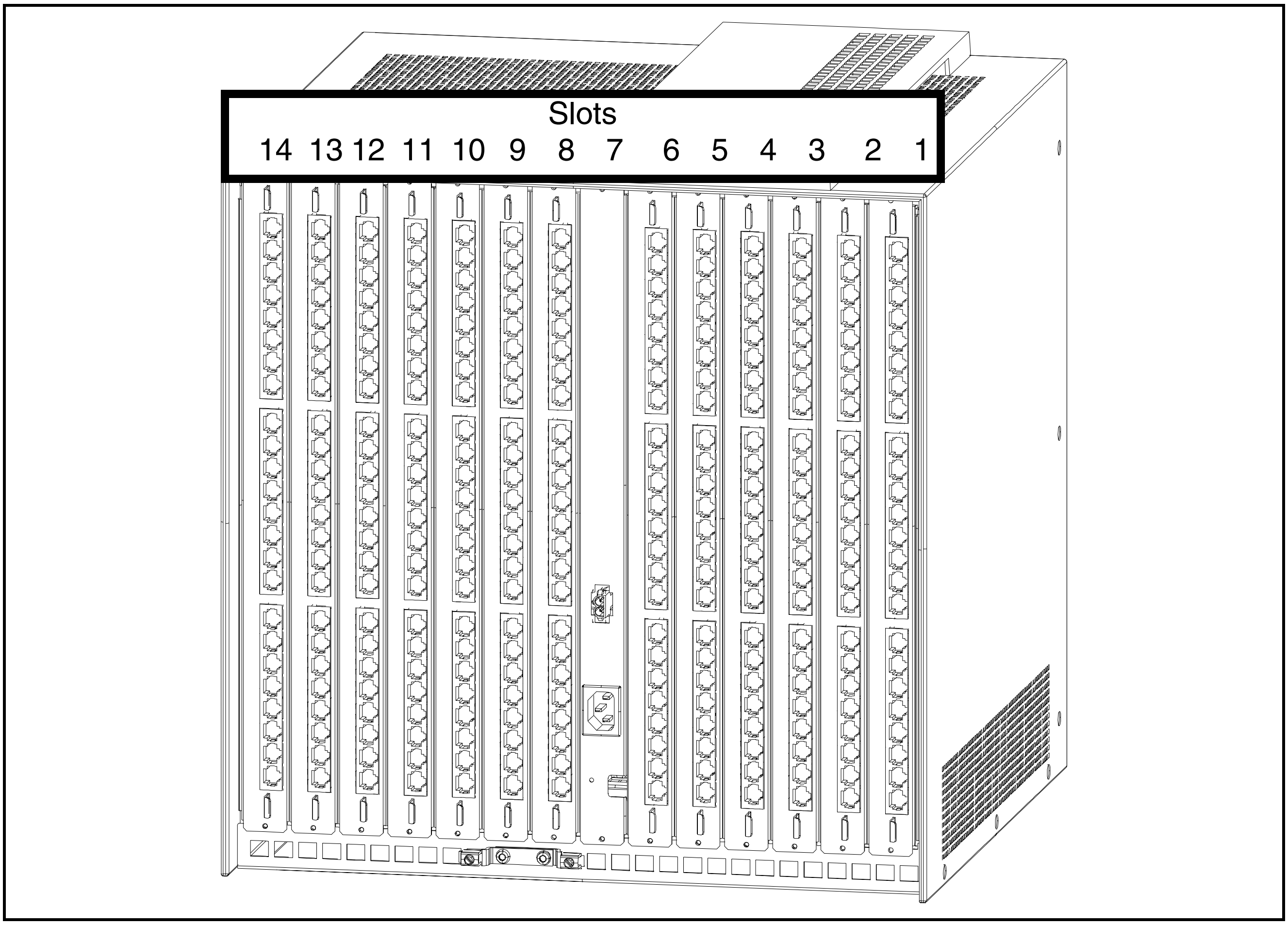


Figure 2-12 AP 3700-13 (Back View) with Patch Panels

2.6.2 Shelf Population (Back) with Patch Panels

- Slot 14 - 8: Patch panels (8, 20 and 24-port RJ-45 connector/CHAMP plug)
- Slot 7: Power supply connection board (DC at the top/AC at the bottom)
- Slot 6 -1: Patch panels (8, 20 and 24-port RJ-45 connector/CHAMP plug)
- Cable clip for earth connection

Figure 2-13 shows the back view of AP 3700-13 without patch panels

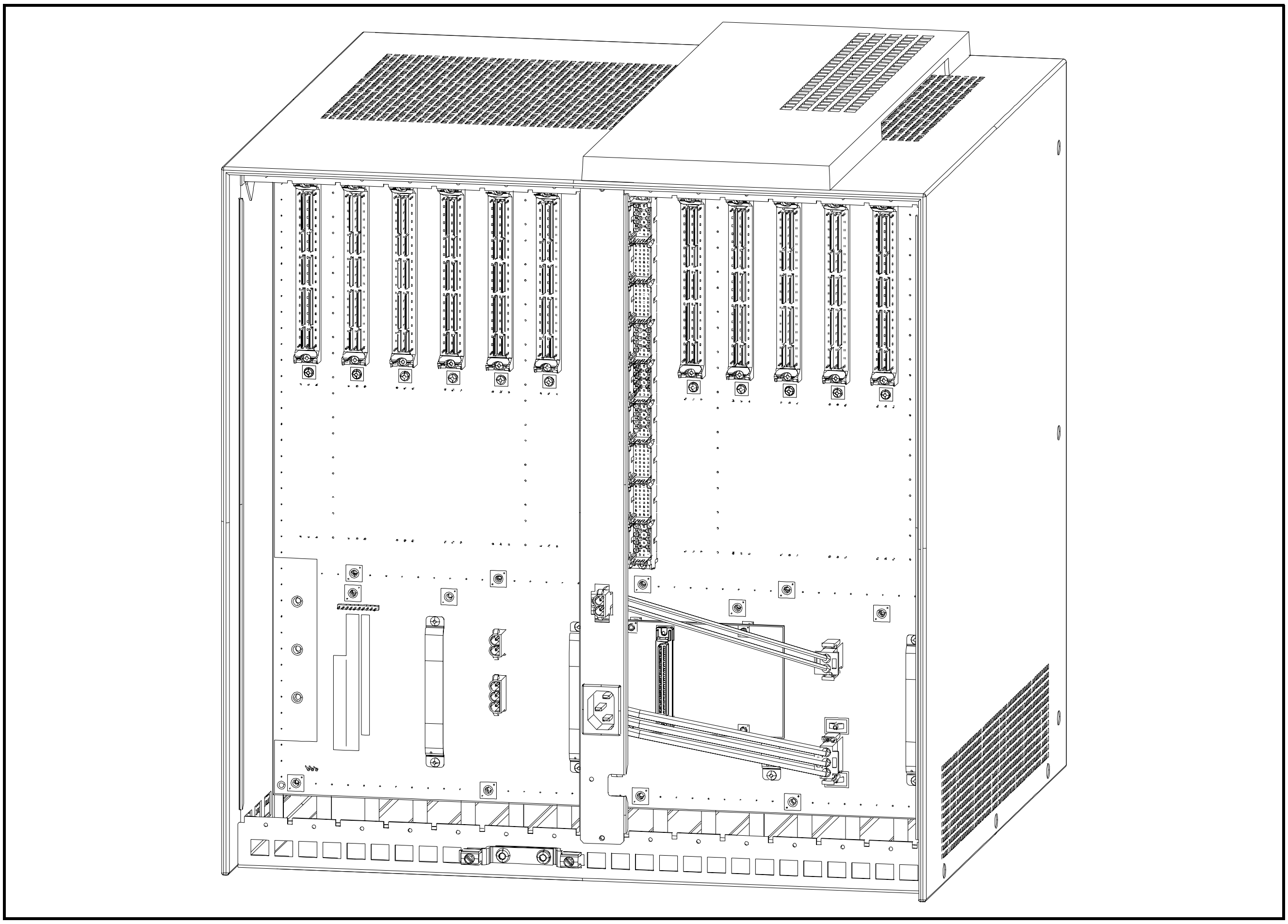


Figure 2-13 AP 3700-13 (Back View) without Patch Panels

2.6.3 Shelf Population (Back) without Patch Panels

- SIVAPAC connector on the backplane for cable connection to external patch panels or to a mains distribution frame (MDF)
- Power supply connection board (DC at the top/AC at the bottom)
- Cable clip for earth connection

Figure 2-14 shows the AP 3700-13 backplane connections

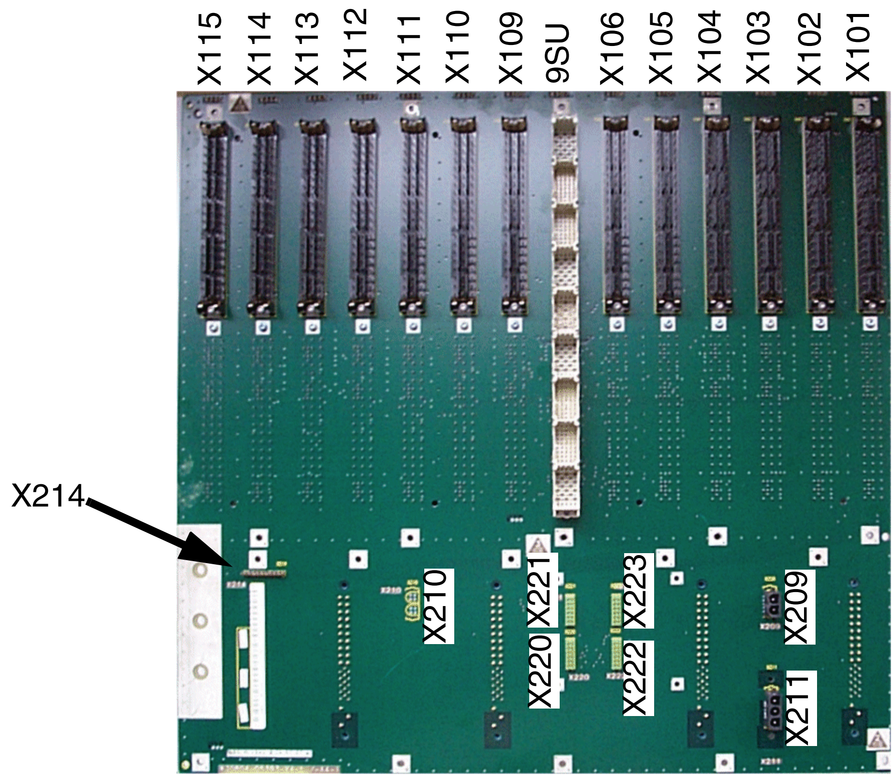


Figure 2-14   AP 3700-13 Backplane Connections

2.6.4   AP 3700-13 Backplane Connections

- Connector X101 - X106: SIVAPAC connector for peripheral connections
- Connector 9SU: SIPAC connector for external signalling (e.g. reference clock)
- Connector X109 - X115: SIVAPAC connector for peripheral connections
- Connector X209/X210: DC connection
- Connector X211: AC connection
- Connector X214: 10-pin plug (RG module)
- Connector X220-223: 14-pin plug (4x DBSAP connection)

2.7 Survivability Server

Survivability Server takes over operation of the access points if central control fails. It can only be used in AP 3700 IP access points.

However, Survivability Server can control all types of IPDA access points (AP 3300 IP, AP 3500 IP, AP 3700 IP) in emergency situations, regardless of whether the access points are equipped with NCUI(1), NCUI2 or NCUI4.

Survivability Server consists of a cassette with a cPCI backplane, DSCXL processor, HDMO/HDCF module, power supply unit and redundant ventilator modules.

Depending on the power supply module used, it can operate with 110/230V AC or 48 V DC. In AP 3700 IP, there is no electrical connection between the access point and the server.

Survivability Server and the access point NCUI communicate with each other exclusively via the IP network (see also service manual "HiPath 4000 V4 IP Solutions - IPDA&APE").

> The factory setting for the CSPCI shelf's power supply coding is always set to ACPCI. To use DC power supplies (DCPCI), you must change the coding according to Figure 2-15.

1) Coding of power supplies:

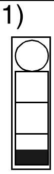
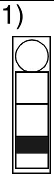
- AC power supply	1) 	Chamber F: empty Chamber E: empty Chamber D: Position 1
- DC power supply	1) 	Chamber F: empty Chamber E: empty Chamber D: Position 3

Figure 2-15 Coding for power supply configurations ACPCI/DCPCI

Figure 2-7 shows the Front View of AP 3700 IP

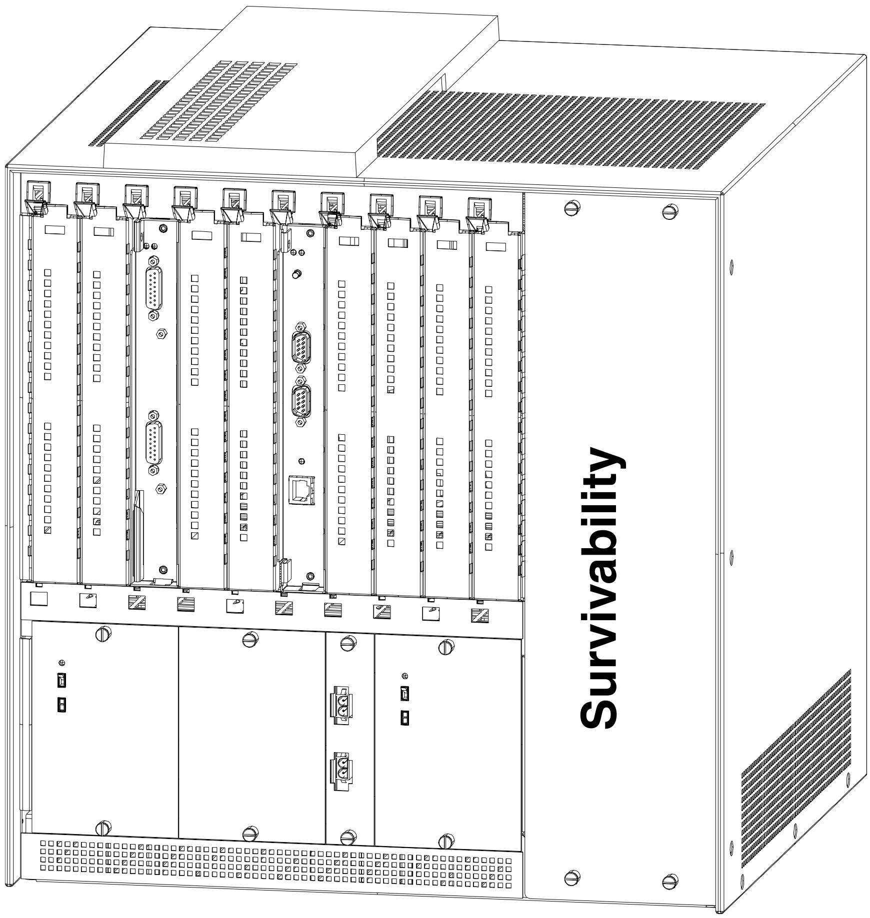


Figure 2-16 AP 3700 IP Front View

Figure 2-17 shows the Slot for Survivability Server

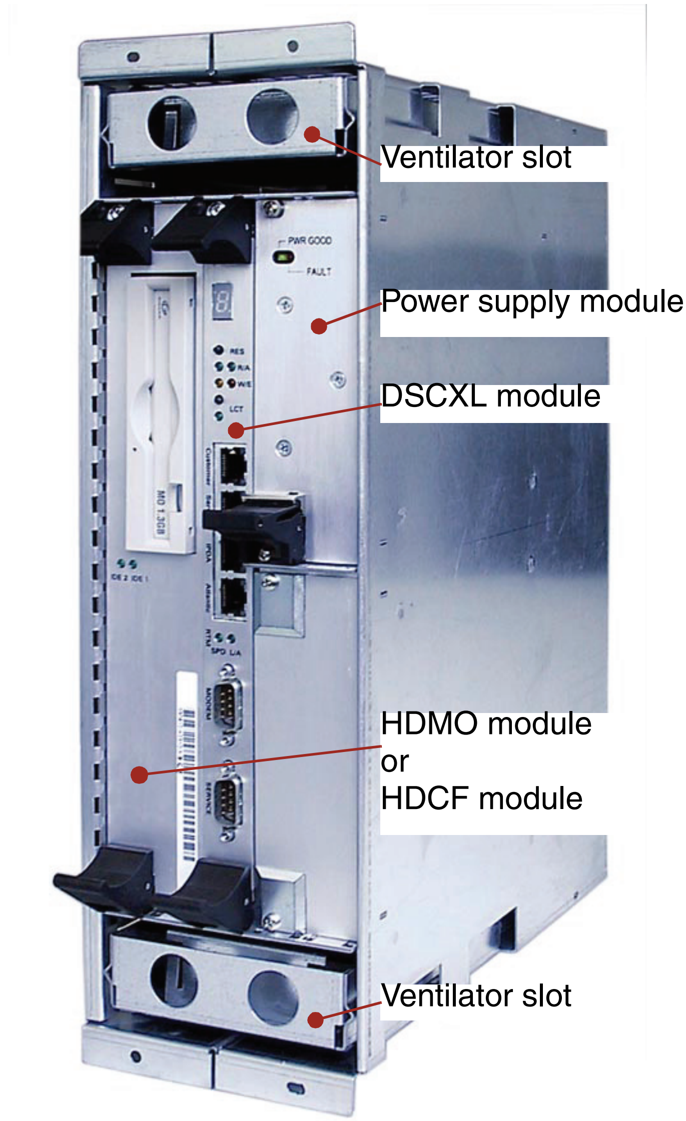


Figure 2-17 Survivability Server Slot

2.8 RG 8300

RG 8300 is a solution which will be used to connect an OpenScape Voice system with an Hicom 300 system, Hicom 300 E/H, HiPath 4000 V1.0/V2.0 or to the local PSTN (Public Switched Telephone Network). Therefor the HiPath 4000 system "AP3700 IP" will be used as gateway in a restricted form via licensing.

The following description shows the hardware of different gateway types which can be used. For more information regarding the equipment of "AP 3700 IP" see Section 2.5, “AP 3700-9 Shelf (IPDA)” and Section 2.7, “Survivability Server”.

2.8.1 RG 8302

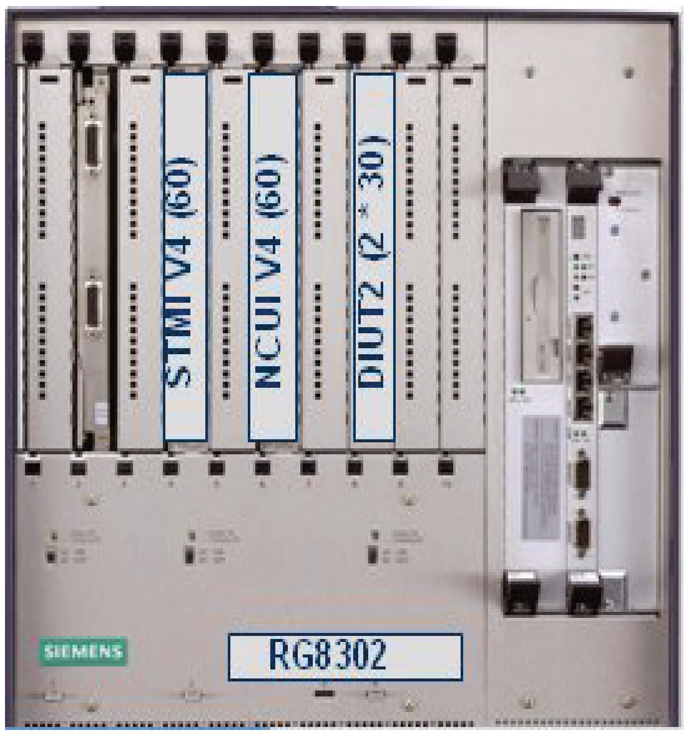


Figure 2-18 RG 8302

- 1 STMI4
- 1 NCUI4 (must be connected to the IPDA LAN port on DSCXL board like a normal HiPath 4000).
- 1 DIUT2 or DIUN2 (IM)/DIU2U (US) (as long as DIUT2 is not released)
- 2 T1-/E1 ports
- 1 x AP 3700 IP

2.8.2 RG 8304

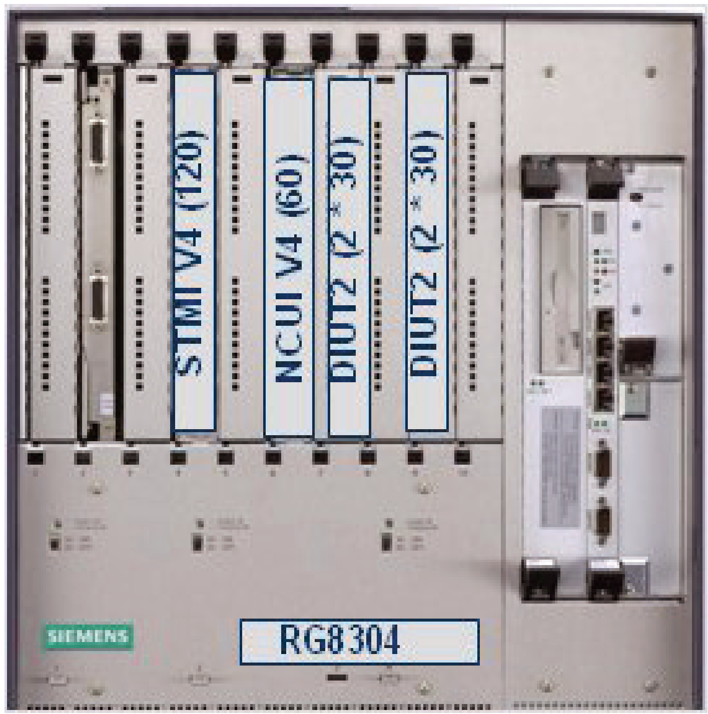


Figure 2-19 RG 8304

- 1 STMI4
- 1 NCUI4 (must be connected to the IPDA LAN port on DSCXL board (like a normal HiPath 4000)
- 2 DIUT2
- 4 T1-/E1-Anschlüsse
- 1 x AP 3700 IP

2.8.3 RG 8308

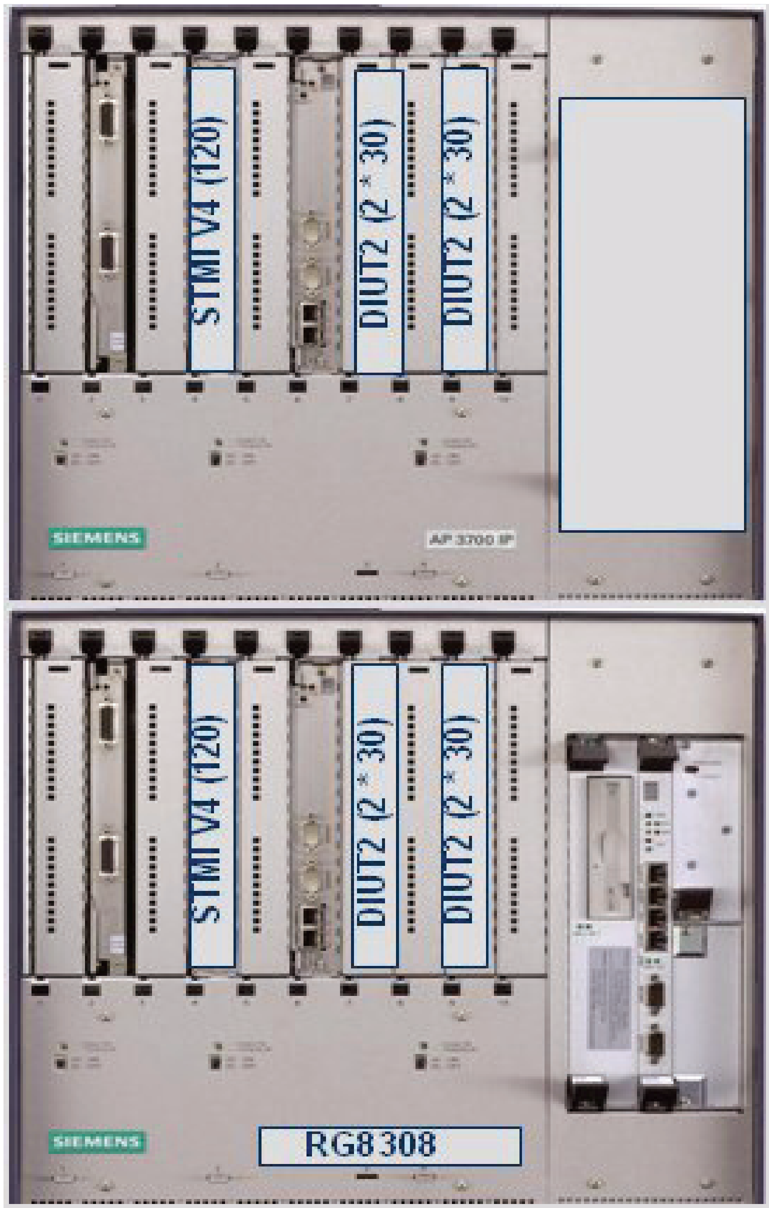


Figure 2-20 RG 8308

- 1 STMI4 per AP
- 2 DIUT2 per AP
- 8 T1-/E1ports
- 2 x AP 3700 IP

3 Boards

3.1 CDG CorNet DPNSS Gateway

The CDG gateway board is used to link the HiPath 4000 system to private systems and networks through Digital Private Network Signaling System No. 1 (DPNSS1) or public exchanges through Digital Access Signaling System No 2 (DASS2). In connection with the DIUS2 board and an APPCU adapter plug, it is possible to link to the HiPath 4000 system as follows:

- iSLX, iSDX, EMS 601 systems through DPNSS1 protocol
- Public exchanges through DASS2 protocol
- Other HiPath systems with DPNSS1 protocol if certified.

The description of the APPCU adapter plug can be found in the Section 6.2, “APPCU”.

The code assignment procedure DPNSS1 deviates from the CorNet-N procedure (used in HiPath 4000) and is used for private Private Automatic Branch Exchange (PABX) links and networks.

The code assignment procedure DASS2 describes the standard interfaces of the British ISDN access.

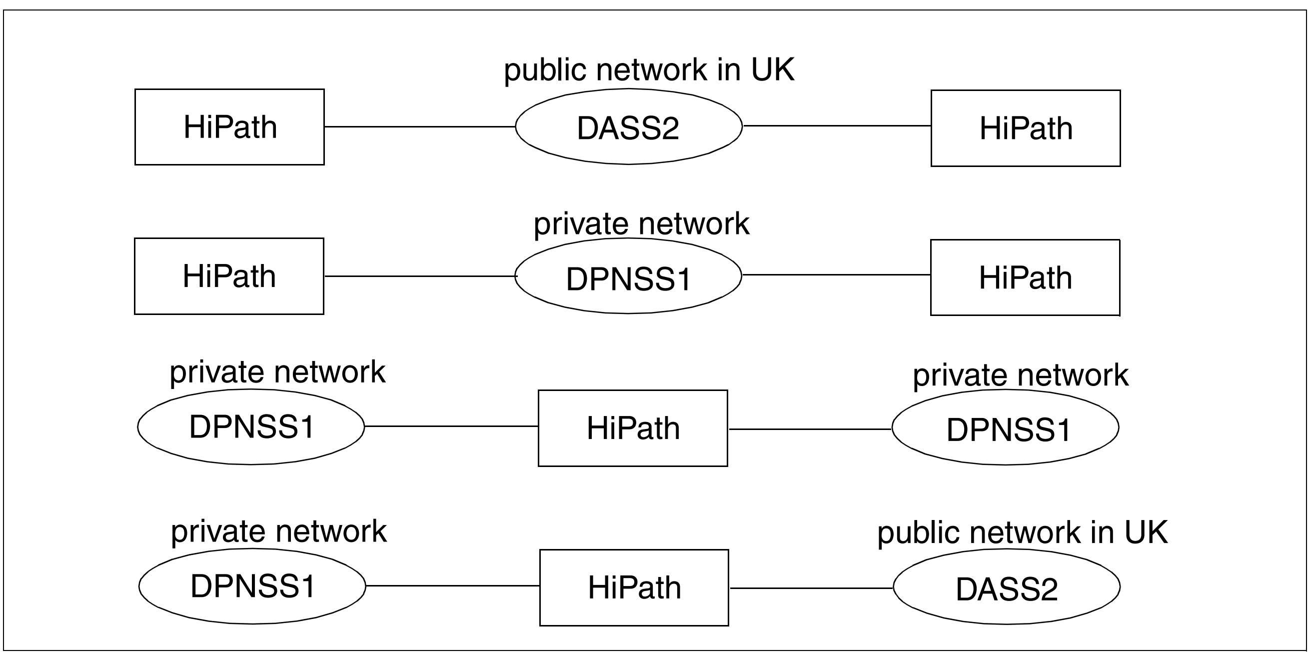


Figure 3-1 CDG, Network Configurations

3.1.1 LED Displays

There are two light emitting diodes (LEDs) on the front panel of the CDG (see Figure 3-5). These LEDs are used for indicating the operating and error status of each transmission path of the Gateway (refer to Table 3-1).

Startup	
Both LEDs flash (100/100ms)	First protocol layer not yet active
LED flashes (1,2/1,2 s)	Second protocol layer active
Operating state	
LED on	Second protocol layer active
LED flashes (1,2/1,2 s)	Second protocol layer active; Highway supplies reference clock (see NOTE)
LED off	Second protocol layer not active
Error events	
LED flashes (300/900 ms)	Layer 1 - error
LED double flash (300/300/300/900 ms)	Layer 2 - error
Both LEDs flash (300/900 ms)	Board - error

Table 3-1 CDG, LED display

This state is only valid for the DASS/DPNSS link LED.
The connected DIUS2 LED should also flash (1.2/1.2 sec.) when the CDG LED in this state.

3.1.2 DIP-FIX-Switches

The dual in-line package (DIP) switches on the board allow the following configurations to be set up .

- Switch 1 - Has no function
- Switches 2, 3 and 4 - These switches define the type of Gateway and the channel negotiation to the network: DPNSS-CorNet, DASS-CorNet, DPNSS-ISDN in Belgium or DPNSS-ISDN in Italy (refer to Table 3-2))

  If the gateway is seized from both directions, an outgoing x-channel connection always has priority.

DIP-FIX switches			Type	X-channels at CDG to Network	Y-channels at Unlike System to CDG
Switch 2	**Switch 3**	**Switch 4**			
OFF	ON	ON	DASS Protocol	1...15 17...31	
ON	OFF	OFF	Italy (DPNSS1) ISDN	1...15 17...31	-- --
ON	OFF	ON	Belgium (DPNSS1) ISDN	1...15 17...31	-- --
ON	ON	OFF	DPNSS1 Protocol	17...31	1...15
ON	ON	ON	DPNSS1 Protocol	1...15	17...31

Table 3-2 CDG, DIP-FIX Switches 2, 3 and 4

> B-channel treatment for the HiPath 4000 must be configured to Yes.

- Switches 5 and 6 - Switches 5 and 6 are used for setting the transmission rate of the V.24 interface (Service Terminal) on the front panel (refer to Table 3-3). The fixed settings are:
  - 7 Data bits
  - No parity
  - 2 Stop bits
  - Flow control with XON/XOFF

DIP-FIX switches		Transmission rate
Switch 5	**Switch 6**	
OFF	OFF	1200 Baud
OFF	ON	2400 Baud
ON	OFF	4800 Baud
ON	ON	9600 Baud

Table 3-3 CDG, DIP-Fix switches 5 and 6

- Switch 7
  - ON - ISDN side is designated as Network (Network is A); DPNSS side is designated as B.

  - OFF - ISDN side is designated as User (User is B), DPNSS side is designated A. This adjustment is mandatory for DASS2 connection.

- Switch 8 - Has no function

> The DIP-FIX switch settings are read by the board software when the Gateway is powered up (cold startup). This is done to set the X/Y bit for each individual DPNSS1 channel into a protected area in RAM. Any time the X/Y bit is needed, its value is taken from what has been stored in that RAM area.
> Using the service terminal connected through the V.24 interface, with the aid of the SUBSTITUTE command, the setting of these bits can be overwritten for any DPNSS channel. In the event of a power failure, the settings of the DIP-FIX switches take effect again.

Position in System

Physically, the CDG board is incorporated into the LTU.. of the HiPath 4000 system. Together with the DIUS2 board, it forms the gateway. The CDG and the DIUS2 boards have to be configured in the same LTU... The CDG board converts the CorNet-N protocol into DPNSS1 or DASS2 and vice-versa. The boards are linked through a cable connected to the backplane and the adapter plug Section 3.1.2, “CDG, Position in the System”, which form the connection to the two PCM30 highways.

The transmission width on the highway is 2048 Kbps. The highway comprises 30 user channels (B-channels), one signaling channel (D-channel = channel 16) and a clock sync channel (channel 0) with a transmission rate of 64 Kbps each.

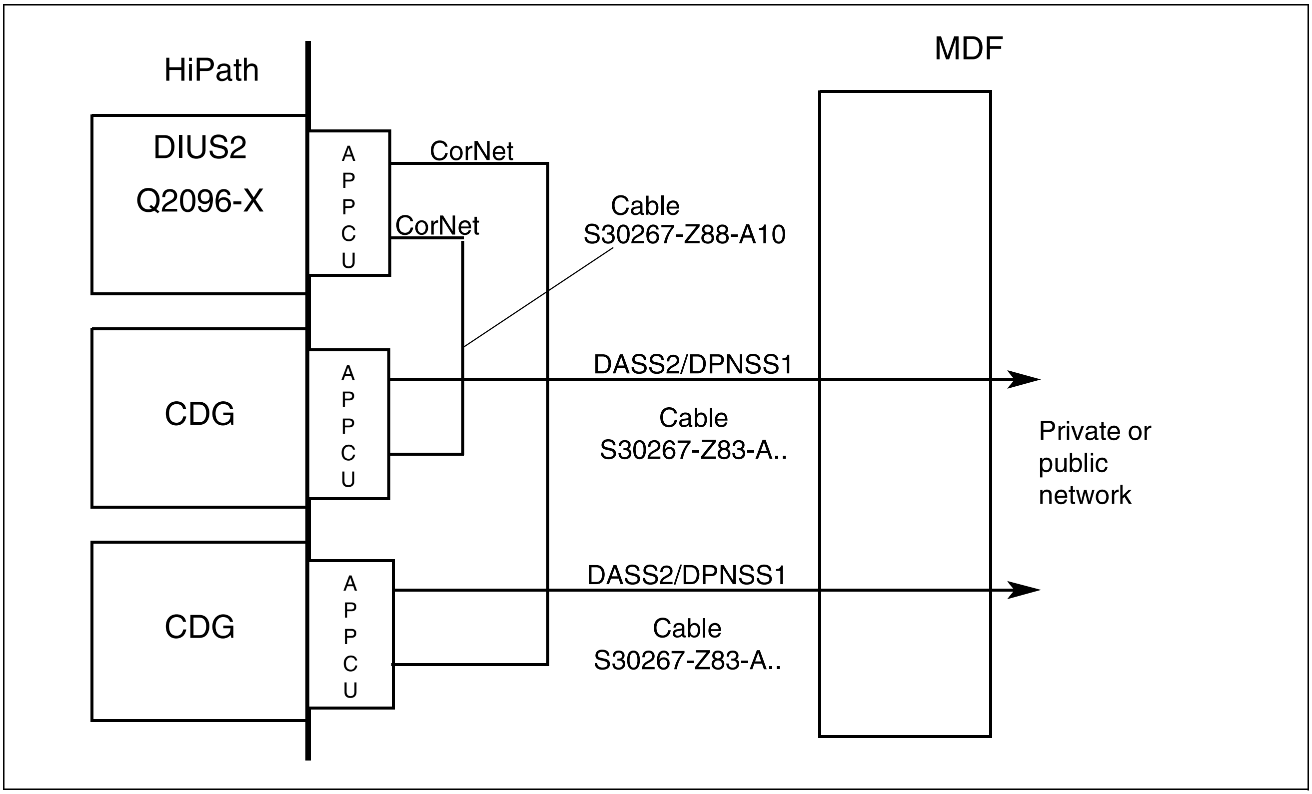


Figure 3-2 CDG, Position in the System

3.1.3 Features

- DPNSS1 for private networking:
  - Basic call setup and call clear down with treatment of invalid, incomplete or missing parameters in protocol levels 1 to 3 (BTNR 188 Sections 0 - 6)
  - Calling number identification
  - Called number identification
  - Less 30 channel working
  - Transmission of messages which are unknown or non-representable data in CorNet-N (non-specified information)
  - Treatment of virtual connections
  - Direct inward dialing (DID)
  - Call back when free
  - Call back when next used

  - Executive Intrusion
  - Call offer for extensions and operators (transfer to busy)
  - Call waiting
  - Call forwarding, diversion
  - Hold/consult
  - Redirection
  - Night Service divert
  - Do not disturb override / Do-not-disturb network-wide
  - Three party service
  - Network Voice Mail access (proprietary to HiPath 4000, iSLX and iSDX)
  - Circuit-switched data call
  - Route Optimization
  - Loop Avoidance
- DASS2 for public network
  - Basic call setup and cleardown with treatment of invalid, incomplete or missing parameters in protocol levels 1 to 3 (BTNR 190 Part 1, Volume 1).
  - Direct inward dialing (DID)
  - Transfer of call charge data dynamically, or at the end of a call (depending on PSTN facility)
  - Calling number identification
  - Called number identification
  - Less 30 channel working
  - Circuit-switched data call

3.1.4 Configuration

The CDG interface board is assembled with a separate software (firmware) which operates on that board only. The following restrictions result while the board is being used:

- Board polling is not possible through HiPath 4000 system
- FW, SW or HW polling are not possible
- The board cannot be configured in the LTU shelf

- Access to devices through remote A&M is not possible
- Administration and maintenance tasks to HiPath 4000 system are not possible
- Error data output is not possible on the service terminal ST

The associated DIUS2 board must be loaded with the appropriate loadware.

> **Warning**
> The CDG board is physically located in the LTU shelf, that is, the location of the CDG board must be configured as ACGEN board so that no permanent reset signal is applied to the LTU board.

The firmware of the CDG board does not send an identification to the HDLC bus, which means that the board is not detected by the DCL and therefore not polled. The voltages and clock signals required for the CDG board are supplied by the HiPath 4000 system through the LTUW backplane.

The CDG board may also provide the reference clock for the clock generator, under control of the associated DIUS2, from the DPNSS1 or DASS2 line. The DIUS2 must be assigned accordingly in the Reference Clock table using AMOs REFTA and LWPAR (refer to Table 3-4).

The lower PCM30 highway 1 (the 2nd highway) of the CDG board is generally linked to the lower PCM30 interface of a DUIS2 board. In the HiPath 4000 system, two LTU shelves are used:

- LTUW in Cabinet System
  - 8 Ports for each slot
  - One cable for every two lCDG-slots to the MDF
  - One adapter plug APPCU for each CDG and DIUS2 boards
- LTUW in Modular Cabinet System
  - 16 Ports for each slot
  - One cable for each slot to the MDF
  - One adapter plug APPCU for each CDG and DIUS2 boards

Figure 3-3 and Figure 3-4 shows examples of a CDG location LTUW for cabinet system

:

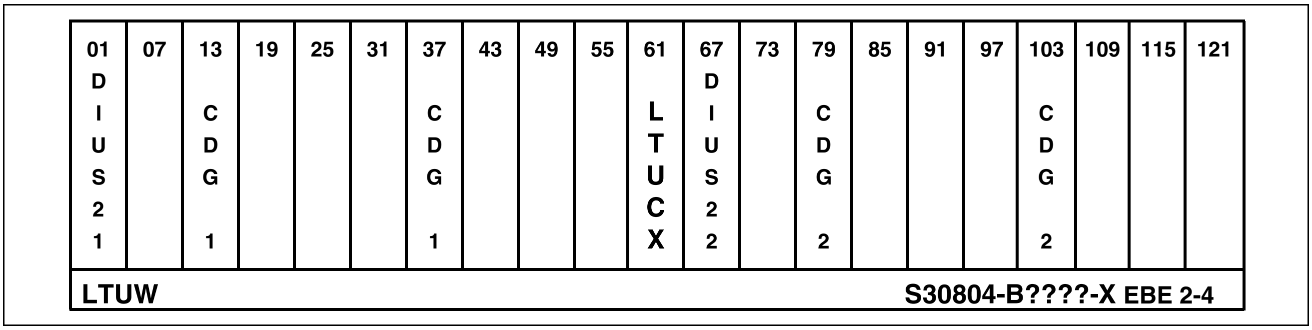


Figure 3-3 CDG, LTUW for Cabinet System

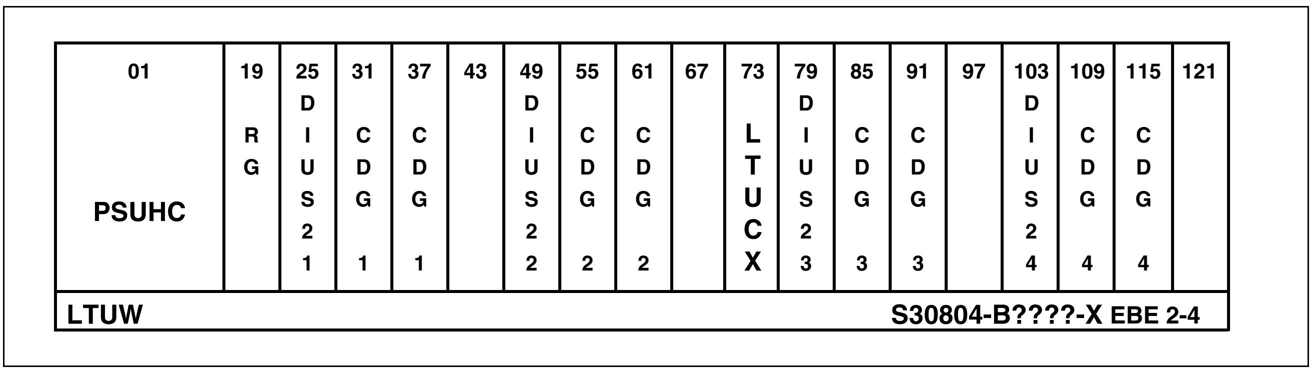


Figure 3-4 CDG, LTUW for Modular Cabinet System

3.1.5 Clock supply

- When connecting the CDG board to the public network (DASS2), the latter is always the clock master. Thus, the connected CDG board must always be configured as the slave (assigned through AMO REFTA and LWPAR).
- For private networks (DPNSS1), the board configuration must fit the network topology.

The clock configuration of a DPNSS1/DASS2/CorNet mixed - mode network is controlled by the DIUS2 board in each case (the Networking rules apply here). The DIUS2 board signals the CDG board to supply the reference clock of the connected DASS2/DPNSS1 line. Bit Sn4 of the Service Word pulse is used. (Assigned through AMOs REFTA and LWPAR.)

DIUS2		**Gateway CDG**		**Network**	
	Incoming		Incoming	Outgoing	Incoming
	Slave	--	Slave	Master (DPNSS1)	
	Master	--	Master	Slave (DPNSS1)	

Table 3-4 CDG, Clock Master/Slave Relation of the Board in a Network

DIUS2		Gateway CDG		Network	
	Incoming		Incoming	Outgoing	Incoming
	Slave	--	Slave	Master (DASS2)	

Table 3-4 CDG, Clock Master/Slave Relation of the Board in a Network

3.1.6 Board Layout

Up to version V2.6 3 EPROMs were used; from firmware-version 2.7 on, 4 EPROMs are used.

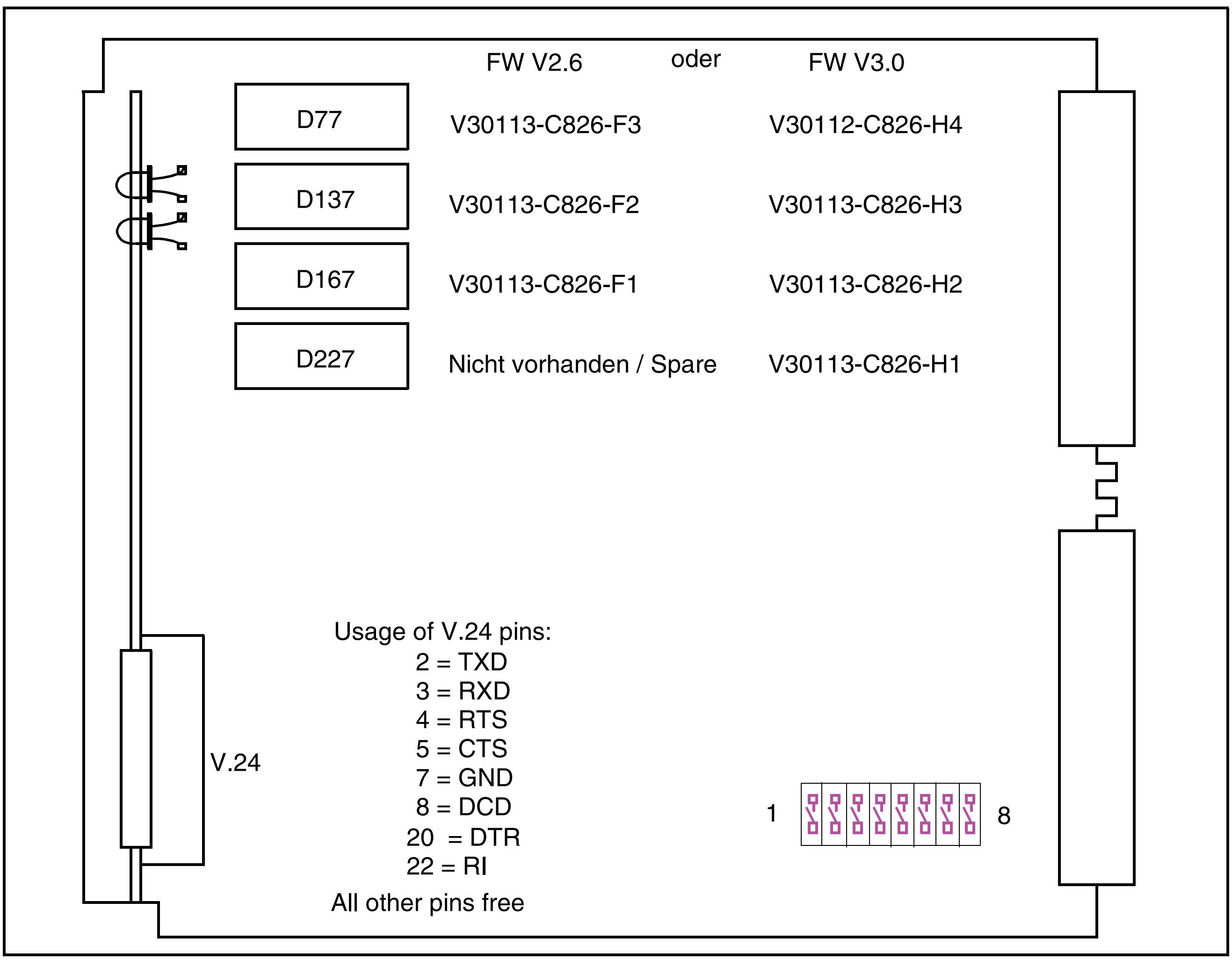


Figure 3-5 CDG Board (Q2218-X)

3.1.7 Service Terminal

The V.24 interface on the front panel can be used to connect a service terminal to perform maintenance and service tasks.

Error Indications on Service Terminal

All error messages generated on the V.24 service terminal have the following syntax:
[Time] - [Error Category]: [Error Description]

[Time]	Relative time indication derived from a 16-bit circular counter which is incremented every minute.	
[Error Category]	LINK ERROR	= in case of a link fault
	PROCESS ERROR	= in case of a fault detected within one of the gateway processes
[Error description]	Textual description of the type of error	

The following errors can be reported:

000 QUEUE OVERFLOW	
001 NO SIGNAL	2-megabit input signal has disappeared for the link
002 AIS DETECTED	Alarm Indication Signal (AIS) is detected on the reporting link.
003 LOSS OF SYNC	Gateway is no longer able to synchronize itself with the remote end on the indicated link.
004	BACKWARD ALARM
005	BIT SLIP
006	EXCESSIVE BIT SLIP
007	CRC FAULTS > THRESH-1
008	CRC FAULTS > THRESH-2
009	CAN’T ACTIVATE L1
010	RAM ERROR
011	ROM ERROR
012	RESTART DUE TO WATCHDOG
013	LACK OF BUFFERS, ONCE
014	LACK OF BUFFERS, MORE
015	INVALID MESSAGE
016	OS ERROR
017	L2: RX UNSOLLIC. SUPV. FRAME (LINK 1)

018	L2: RX UNSOLLIC. DM RESP, F=1 (LINK 1)
019	L2: RX UNSOLLIC. UA RESP, F=1 (LINK 1)
020	L2: RX UNSOLLIC. UA RESP, F=0 (LINK 1)
021	L2: RX UNSOLLIC. DM RESP, F=0 (LINK 1)
022	L2: PEER INITIATED REESTABLISH (LINK 1)
023	L2: ERROR RETRANSM. SABME (LINK 1)
024	L2: ERROR RETRANSM. DISC (LINK 1)
025	L2: ERROR RETRANSM. STAT ENQ (LINK 1)
026	L2: N(R) SEQUENCE ERROR (LINK 1)
027	L2: RX FRMR (LINK 1)
028	L2: RX NON-IMPLEM. FRAME (LINK 1)
029	L2: RX INVALID I-FIELD (LINK 1)
030	L2: RX FRAME WITH WRONG SIZE (LINK 1)
031	L2: N201 ERROR (LINK 1)
032	L2: PEER RX BUSY CONDITION (LINK 1)
033	L2: TX FRAME SUPERV. TIMEOUT (LINK 1)
034	L2: REESTABLISH INITIATED (LINK 1)
035	L3: ERROR (LINK 1)
050	DLCMP: BAD STATE
051	DLCMP: BAD IDLE MESSAGE
052	DLCMP: BAD WAIT MESSAGE
053	DLCMP: BAD IN SERVICE MESSAGE
054	DLCMP: BAD OUT OF SERVICE MESSAGE
060	DINTF: LINK FAULT
061	DINTF: UNRECOGNIZED LINK MESSAGE
062	DINTF: CARD FAULT
063	DINTF: UNRECOGNIZED CARD MESSAGE
064	DINTF: CHANNEL FAULT
065	DINTF: UNRECOGNIZED CHANNEL MESSAGE
066	DINTF: UNRECOGNIZED MESSAGE
071	L1(0)-int: bad frame
072	L1(0)-int: no buffers

073	L1(0)-int: message too long
074	L1(0)-int: extend int B fault
075	L1(0)-int: extend int A fault
076	L1(0)-int: xmit data underrun
077	L1(0)-int: rcv frame overflow
081	L1(1)-int: bad frame
082	L1(1)-int: no buffers
083	L1(1)-int: message too long
084	L1(1)-int: extend int B fault
085	L1(1)-int: extend int A fault
086	L1(1)-int: xmit data underrun
087	L1(1)-int: rcv frame overflow
088	Save buffer overflow
089	Message buffer overflow
090	Loss of DPNSS transit info
091	SNU field received from MOSP
092	ICCP feat info overflow

Processing of Input Commands

The Management Software offers the possibility of running a number of maintenance actions, as required. The dialog command which is needed for that purpose is entered as follows:

- Commands can only be entered after receiving the prompt character (<).
- Dialog command characters are echoed back to the V.24 interface before being accepted.
- All entered characters are echoed back to the V.24 interface.
- Characters can be entered in both uppercase and lowercase.
- A command is only run when the command line is terminated with a carriage return character 0x0D.
- The only acceptable line editing character is the backspace (BS) character 0x08. This input character deletes the previous character on the command line and is echoed back as BS, SPACE, BS' on most terminals.
- Entering the Control-S character 0x13 inhibits the output of new character whereas the Control-Q character 0x11 re-enables the output.
  Both characters can be entered at any time to temporarily freeze the system.

The following conventions must be observed:
COMMAND
Command keywords are displayed in capital letters. The command keywords can be entered in small letters or capital letters as desired, but must be entered in full, as displayed.
(Menu)
Round brackets indicate optional items of which you may select only one.
[Menu]
Square brackets indicate that you must select the indicated item.

Tracing (Activate / Deactivate)

Syntax: T S [nnn] { [T-Id] {[T-Id]} ... {[T-Id]} }
T R [nnn] { [T-Id] {[T-Id]} ... {[T-Id]} }
T SR [nnn] { [T-Id] {[T-Id]} ... {[T-Id]} }
T 0

Purpose: The Trace Message command displays all messages sent from one process to another.

The {T S [nnn] T-Id .. T-Id} command starts message tracing for all messages that are sent to or sent the indicated Task-Ids [T-Id] (os-send).

The {T R [nnn] T-Id .. T-Id} command starts message tracing for all messages that are received y the indicated Task-Ids (os-receive, os-dreceive, os-accept).

The {T SR [nnn] T-Id .. T-Id} command starts message tracing for all messages that are sent to, sent by or received by the indicated Task-Ids.

Not more than 10 Task-Ids can be entered on the command line. Task-Id numbers have to be entered in decimal notation.

A trace command without task ids, when issued before any other {T .. } command, enables message tracing only for those messages which are sent and received by the Interworking Unit task. When issued after a {T x[nnn] T-Id .. T-Id}/{T0} sequence, the command restarts tracing for the previously indicated tasks.

The trace command allows the option of specifying the amount of bytes to be displayed from the traced message. This amount can be given in [nnn]. Unless specified, a default of 96 bytes will be printed. Between 1 and 300 bytes may be specified for printing out the message contents. The number remains in effect until a new one is entered.

The command, Trace Off, deactivates tracing.

Only one trace can be active at any time. Entering a new trace job automatically stops the first one.

Example:

Input:

<T SR32 52 54

Output:

```
TRACE =>   01040 - SEND from [048] to [54] - [3BC3:2ED8]
           13 33 55 77 99 14 56 34 23 56 01 02 03 14 15 16
           CD 45 DF 00 00 00 00 00 00 00 00 00 00 00 00 00

 TRACE=>   01040 - RECEIVED by [52] - [2BC3:2328]
           9F 22 10 00 00 00 00 44 77 00 01 02 03 14 15 16
           AA BB 00 00 00 00 00 00 00 00 00 00 00 00 00 00

 TRACE=>   01040 - SEND from [050] to [52] - [2BC3:2328]
           9F 22 10 00 00 00 00 44 77 00 01 02 03 14 15 16
           AA BB 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

The [XXXX:YYYY] at the end of the TRACE line gives the address of the buffer, containing the message displayed.

The numbers known by the Gateway are:

T_ID_T1L1LKIN_SERVICE	1
T_ID_T1L2LKIN_SERVICE	2
T_ID_T3LKIS_ACK_IN_SERVICE	3
T_ID_T2L1LKOS_OUT_OF_SERVICE	4
T_ID_T2L1LKIN_SERVICE	5
T_ID_T2L1LAPR_TXRESET	6
T_ID_T2L1RXFR_FRAME	7
T_ID_T2L1TXFR_FRAME	8
T_ID_T2L1RETX_FRAME	9
T_ID_T3INCM_FAULT	10
T_ID_T3TXFT_FAULT	11
T_ID_T3RXRR_RX_LAPRESET	12
T_ID_T3RACK_LAPRESET_ACK	13
T_ID_T3LKFT_FAULT	14
T_ID_T3M_ALL_MOSP	15
T_ID_T3M_CARD_MOSPTRANS	16
T_ID_T3M_CHAN_MOSPTRANS	17

T_ID_T3L1M_LK_MOSPTRANS	18
T_ID_T3M_CALL_MOSPTRANS	19
T_ID_T3L1D_RX_LINEMESSAGE	20
T_ID_T3D_TX_DPNSS_TO_LEVEL2	21
T_ID_T_L1TIMER_SERVICE	22
T_ID_T_L2TIMER_SERVICE	23
T_ID_T1L2LKOS_OUT_OF_SERVICE	24
T_ID_T3L2D_RX_LINEMESSAGE	25
T_ID_T1L2TXFR_FRAME	26
T_ID_T2L2LKOS_OUT_OF_SERVICE	27
T_ID_T2L2LKIN_SERVICE	28
T_ID_T2L2LAPR_TXRESET	29
T_ID_T2L2RXFR_FRAME	30
T_ID_T2L2TXFR_FRAME	31
T_ID_T2L2RETX_FRAME	32
T_ID_T1L1TXFR_FRAME	33
T_ID_T1L1LKOS_OUT_OF_SERVICE	34
T_ID_MU_LINK_CONTROL	35
T_ID_LED_DISPLAY_DRIVER	36
T_ID_MU_MEMORY_TEST	37
T_ID_INTERMITTENT_FAULT_CONTROL	38
T_ID_MU_COMMAND_HANDLER	39
T_ID_MU_WATCHDOG_CONTROL	40
T_ID_V.24_IO_DRIVER	41
T_ID_CL2_L1_INP	42
T_ID_CL2_L1_OUT	43
T_ID_CL2_L3_INP	44
T_ID_CL2_L2_PROTOCOL	45
T_ID_GCL3_IN	46
T_ID_GCL3_OUT	47
T_ID_GCL3_SDL	48
T_ID_GTW_TIMING_TASK	49

T_ID_GTW_NOTIFY_TASK	50
T_ID_DL3CP_CCCP	51
T_ID_CORNET_L1	52
T_ID_DPNSS_L1	53
T_ID_ICCP_IN	54
T_ID_MU_MEMORY_WATCH	55
T_ID_DLCMP	56
T_ID_DPNSS_INTERFACE	57
T_ID_HSCC_DPN_TX	58
T_ID_HSCC_CRN_TX	59
T_ID_SEIZE_FREE_BUFS	60
T_ID_T2L1TEST_LINK_CONNECTED	61
T_ID_T2L2TEST_LINK_CONNECTED	62
T_ID_ERROR_INT	63

Status Request

Syntax: ST[atus]

ST[atus] C[lear]

Both commands can be used to request a status report of the Gateway. This report shows the status of Level-1, Level-2 and Level-3 on both links and contains a dump of all event counters and the settings of the DIP-FIX switches.
The ST C command additionally clears all event counters after the status report has been dumped.

Example:

Input:

```
<ST
```

Output:

```
Link 0 / L1:     [Level1-State]
Link 0 / L2:     LAP-01 =>[LAP01-State] ... [LAP08-State]
                 LAP-09 => [LAP09-State] ... [LAP16-State]
                 .. .. .. .. .. .. .. .. .. ..
                 LAP-25 => [LAP25-State] ... [LAP30-State]
Link 0 / L3:     [Level3-State]
```

Link 1 / L1:	[Level1-State]
Link 1 / L2:	LAP-D => [LAP-State]
Link 1 / L3:	[Level3-State]

Event Count 00:	[count]	(count] ... [count]
Event Count 16:	[count]	[count] ... [count]
	.. ..	
Event Count xx:	[count]	[count] ... [count]
Reset time....:	[time]	
Current time..:	[time]	

DIP switch: UsrNtw:[A/USR,B/NETW], GWTyp:[DPNSS,DASS], Bdrate[9600,4800,2400,1200]

Where:

Link 0	=	DPNSS side
Link 1	=	CorNet (ISDN) side

[L1 State]	=	Idle
		Active Wait
		Active
		Wait Resync

[DPNSS State]	=	X_LKINV or Y_LKINV	=	Invalid link state
		X_LKOOS or Y_LKOOS	=	Link out of service
		X_CHOOS or Y_CHOOS	=	Channel out of service
		X_CHWIS or Y_CHWIS	=	Channel wait in service
		X_CHBLK or Y_CHBLK	=	Channel blocked
		X_CHINV or Y_CHINV	=	Invalid channel state
		X_LPRSA or Y_LPRSA	=	Reset attempted
		X_LPRSF or Y_LPRSF	=	Reset failed
		X_LPRSC or Y_LPRSC	=	Reset completed
		X_LPINF or Y_LPINF	=	Information Transfer
		X_LPINV or Y_LPINV	=	Invalid LAP state

		The X_ or Y_ prefix indicates the channel's priority on collision.
[CorNet State]	=	Disconnected SABME Sent Reestablish Started Release Pending DISC Sent Connected Timer Recovery
[L3-State]	=	Out-of-service In service
[count]	=	Accumulated number of steady/intermittent errors.
[time]	=	Relative time indication when the event counters have been cleared and a current relative time indication.
[events]	=	At present 70 different types of errors are counted. Refer to the Error Description strings (in the previous paragraph) for the relation Event_number <> Error Type.
[UsrNtw]	=	User Network
[GW Typ]	=	Gateway-Type
[Bdrate]	=	Baud rate Refer to description of the corresponding DIP-FIX switches.

Force Gateway Out-of-Service / In Service

Syntax: FORCE [OOS | INS]

Purpose: This command enables the Gateway to be forced out of service or forced in service.

With the FORCE OOS command, all B-channels that are not in idle state are force-released by sending CRM message for every channel. On the ISDN side a RESTart message is sent with a request to release all Call References. From then on, all new calls coming in are immediately released by DPNSS or ISDN Level 3. Levels 1, 2 and 3 remain active.

With the FORCE INS command the Interworking Unit is enabled for accepting incoming calls.
Example:

1. Force out-of-service

Input:

< FORCE OOS

Output:

Command Executed

2. Force in service

Input:

< FORCE INS

Output:

Command Executed

Fault Log (Dump / Clear)

Syntax: FLOG [Log-number]
FLOG C[lear]

The first Fault Log command is used to dump the last 32 saved major error reports from the specified [Log]: 0, 1 or 2, where:

0: Link 0 log
1: Link 1 log
3: Process log

The second command clears the 3 Fault Logs.

Example:
1. Dump fault report

Input:

< FLOG 1

Output:

FLOG => [Time] - [Error Category] : [Error Description]
FLOG => [Time] - [Error Category] : [Error Description]
Reset time..: [Time]
Current time: [Time]
END OF FAULT LOG

2. Clear fault log

Input:

< FLOG C

Output:

Fault Logs Cleared

Dump

Syntax: D[ump] [address] [range]

The command DUMP is used to display the contents of a memory at the specified address or in the specified range of addresses. The display occupies one or more lines, depending on the address or range specified.

If a starting address is not given, 128 bytes are dumped starting from the current dump address.

If a range is not given then a default of 128 data bytes is dumped. The address and range must be entered in hexadecimal form. The address is entered by specifying the segment and offset value, separated by a colon (:).

Example:

Input:

<D 154A:0036 1A

Output:

```
154A:0036  11 22 00 44 55 66 77 88 00 00 00 00 00 00 00 00
 154A:0040  FC 00 00 33 25 AA 77 FF 00 FF
```

Substitute Memory

Syntax: S[ubstitute] [address]

The Substitute command enters a value into memory at the specified address. This is done by displaying the address and its current value and prompting for a new value.
Subsequently, the following options are possible:

- To replace the value, the new value must be entered and terminated with a Return (0x0D). Then the next address is shown.
- To skip to the next value to be changed, press the SPACE bar (0x20).
- To stop entering values, press Return (0xD)

The address and values must be entered in hexadecimal form.
The address is the segment and offset value, separated by a colon (:).
When a value is changed, a check is carried out to verify that the change has been successful. If this is not the case (e.g. if attempting to write in the ROM), a message is output at the terminal.

Example:

1. Valid Substitute command

Input:

```
< S 1200:0100
```

Output:

```
1200:0100  11-
1200:0101  FF-00
1200:0102  FF-
1200:0103  EF-
```

2. Invalid Substitute command

```
< S FF00:0100
```

Output:

```
FF00:0100  CA-77
SUBSTITUTE ERROR
```

Memory Watch

Syntax: MW [watch-no] [address]
MW [watch-no]

The Memory Watch enables one or more watch points to be set in the memory. The system checks at regular intervals the system checks the contents (byte value) of these locations and compares the value with the last reading. If a change has occurred, the old and new contents are outputted to the V.24 port (that is displayed on the service terminal).

Up to 10 watch points can be entered in the system. The {MW} command always requires a *watch-no* to be entered in order to set up the correct watch point.

When followed by [address], the {MW [watch-no]} command establishes a new watch point at the specified address.

Without [address], the command {MW [watch-no]} removes the currently set watch point under the specified [watch-no.].

Both [watch-no] and [address] must be entered in hexadecimal form.
Legal values for [watch-nr] are: 0 to 9.
The address consists of segment and offset, separated by a colon (:).

Example:

1. Set 2 new watch points

Input:

```
<MW 5 0000:A900
 MW 6 0000:A901
```

2. Remove a watch point

Input:

```
< MW 5
```

3. System response when watch point value changes

Output:

```
< WATCH: [watch-no] [address] ([old value]) [new value]
```

RESET LAP

Syntax: reset lap.. where .. indicates a valid lap number.
The indicated DPNSS/DASS lap resets by sending a *sabmr*. This command is for approval test purposes only, and must not be used under normal conditions.

Example:

Input:

```
< RESET LAP 3
```

Output:

```
Reset lap 3
<
<
<RESET LAP 88
Illegal value
<
```

Restart

Syntax: RESTART

This command can be used to initiate a soft restart for the Gateway (e.g. after changing the number of channels to be put in service).

Example:

Input:

```
<RESTART
```

Output:

```
> Warm Restart
```

Show Configurable Items

Syntax: SH[ow]
This command gives a display of all the items which are configurable in the Gateway by means of the V.24 terminal.
These items can be changed with the S[ubstitute] command.

Example:

Input:

<SH

Output:

Number of ISDN called_party digits to strip:	[ssss:oooo] [xxxx]
Log_reset_time:	[ssss:oooo] [xxxx]
Three party hold by DPNSS allowed:	[ssss:oooo] [xx]
Collision timer:	[ssss:oooo] [xx]
Rop CDG rlse time:	[ssss:oooo] [xx]
Rop both rlse time:	[ssss:oooo] [xx]
Insert NSI string:	[ssss:oooo] [xx]
Datacalls permitted:	[ssss:oooo] [xx]
Wait for end of selection timer:	[ssss:oooo] [xxxx]
Call back interdigit timer:	[ssss:oooo] [xxxx]
Event count reset time:	[ssss:oooo] [xxxx]
Empty UI(c) frames:	[ssss:oooo] [xx]
Reset failed laps slowly:	[ssss:oooo] [xx]
Operator number:	[ssss:oooo] [AA] [BB]....[BB]
DASS NAE translation:	[ssss:oooo] [xx]
Laps equipped:	[ssss:oooo] 01 lap1 lap2 lap3..........
	01 lap17 lap18 lap19 .... lap31
	01 lap33 lap34 lap35 .... lap47
	01 lap49 lap50 lap51 .... lap63
Transmit delay time:	[ssss:oooo] [xxxx]
Maximum number of transits:	[ssss:oooo] [xxxx]
Tids_option:	[ssss:oooo] [xxxx]
Address complete allowed in SETUP:	[ssss:oooo] [xxxx]

Logging task stacks:	[ssss:oooo] [xxxx]
Error msgs to be displayed:	[ssss:oooo] [xxxx]
Convert HTP backward class:	[ssss:oooo] [xxxx]

Where:

ssss:oooo	The segment: offset address where the item is located in memory.
xx	Byte at that address
xxxx	Word at that address
Number of ISDN called_party digits to strip:	Defines the number of digits to be stripped from the Called Party number information element in CorNet messages going into the CDG (default is zero).
Log_reset_time:	Next time the fault log will be cleared.
Three party hold by DPNSS allowed:	Set to 01 (default) when HiPath 4000 is capable of accepting a hold request from the DPNSS PBX in a 3-way.
Collision timer:	Timeout (in 100 ms) after which the CDG assumes that the outgoing DPNSS channel is successfully seized.
Rop CDG rlse time:	(Default 30 seconds) Period after Route Optimize request that CDG releases the old path if no release from DPNSS and also no release from CorNet.
Rop both rlse time:	(Default 10 seconds) Period after Route Optimize request that CDG will release the old path if release from both DPNSS and CorNet.
Insert NSI string:	(Default is 01) Set to 00 when DPNSS PBX is not able to receive NSI Gateway string in ISRM message.
Datacalls permitted:	If this parameter is set to 1 (default) then data calls are permitted through the CDG.
Wait for end of selection timer:	Timeout, which is started after receiving the CALL PROCEED message from HiPath 4000, during which either an ALERT or CONN message is expected. Upon expiry, the call is cleared by the CDG.
Call back interdigit timer:	In Call Back this period (default is 5 seconds) is the Time after the CDG has received a SETUP (that has no address complete information element) before the CDG assumes there will be no more called party digits.
Event count reset time:	Next time the fault event counters are cleared.

Empty UI(c) frames:	Default is off (0). If set to a non-zero value then test frames are sent over the DPNSS link. This may slow the operation of the link down.
Reset failed laps slowly:	If set to zero (default) then if a DPNSS LAP fails to reset, then reset frames are sent on that LAP in bursts of 64 every 2 minutes. Otherwise reset frames are sent all the time on a LAP that fails to reset.
Operator number:	Only displayed in case of a DASS-2 gateway. It is the destination number which is used when an incoming DASS-2 call does not provide a destination address (typically the operator number of the PBX) AA: length of number BB BB .. : the number itself
DASS NAE translation:	Default is NSAP (0). This parameter defines the mapping of the sub address from DASS to CorNet if specifies the CorNet sub address type produced. It is either NSAP (0) or user-user (2).
Laps equipped:	Can be used to ensure that a number of channels are not put into service upon startup 01 = put channel out of service 00 = put channel in service Issue RESTART command when table is changed.
Transmit delay time:	The minimum time between the sending of two DPNSS frames (for test purposes only).The value of the delay time is given in 100 ms units.
Maximum number of transits:	Default is 25. This parameter specifies the maximum transit count value allowed in Loop Avoidance. This is used to translate the Loop Avoidance count value between CorNet and DPNSS.
Tids_option:	If set to 0 the TID strings received from DPNSS are mapped to CorNet Calling Party Name information elements. This option allows TID strings to be displayed on HiPath 4000 sets for maintenance use. If set to 1 (default) then TID strings from DPNSS are ignored by the CDG.
Address Complete allowed in Setup:	If set to 0 (default) the CorNet SETUP messages produced by the CDG contain the sending complete information element mapped from DPNSS. If the parameter is non zero the the CDG never generates the sending complete element in a CorNet SETUP message.

Logging task stack:	If set to 1 the CDG logs stack data from the stacks of the 6 largest CDG operation system processes. (Each process has a separate stack). The stack data are printed on the CDG V.24 terminal if there is a CDG warm restart.The default is 0 (stack logging turned off).
Error msgs to be displayed:	This byte is a bit field. Each bit specifies if an error type is to be displayed on the CDG V.24 terminal when that error occurs. Errors are logged regardless of the bit setting. Bit set to 0 (default) suppresses the display. Bit set to 1 enables the display. The bits control Error messages as follows: Bit 0: Interface unrecognized card messages. Bit 1: Management unit invalid messages. Bit 2: Management unit CorNet layer 3 error messages. Bit 3: Management unit MOSP protocol SNU message received. Bit 4: Management unit Network Name Display error messages.
Convert HTP backward classmarks:	If set to 1 the classmarks in backward NOTIFY messages from CorNet for HOLD and THREE PARTY ORDINARY. Default is 0 (no conversion).

3.2 DIU2U

This section describes the functions and features of the Digital Interface Unit 2 Universal (DIU2U) board. It also provides procedures for removing, replacing, and verifying this board.

3.2.1 Functional Description

The DIU2U board (see Figure 3-6) supports two T1 spans for ISDN PRI and CorNet-VN functions (Message Oriented Signaling [MOS]) and (Cornet-VN). Any combination of MOS and CVN can be supported by the two T1 spans.

The DIU2U board can also be used for the analog emulation function (Bit Oriented Signaling [BOS]. Only one span, Line 1, is used to support the BOS circuits such as T1 trunks and tie lines. Line 2 is not functional when line 1 supports BOS..

3.2.2 Systems Supported

The DIU2U board is only supported in HiPath 4000 V2.0

3.2.3 Hardware

It has two interfaces (see Figure 3-6) that connect to adapter cables (Figure 3-7).

The adapter cables connect to a T1 customer service unit (CSU) or data service unit (DSU). With this cable, Line 1 pairs are the same as those of the TMDNH board, pair 13 transmit and pair 16 receive.

Figure 3-6 DIU2U Board, Front Panel

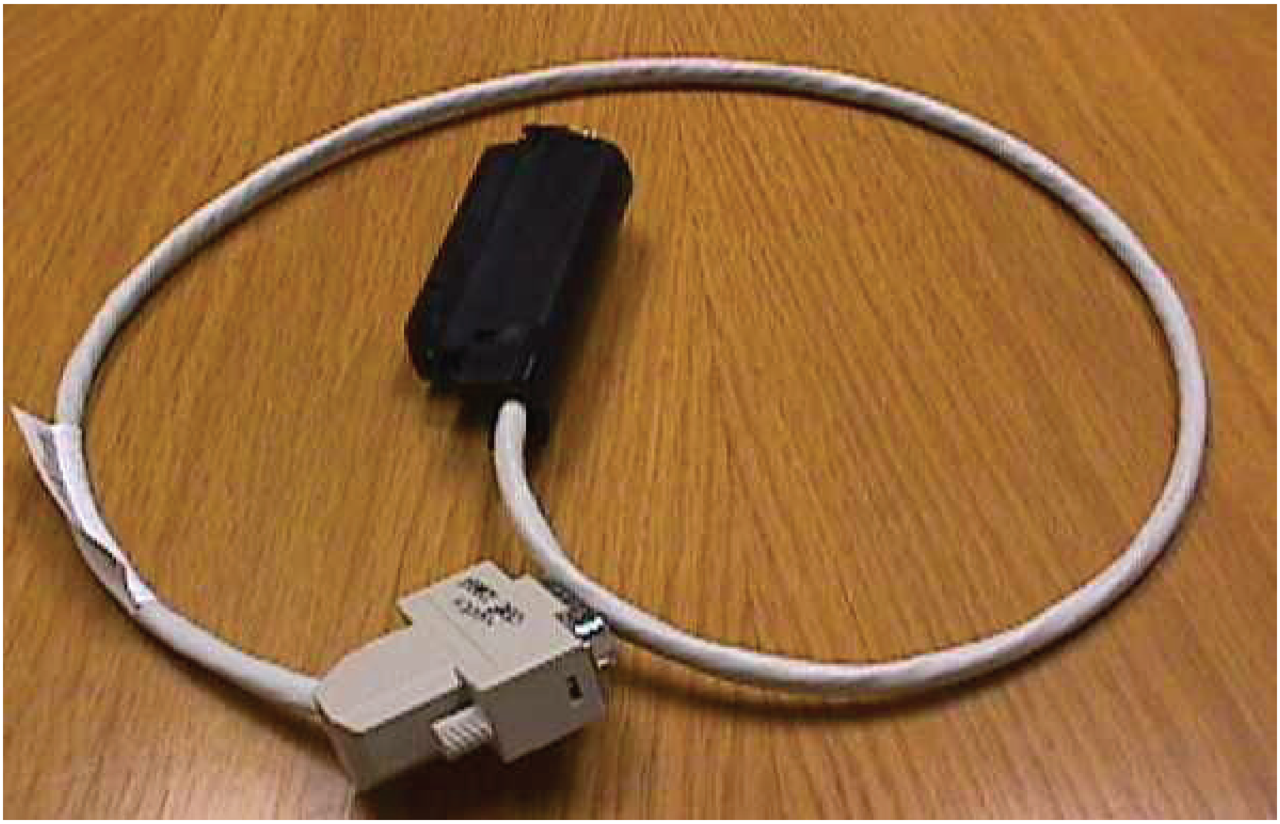


Figure 3-7 T1 CSU or DSU Cable

Detailed Cable Description T1 Cable

Part number: C39195-A7269-Bxxx

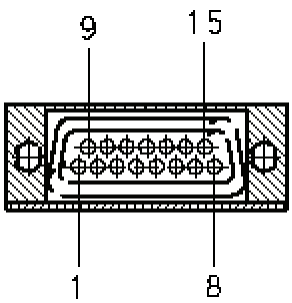
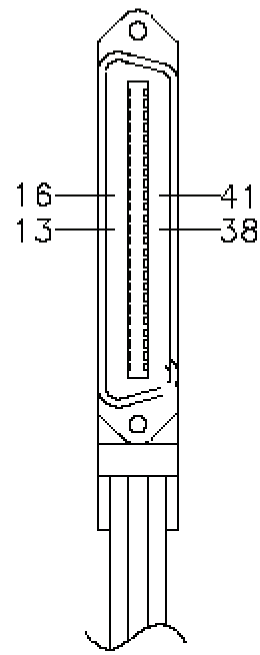
Connector 1	Connection	Connector 2
 SubD, 15 pos. / male Cable outlet: diagonal Fastening: Screw	Wiring mode: 1 - 1 Contacts: 4 - Ground: n/c - Signals: (1 --- 13, 9 --- 38) (8 --- 16, 15 --- 41) Braided shield connected ( ) = Twisted pairs	 Champ, 50 pos. / male Cable outlet: 90 Degree Fastening: Screw
Material:) Round-cable, solid conductor, 2 twisted pair, 24 AWG ,UL Category 5; braided shield+ foil shield , Length: 0.7M		

Table 3-5 T1 Cable pinout

3.2.4 LED Indications

Table 3-6 lists the LED indications for the DIU2U board.

Red LED State	Green LED State	Indication
On	Off	The board has initial power applied.
Flashing	Off	The board is being loaded with loadware.
On	Off	The board is defective or out-of-service.

Table 3-6 DIU2U Board LED Indications

Red LED State	Green LED State	Indication
Off	On	The board is operational and all channels are inactive.
Off	Flashing	The board is operational and one or more channels are active.

Table 3-6 DIU2U Board LED Indications

The DIU2U board does not provide the red and yellow line status LED indications which are present on the TMDNH board. However, AMO DIS-PETRA (address FFFF:FFFC, count 0) can be used to display the line status LED indications. Refer to Section 3.2.5, “Configuring the DIU2U Board”, “AMO-PETRA”.

3.2.5 Configuring the DIU2U Board

The following AMOs are used to identify, display, and configure the DIU2U board:

- **AMO BGDAT**

  This AMO lists the available function identifications (FCTID), the number if circuits, line types and the location of the loadware.

  – FCTID 5 is for BOS circuits, that is. T1 ground start or T1 tie lines.

  – FCTID 6 is for MOS and CVN (CorNet VN), that is Primary Rate or CorNet NQ.

  The BOS CIRCUITS quantity is 25. For a BOS configuration, each circuit or channel is configured with AMO TACSU.

  The MOS CIRCUITS quantity is 2. Each Primary Rate Span is configured with AMO TDCSU.

```
DIS-BGDAT:Q;
H500:  AMO BGDAT STARTED
                                UBGDAT BOARD TABLE
POS Q-NUMBER   TYPE  BD-NAME FCTID CIRCUITS LINE-TYPE    LW-FILE
=========================================================================
079 Q2216-X    TMD   DIU2U-B    5       25   TMDN_BOS     LG82/PZFDUNBK
080 Q2216-X    TMD   DIU2U-M    6        2   TMDN_MOS_CVN LG82/PZFDUNMK
```

- **AMO BCSU**

  <u>**ADD-BCSU**</u>

  Adding a DIU2U board

Parameter LWPAR is not used when adding line type MOS.

BOS type circuits for North America Installation

```
ADD-BCSU:MTYPE=TMD,LTG=1,LTU=<1-99),SLOT=<25-121>,
PARTNO="Q2216-X",FCTID=5,LWVAR="K",LWPAR=<1-200>,FIDX=1,HWYBDL=A;
```

(Adding a DIU2U to shelf 2 slot 31)

```
ADD-BCSU:MTYPE=TMD,LTG=1,LTU=2,SLOT=31,PARTNO="Q2216-X",FCTID=5,
LWVAR="K",LWPAR=1,FIDX=1,HWYBDL=A;
```

MOS type circuits for North America Installation.

```
ADD-BCSU:MTYPE=TMD,LTG=1,LTU=<1-99>,SLOT=<25-121>,PARTNO="Q2216-X
",FCTID=6,LWVAR="K",HWYBDL=A;
```

(Adding a DIU2U to shelf 2 slot 37)

```
ADD-BCSU:MTYPE=TMD,LTG=1,LTU=2,SLOT=37,PARTNO="Q2216-X",FCTID=6,
LWVAR="6“,HWYBDL=A;
```

CHA-BCSU

This AMO allows changing a TMDNH board to a DIU2U board for a BOS line type.

```
CHA-BCSU:TYPE=PARTNO,LTG=1,LTU=8,SLOT=55,PARTNO1="Q2192-x",PARTNO2=
"Q2216-X",FCTID1=1,FCTID2=5;
```

Changing a TMDNH board to a DIU2U board for a MOS line type is not possible.

DIS-BCSU

This AMO shows the assigned loadware table index (LWPAR). The display for a MOS type only shows the first line or span of the DIU2U board. To read the first or second line of the DIU2U, use AMO TDCSU.

```
DIS-BCSU:TYPE=MODE,LTG=1,LTU=2,SLOT=31;

    ADDRESS  | ASSIGNED MDL|   TYPE    |   MODE
    ----------+-------------+----------+---------------------
    1. 2. 31 | Q2216-X     | BOS       | LWPAR:   1  FIDX:  1

AMO-BCSU -111      BOARD CONFIGURATION, SWITCHING UNIT
```

```
DIS-BCSU: TYPE=MODE,LTG=1,LTU=2,SLOT=37

    ADDRESS   | ASSIGNED MDL|   TYPE    |   MODE
    ----------+-------------+----------+---------------------
    1. 2. 37 | Q2216-X      | MOS-CVN  | LWPAR:   3
```

- **AMO LWPAR**

CHA-LWPAR

When adding a DIU2U board for a BOS circuit, the LWPAR parameter is required.

The following example shows a BOS circuit for extended superframe format with binary eight zero substitution.

```
CHANGE-LWPAR:
TYPE=TMD,TMDTYPE=TMDBOS,BLNO=1,OPMODE=FRAMEESF&BISUB8ON&BDETON;
```

The following example shows a MOS circuit for a WORLDCOM/MCI primary rate span

```
CHANGE-LWPAR:TYPE=TMD,TMDTYPE=TMDMOS,BLNO=3,
OPMODE=FRAMEESF&BISUB8ON&BDETON,CABLETYP=1,CRIDC=0222;
```

DIS-LWPAR

```
DIS-LWPAR:TYPE=TMD,TMDTYPE=TMDMOS,BLNO=3;

+----------------------------------------------------------------------+
|  BLOCK TYPE TMDN64          OPMODE: MOS         BLNO : 3              |
+----------------------------------------------------------------------+
|  OPMODE:  FRAMEESF: [X]      BISUB8ON: [X]       BDETON : [X]         |
|         TABSON  : [ ]     NETUSER : [ ]      TIMLOOP: [ ]             |
|  OESDISTH : 30              OESREQTH:  4                               |
|  SESDISTH : 10              SESREQTH:  10       CABLETYPE: 1           |
|  ACKTIM   : 10             DLVTIM  :  300      WINDOW   : 7            |
|  OCTMAX   : 260            RETMAX  :  3        CRIDC    : 0222         |
|  NSFIV    : 1               NSFTTSC :  9        TTSC     : 4           |
+----------------------------------------------------------------------+
```

- **AMO TACSU**

For adding circuits for conventional T1 circuits (GRDSTR, LPSTR, T1TIE, etc.), each channel needs to be configured. This is the same as all previous released TMDH or TMDHN boards.

- **AMO TDCSU**

ADD-TDCSU

The first line on the DIU2U of a MOS trunk type gets the PEN parameter CCT value of "0" and the second line gets a value of "1"

```
ADD-TDCSU:OPT=NEW,PEN=<ltg-ltu-slot-cct>
```

CHA-TDCSU

The following example shows the required parameters to change the LWPAR block number for a CorNet-VN circuit on the second circuit of the DIU2U board.

```
CHA-TDCSU:PEN=1-2-37-1,DEV=S1CVN,LWPAR=2,BCGR=1;
```

DIS-TDCSU

The following example shows both circuits of a DIU2U. The first circuit is CorNet-N and the second circuit is a CorNet-NQ.

```
DIS-TDCSU:1-2-79;

H500:  AMO TDCSU STARTED

                       DIGITAL TRUNKS (FORMAT=S)
DEVICE       PEN     BCGR B-CHANNEL TGRP  CCT
-------------------------------------------------------
S1CONN    1-02-079-0     1    1 && 23    66   CORNUS-V66
S1CONN    1-02-079-1     1    1 && 23   201   DIU2U CORNET
-------------------------------------------------------
```

- **AMO-REFTA**

AMO TACSU and TDCSU automatically add the DIU2U to the REFTA table. When T1OPS circuits are added with AMO SCSU, the DIU2U board are not added to the REFTA table. This must be done manually with AMO REFTA.

```
ADD-REFTA:TYPE=CIRCUIT,PEN=1-2-61-0,PRI=0,BLOCK=N,READYASY=N;
```

DIS-REFTA

The following example shows the DIU2U BOS used for T1OPS

```
DIS-REFTA:TYPE=CIRCUIT,PEN=1-2-61-0;

+--------------------------------------------------------------------+
|          R E F E R E N C E   C L O C K   C I R C U I T S           |
+-------------+--------+----------+---+------+------+------+-----+------+
| PEN         | MODULE | DEVICE   |PRI|ERROR |BLOCK |SUPP. |READY|SRCGRP|
|             |        |          |   |      |      |      |BUT  |      |
|             |        |          |   |      |      |      |ASYN.|      |
+-------------+--------+----------+---+------+------+------+-----+------+
|  1- 2- 61- 0 | DIU2-B |          |  0| 00000|     N |      |  N  |     1|
+-------------+--------+----------+---+------+------+------+-----+------+
```

The following example shows a DIU2U MOS used for two NI2 spans

```
DIS-REFTA:TYPE=CIRCUIT,PEN=1-2-85;
+--------------------------------------------------------------------+
```

```
|          R E F E R E N C E   C L O C K   C I R C U I T S              |
+-------------+--------+---------+---+------+------+------+-----+------+
| PEN         | MODULE | DEVICE  |PRI|ERROR |BLOCK |SUPP. |READY|SRCGRP|
|             |        |         |   |      |      |      |BUT  |      |
|             |        |         |   |      |      |      |ASYN.|      |
+-------------+--------+---------+---+------+------+------+-----+------+
|  1- 2- 85- 0 | DIU2-M | S1COD   |  0|     0|    N |      |  N  |     1|
|  1- 2- 85- 1 | DIU2-M | S1COD   |  0|     0|    N |      |  N  |     1|
+-------------+--------+---------+---+------+------+------+-----+------+
```

- **AMO-PETRA**

  The two LEDs on the top of the board faceplate show the status of the board itself. Refer to Section 3.2.4, “LED Indications”.

  DIS-PETRA

  AMO PETRA is used to read the status of each line to determine if they are in red alarm, yellow alarm or active at layer three.

  Table 3-7 lists the generic indications for the red and yellow line status LEDs.

Line LED (Red)	Line LED (Yellow)	Indication
Off	Off	Indicate the span is in Green state, layer 1 is active and possibly higher layers (layer 2 and layer 3) are also active.
Off	On	Indicates that the far end is in Loss of Frame alarm state and is unable to synchronize on its in coming signal. The far end is transmitting Remote Alarm Indication (RAI)
On	Off	Indicates that the near end is in the Loss of Frame alarm state (red or blue) and is unable to synchronize on the incoming signal.
On	Off	Indicate that the span is not configured or is disabled by the switching unit.

Table 3-7 Line Status LED Indications

The following example shows the status of a DIU2U set up as BOS. In the right column, the DIU2U board state is GREEN. For the first circuit or Line 1 of the board, the “OFF” status means the circuit is active in Layer 3. For Line 2, “RED YELLOW” means that there are no circuits data based. Since this is a BOS type board, Line 2 is not available for use.

```
DIS-PETRA:TYPE=DUMP,LTG=1,LTU=2,SLOT=31,CPU=86,SEG=FFFF,ADR=FFFC;
```

```
H500:  AMO PETRA STARTED
F11: BOARD HAS NO DUMP FUNCTION
ALTHOUGH SEND THE COMMAND TO THE PERIPHERAL MODULE? (Y/N)
```

```
 *y
DUMP FOR    LTG 1    LTU 2    SLOT 31
FFFF:FFF0                                        20 20 20 20
FFFF:   0   43 41 52 44 20 4C 45 44  20 53 54 41 54 45 20 20  CARD LED STATE
FFFF:  10   20 20 47 52 45 45 4E 20  4F 4E 20 20 20 20 20 20    GREEN ON
FFFF:  20   4C 49 4E 45 20 4C 45 44  20 53 54 41 54 45 20 20  LINE LED STATE
FFFF:  30   20 20 31 20 4F 46 46 20  20 20 20 20 20 20 20 20    1 OFF
FFFF:  40   20 20 32 20 52 45 44 20  59 45 4C 4C 4F 57 20 20    2 RED YELLOW
```

The following example shows the DIU2U board set up as MOS and both circuits are in use, Line 1 is at layer 3 and Line 2 is in red alarm.

```
DIS-PETRA:TYPE=DUMP,LTG=1,LTU=2,SLOT=37,CPU=86,SEG=FFFF,ADR=FFFC;
H500:  AMO PETRA STARTED
F11: BOARD HAS NO DUMP FUNCTION
ALTHOUGH SEND THE COMMAND TO THE PERIPHERAL MODULE? (Y/N)
 *y
DUMP FOR    LTG 1    LTU 2    SLOT 37
FFFF:FFF0                                        20 20 20 20
FFFF:   0   43 41 52 44 20 4C 45 44  20 53 54 41 54 45 20 20  CARD LED STATE
FFFF:  10   20 20 47 52 45 45 4E 20  4F 4E 20 20 20 20 20 20    GREEN ON
FFFF:  20   4C 49 4E 45 20 4C 45 44  20 53 54 41 54 45 20 20  LINE LED STATE
FFFF:  30   20 20 31 20 4F 46 46 20  20 20 20 20 20 20 20 20    1 OFF
FFFF:  40   20 20 32 20 52 45 44 20  20 20 20 20 20 20 20 20    2 RED
AMO-PETRA-111       PERIPHERY TRACING AND DUMPING
DISPLAY COMPLETED;
```

3.2.6 Removing the DIU2U Board

This procedure removes all the channels on this trunk board from service.

Attention: Static Sensitive Devices
Observe all precautions in for electrostatic discharge.

Remove the DIU2U board as follows:

For ISDN applications, first deactivate the B channels, and then deactivate the D channel.

Deactivate all channels as follows:

a) Type **`DEA-DSSU`** and press **Enter**.

b) Type the following values, then press **Enter**.

Field	Value
OFFTYPE	DC
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

> PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

4. Deactivate the board as follows:

a) Type **`DEA-BSSU`** and press **Enter**.

b) Type the following values, then press **Enter**.

Field	Value
OFFTYPE	DC
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
REFOFF	<blank>

The board is deactivated when the yellow LED is lit and the other LEDs are off.

5. Before removing the board, ensure that the red board status LED is lit, remove the board.

If the red board status LED does not light within 30 seconds, repeat steps 4a and 4b. If the red board status LED still does not light within 30 seconds, remove the board.

3.2.7 Replacing the DIU2U Board

Replace the DIU2U board as follows:

1. Slide the board into the appropriate slot until it seats firmly into the backplane connector.
2. Activate the board as follows:

a) Type **`ACT-BSSU`** and press **Enter**.

b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>

> For ISDN applications, first activate the D channel, and then activate the B channels.

Activate the channels as follows:

a) Type **ACT-DSSU** and press **Enter**.

b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

> PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

3.2.8 Verifying the DIU2U Board

To verify the operation of the DIU2U board, confirm that the green LED turns on.

3.3 DIU-N2 / DIU-N4

With HiPath 4000 V4 the **DIUN4** board (Q2195) are not supported any longer. Only the DIUN2 board will be supported.

In this section, the digital interface unit ISDN (DIU-N2 and DIU-N4) boards are going to be called DIU-Nx. These boards are designed to connect to public and private E1 and T1 (DIUN4 only) networks and subscribers. Also, the boards fulfill the Nx64Kbit feature. The DIU-Nx has two/four line-interfaces (ports). If the LTUW shelf use the LTUCX board, then the DIU-Nx can choose between the old or the new PCM highways. If the LTUW shelf use the LTUCE board, then the DIU-Nx is connected to the old PCM highways.

Figure 3-8 shows a functional diagram of the DIUN2 or DIUN4 board.

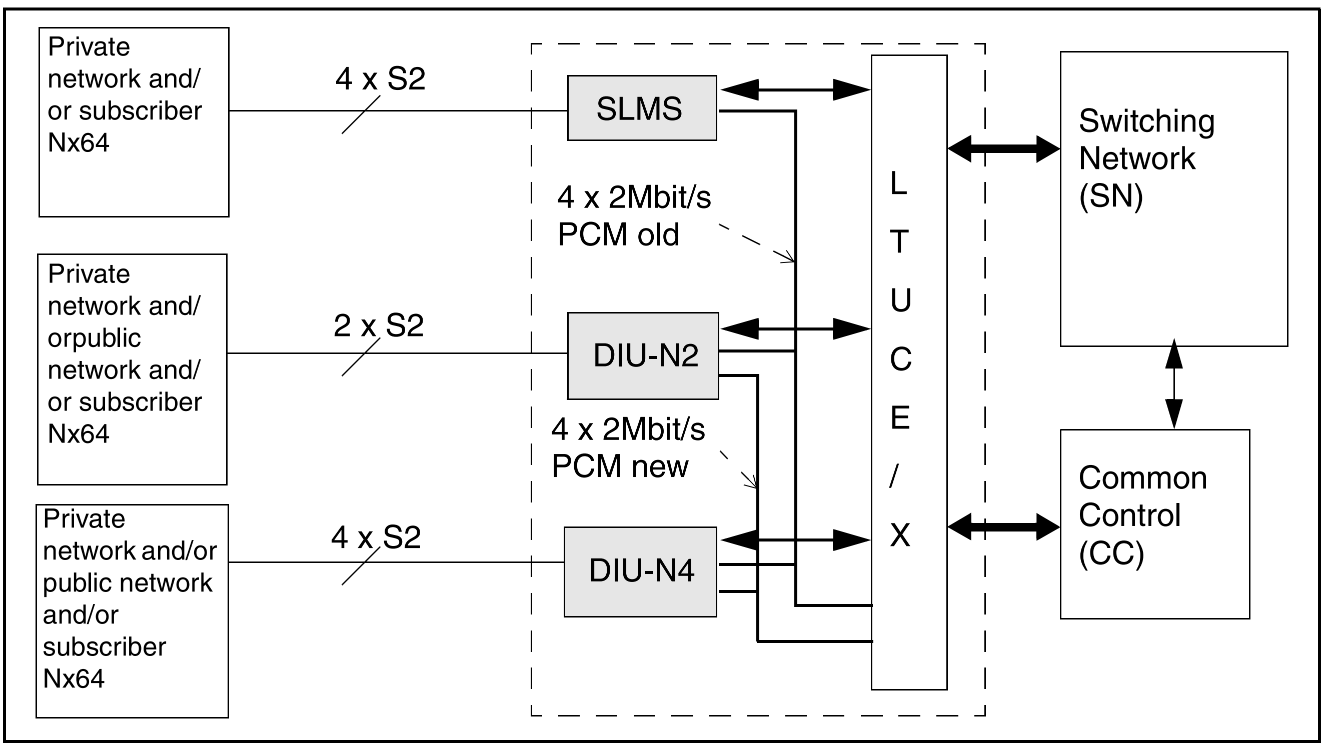


Figure 3-8 DIUN2 or DIUN4 Functional Diagram

Following features are available:

Number of ports:

- DIU-N2 2ports
- DIU-N4 4ports (not for DIU-C)

Type of connection:

- Fiber optical interface
- 75 Ohm copper interface
- 100 Ohm copper interface (DIU-N4 only)
- 120 Ohm copper interface
- Receive clock recovery for network mode on all ports

At the **DIU-N2** (DIU-C) an optical line access is available at FRONT or BACK. The copper line access is possible at FRONT only.

At the **DIU-N4** the optical and copper line access is possible at FRONT only.

To link the optical fibers to the front panel, three new adapter modules (AMOM) are used.

3.3.1 LED indications

The front panel contains 2 LEDs.

The DIU-Nx has a red and a green LED to support LED service strategy. The control output of the red LED is additionally used for signaling results of the on-board self test. The output (TOUT) is, in parallel, connected to a pin of the board plug. The signal is active low.

3.3.2 Board Variants

- DIU-N2 S30810-Q2196-X
- DIU-N4 S30810-Q2195-X

The following types of adapter modules are available:

- AMOM S30807-K5480-X100 850nm, multi mode
- AMOM S30807-K5480-X200 1300nm, multi mode
- AMOM S30807-K5480-X300 1300nm, single mode

3.3.3 Board Functions

DIU-N2

The DIU-N2 provides two types of optical line interfaces. It is possible to access either all two ports through the old backplane interface or through the new optical interface at the front panel of the board(15-pin Sub-D). Only one of these two interfaces is activated by the LW at a time. After a reset, the optical interface at the backplane connector becomes active. It is possible to use either Multimode- or Monomode optical fibers.

- Line access
  - If the optical interface on the backplane is chosen then the ports #0 and #1 are accessible by means of the old adapters **APCFM and APCFL only** (S30807-Q5446 and S30807-Q5422).

    The DIU-N2 does not use the APCFM/L in mixed mode.

> Do not connect copper cable with port #1 of the adapter.

- If the optical interface at the front panel is used, the ports are accessed through an optical/ electrical converter AMOM connected to the 15-pin Sub-D. mono mode or multi mode optical fibres can be used.

DIU-N4

The DIU-N4 has one optical interface for every port, which can be accessed through the 15-pin Sub-D connector at the front panel of the board.

3.3.4 Copper interface

Two pairs of lines represents the physical interface of each port of the DIU-Nx board; one pair the receive and one pair the transmit direction.

- Line access
  - To connect copper lines to the ports of the DIU-Nx, the 2/4 15-pin Sub-D connectors at the front side of the board must be used. With the DIU-N4 100Ω Impedances can additionally be handled. The selection of the appropriate line termination impedance **(75Ω (LWPS=2), 120Ω (LWPS=0)**, **100Ω (LWPS=1) with DIU-N4)** are performed by the loadware. If coaxial lines are connected, 75Ω line impedance has to be selected; for shielded-twisted-pair lines (2x2x0.6/PE, S30267-Z167), 120Ω line impedance must be used. For shielded twisted pair cables of the AT&T type 1251 or United Wire&Cable P/N 21257, the 100Ω line impedance must be selected. (DIU-N4 only). Copper lines are directly connected to the board‘s 15-pin Sub-Ds (without any adaptor).

– AMO TDCSU and parameter LWPS are used to select the impedance. Line termination is set with the AMO LWPAR for the DIUC function.

It is **not possible to connect copper lines** to the DIU-N2 ports through the SIPAC connector of the backplane. With the DIU-N2 the adapter APCFM/L can only be used for connecting optical lines. The 9-pin Sub-M connector of this adapter is unused.

> Fiber optics connected with the new AMOM adapters cannot be connected directly with the old APCFL adapter of the distant end because they operate with different standards

3.3.5 Connecting Variants to DIU-N2 Ports

Table 3-8 lists the connecting variants to the DIU-N2 ports.

Variation number	**PORT0** FRONT	**PORT0** BACK	**PORT1** FRONT	**PORT1** BACK
1.	-	-	-	LWL
2.	-	-	LWL	-
3.	-	LWL	-	-
4.	LWL	-	-	-
5.	-	-	Cu	-
6.	Cu	-	-	-
7.	Cu	-	Cu	-
8.	Cu	-	-	LWL
9.	Cu	-	LWL	
10.	-	LWL	Cu	-
11.	LWL	-	Cu	-
12.	LWL	-	LWL	-
13.	-	LWL	-	LWL

Table 3-8 Connecting Variants to the DIU-N2 Ports

3.3.6 SIPAC Connector Pin Assignments

Table 3-9 lists the pin assignments of the SIPAC connector on the DIU-N2 board.

Signal Name	Connector Pin	Signal Description	Direction
LWLI0_BACK	X3-04	Port 0: fiber link data input (back)	Input
LWLO0_BACK	X3-02	Port 0: fiber link data output (back)	Output
LWLCI0	X1-26	Port 0: fiber link clock in	Input
LWLCO0	X2-02	Port 0: fiber link clock out	Output
LWLLOOP	X4-04	fiber link loop	Output
LWLI1_BACK	X3-10	Port 1: fiber link data input (back)	Input
LWLO1_BACK	X4-02	Port 1: fiber link data output (back)	Output
LWLCI1	X4-26	Port 1: fiber link clock in	Input
LWLCO1	X4-06	Port 1: fiber link clock out	Output

Table 3-9 SiPAC Connector Pins

3.3.7 Sub-D Connectors X21 and X22 Pin Assignments

Table 3-10 lists the pin assignments for the sub-D X21 and X22 connectors.

Signal name	Connector pin	Signal description	Direction
RTIP0	X21-8	Port 0: TIP 120Ω / 75Ω	Input
RRING0	X21-15	Port 0: RING 120Ω/ 75Ω	Input
TTIP0	X21-1	Port 0: TIP 120Ω / 75Ω	Output
TRING0	X21-9	Port 0: RING 120Ω/ 75Ω	Output
LWLI0_FRONT	X21-11	Port 0: fiber link data input (front)	Input
LWLO0_FRONT	X21-4	Port 0: fiber link data output (front)	Output
+5V	X21-10; X21-14	+5V power supply	Output
GND	X21-5: X21-12	ground return for the +5V power supply	Input/ Output
SCAN_IN0	X21-7; X21-6	adapter check	Input
RTIP1	X22-8	Port 1: TIP 120Ω / 75Ω	Input
RRING1	X22-15	Port 1: RING 120Ω/ 75Ω	Input
TTIP1	X22-1	Port 1: TIP 120Ω / 75Ω	Output
TRING1	X22-9	Port 1: RING 120Ω/ 75Ω	Output

Table 3-10 Sub-D X21 and X22 Connectors Pin Assignments

Signal name	Connector pin	Signal description	Direction
LWLI1_FRONT	X22-11	Port 0: fiber link data input (front)	Input
LWLO1_FRONT	X22-4	Port 0: fiber link data output (front)	Output
+5V	X22-10; X22-14	+5V power supply	Output
GND	X22-5; X22-12	ground return for the +5V power supply	Input/ Output
SCAN_IN1	X22-7; X22-6	adapter check	Input

Table 3-10 Sub-D X21 and X22 Connectors Pin Assignments

3.3.8 Sub-D line interface connectors X23 and X24 Pin Assignments

Table 3-11 lists the pin assignments for the Sub-D line interface X23 and X24 connectors.

Signal name	Connector pin	Signal description	Direction
RTIP2	X23-8	Port 0: TIP 120Ω / 75Ω	Input
RRING2	X23-15	Port 0: RING 120Ω/ 75Ω	Input
TTIP2	X23-1	Port 0: TIP 120Ω / 75Ω	Output
TRING0	X23-9	Port 0: RING 120Ω/ 75Ω	Output
LWLI0_FRONT	X23-11	Port 0: fiber link data input (front)	Input
LWLO0_FRONT	X23-4	Port 0: fiber link data output (front)	Output
+5V	X23-10; X23-14	+5V power supply	Output
GND	X23-5; X23-12	ground return for the +5V power supply	Input/Output
SCAN_IN0	X23-7; X23-6	adapter check	Input
RTIP1	X24-8	Port 1: TIP 120Ω / 75Ω	Input
RRING1	X24-15	Port 1: RING 120Ω/ 75Ω	Input
TTIP1	X24-1	Port 1: TIP 120Ω / 75Ω	Output
TRING1	X24-9	Port 1: RING 120Ω/ 75Ω	Output
LWLI1_FRONT	X24-11	Port 0: fiber link data input (front)	Input
LWLO1_FRONT	X24-4	Port 0: fiber link data output (front)	Output
+5V	X24-10; X24-14	+5V power supply	Output
GND	X24-5; X24-12	ground return for the +5V power supply	Input/Output
SCAN_IN1	X24-7; X24-6	adapter check	Input

Table 3-11 Sub-D line interface X23 and X24 Connectors Pin Assignments

3.3.9 Configuring the DIU-N2 Board Using AMOs

To configure the DIUN2 board, use the following AMOs:

- AMO TDCSU—configures the trunk assignment
- AMO LWPAR —configures the following loadware parameter specifications:
  - With/without CRC4 in the TSL0
  - Layer 2 master/slave setting
  - Line interface Copper/Fiber (HDB3/NRZ)
  - Reference clock activation
  - LAPD in TSL
  - IDLE CHANNEL CODE
  - Deactivation and message times
- AMO REFTA—configures the reference clock table specification (PRI 0 - 90)
- AMO BSSU—Displays the board statistics
- AMO BCSU—adds the new boards under the branch PER and not DIU.
- AMO PETRA—displays the memory contents of the board
  - Starts and stops trace jobs
  - Displays trace results.

3.4 DIUS2

The digital interface unit ISDN (DIUS2) implements two S_2 primary rate access (PRA) interfaces in the HiPath 4000 system according to CCITT:

- Receive path for PRAs 0 and 1.
  Transmission rate: 2048 Kbps, coding: HDB3
- Send path for PRAs 0 and 1.
  Transmission rate: 2048 Kbps, coding: HDB3.
- Signalling comprises 30 B-channels, 1 D-channel and 1 synchronization channel per path

The DIUS2 board is used for connections to public ISDN networks and for networking HiPath systems.

> The DIUS2 board cannot used in CSPCI shelf.

3.4.1 Interface

The DIUS2 (S_2 interface for 4-wire line) is installed in the LTU in a peripheral board slot with an uneven number, since the slot immediately adjacent to it is also used.

S_{2M}	=	Exchange trunk connection
Da_{2M}	=	digital tie-line (public network)
S_2	=	digital tie-line (private networks) for connection to HOST, SERVER, GATEWAY

For failure protection reasons, the two links on the same board should not be routed parallel. . The range is 6 dB (approximately 240 m).

The transmission bandwidth is 2 x 2048 Kbps (2 highways). Each highway consists of 30 user channels (B-channels), one signalling channel (D-channel) and one synchronization channel with 64 Kbps each.

Integrity counters maintain statistics for layer 2 protocols on the S_0/S_2 interface. The statistical data can be queried by means of AMO BSSU.

The DIUS2 processes the signalling data (s-data) of the D-channel. The DIUS2 provides a reference clock for the clock generator; this clock is obtained from one of the two link signals. For this purpose, the reference clock table must be assigned according to the network topology (AMO REFTA).

> If two HiPath 4000 systems are linked by means of a DIUS2, both trunks can supply the reference clock for the PCG.

3.4.2 Adapter Plugs

For connecting electrical and optical S_2 paths (PCM30) with different transmission ranges to the HiPath 4000 system, an adapter plug is necessary. This adapter plug is plugged into the back of the LTU shelf.

The adapter plug includes a lightning protection switch for two paths. One adapter plug is necessary for each DIUS2. The operating voltage is taken directly from the shelf. For failure control, the DIUS2 controls the adapter plug as part of the transmission path. Since it has a starting current limiter, the adapter can be plugged and unplugged without causing interference to the system.

The following adapter plugs are available: APPCU, APCF, APCFL, APPC2, APPC3, (refer also to Adapters).

3.4.3 Board Variants

- Q2096-X
- Q2096-X100 China

3.4.4 LED indications

The front panel has two LEDs.

Table 3-12 lists the LED indications of the DIUS2 board.

Startup	
All LEDs on All LEDs flashing (120/120 ms, maximum 10 min) All LEDs off	After board loading: loadware startup End of loadware startup Loading the line data
Operating State	
LED on LED off LED flash slowly (1, 2/1, 2 s)	Trunk in service (Layer 2 activated) Trunk blocked or not assigned (Layer 2 deactivated) Trunk supplies reference clock

Table 3-12 DIUS2 Board LED Indications

Errors	
LED flashes rapidly (300/900 ms) LED double flashing (300/300/300/900 ms) All LEDs flash rapidly (300/900 ms)	Board defective (Layer 1 error) Layer 2 error Board error / failure of both paths

Table 3-12 DIUS2 Board LED Indications

3.4.5 Pin Assignment

Table 3-13 lists the pin assignments of the DIUS2 board.

Pin	Signal
1	OA
6	OB
9	IA
5	IB
2, 3, 4, 7, 8	chassis

Table 3-13 Pin assignements

3.4.6 Board Functions

Character Coding

- PRA side
  HDB3, pseudo-ternary code. Transmission of path clock and user data at the same time. Bit rate 2048 Kbps.
- System side
  Binary code, TTL level, MSB first.

Transmission Procedure

1. PRA side
   a) D-channel
   A LAPD protocol is exchanged between the DIUS2 board and the ISDN partner / exchange. The channel on which the D-channel is to be transported is freely definable. Transmission rate: 64 Kbps
   b) B-channels
   Transparent through-connection of path (clear channel) when seized.
   If the channels are not seized, idle code is sent.

2. System side
   Transparent PCM switching (clear channel) in the case of seized channels.
   Channels which are not seized are switched to a high impedance state.
   High Level Data Link Control (HDLC), bit rate 2048 Kbps.

An additional LAPD B-channel connection may be switched for each S2 path, either from the PRA side or the system side (2 HSCC chips on the board).

3.4.7 Configuring the DIUS2 Board Using AMOs

To configure the DIUS2 board, use the following AMOs:

- AMO TDCSU - configures the trunk assignment
- AMO LWPAR - configures the following loadware parameter specifications:
  - With/without CRC4 in the TSL0
  - Layer 2 master/slave setting
  - Line interface Copper/Fiber (HDB3/NRZ)
  - Reference clock activation
  - LAPD in TSL
  - IDLE CHANNEL CODE
  - Deactivation and message times
- AMO REFTA - configures the reference clock table specification (PRI 0 - 90)
- AMO BSSU - displays board statistics
- AMO PETRA - displays the memory contents of the board
  - Starts and stops trace jobs
  - Displays trace results

3.4.8 DIUS2 Board Connector Assignment

Figure 3-9 shows the connector assignment of the DIUS2 board.

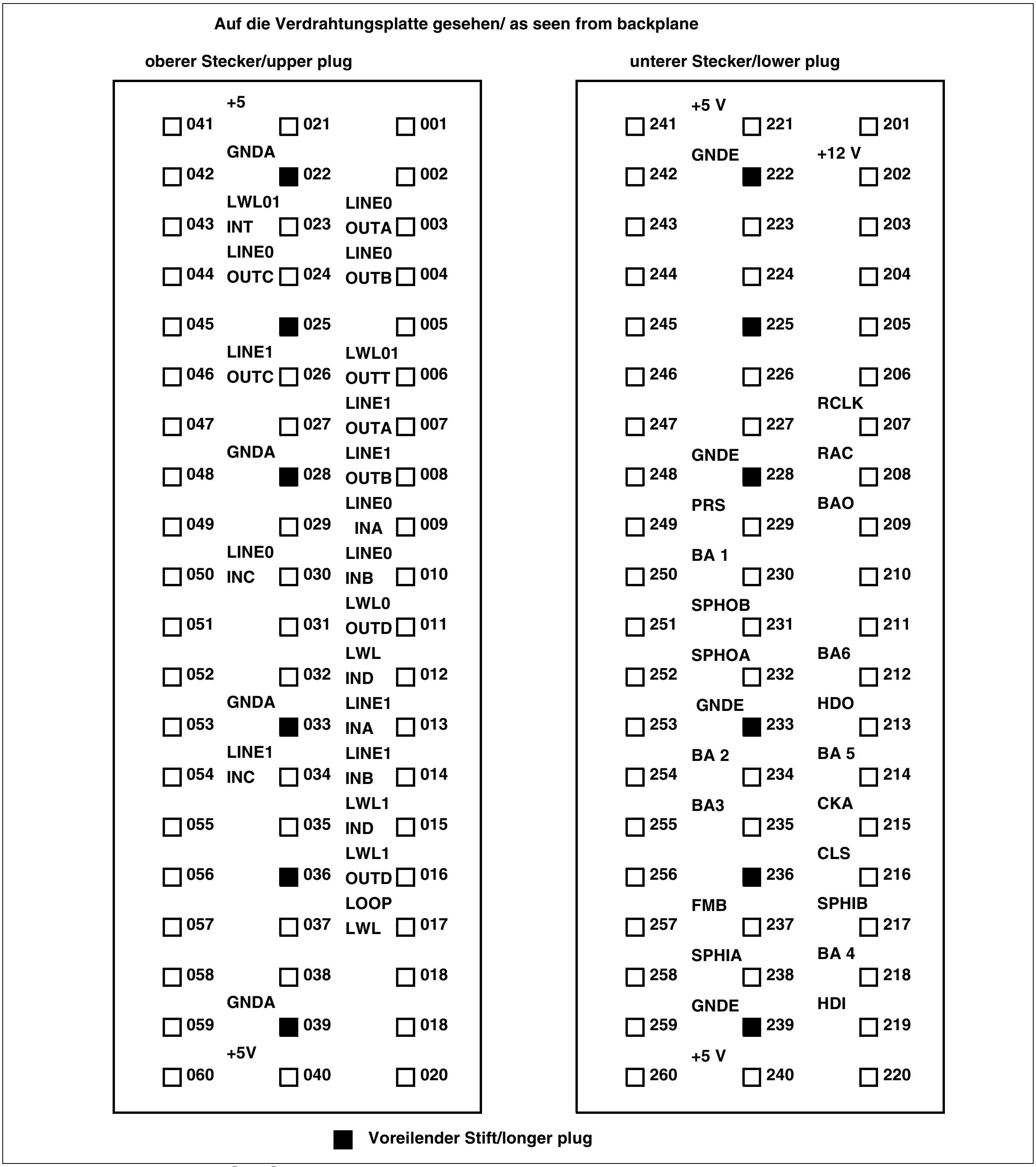


Figure 3-9 DIUS2 Connector Assignment

3.5 DIUT2

This section describes the functions and features of the Digital Interface Unit Trunk 2 (DIUT2) board. It also provides procedures for removing, replacing, and verifying this board.

3.5.1 Functional Description

The new DIUT2 board (S30810-Q2226-X200) for HiPath 4000 will replace the existing DIUN2 (Q2196) and DIU2U (Q2216) modules in SWU releases in HiPath 4000 V3 and V4 and connect to public and private E1 and T1 networks and subscribers.

This board unify the two different cards with one technology family on unique PCB. Additionally, two different LW variants will be supported:

- LW for E1 (ISDN & CAS)
- LW for T1 (BOS & MOS/CVN)

As its predecessors DIU2U and DIUN2 board, the DIUT2 can access either the four standard PCM highways of a LTU shelf or the new additional four highways of the extended (Wideband) LTU shelf.

> The Optical interface at the backplane connectors are not supported by the DIUT2 board, because the optical adapter APCFL is phased-out. The Optical Interface must be used only in the front connectors.

E1 Loadware:

The E1 loadware of DIUT2 is based on the existing DIUN2/ISDN and DIUN2/CAS LWs with no functional changes in E1 applications.

T1 Loadware:

The T1 loadware of DIUT2 board is derived from the current loadware of DIU2U board and all features already implemented in the current loadware are kept active in the new one, except by the TSSI (Time Slot Sequence Integrity).

The DIUT2 provides two T1 spans with MOS/CVN signaling and only one span with BOS signaling.

3.5.2 Systems Supported

The DIUT2 can replace the DIU2U/DIUN2 modules in SWU equal or greater than HiPath 4000 V3. An upgrade of existing systems is not possible.

3.5.3 Hardware

The DIUT2 board has two interfaces (see Figure 3-10) that connect to adapter cables (see Section 3.5.3.5, “Cables and Adapters”) and two LEDs which indicates the status of board.

Figure 3-10 DIUT2 Front panel (S30810-Q2226-X200)

3.5.3.1 Hardware Variants

S30810-Q2226-X200

3.5.3.2 LED statuses and their meanings

Red LED	Green LED	Status	Action
Off	Off	Board not receiving power or not plugged in correctly. Board is out of order.	Check plug contact on board.
On	Off	Board is receiving power and board test is in progress. Board is defective if status remains unchanged (board test unsuccessful).	Replace the board.
		Loadware loading not successfully completed. Board is faulty.	Replace the board.
		Error detected on board. Board is deactivated (not applicable to errors detected by test loops).	Check whether the board was deactivated. If not, replace board.
Flashing	Off	Loadware is being loaded.	
Off	On	Board test completed successfully. Board is OK (idle state).	
Off	Flashing	At least one subscriber line circuit is activated.	

Table 3-14 DIUT2 - LED Statuses

3.5.3.3 Power supply

The DIUT2 is powered by a +5V (± 5%) from the backplane. Other required voltage are generated from onboard regulators, namely +1.5V and +3.3V.

3.5.3.4 DIUT2 Interfaces

Connectors on Backplane/Front Panel

Connector Identifier	Function	Connector Type	Location
X1 to X9	System interface	SIPAC	Backplane
X10	E1/T1 link 0	DB15 female	Front Panel
X11	E1/T1 link 1	DB15 female	Front Panel

Table 3-15 External Connections

DB15 Connector pin assignment X10/X11

Pin	Signal	Direction	Description
1	TTIP	Output	Transmitter Port (balanced pair with TRING)
2	NC		Not Connected
3	NC		Not Connected
4	LWLO_F	Output	Transmit Optical interface Data (+5V logic)
5	GND		Ground
6/7	SCAN_IN	Input	Adapter check (+5V logic active high). Pin 6 and 7 are tied together.
8	RTIP	Input	Receiver Port (balanced pair with RRING)
9	TRING	Output	Transmitter Port (balanced pair with TTIP)
10	5V	Output	5V Supply
11	LWLI_F	Input	Receiver optical interface Data (+5V logic)
12	GND		Ground
13	NC		Not Connected
14	5V	Output	5V Supply
15	RRING	Input	Receiver Port (balanced pair with RTIP)

Table 3-16 DB15 Connector pin assignment

SIPAC Connector pin assignment X1 to X9

Signal Name	Connector Pin	Signal Description	Direction
+ 5V	X1-22, X4-30, X5-30, X9-28	Power Supply + 5 V DC	Input
U_VOR	X5-16, X5-26, X5-36, X5-18, X5-28, X5-38	Power Supply + 5 V DC for hot plug	Input
GND	X1-24, X2-26, X3-26, X4-28, X6-22, X7-24, X8-24, X9-26 X5-12, X5-22, X5-32, X5-14, X5-24, X5-34	Ground return for the + 5 V DC	Input / Output
GND	X5-23	Ground return for the hot plug	Not connected
- 48V	X6-04	-48V power supply	Not connected
BGx_0A, BGx_0B	X1-02, X1-26 X1-06, X1-08 X1-10, X2-02 X2-04, X2-06 X2-08, X2-10 X3-02, X3-04 X3-06, X3-08 X3-10, X4-02	Trunks 0 to 7 AB pair	Not connected
HO0 … HO3	X8-22, X7-30, X8-44, X8-42	Old PCM Highways (2.048 Mbps)	Input
HI0 … HI3	X9-24, X9-02, X9-44, X9-42	Old PCM Highways (2.048 Mbps)	Output
WHO0 … WHO3	X6-32, X6-33, X6-34, X6-35	New PCM Highways (2.048 Mbps)	Input
WHI0 … WHI3	X7-31, X7-32, X7-33, X7-34	New PCM Highways (2.048 Mbps)	Output
HDI	X9-06	HDLC Highway	Input
HDO	X8-04	HDLC Highway	Output
PRS	X7-26	System Reset	Input
BA0 … BA6	X7-06, X7-28, X8-26 X8-28, X9-04, X8-06, X8-2	Shelf Address Identifier	Input

Table 3-17 SIPAC Connector pin assignment

Signal Name	Connector Pin	Signal Description	Direction
FMB	X9-22	Clock synchronizing signal	Input
CKA	X8-08	System clock (2.048 MHz)	Input
CLS	X8-10	Clock select (CLS=GND --> CKA=2,048 MHz) The CLS-pin is expected to be connected to ground in the Backplane.	Input
RCLK	X7-02	Reference clock	Output
RAC	X7-04	Reference clock enable Active low to enable RCLK Tri-state to disable CLK	Output tri-state
LWLOOP	X4-04	Self-test result output	Not connected
TOUT	X6-48	Self-test result output	Not connected
TCK	X7-44	Boundary scan: test clock	Not connected
TMS	X7-46	Boundary scan: test mode select	Not connected
TDI	X7-48	Boundary scan: test data input	Not connected
TDO	X7-50	Boundary scan: test data output	Not connected

Table 3-17 SIPAC Connector pin assignment

3.5.3.5 Cables and Adapters

DIUT2 use the same cables and adapters as the DIU2U and DIUN2 modules.

Application	Part number	Type
T1	C39195-A7269-B625	100Ω Unshielded twisted pair
E1	S30267-Z167-A100	120Ω Shielded twisted pair 10m
E1	S30267-Z80-A*	75Ω Coaxial cable
E1	S30267-Z83-A*	75Ω Coaxial cable for UK
E1/T1	S30807-K5480-X100	Optical adapter AMOM for 850nm multi-mode fiber
E1/T1	S30807-K5480-X200	Optical adapter AMOM for 1300nm multi-mode fiber
E1/T1	S30807-K5480-X300	Optical adapter AMOM for 1300nm single-mode fiber

Table 3-18 DIUT2 Cables and adapters

> The Optical interface must be used only in the front connectors.

3.5.4 Board substitution

It is possible to substitute the boards from DIUN2 to DIUT2 or DIU2U to DIUT2.

Examples:

DIUN2 ISDN ---> DIUT2 E1 ISDN

```
CHA-BCSU:TYPE=PARTNO,LTG=1,LTU=18,SLOT=7,PARTNO1=Q2196-X,PARTNO2=Q2226-
X200,FCTID1=1,FCTID2=1;
```

DIUT2 E1 ISDN ---> DIUN2 ISDN

```
CHA-BCSU:TYPE=PARTNO,LTG=1,LTU=18,SLOT=7,PARTNO1=Q2226-X200,PARTNO2=Q2196-
X,FCTID1=1,FCTID2=1;
```

DIUN2 CAS ---> DIUT2 E1 CAS

```
CHA-BCSU:TYPE=PARTNO,LTG=1,LTU=18,SLOT=7,PARTNO1=Q2196-X,PARTNO2=Q2226-
X200,FCTID1=1,FCTID2=1;
```

DIUT2 E1 CAS ---> DIUN2 CAS

```
CHA-BCSU:TYPE=PARTNO,LTG=1,LTU=18,SLOT=7,PARTNO1=Q2226-X200,PARTNO2=Q2196-
X,FCTID1=2,FCTID2=2;
```

DIU2U BOS ---> DIUT2 T1 BOS

```
CHA-BCSU:TYPE=PARTNO,LTG=1,LTU=17,SLOT=43,PARTNO1=Q2216-X,PARTNO2=Q2226-
X200,FCTID1=5,FCTID2=3;
```

DIUT2 T1 BOS ---> DIU2U BOS

```
CHA-BCSU:TYPE=PARTNO,LTG=1,LTU=17,SLOT=43,PARTNO1=Q2226-X200,PARTNO2=Q2216-
X,FCTID1=3,FCTID2=5;
```

DIU2U MOS ---> DIUT2 T1 MOS

```
CHA-BCSU:TYPE=PARTNO,LTG=1,LTU=17,SLOT=43,PARTNO1=Q2216-X,PARTNO2=Q2226-

X200,FCTID1=6,FCTID2=4;
```

DIUT2 T1 MOS ---> DIU2U MOS

```
CHA-BCSU:TYPE=PARTNO,LTG=1,LTU=17,SLOT=43,PARTNO1=Q2226-X200,PARTNO2=Q2216-
X,FCTID1=4,FCTID2=6;
```

To programming trunk parameters, the same programming used to DIUN2 (E1 CAS or E1 ISDN) and DIU2U (T1 BOS or T1 MOS) boards can be used without changes in DIUT2 board.

> Please see that the parameters PARTNO1 and FCTID1 are not required, but if included, then the SSW can check if the information/replacement is correct.

3.5.5 Configuring DIUT2 board in the AMO BCSU

> See that there is a strange characters (**¡)** at the E1 ISDN and T1 BOS lines

E1 ISDN - PARTNO=Q2226-X200, FCTID = 1

```
ADD-BCSU:MTYPE=DIU,LTG=1,LTU=1,SLOT=97,PARTNO="Q2226-
X200",LWVAR=0,FCTID=1,HWYBDL=A,ALARMNO=0;
```

E1 CAS - PARTNO=Q2226-X200, FCTID = 2

```
ADD-BCSU:MTYPE=DIU,LTG=1,LTU=1,SLOT=12,PARTNO="Q2226-
X200",LWVAR=0,LWPAR1=1,FIDX1=1,LWPAR2=1,FIDX2=1,FCTID=2,HWYBDL=A,ALARMNO=0;
```

T1 BOS - PARTNO=Q2226-X200, FCTID = 3

```
ADD-BCSU:MTYPE=TMD,LTG=1,LTU=1,SLOT=67,PARTNO="Q2226-
X200",FCTID=3,LWVAR=0,LWPAR=4,FIDX=1,HWYBDL=A,ALARMNO=0;
```

OBS: It is possible to use only the first link.

T1 MOS - PARTNO=Q2226-X200, FCTID = 4

```
ADD-BCSU:MTYPE=TMD,LTG=1,LTU=1,SLOT=103,PARTNO="Q2226-
X200",FCTID=4,LWVAR=0,HWYBDL=A,ALARMNO=0;
```

3.5.6 Removing the DIUT2 Board

This procedure removes all the channels on this trunk board from service.

Attention: Static Sensitive Devices
Observe all precautions in for electrostatic discharge.

Remove the DIUT2 board as follows:

For ISDN applications, first deactivate the B channels, and then deactivate the D channel.

Deactivate all channels as follows:

a) Type **`DEA-DSSU`** and press **Enter**.

b) Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	DC
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

3. Deactivate the board as follows:

a) Type **`DEA-BSSU`** and press **Enter**.

b) Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	DC
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
REFOFF	<blank>

The board is deactivated when the red LED is lit and the green LED is off.

4. Before removing the board, ensure that the red board status LED is lit, remove the board.

   If the red board status LED does not light within 30 seconds, repeat steps 3a and 3b. If the red board status LED still does not light within 30 seconds, remove the board.

3.5.7 Replacing the DIUT2 Board

Replace the DIUT2 board as follows:

1. Slide the board into the appropriate slot until it seats firmly into the backplane connector.
2. Activate the board as follows:
   a) Type **ACT-BSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
ONTYPE	AUL
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>

> For ISDN applications, first activate the D channel, and then activate the B channels.

Activate the channels as follows:

a) Type **ACT-DSSU** and press **Enter**.

b) Type the following values, then press **Enter**.

Field	Value
ONTYPE	AUL
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

> PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

3.5.8 Verifying the DIUT2 Board

To verify the operation of the DIUT2 board, confirm that the green LED turns on.

3.6 DPC5

The data processor controller 586 with local area network (DPC5) board is a CPU PentiumAMD K6III+/400 central processor. It has a clock speed of 400 MHz and has 256 MB of local memory. It also provides 512 KB of flash memory, which is used by the firmware loading process. In the HiPath 4300, the DSCX board is the processor; in the HiPath 4500, it is the DPC5 board.

> In the case of upgraded systems with a DPC5 board in the ADP (duplex or simplex-dual), the 128 MB memory module must be replaced by a 256 MB memory module (included in the delivery when upgrading to HiPath 4000 V4).

3.6.1 LED and SSD Indications

The DPC5 board LED and SSD indicators provide status and error information. The LED and SSD indicators are located on the front panel of the board (see Figure 3-11 and Figure 3-12).

The DPC5 front view (Figure 3-11) and DPC5 side view (Figure 3-12 and Figure 3-13) provides connectors and switches for resetting the board, testing the board, and port functions. A jumper block (X18) is provided on the component side of the board for SCSI and clock battery functions. The DPC5 board front panel provides the following switches and connectors:

- A reset button
- An LCT button (load from MO-disk drive)
- A synchronous/asynchronous EIA/TIA-232-E selector switch
- A SCSI (50-pin receptacle) port connector
- A V24/1 (EIA/TIA-232-E, 25-pin receptacle) port connector

Seven Segment Display - Indicates current detailed operation status of DPC5 card.

RESET - Reset switch

ACT - Power LED activity

load from tape, and the LCT LED illuminates, pressing reset after LCT causes processor to attempt load from tape on ADP processor only.

GREEN AL - Minor Alarm LED; ON=Minor Alarm

V24/1 - COM1 RMX / CDR port 4800 7,E,1

SYN/ASYN - Toggling will cause reset of V24/1 port. Either position correct.

RUN - CPU LED; ON= high CPU

BUSY - SCSI Activity LED; ON=high SCSI activity

LCT LED - Activated by pressing LCT switch. ON=active and awaiting reset to initiate attempted tape load.

RED AL - Major Alarm LED; ON=Major Alarm

SCSI - Unused

RECTANGULAR CUTOUT - Used on ADP only, for SL200 card access.

V24/2 through V24/4 - serial ports available through backplane or I/O Filter Panel connections.

Figure 3-11 DPC5, Front View

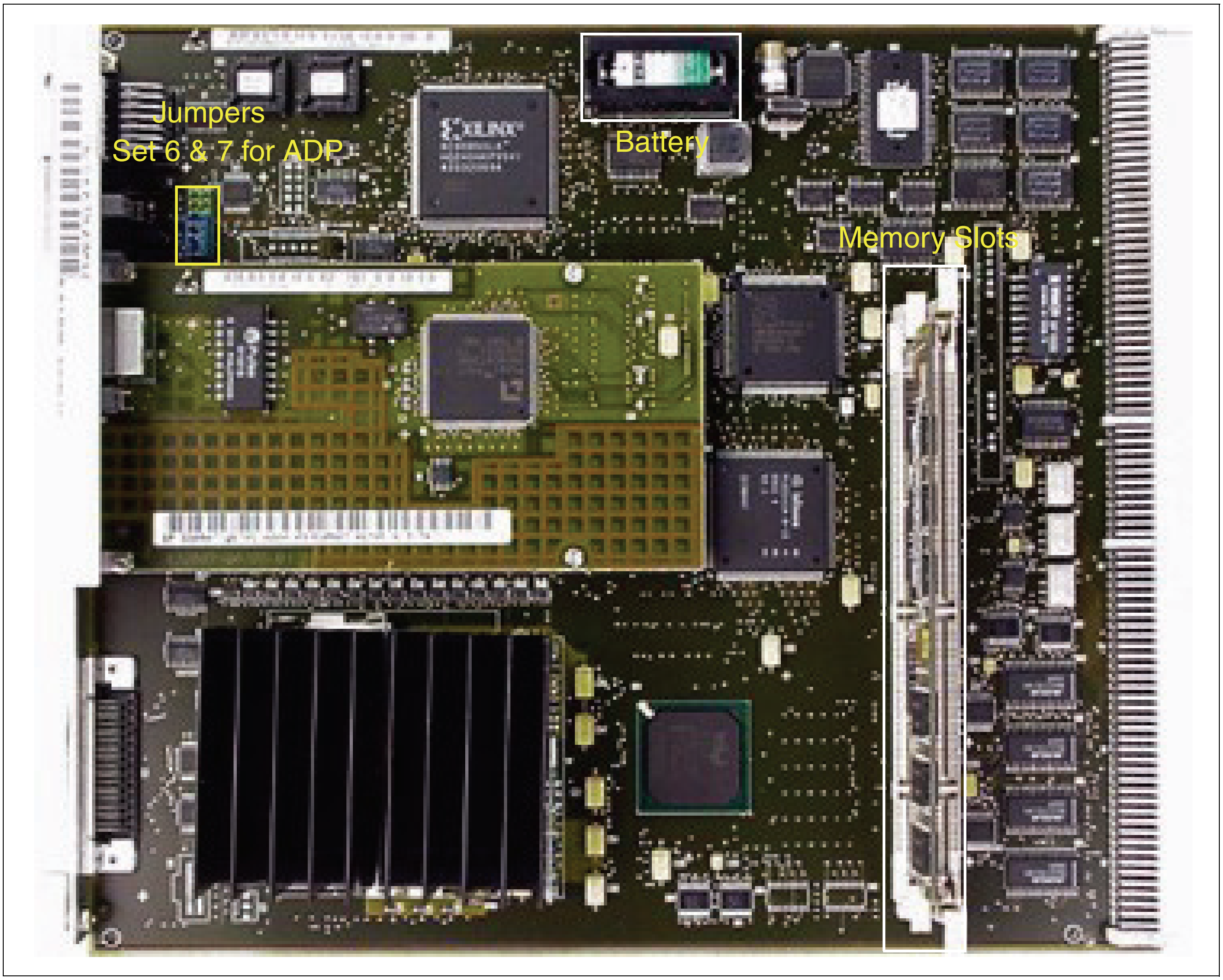


Figure 3-12 DPC5, ADP, Side View

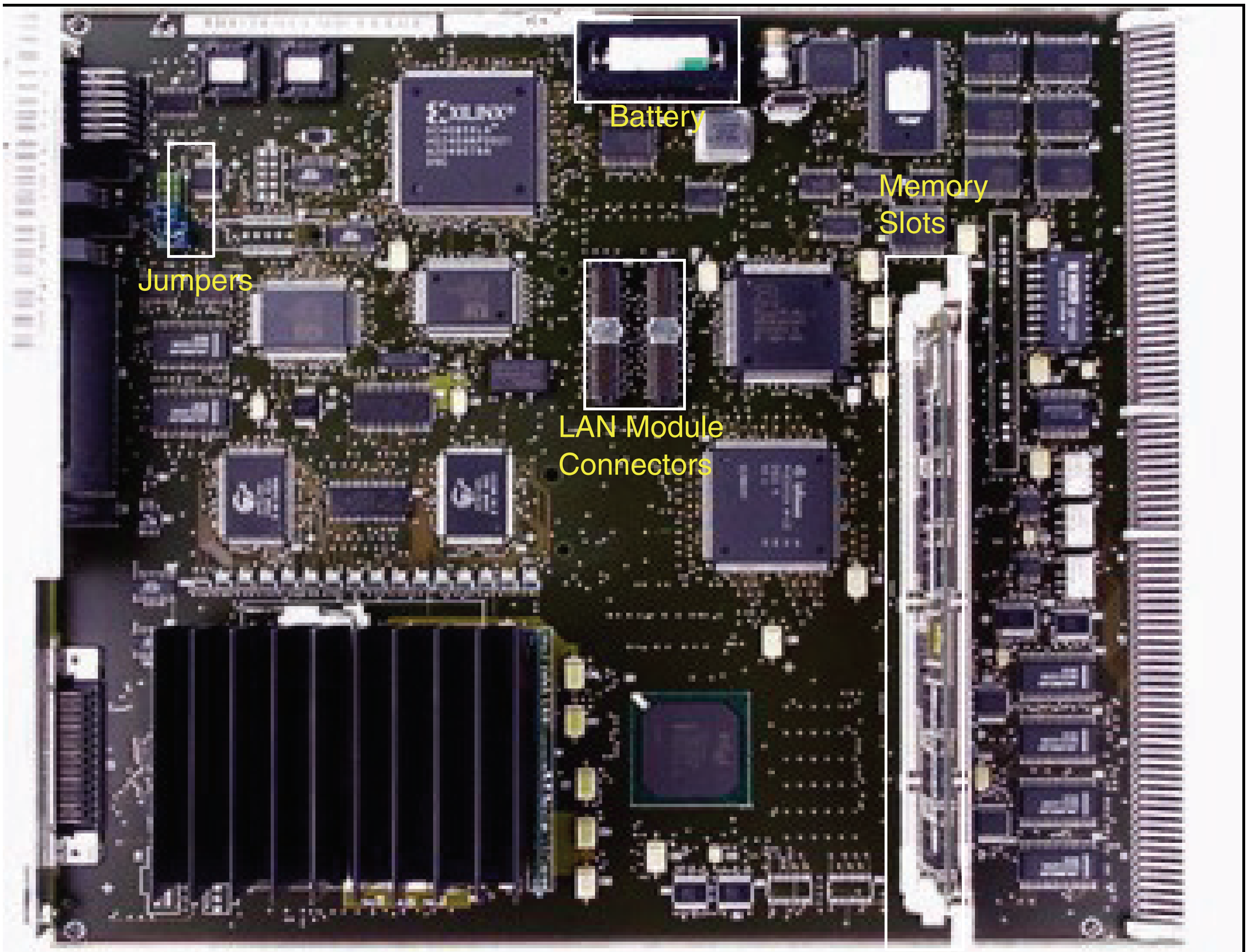


Figure 3-13 DPC5, SWU, Side View

Table 3-19 lists the LED indications for the DPC5 board. Table 3-20 lists the SSD information for the DPC5 board.

LED	Color	State	Indication
RUN	Green	Flickering	Processor is running.
		Off	Processor is not running.
ACT	Green	On	Processor is active.
		Off	Processor is not active.

Table 3-19 DPC5 and Board LED Indications (Seite 1 von 2)

LED	Color	State	Indication
BUSY	Green	On	SCSI bus is active.
		Off	SCSI bus is inactive.
LCT	Green	On	DAT cassette is loading.
		Off	DAT cassette is not loading.
Minor Alarm	Yellow	On	Processor has a noncritical error.
		Off	Processor has no noncritical errors.
Major Alarm	Red	On	Processor has a critical error.
		Off	Processor has no critical errors.

Table 3-19 DPC5 and Board LED Indications (Seite 2 von 2)

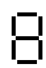
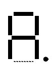
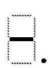
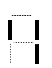
SSD Pattern	Indication
	Start-up is complete.
	DP is active (HiPath 4300 and HiPath 4500 switching unit). This is a normal operating indication for active switching unit, internally.
	DP is active or null database (HiPath 4500). This is a normal operating indication for the ADP only.
	Null database (HiPath 4300)

Table 3-20 DPC5 and Board SSD Indications

Table 3-21 and Table 3-22 provide the strapping information for jumper block X18 on the DPC5 board.

Jumper	Function	ADP Strapping
1	SCSI test	Open
2	Not applicable	Open
3	Not applicable	Open
4	SCSI parity check	Closed
5	SCSI disconnect/reselect	Closed

Table 3-21 DPC5 Board X18 Jumper Block Information (Seite 1 von 2)

Jumper	Function	ADP Strapping
6	SCSI ID	Closed
7	Battery for clock	Closed

Table 3-21 DPC5 Board X18 Jumper Block Information (Seite 2 von 2)

Jumper	Function	Switching Unit Strapping
1	SCSI test	Open
2	Not applicable	Open
3	Not applicable	Open
4	SCSI parity check	Closed
5	SCSI disconnect/reselect	Closed
6	SCSI ID	Open
7	Battery for clock	Open

Table 3-22 DPC5 Board X18 Jumper Block for the SWU.

3.6.2 Clock Accu

If the clock accu voltage drops below 2.2V (clock accu depleted), a power fail interrupt is indicated by the clock component (PFI signal).- The interrupt is “interrupt-pending” and can be masked.

3.6.3 System Time & Date Function

The time and date chip has a backup accu. This accu must be connected to the time chip before the board is installed by plugging jumper 7.

In order to avoid discharging the accu, always remove jumper 7 when placing the board in storage for a longer period of time.

> Accu may explode if inserted with reversed terminals!
> Follow the manufacturers guidelines for disposal of used batteries!

The accu is covered in order to avoid discharging itself against the aluminium foil of the antistatic cover during transport.

3.6.4 Front Panel Serial Interface

Pin	IO	Board configured as DCE	Board configured as DTE
7	-	102 Protective ground	102 Protective ground
2	I	103 Transmit data	104 Receive data
3	O	104 Receive data	103 Transmit data
4	I	105 Request to send	106 Clear to send
5	O	106 Clear to send	105 Request to send
6	O	107 Data set ready	108.1 Connect data set to line 108.2 Data terminal ready
20	I	108.1 Connect data set to line 108.2 Data terminal ready	107 Data set ready
8	O	109 Data carrier detect	111 Data channel received line signal detector
22	I	125 Ring Indicator	

Table 3-23 Front Panel Serial Interface

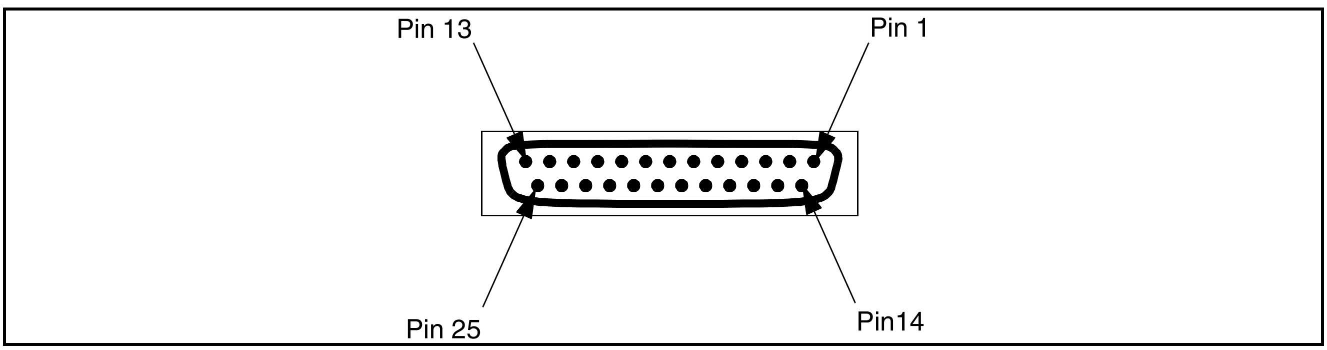


Figure 3-14 Serial Interface Connector

3.6.5 Front Panel SCSI Interface

SCSI signal	SCSI adapter	Name
RST/	45	SCSI reset
BSY/	43	SCSI busy
SEL/	47	SCSI select

Table 3-24 Front Panel SCSI Interface(Seite 1 von 2)

SCSI signal	SCSI adapter	Name
ATN/	41	SCSI attention
MSG/	46	SCSI message
C/D	48	SCSI control/data
I/O	50	SCSI in/out
REQ/	49	SCSI request
ACK/	44	SCSI acknowledge
SDB7/	33	SCSI data bus bit 7
SDB6/	32	SCSI data bus bit 6
SDB5/	31	SCSI data bus bit 5
SDB4/	30	SCSI data bus bit 4
SDB3/	29	SCSI data bus bit 3
SDB2/	28	SCSI data bus bit 2
SDB1/	27	SCSI data bus bit 1
SDB0/	26	SCSI data bus bit 0
SDBP/	34	SCSI data parity
TP	38	Terminator power
CTAN/	2, 25	Attached

Table 3-24 Front Panel SCSI Interface(Seite 2 von 2)

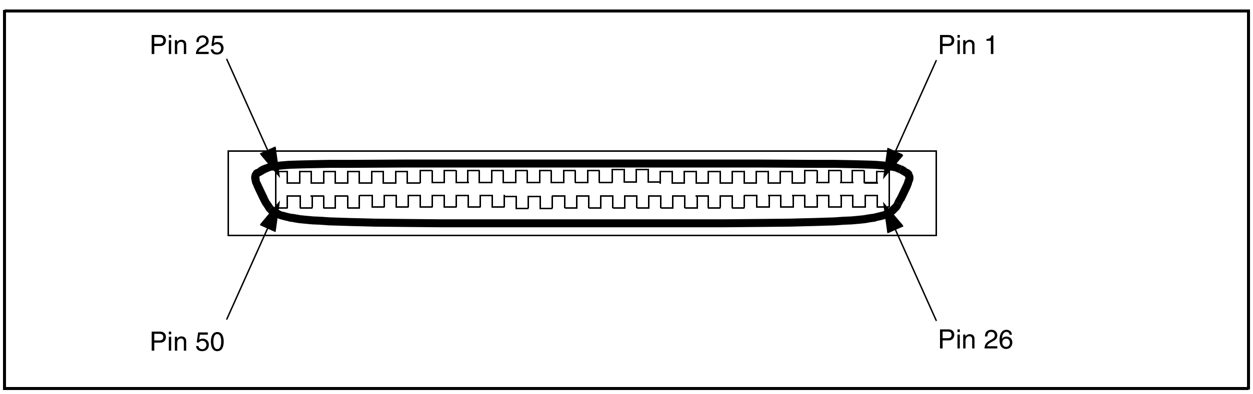


Figure 3-15 SCSI connector

3.6.6 Removing the DPC5 Board

⚠	**Warning** This procedure removes the ADP or affected SWU from service.

	Attention: Static Sensitive Devices Observe all precautions for electrostatic discharge.

Remove the DPC5 board as follows:

1. Deactivate and power off the HiPath 4300 base cabinet or HiPath 4500 CCDAX shelf, as applicable.
2. Using the board extractor, unseat the board and remove it from the shelf.
3. Remove the memory module from the board.

Enabling the DPC5 Board Clock Battery on the ADP Only

The DPC5 board is shipped with the clock battery disabled to prolong the battery life. The clock battery must be enabled before the board is installed in the ADP. The DPC5 board(s) residing in the SWU must have the clock battery disabled.

Enable the board clock battery as follows:

1. Remove the battery cover and note the battery polarity.
2. Remove the battery.
3. Remove any tape or packaging material from the battery.
4. Replace the battery and ensure that the battery polarity is correct.
5. Replace the battery cover.
6. Ensure that the X18 jumpers are set properly. Refer to Table 3-21 and Table 3-22.

3.6.7 Replacing the DPC5 Board

Replace the DPC5 board as follows:

1. Install the defective board’s memory module on the replacement board.
2. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
3. Power on and activate the HiPath 4300 base cabinet or HiPath 4500 CCDAX shelf as applicable.

3.6.8 Verifying the DPC5 Board

Verify the operation of the DPC5 board as follows:

1. Wait approximately 15 minutes for the system to re-initialize.
2. **HiPath 4300:** Ensure that an A appears on the SSD.

   HiPath 4500: Ensure that SSD indicates a dash (-) and a dot (.) for the ADP and an A or S on the SWU.
3. Log on to the HiPath 4000.
4. Display the board as follows:
   a) Type **`DIS-SDSM`** and press **Enter**.
   b) Type the following values and press **Enter**:

Field	**Value**
UNIT	A1
AREA	file

3.6.9 DPC5 Board MDF Assignments

Cable punch-down is standard. Table 3-25 provides additional punch-down information on pair number 1 through 4.

Pair No.	Wire Color	Demarc PIN	Alarm Designation	Description	Normal State of Relay Contacts	SSD or Functional Definition
1	WHT-BLU BLU-WHT	34 35	ALUM 1 ALUM 2	Trunk failure Transfer	Closed	*Trunk bypass activates
2	WHT-ORG ORG-WHT	32 31	NAL1 NAL2	Minor Alarm	Open	SSD indication: P2 - minor alarm
3	WHT-GRN GRN-WHT	31 30	UAL1 UAL2	Major Alarm	Open	SSD indication: C3 - major alarm

Table 3-25 DPC5 Board Punch-Down Sequence

Pair No.	Wire Color	Demarc PIN	Alarm Designation	Description	Normal State of Relay Contacts	SSD or Functional Definition
4	WHT-BRN BRN-WHT	14 13		0V 0V		
* Refer to the *HiPath 4000 Installation Guide* to install the trunk bypass.						

Table 3-25 DPC5 Board Punch-Down Sequence

3.7 DRAM Memory Modules

Table 3-26 lists the EDM module types and variants.

Module capacity	**EDM25 S30807-Q6130**	**EDM45 S30807-Q6140**	**EDM3A S30807-Q6142**	**BDM3A S30807-Q6706**
8 MB	-X300	--	--	--
16 MB	-X200	-X200	-X300	--
24 MB	-X100	--	--	--
32 MB	X	X	-X200	-X300
48 MB	--	--	-X100	--
64 MB	--	--	X	-X200
96 MB	--	--	--	-X100
128 MB	--	--	--	X
256 MB				S30122-X7673-X
Mem. tech. Data backup	16 MB PTY	16 MB ECC	64 MB PTY/ECC	64 MB PTY/ECC
32bit-system 64bit-system	-X....X300 --	-- -X, -X200	-X.....X300 -X, -X200	-X200,- X300 -X....X300

Table 3-26 Module Types, Variants, and Memory Capacity

Table 3-27 lists the boards with EDM memory modules.

Board	**MM-Slot**	**Possible memory modules**							
Controller (Data Backup)		S30810-Q2270		S30810-Q2311		S30810-Q2261		BDM3A***1)** S30807-Q6706	
				Variant	Capa.	Varian-te	Capa.	Variant	Capa.
DSCX XDM76 S30122-X7673-X 256MB EDO 72-bit ECC	1					**-X100**	256MB	**-X** **-X100** **-X200** **-X300**	128 MB 96 MB 64 MB 32 MB

Table 3-27 Boards with Memory Modules and Slots

Board	**MM-Slot**	**Possible memory modules**							
DPC5***4)** HX82439 (ECC)	1	**-X100**	256MB					**-X** **-X100** **-X200** **-X300**	128 MB 96 MB 64 MB 32 MB
	2	**-X100**	256MB					**-X** **-X100** **-X200** **-X300**	128 MB 96 MB 64 MB 32 MB
DSCXL DDR SO-DIMM 256 MB V20810-F7095- B290 72-bit ECC/Parity 8MX 8x4B; 133MHz	1			**-x**	256MB				
DSCXL	2			**-x**	256MB				
DSCXL				**-X300**	1GB				

Table 3-27 Boards with Memory Modules and Slots

The X variants can be mixed within one memory module family. The overall memory capacity of boards with two module slots (MM slots) equals the total capacities of slot 1 and slot2. If only one module is to be used with boards with two module slots, the module can be slotted alternatively in slot 1 or slot 2.

3.8 DSCX Data Processor Board and Serial Channel Extended

The data processor board and serial channel extended (DSCX) board is the central processor of the HiPath 4300. This board performs ADP processing, which includes controlling the SCSI bus and provides basic system switching functions, tone processing (incoming), conference bridge, system clock control, and HDLC / VXDX termination.

The DSCX board:

- Requires at least Hicom 300 H V1.0 software
- Uses SIPAC connectors
- Provides an Ethernet LAN interface
- Uses flash memory for quick loading of boot, loadware, and firmware

If your system has the ATM feature, you must have a clock generator on the DSCX board. The clock generator on the DSCX board synchronizes with the clock on the STMA board.

The DSCX is equipped with the following:

  – CPU PentiumAMD K6III+/400 for system control
  – MPC860 preprocessor (SIUL) to support DCL data transfer, MTS and SIU
  – Additional built-in clock generator
  – 512 Kbyte Flash EPROM
  – Pluggable 64 or 96 MB DRAM module
  – One serial V.24 interface on the front panel featuring transmission speeds of 19200 baud in asynchronous mode and 9600 baud in synchronous MSV1 mode
  – One SCSI interface for HOT or external MO drive on the front of the back panel
  – Additional LAN module
  – Accumulator-backed system clock

3.8.1 Board Part Numbers

This section lists the part numbers associated with the DSCX board as follows:

- DSCX S30810-Q2216-X100 (256 MB)
- Clock Generator module S30807-Q6906 -X
- LAN module SL100 S30807-Q6705-X

3.8.2 LEDs

The front panel has two keys, six LEDs and two connectors for the connection of the V.24 interface and the SCSI bus thus facilitating the connection of external devices for maintenance or control.

Figure 3-16 shows the front panel of the DSCX board.

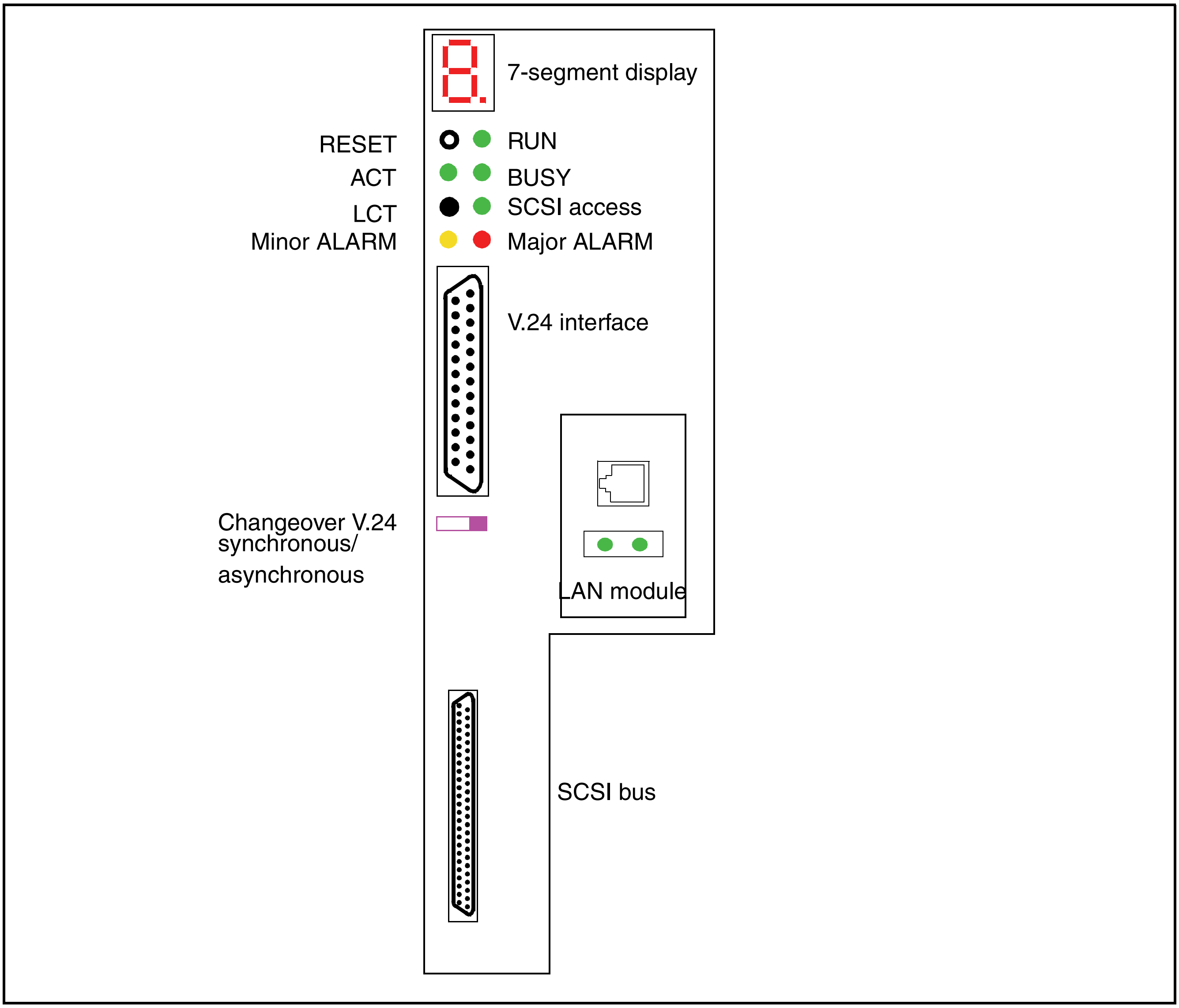


Figure 3-16 DSCX Board Front Panel

Table 3-28 lists the LED indications of the DSCX board.

LED	Color	State	Indication
RUN	Green	Flickering	Processor is running.
		Off	Processor is not running.
ACT	Green	On	Processor is active.
		Off	Processor is not active.
BUSY	Green	On	SCSI bus is active.
		Off	SCSI bus is inactive.
LCT	Green	On	MO disk is loading.
		Off	DAT cassette is not loading.
Minor alarm	Green	On	Processor has a noncritical error.
		Off	Processor has no noncritical errors.
Major alarm	Red	On	Processor has a critical error.
		Off	Processor has no critical errors.

Table 3-28 DSCX Board LED Indications

3.8.3 SSD

Table 3-29 lists the seven segment display (SSD) indications of the DSCX board.

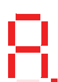
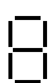
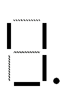
SSD Pattern	Indication
	DP active
	Start-up is complete.
	Null database.

Table 3-29 DSCX SSD Indications

3.8.4 Buttons, Switches

The front panel of the DSCX board has buttons, switches, and connectors for performing or enabling board functions. Table 3-30 lists the buttons and switches, and its functions

Buttons and Swtiches	Function
Reset button	Resets all board functions to the default values (delivery state).
LCT button	Initiates loading from the MO disk. Pushing the LCT button changes the boot medium to the MO with the SCSI-ID 5. After pushing the RESET button, the system reloads from the MO with the SCSI-ID 5.
SYN/ASYN switch	Selects the mode for the V.24 interface on the front panel (default = asynchronous). The switch position can be read from register 0x16A6, data bit 2. Switch position left corresponds to synchronous (bit 2 = 0), switch position right to asynchronous (bit 2 = 1). The switch is used to release line 8. If the operating terminal does not respond set the switch to SYN and back. This re-initializes line 8.
SCSI connector (50-pin receptacle)	Unused

Table 3-30 Functions of the Buttons and Switches of the DSCX Board

Figure 3-17 illustrates the DSCX side view.

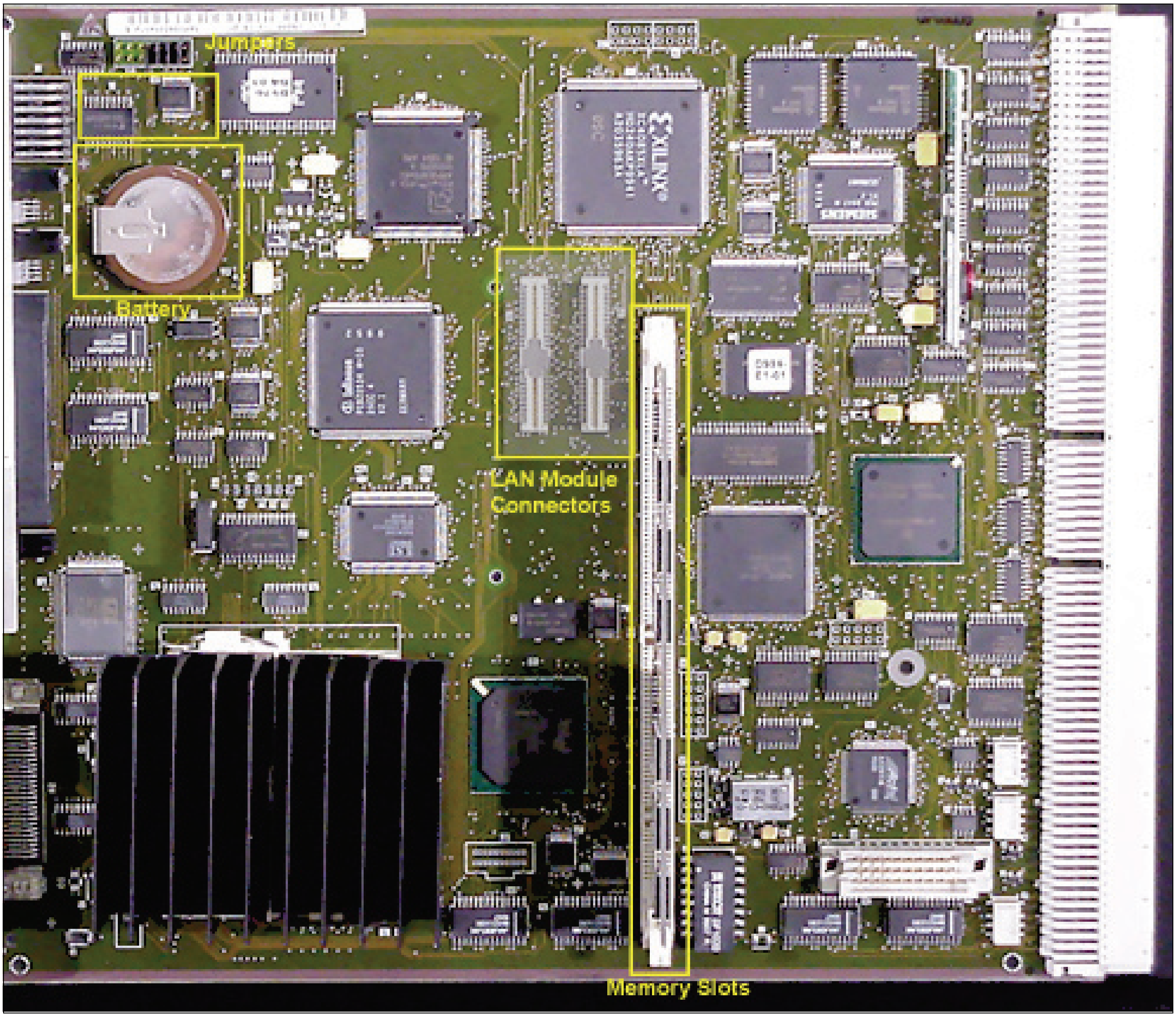


Figure 3-17 DSCX Side View

3.8.5 Setting the Jumpers

You can use the jumper block on the component side of the board to disable or enable SCSI and clock functions.

Table 3-31 lists the jumper settings (port 0x16A6) on the DSCX board.

Jumper	Function	Value range	Default operation
1			Closed
2	SCSI test	0 = off 1 = on	0
3	SCSI parity check	0 = No parity check 1 = parity check	0
4	SCSI disconnect/reselect	0 = not activated (not plugged) 1 = activated (plugged)	1
5	Individual SCSI ID	0 = ID6 1 = ID7	1
6	Reserved	0 = not reserved 1 = reserved (plugged)	1
7	RTC battery (battery on clock)	0 = battery not active 1 = battery active (plugged)	0

Table 3-31 Jumper Settings

3.8.6 Connector

One V.24 interface leads to a 25-pin Canon plug on the front panel. Two of the interfaces (channel 0, channel 1) are optionally synchronous or asynchronous. The transmission mode (synchronous or asynchronous) is set during installation. The remaining two channels are asynchronous.

If the operating terminal does not respond, the mode can be changed from asynchronous to synchronous using a switch on the front panel. This re-initializes line 8.

Figure 3-18 shows the pin locations for the V.24 serial connector.

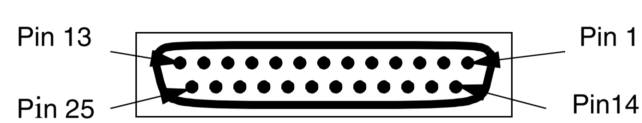


Figure 3-18 V.24 Interface

3.8.7 Pin Assignment on the V.24 Interface

DSCX Board as a Data Transmission Unit

Table 3-32 lists the pin assignment on the V.25 connector when the DSCX board is used as a data transmission unit.

Pin	I/O	Assignment
7	-	102 Ground
2	I	103 Transmit data
3	O	104 Receive data
4	I	105 Switch on transmitter
5	O	106 Ready to transmit
6	O	107 Ready status
20	I	108.1 Activate transmission line 108.2 DTE ready
8	O	109 Incoming signal level
22	O	125 Incoming call

Table 3-32 PIN assignment of the DSCX Board as a Data Transmission Unit

DSCX Board as a Data Terminal Equipment

Table 3-33 lists the pin assignment on the V.25 connector when the DSCX board is used as a data terminal equipment.

Pin	I/O	Assignment
7	-	102 Ground
2	I	104 Receive data
3	O	103 Transmit data
4	I	106 Ready to transmit
5	O	105 Switch on transmitter
6	O	108.1 Activate transmission line 108.2 DTE ready
20	I	107 Ready status
8	O	111 Activate high transmission rate

Table 3-33 Pin Assignment of the DSCX Board as a Data Terminal Equipment

3.8.8 SCSI Connector

Figure 3-19 shows the SCSI operating modes of the SCSI connector.

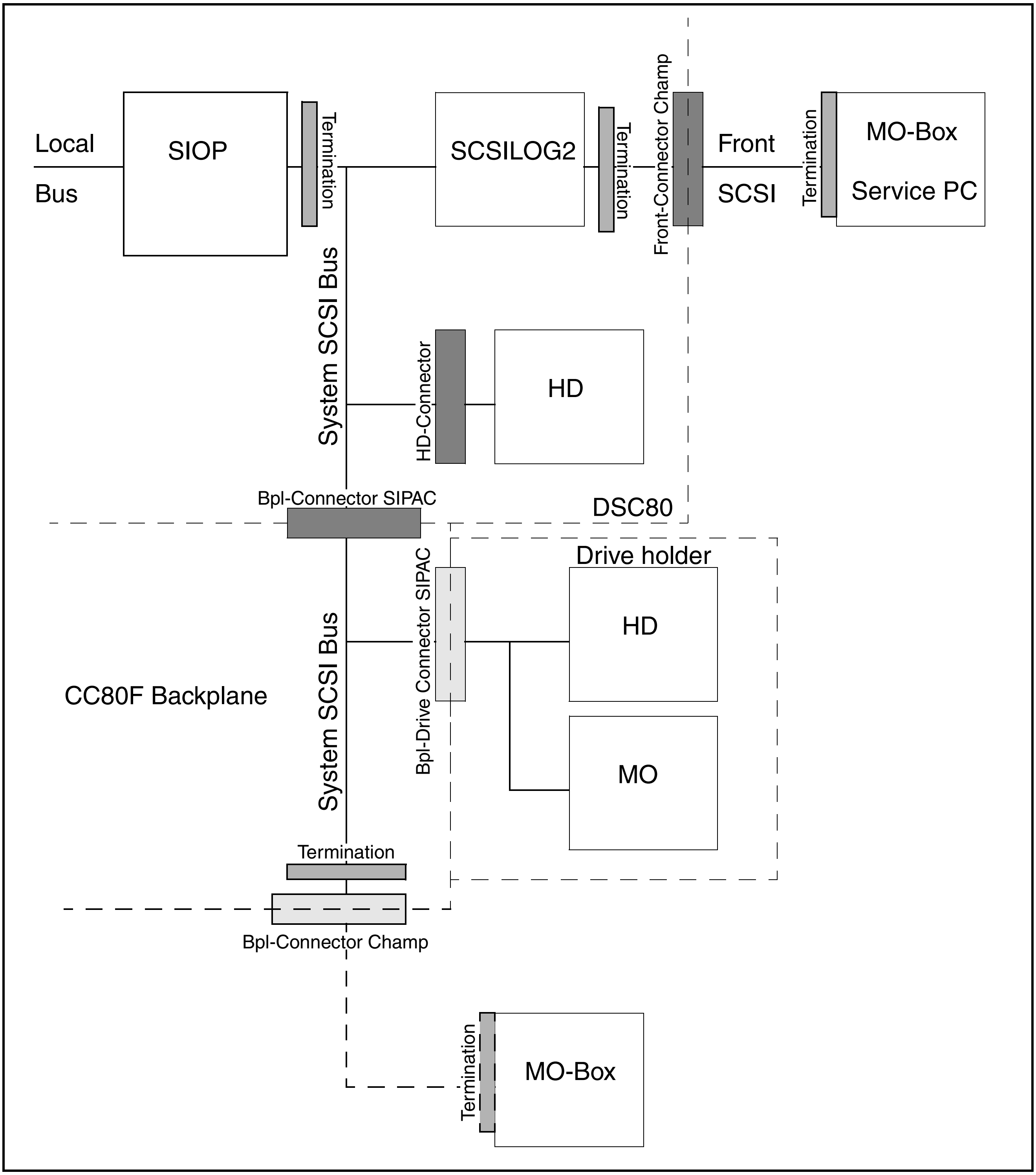


Figure 3-19 SCSI Controller

Figure 3-20 shows an illustration of the SCSI connector.

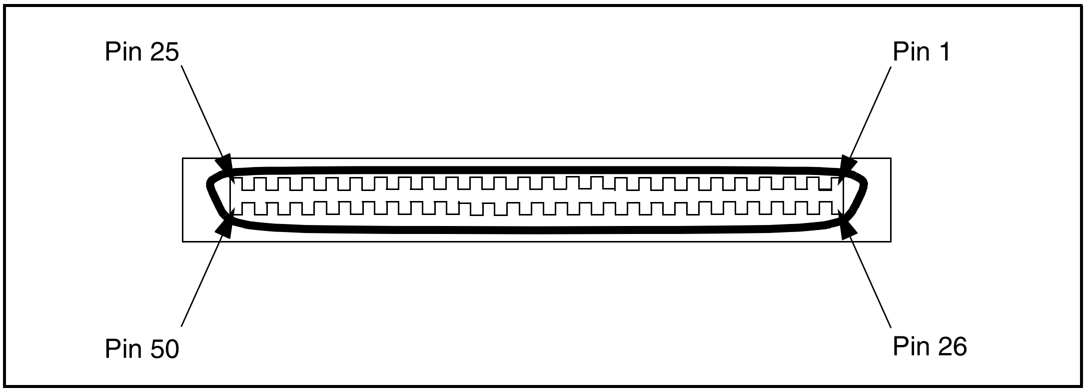


Figure 3-20 50-pin SCSI Connection

If a SCSI drive is connected to the system SCSI bus, the terminating resistors must be removed from the backplane, otherwise, the drive is terminated.

3.8.9 SCSI Operating Modes

Figure 3-21 shows an illustration of a SCSI jumper.

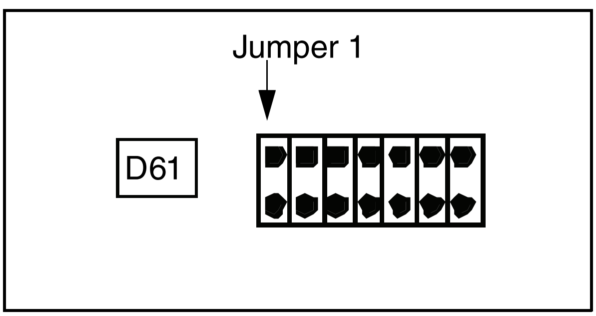


Figure 3-21 SCSI Jumper

SCSI Parity

- Parity generator is always enabled
- Parity check can be disabled or enabled by jumper 3

SCSI Identification Address 0 .. 7

- Each component needs its own address in the range 0 .. 7
- SIOP (host)-ID is set to SCSI-ID 7 (default, highest priority on the SCSI bus).It can be changed to SCSI-ID 6 with jumper 5
- Disconnect / reselect function is enabled (default), can be disabled by jumper 4

SCSI monitoring

- The SCSI program sequences can be monitored by setting jumper 2 (only for test purpose)

Table 3-34 lists the operating modes of the SCSI connector.

Operating Modes	Default	Options
Single-ended/differential-ended	Single-ended	Differential-ended not possible on the board
Single host/multiple hosts	Single host	Multiple hosts possible
Synchronous/asynchronous transfer	Asynchronous	Synchronous possible by HW, not planned
With SCSI parity/non-parity	Non-parity	Selectable by placing jumper 3
Disconnect/reconnect enable/ disable	Enable	Selectable by placing jumper 4

Table 3-34 SCSI Operating Modes

3.8.10 Pin Assignment on the SCSI Interface

Table 3-35 lists the pin assignments on the SCSI interface.

SCSI Signal	System Bus Pin Name	SCSI Front Cover Pin	Name
RST/	SRST*	X10-45	SCSI reset
BSY/	SBSY*	X10-43	SCSI busy
SEL/	SSEL*	X10-47	SCSI select
ATN/	SATN*	X10-41	SCSI attention
MSG/	SMSG*	X10-46	SCSI message
C/D	SDC*	X10-48	SCSI control/data
I/O	SIO*	X10-50	SCSI in/out
REQ/	SREQ*	X10-49	SCSI request
ACK/	SACK*	X10-44	SCSI acknowledge
SDB7/	SD7*	X10-33	SCSI data bus bit 7
SDB6/	SD6*	X10-32	SCSI data bus bit 6
SDB5/	SD5*	X10-31	SCSI data bus bit 5
SDB4/	SD4*	X10-30	SCSI data bus bit 4
SDB3/	SD3*	X10-29	SCSI data bus bit 3

Table 3-35 SCSI Interface Pin Assignments (Seite 1 von 2)

SCSI Signal	System Bus Pin Name	SCSI Front Cover Pin	Name
SDB2/	SD2*	X10-28	SCSI data bus bit 2
SDB1/	SD1*	X10-27	SCSI data bus bit 1
SDB0/	SD0*	X10-26	SCSI data bus bit 0
SDBP/	SDP*	X10-34	SCSI data parity
TP	STP*	X10-38	Terminator power
CTAN/	-	X10-2, X10-25	Attached
-	-	X10-2 to 25 X10-35 to 37 X10-39, 40 X10-42	Ground

Table 3-35 SCSI Interface Pin Assignments (Seite 2 von 2)

3.8.11 LAN Interface

The LAN interface is implemented as a 10 Mbps twisted pair Ethernet (10Base-T). The physical connection is performed by the SIPAC plug by means of differential transmit and receive pairs.

The LAN connects to the main memory of the processor by means of a 10Base-T interface and an AMD 79C965 controller device. The 10Base-T interface is only produced at the backplane connectors.

There are two different BNC-RJ45 adapters available depending from the connected device

- External HUB S30267-Z170-A-2 (line connection not crossed)
- SLMPX/WAML2 board or PC S30267-Z170-A-2 (line connection crossed)

Figure 3-22 shows a block diagram of the DSCX board.

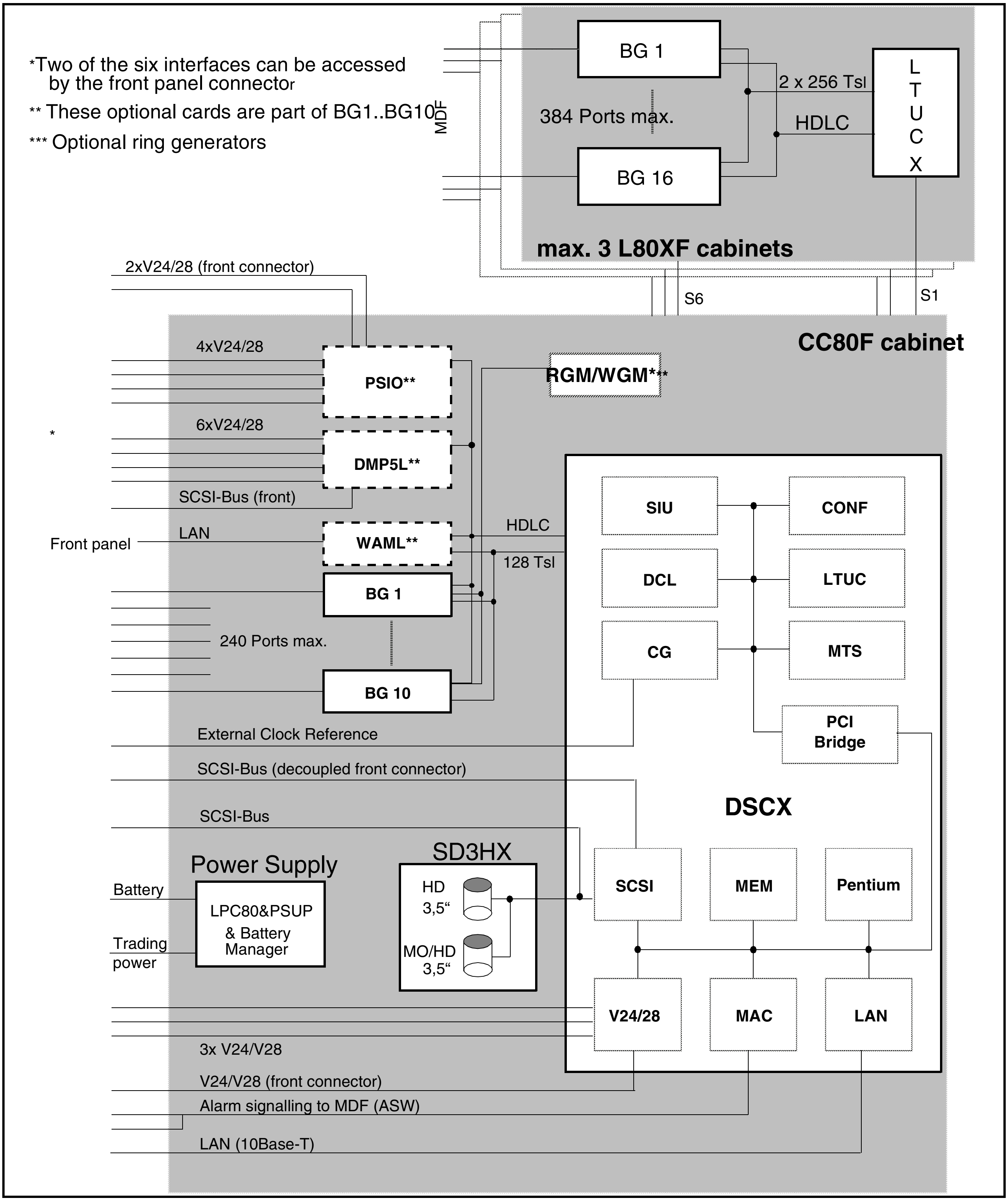


Figure 3-22 DSCX Board Block Diagram - HiPath 4300

3.8.12 Removing the DSCX Board

> **Warning**
>
> The DSCX board is attached to the shelf with two screws. Before you remove the module, first unscrew the screws.
>
> This procedure removes the system from service.

> **Attention: Static Sensitive Devices**
>
> Observe all precautions for electrostatic discharge.

To remove the DSCX board from the system:

1. Deactivate and turn off the CC80F cabinet.
2. Using the board removal and replacement tool, unseat the board and remove it from the shelf.
3. If you are replacing this board, remove the memory module from the component side of the board. You are going to need the memory module for the replacement board.

3.8.13 Enabling the DSCX Board Clock Battery

The DSCX board is shipped with the clock battery disabled to prolong the battery life. The clock battery must be enabled before the board is installed.

To enable the board clock battery:

1. Ensure that the X10 jumpers are set properly (refer to Table 3-31).
2. The clock battery is soldered to the board on the DSCX and is therefore not removable.

3.8.14 Replacing DSCX Board

To replace the DSCX board in the system:

1. Install the defective board’s memory module on the replacement board.
2. Slide the board into the appropriate slot until it seats firmly into the backplane connector.
3. Power on and activate the CC80F cabinet.

3.8.15 Verifying the DSCX Board

To verify the operation of the DSCX board:

1. Wait approximately 5 minutes for the system to fully re-initialize.
2. Ensure that an `A` appears on the SSD.
3. Log on to the HiPath 4300.
4. Display the board as follows:
   a) Type **`DIS-SDSM`** and press **Enter**.
   b) Type the following values and press **Enter**:

Field	**Value**
Unit	**A1**
AREA	**file**

3.8.16 DSCX Board MDF Assignments

Cable punch-down is standard. Table 3-36 provides additional punch-down information on pair number 12 through 14.

Pair No.	**Wire Color**	**Demarc PIN**	**Alarm Designation**	**Description**	**Normal State of Relay Contacts**	**SSD or Functional Definition**
12	BLK-ORG ORG-BLK	12 37	ALUM 1 ALUM 2	Trunk failure Transfer	Closed	Trunk bypass activates (contact is open)
13	BLK-GRN GRN-BLK	13 38	NAL1 NAL2	Minor alarm	Open	SSD indication: P2 - minor alarm
14	BLK-BRN BRN-BLK	14 39	UAL1 UAL2	Major alarm	Open	SSD indication: C3 - major alarm

Table 3-36 DSCX Board Punch-Down Sequence

3.9 DSCXL

The DSCXL (**D**ata and **S**witch Processor for **C**ompactPCI/**L**AN) is the central processor board in HiPath 4000 (see Figure 3-23). The board controls ADP processing (including controlling the CompactPCI buses in the backplane) and is responsible for fundamental system control functions.

As of HiPath 4000 V4, only DSCXL with 1 GB of memory is supported.

For this reason, either the existing DSCXL (S30810-Q2311-X with 256MB of memory) must be extended using a 1 GB memory module (in the case of upgrades, see also Section 3.9.6, “Upgrading the S30810-Q2311-X Board to 1 GB”), or the new DSXCL-X300 board (S30810-Q2311-X300) is used (in the case of new installations).

ⓘ	The new DSCXL-X300 board (S30810-Q2311-X300) is now only supplied with a 1 GB memory module. The old DSCXL board (S30810-Q2311-X) only supports **the 1 GB memory module as of board status E1**.

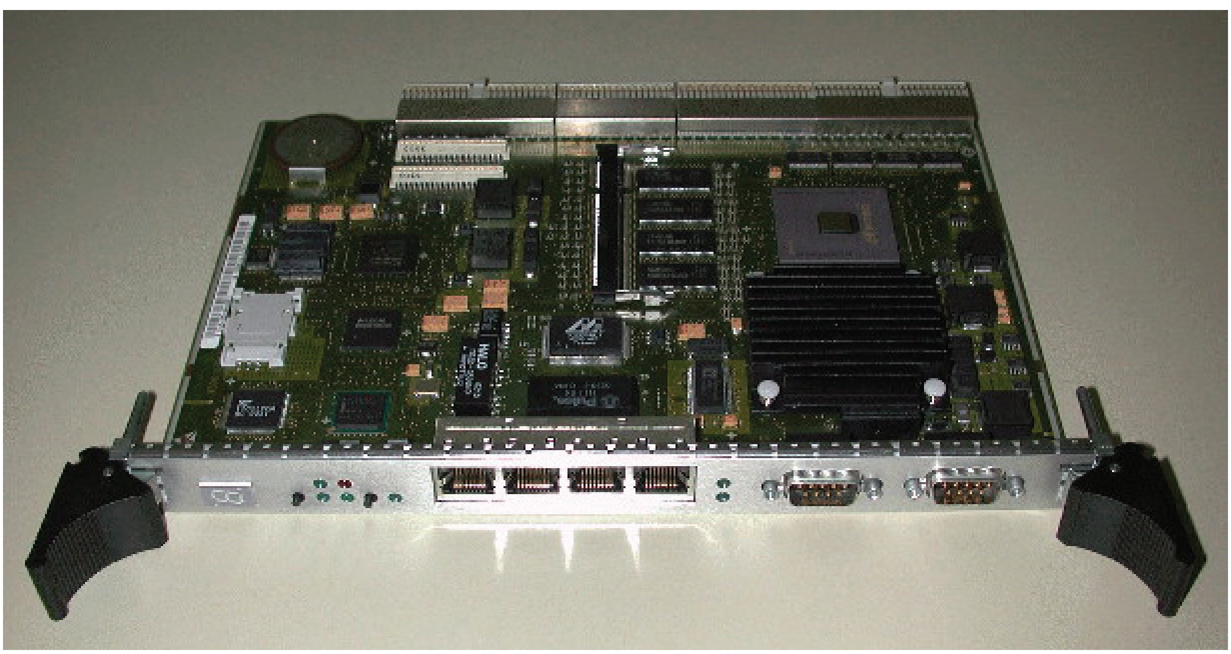


Figure 3-23 DSCXL board

3.9.1 Hardware Variants

S30810-Q2311-X (256 MB on-board, has to be upgraded to 1 GB memory module V20810-F7111-B290)

S30810-Q2311-X300 (1 GB on-board memory module V20810-F7111-B290)

3.9.2 LED and SSD Displays/Keys

The front side of the board features one SSD display, two keys, five LEDs for DSCXL status and two LEDs for the LAN interface to the RTM board with the following properties (see Table 3-37 for LED and SSD displays, and key functions):

DSCXL displays	**Properties**
SSD display	Indicates the current status of the DSCXL
RUN LED green	CPU is active
ACTIVE LED green	System is active
LCT LED green	Loading from MO active
Minor alarm LED yellow	Minor alarm
Major alarm LED red	Major alarm
Keys	
Reset	Manual reset for DSCXL
LCT	Starts loading from the MO instead of the HD

Table 3-37 LED and SSD displays/keys

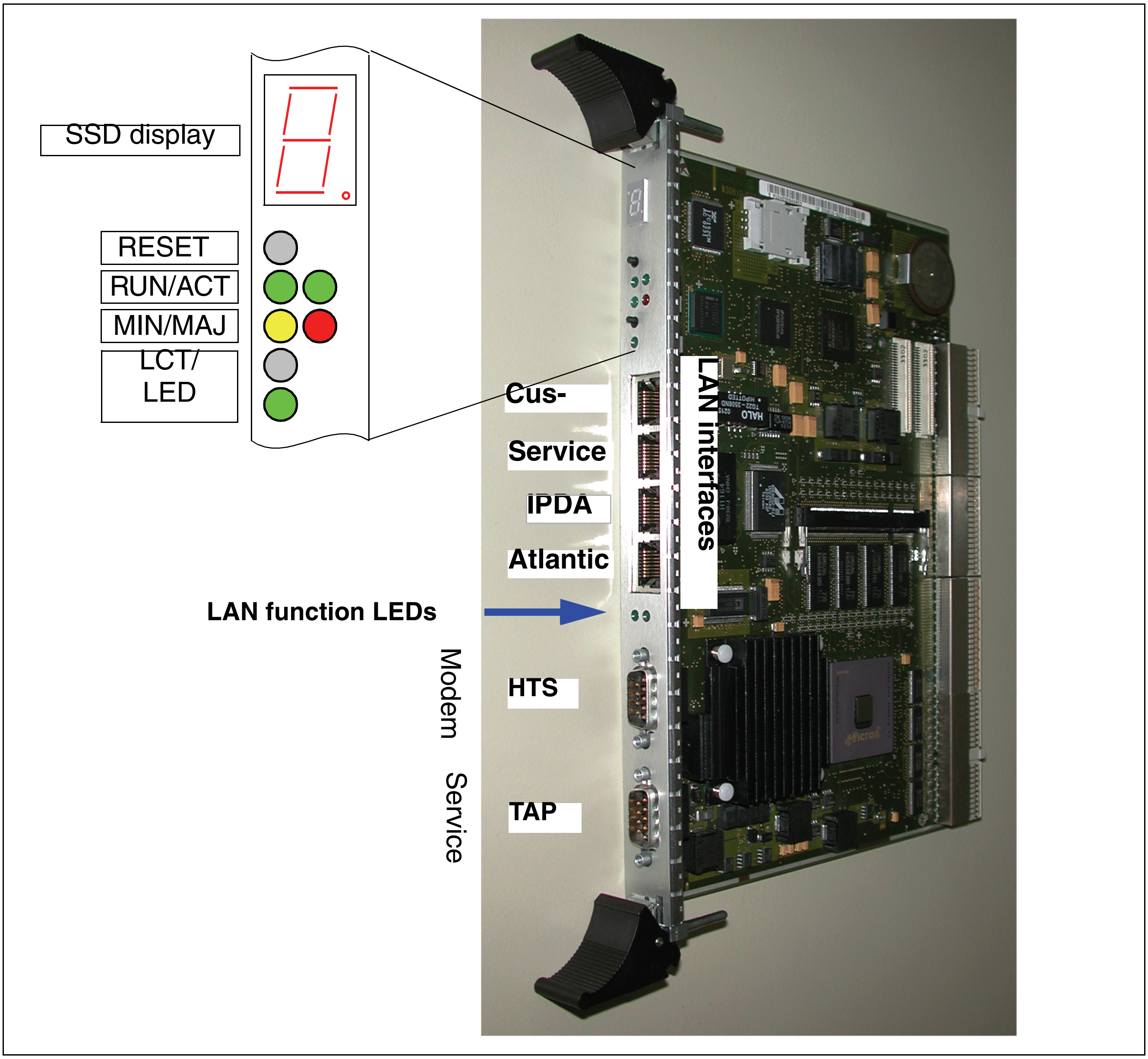


Figure 3-24 DSCXL board front panel

Warning
???Removing the DSCXL board during a write operation to the HD or the MO/HDCF may permanently damage the HD or the MO/HDCF. You must therefore ensure that the HD or the MO/???HDCF is switched off before you remove the DSCXL board.

- **Loading from MO disk:**
  Press the LCT key briefly followed by the Reset key.

LAN displays	LED on	LED off	LED flashing
LINK/ACT green	Connection	No connection	Transferring or receiving signal
SPEED green	100 Mbps	10 Mbps	

Table 3-38 LED Displays for LAN interface to the RTM board

The LEDs for the LAN interfaces on the front panel are integrated in the RJ45 receptacles.

3.9.3 Interfaces

- Standard CompactPCI interface (C39334-Z7086-*) for the backplane
- 4 x RJ45 connectors for LAN interfaces
- 2 x V.24 9-pin SUB-D connector (service terminal/modem)

Standard CompactPCI interface

The DSCXL board can be implemented in all compatible CompactPCI 2.16 backplanes. Once implemented, the DSCXL takes over the control of the CompactPCI buses in the system slot. If the DSCXL is inserted in a peripheral slot, it cannot be connected to the CompactPCI bus. The special HiPath features can only be provided in connection with the HiPath backplane.

LAN interfaces

- Customer LAN
- Service LAN
- IPDA LAN
- Atlantic LAN

> The LAN access ports “SERVICE and “ATLANTIC” are blocked on the DSCXL board, if the board is used as a common control board.

V.24 interfaces

Table 3-39 lists the interfaces for connecting terminals and modems (service/HTS).

PIN No.	Signal	I/O	Note
1	DCD	I	
2	RXD	I	
3	TXD	O	
4	DTR	O	
5	0 V		Ground
6	DSR	I	
7	RTS	O	
8	CTS	I	
9	RI	I	

Table 3-39 V.24 interfaces

3.9.4 Power Supply

The board can plugged in and unplugged while the system is running. The power supply voltages (+12 V, +5 V and +3.3 V) are supplied through the backplane. DC/DC converter generates the individual power supply voltages needed for the various circuits on the DSCXL board.

3.9.5 Temperature Monitoring

The processor board and the processor itself are monitored using temperature sensors. If one of the two operating temperatures is exceeded, the speed of the fans in the CompactPCI shelf is increased to regulate the operating temperature.

3.9.6 Upgrading the S30810-Q2311-X Board to 1 GB

3.9.6.1 Important Notices

- The 1 GB memory module can only be used with the S30810-Q2311-**X** board (DSCXL with 256 MB on-board) if the board status is higher than D5. The lowest possible board status is E1.
- If the 1 GB memory module is used in the S30810-Q2311-**X** board, this can only be operated as of HiPath 4000 V4. The corresponding loadware for controlling the 1 GB memory module is only supplied as of HiPath 4000 V4.

- If the 1 GB memory module is used with the S30810-Q2311-**X** board, this is detected by the loadware and the 256 MB on-board memory is blocked by the loadware during booting. As a result, the maximum memory capacity is always 1 GB.

3.9.6.2 Upgrade Procedure

Verifying whether the board can be upgraded to 1 GB

1. Query the output of the boot process (also possible remotely and via UW7):

   `STA-LIST:":<BOOTMEDIUM>:HIM/BS/ADP/POWERON",BEGADR=0,AUSART=S;`

   `STA-LIST":<BOOTMEDIUM>:HIM/BS/CCA/POWERON",BEGADR=0,AUSART=S;`

   `STA-LIST":<BOOTMEDIUM>:HIM/BS/CCB/POWERON",BEGADR=0,AUSART=S;`

   `<BOOTMEDIUM>`: A1H1F: for the HD (:A1H6F:, if booted from the MO/HDCF)

   `<PROCESSOR>`: ADP, CCA, CCB (in the case of mono: CCA)

   See **Extract from the output of the STA-LIST command (example: ADP)**.

2. Search for "PCB-ID" in the output text.

   If a number **less than 03** is given, the board you have queried has the board status **D5 or older** and cannot be upgraded.

   If a number **greater than or equal to 03** is given, the board you have queried has the board status **E1 or newer** and can be upgraded using the 1 GB memory module.

Reducing the duration of the boot process during upgrades

In order to keep the boot process as short as possible during upgrades, proceed as described below.

> If the number "9" appears on the SSD display it can generally be assumed that the new boot process has already loaded and that the board can be removed and up-graded with 1 GB.

DUPLEX systems

- ADP

  1. Perform a reload of the ADP.

     UnixWare will be shut down properly as part of this reload. As a result of the reload, the new loadware will be loaded to the board. You do not need to explicitly switch off the hard disk.

2. Remove the board when the number "9" appears on the SSD display or when "LOAD ALL REQUESTED" appears on the console.
3. Insert the 1 GB memory module in the slot provided.
4. Insert the board back into the CPCI.

- CC

  Upgrading the "active" board:

  1. Reload the "active" board.

     `EXEC-REST:TYPE=UNIT,UNIT=BPA,RSLEVEL=RELOAD;`

     The board now performs a reload and the system automatically switches to the standby board.
  2. Remove the board when the number "9" appears on the SSD display or when "LOAD ALL REQUESTED" appears on the console.
  3. Insert the 1 GB memory module in the slot provided.
  4. Insert the board back into the CPCI and wait until it has booted.

  Upgrading the standby board:

  1. Reload the standby board (now the "active" board).

     `EXEC-REST:TYPE=UNIT,UNIT=BPA,RSLEVEL=RELOAD;`

     The board now performs a reload and the system automatically switches to the original "active" board that is currently running in standby mode.
  2. Remove the board when the number "9" appears on the SSD display or when "LOAD ALL REQUESTED" appears on the console.
  3. Insert the 1 GB memory module in the slot provided.
  4. Insert the board back into the CPCI and wait until it has booted.

> You can also upgrade the standby board first, followed by the "active" board. You should note that following a successful upgrade, the standby processor becomes the active processor.

Mono systems

> In the case of mono systems, reloading the processor or board will result in a total system outage. Existing connections will be interrupted.

1. Reload the board.

   `EXEC-REST:TYPE=UNIT,UNIT=BP,RSLEVEL=RELOAD;`

   The board now performs a reload and existing connections are interrupted.

2. Remove the board when the number "9" appears on the SSD display or when "LOAD ALL REQUESTED" appears on the console.

3. Insert the 1 GB memory module in the slot provided.

4. Insert the board back into the CPCI and wait until it has booted.

Extract from the output of the STA-LIST command (example: ADP)

```
..START BOOT VERSION H062-N-066 (FLASH 2 LOADED) CARD TYPE: DSCXL-X..01    00201
00B     LAN        0290    MAC: 00 0F BB 0E 03 D4 ..04     015213A8     V.24       008
0 ..06     12098086     LAN-UW7    0290    MAC: 00 0F BB 0E 03 D5 ..0A     4028110A
  CGA5L      0480 ..14     33301344     PCI-PCI    02B0 ..    0E     06801095     IDE
     0290 ..18     33201344     NORTH      02A0 ..RESTART REASON DETERMINATION..
      RESTART REASON (RR) SAVED IN BCA:00 ..          RR IN HW PORTS: SUM (FWLP /
 RRP):0008 (008E / 0004 )..RESTART REASON   :   POWERON....RESTART MANAGER DATA:.
.                HD-PDS   MO-PDS   HD-GLA   RESCUE..SCSI ID      :      00       05
   00       00       ..AREA SIGN    :                                  ..AREA NAM
E    :      PDS      PDS      GLA      GLA      ..RELOAD SEQ. :      01       02       0
3       04       ..AREA STATUS :  ACTIVE   ENABLE   ENABLE   DISABLE ..AREA CONFIG.:
 ENABLE   ENABLE   ENABLE   DISABLE ..ACTIVE LOAD AREA:    HD-PDS..RESTART REASON
:   POWERON..HARD REST COUNT :         00 ..RELOAD COUNT     :         01 ..SYSTEM
RELOAD    :     FALSE....CPU-ID : GenuineIntel..         47 65 6E 75 69 6E 65 49
6E 74 65 6C B4 06 00 00 ....PCB-ID : 04     SHELF-ID : 00     SLOT-ID : 01 ..MEMOR
Y: ..  LOCAL MEMORY: ..    CAS                  :   3 ..    FINE ADJUST       : 1D
...
```

3.10 HUBC

The hub controller (HUBC) board is required to support the local area network (LAN) in all HiPath 4500 configurations. This board provides the physical link between the administration and data processor (ADP), active switching unit (SWU), and standby SWU.

The HUBC board is a centralized wiring hub for the twisted pair Ethernet star topology. It is controlled by the ADP. The HUBC board provides basic Ethernet management. The ADP uses free I/O addresses to access the HUBC board through the multibus 1 interface. The ADP reads the HUBC board port status information and disables ports if necessary. The ADP writes the link status for the eight twisted pair ports to the HUBC board LED register, providing the port status LED indications. The HUBC board is installed in slot 25 and controlled by the ADP (DPC5 in slot 31).

Figure 3-25 shows HUBC LAN configuration examples.

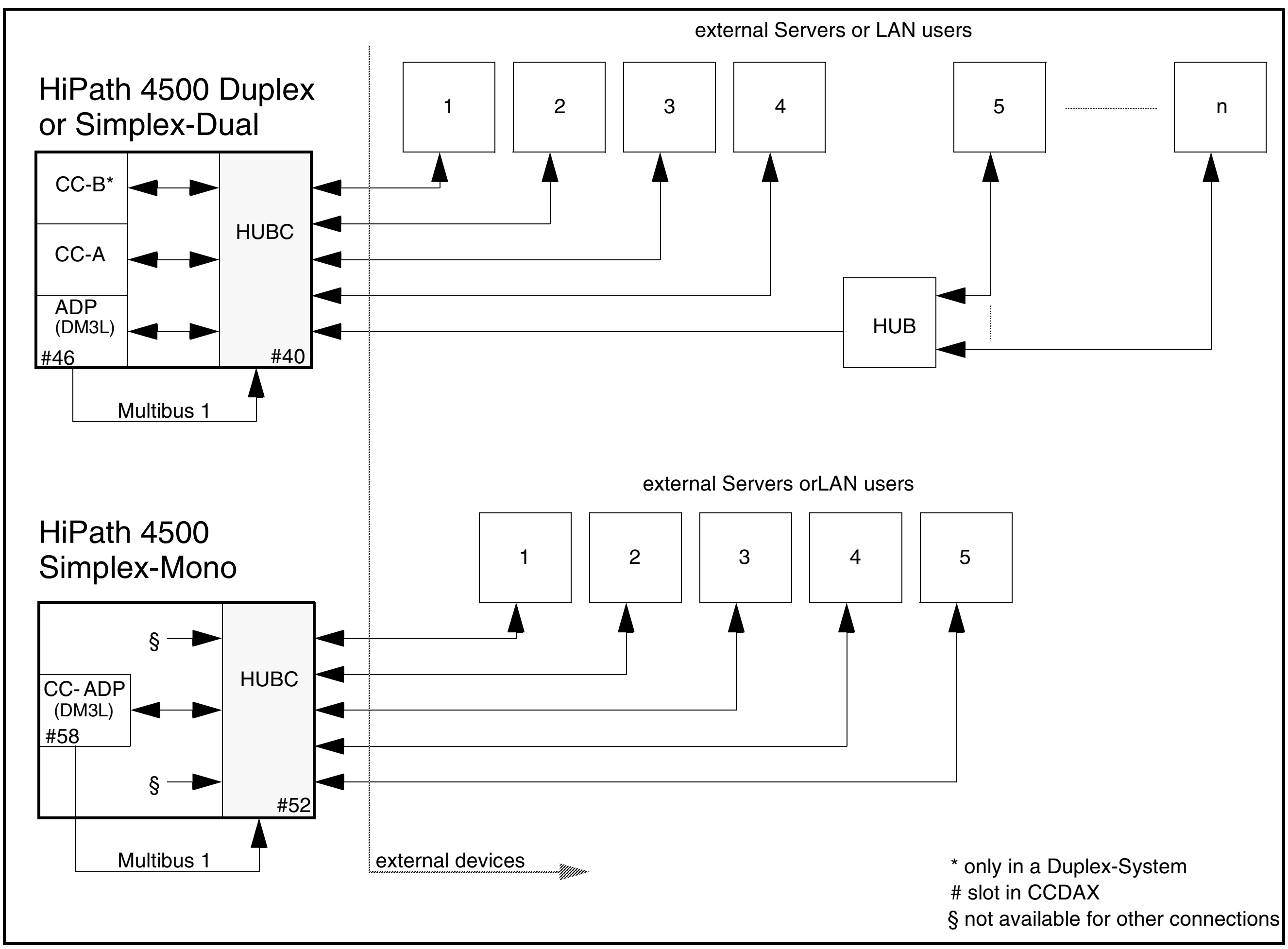


Figure 3-25 HUBC, LAN Configuration Examples

3.10.1 Functions of the Board

The LAN chipset of the board performs the following functions:

- Reception and distribution of data packets
- Various error detection and error localization
- Automatic connection verification by sending and receiving periodic connection verification pulses
- Controlling processor board can query the statuses of the LAN ports and connections and initialize the LEDs accordingly (LEDs currently show connection verification results)
- Controlling processor board can also deactivate individual LAN ports, such as block connection paths.

3.10.2 LED Indications

The front panel of the HUBC board (see Figure 3-26) has 8 LEDs (one for every port).

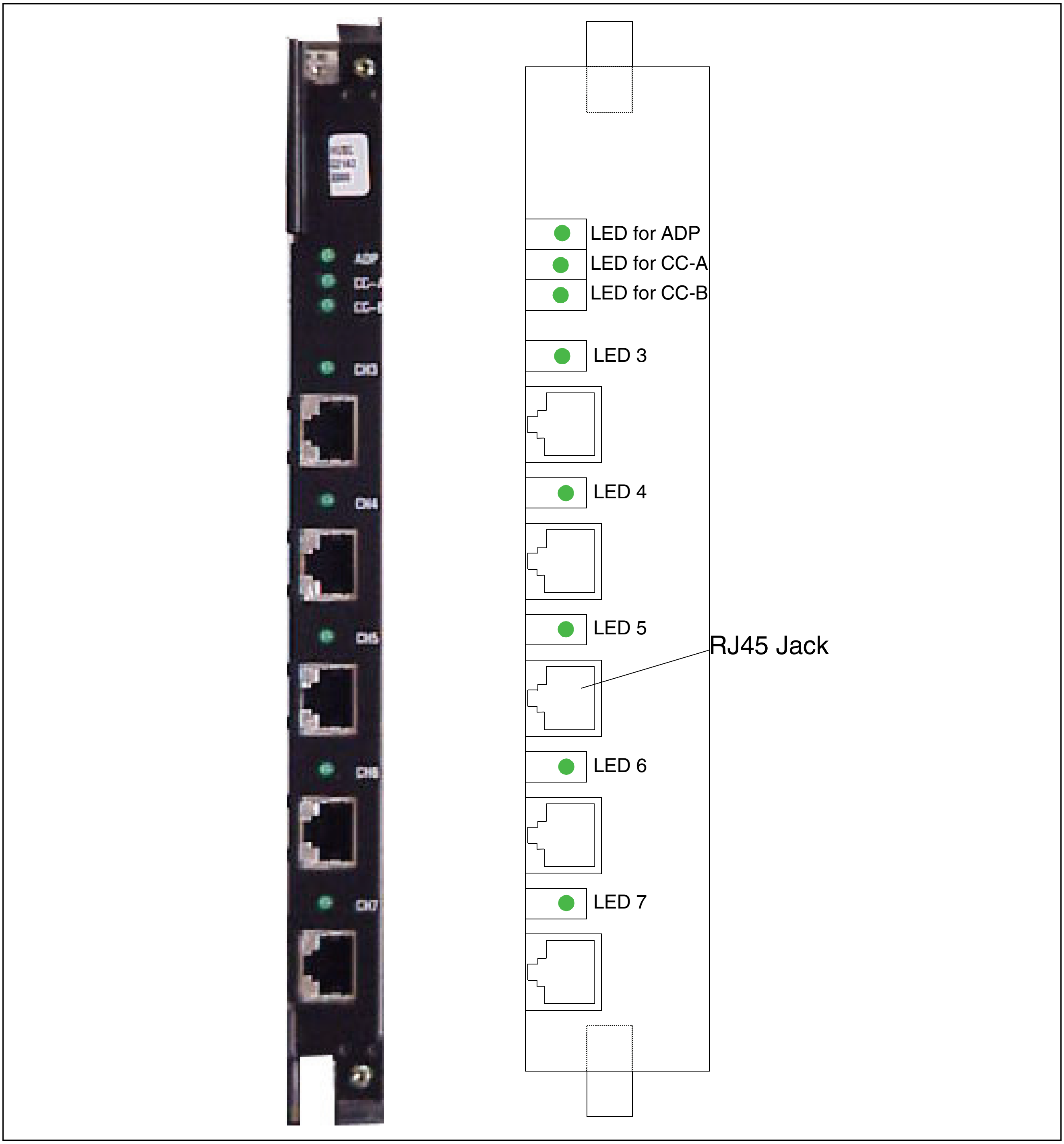


Figure 3-26 HUBC Board Front Panel

Table 3-40 lists the LED indications for the HUBC Board.

Port Number	Color	State	Indication
ADP	Green	On	Port status is active
CC-A	Green	On	Port status is active
CC-B	Green	On	Port status is active
CH3	Green	On	Port status is active
CH4	Green	On	Port status is active
CH5	Green	On	Port status is active
CH6	Green	On	Port status is active
CH7	Green	On	Port status is active

Table 3-40 HUBC Board LED Indications

3.10.3 Connectors

The front panel of the HUBC board (Figure 3-26) contains five shielded RJ45 jacks for external LAN connections (refer to Table 3-41).

The cross-connection of the transmit outputs to the receive inputs and vice-versa is done on the HUBC card. Only shielded cables (STP) with a maximum length of 100 m are allowed.

Connector	Description
1	LANTRA
2	LANTRB
3	LANRVA
4	NC (not connected)
5	NC (not connected)
6	LANRVB
7	NC (not connected)
8	NC (not connected)

Table 3-41 HUBC, RJ45 Connections

3.10.4 Card interface Connector to the Backplane

	E 4	D 3	C 2	B 1	A 0	
						1
		ADR1*	GND	ADR2*		2
	ADR3*					3
	ADR7*	ADR8*	ADR9*	ADRA*		4
X1	ADRB*	ADRC*	ADRD*	ADRE*		5
	ADRF*					6
						7
			GND			8
						9
	+5V	+5V	+5V			10
	DAT0*	DAT1*	DAT2*	DAT3*		1
	DAT4*	DAT5*	GND	DAT6*		2
	DAT7*					3
						4
X2						5
						6
						7
			GND			8
						9
		+5V	GND			10
						1
			GND			2
						3
						4
X3				TDI		5
			TRST			6
		TMS		TDO		7

Table 3-42 HUBC, SIPAC Connector Signal Assignment

	TCK		GND			8
						9
		+5V	GND			10
X4	IORC*	IOWC*				1
		XACK*	GND			2
						3
						4
						5
						6
						7
		INT6*	GND			8
						9
		+5V	+5V			10
X5						1
			GND			2
						3
						4
						5
						6
						7
			GND			8
						9
		+5V	+5V			10
X6						1
			GND			2
	LANTRA2	LANTRB 2	LANRVA2	LANRVB2		3
						4
						5
	LANTRA1	LANTRB 1	LANRVA1	LANRVB1		6
						7

Table 3-42 HUBC, SIPAC Connector Signal Assignment

			GND			**8**
	LANTRA0	LANTRB 0	LANRVA0	LANRVB0		**9**
		+5V	GND			**10**
						1
			GND			**2**
						3
						4
X7						**5**
						6
						7
			GND			**8**
						9
		+5V	GND			**10**
						1
			GND			**2**
						3
						4
X8						**5**
						6
						7
			GND			**8**
						9
	+5V	+5V	+5V			**10**
						1
			GND			**2**
						3
						4
X9						**5**
						6
						7
			GND			**8**

Table 3-42 HUBC, SIPAC Connector Signal Assignment

					9
4	3	2	1	0	
E	D	C	B	A	

Table 3-42 HUBC, SIPAC Connector Signal Assignment

The Multibus 1 interface is through the SUs (System Units) X1, X2, X4. 12 address and 8 data bits are used for I/O accesses from the DM3L to the HUBC.

In SU 6, the LAN interface to ADP, CC-A and CC-B is arranged. The transmit outputs (LANTR..) and the receive inputs (LANRV..) are cross-connected in the backplane.

SU 3 contains the Boundary Scan signals for board/card testing. These signals are not used by the HUBC card.

3.10.5 Removing the HUBC Board

> **Warning**
> This procedure removes the HUBC board, ADP, and external server applications from service.

> **Attention: Static Sensitive Devices**
> Observe all precautions for electrostatic discharge.

Remove the HUBC board from the HiPath 4000 as follows:

1. If applicable, deactivate ACD UNIX software in the DMP5L board).
2. Deactivate UNIX software as follows:
   a) If applicable, deactivate ACD UNIX software in the DMP5L board.
   b) Deactivate UNIX software in the ADP.
   c) Deactivate the ADP hard disk drive.
3. For a dc-powered HiPath 4500, continue to step 5. For an ac-powered HiPath 4500, proceed as follows:

   At the back of shelf 2 in cabinet 1, turn off the backup battery circuit breaker.
4. Turn off the ADP power switch on the CCDAX DC-to-DC shelf power module. For a redundant CCDAX shelf, turn off both DC-to-DC ADP power switches.

> Do not turn off the CCDAX DC-to-DC shelf common control (CC-A or CC-B) power.

5. Label and remove the twisted pair Ethernet (RJ45 connectors) interfaces from the HUBC front panel (Figure 3-26), if applicable.
6. Using the board extractor, unseat the board and remove it from the shelf.

3.10.6 Replacing the HUBC Board

Replace the HUBC board in the HiPath 4500 as follows:

1. Slide the HUBC board into the appropriate slot until it is seated into the backplane connector.
2. Reconnect the twisted pair Ethernet (RJ45 connectors) interfaces to the HUBC front panel, if applicable.
3. Turn on the ADP power switch on the CCDAX DC-to-DC shelf power module. For a redundant CCDAX shelf, turn on both DC-to-DC ADP power switches.
4. For a dc-powered HiPath 4500, continue to step 5. For an ac-powered HiPath 4500, proceed as follows:

   At the back of shelf 2 in cabinet 1, turn on the backup battery circuit breaker.
5. Activate UNIX software as follows:
   a) Activate the ADP hard disk drive.
   b) Activate UNIX software in the ADP.
   c) If applicable, activate ACD UNIX software in the DMP5L board.

3.10.7 Verifying the HUBC Board

Verify the operation of the HUBC board in the HiPath 4500 as follows:

1. Wait approximately 15 minutes for the ADP to reinitialize.
2. Ensure that a - (dash) and a . (dot) appear on the ADP DPC5 board.
3. Ensure that the HUBC board status (green) LEDs are lit for the ADP, CC-A, CC-B (redundant CCDAX), and all applicable channels for external servers.

4. Ensure that the HUBC board is in service as follows:
   a) Type `DIS-SDSM` and press **Enter**.
   b) Type the following values, then press enter.

Field	**Value**
UNIT	**A1**
AREA	**file**

3.11 LTUCA

The LTUCA (Line Trunk Unit Control Advanced) board (see Figure 3-27) is the interface between central and peripheral parts of the system. The LTUCA selects the signals from the active control unit and distributes them to the appropriate boards in the LTU shelf (LTU shelf is a general expression for all types of peripheral shelf. It can be one of the compact or extended compact shelves). The LTUCA also receives signals from the peripheral boards and transmits them to the common control.

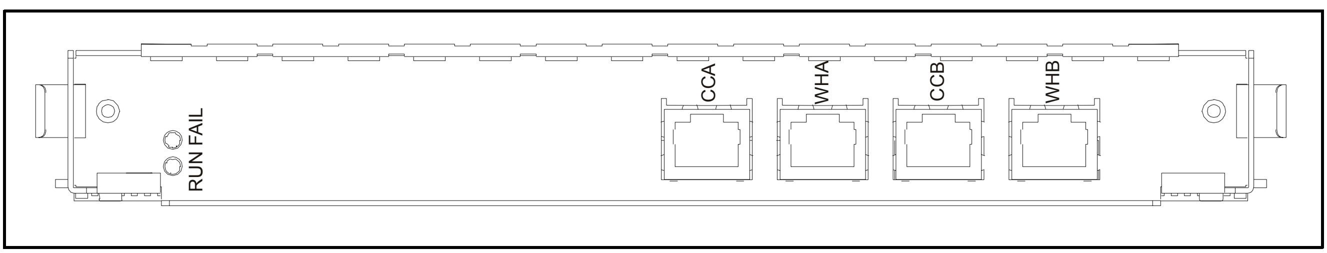
Existing LTU cables are replaced by the new high-speed cables (HSC) (RJ45 CAT5). The signals are routed in a multiplexed data flow. This multiplex functionality is supported on the common control side of the RTM board and on the peripheral side of the LTUCA board.

Two (HSC) interfaces are provided on the LTUCA for CCA and CCB. Two additional lines are connected for broadband applications. Four RJ45 connector sockets are installed for this on the front of the LTUCA board. In this case, a maximum of only eight peripheral LTU shelves can be connected for each HiPath 4000 V2 system.

The LTUCA board can be integrated in the following system architectures:

- Hicom 300 (Atlantic architecture)
- HiPath 4000 (AP3300 flexpack)
- HiPath 4000 (AP3700 19“ architecture)

The LTUCA does **not** replace the LTUCX or LTUCE in existing systems. These boards are still used because the LTUCA is not compatible with existing processor boards.



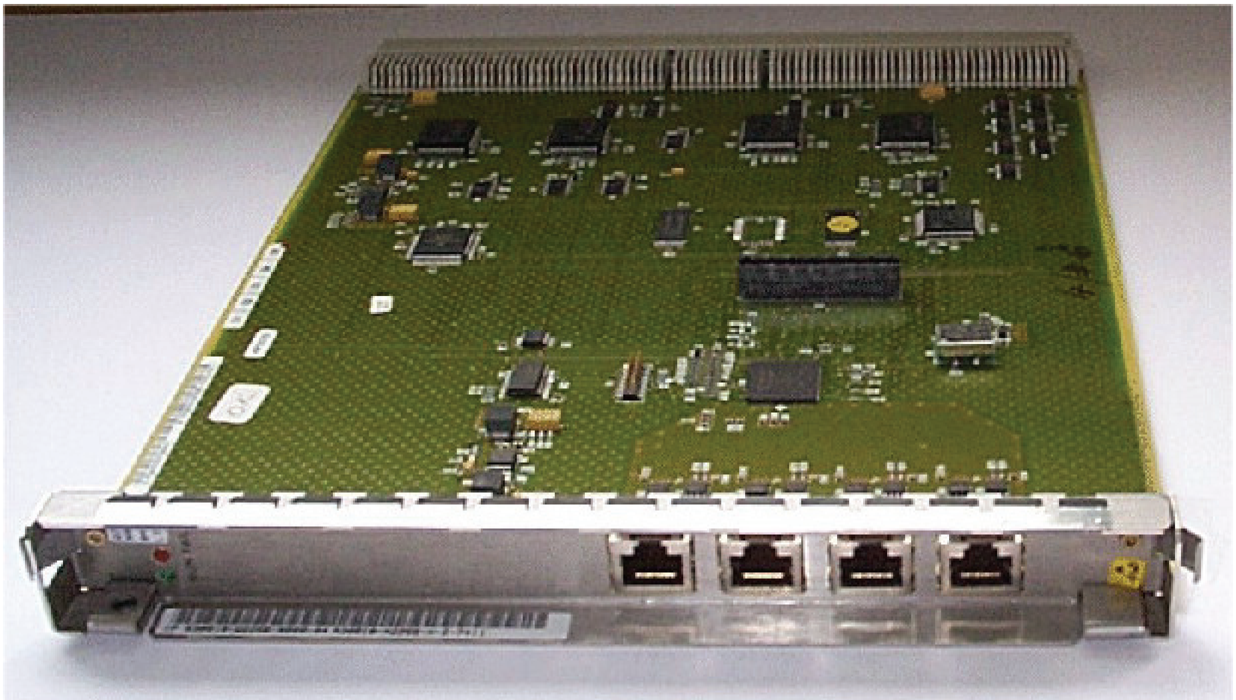


Figure 3-27 LTUCA Board

3.11.1 LEDs

The front side of the board features a green LED (RUN) and a red LED (FAIL) that indicate board status.

3.11.2 Hardware Part Number

S30810-Q2266-X-*

3.11.3 Use in Extended Shelves

The LTUCA board can be used in the following extended shelves:

LTUW: S30804-B5367-X/B5385-X and B5388-X

L80XF: S30804-B5379-X and B5389-X

L80XW: S30804-B5366-X

AP3700: S30807-U6620-X

3.11.4 Cable Types

The following CAT 5 RJ45 cable types are available for connecting the LTU shelf:

C39195-Z7211-A20	, 2 m	twisted cable, 10BT (RJ45)
C39195-Z7211-A50	, 5 m	twisted cable, 10BT (RJ45)
C39195-Z7211-A100	, 10 m	twisted cable, 10BT (RJ45)

3.11.5 LTUCA Hardware Concept (Application Scenarios)

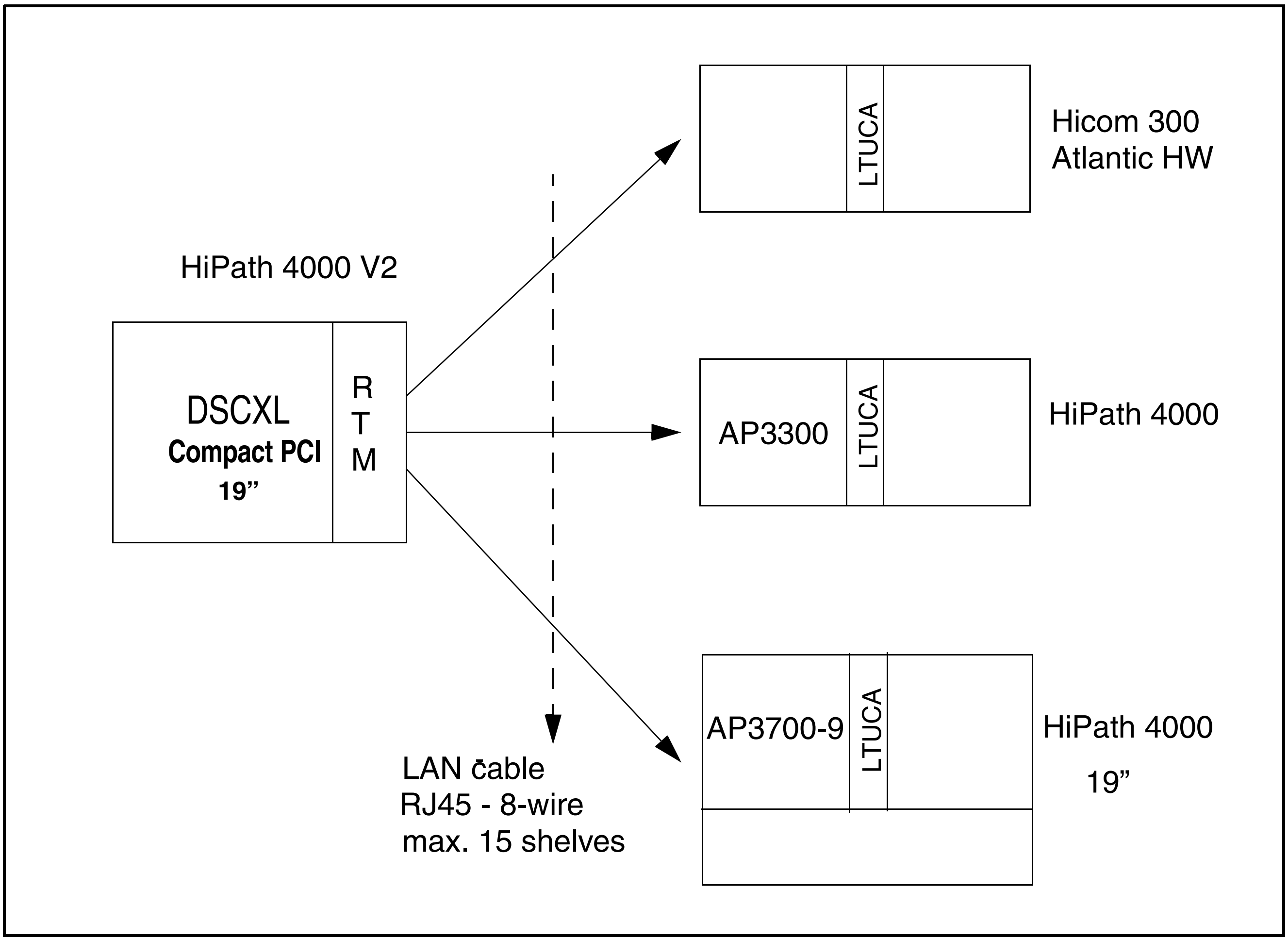


Figure 3-28 LTUCA Diagram for HiPath 4000 V2.0

3.11.6 Power Supply

The LTUCA board receives a direct current of 5 V over the backplane. The individual voltages required (1.8 V/3.3 V) are generated by the DC/DC converter on the board.

3.12 LTUCE

The LTUCE is the interface between central and peripheral parts of the system. It has an interface to the MTSCG /SICOE and the QDCL boards of both common controls. The transmission mode to and from the common control is balanced. On the peripheral part the LTUCE has an interface to all boards in the shelf with an unbalanced transmission mode. The LTUCE selects the signals from the active common control and distributes them in the LTU-Shelf (LTU-Shelf is a general expression for the peripheral-shelf. It can be one of the compact- or extended compact-shelf). The LTUCE also receives signals from the peripheral boards and transmits them to the common control.

Figure 3-29 shows the LTUCE board block diagram.

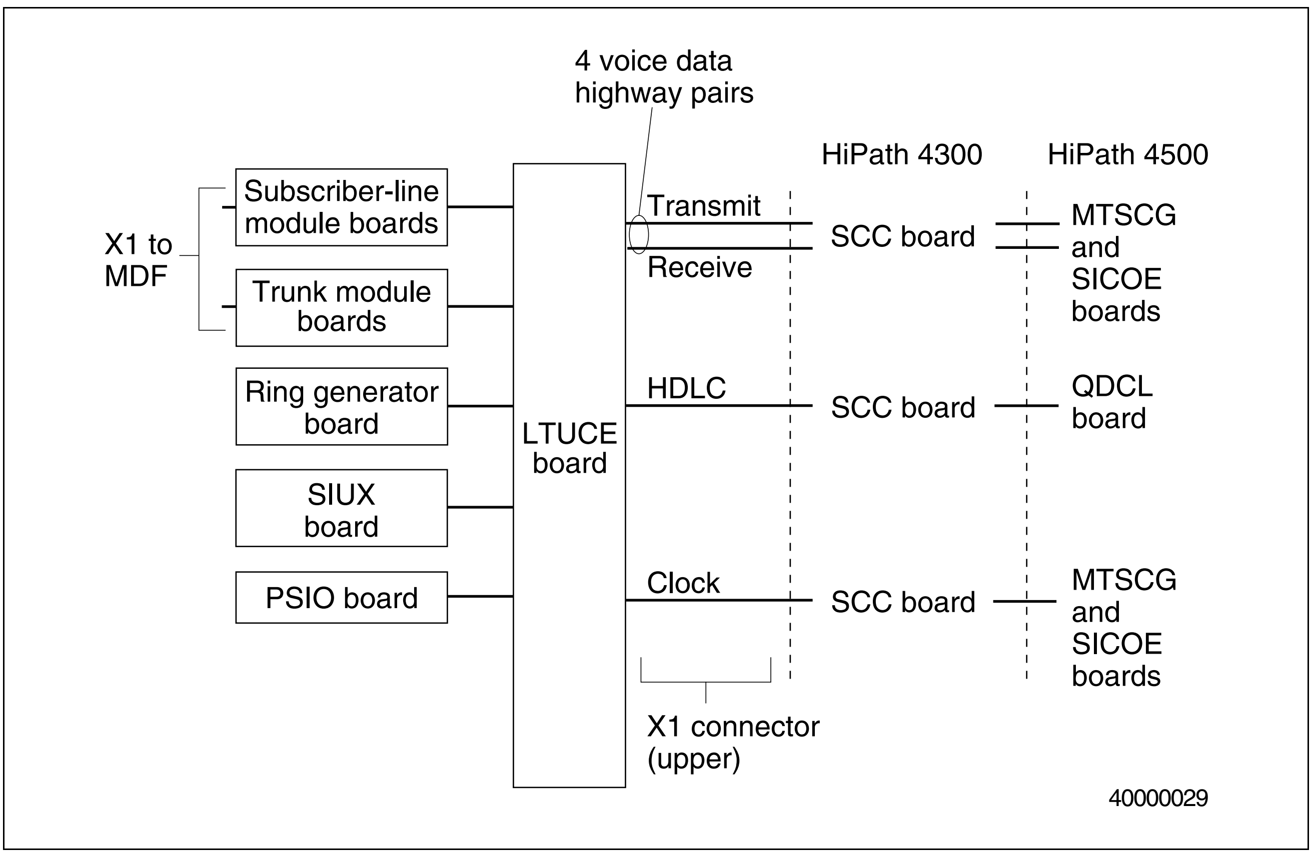


Figure 3-29 LTUCE Board Block Diagram

3.12.1 LED Indications

The LTUCE board front panel (see Figure 3-30) has:

- One top (red) LED for startup and error reporting

- One bottom (green) LED for operation status information

Figure 3-30 LTUCE Board Front Panel

Table 3-43 shows the LED indications for the LTUCE board.

LED	State	Indication
Green	On	Board is active and all channels are idle.
	Flashing	One or more channels is active.
	Off	Board is not initialized or has a fatal error.
Red	On	Initial board test in progress or a fatal board error is detected.
	Flashing	Board loadware is loading.
	Off	Board is operating normally.

Table 3-43 LTUCE or LTUCP Board LED Indications

3.12.2 Interface to MTSCG and SICOE Boards

The LTUCE has an interface to the MTSCG board if it is plugged in LTU-shelves 1..7. If it is plugged in the LTU-shelves 8..15 it has an interface to the SICOE board. The LTUCE does not know which board it interfaces with (MTSCG, SICOE) due to the same treatment of the transmitted bytes.

The LTUCE board is compatible to the other HiPath systems highway interfaces.

- **MTSCG**
  The MTSCG board has an interface of four 4 Mbps highways with a total of 256 time slots to the switching network part of the MTSCG board. From the clock generator part there is an input of a 2.048MHz System-Clock (CKA) and a 4kHz clock for synchronization (FMB). In case of system architectures which runs in duplex mode, an Active signal (ACT) indicates which of the redundant common control functions are in active state. This signal is an input. It contains information that identifies whether the common control A or B is active or not. If there is no Active-Signal from either common control, there is a default adjustment to common control A. For system synchronization purpose it is necessary to adjust the system to the clock, generated by an other system (HiPath or Central office). Trunk cards are able to recover this clock and extract the Reference-Clock (RCLK). The LTUCE transmits this reference clock from the periphery to the central clock generator on the MTSCG board. This centralized clock generator is able to synchronize on this clock . Through the ACT signal the SICOE board transmits the CKA and FMB clocks from the clock generator part of the MTSCG to the LTUCE.

- **SICOE**
  The SICOE board and the MTSCG board uses the same interface. The SICOE has an MTS function._Through the ACT signal the SICOE board transmits the CKA and FMB clocks from the clock generator part of the MTSCG to the LTUCE. The RCLK clock from the periphery is also transmitted to the clock generator part of the MTSCG.

3.12.3 Input from the Peripheral Shelf

Additionally there are wires in the LTU shelf where only certain boards have access independent of the slot they are plugged in.

- Input of a reference clock RCLK and the matching clock active signal RAC from the trunk boards in the shelf
- Input of synchronization signals RGSYN or WGSYN from the RG
  An HDLC controller is not available to the RG so there is a special interface between RG and LTUCE. The LTUCE requests the hardware ID and initializes the RG through this interface. It consists of a bidirectional data line (RGD) and a clock line (RGCL). With RGD the LTUCE initializes the RG and also receives the answer. RGCL provides the clock for this interchange of data.

3.12.4 Pin Assignment

The LTUCE (Q2148) has two SIVAPAC connectors at the back of the board. Table 3-44 lists the pin assignments for the upper SIVAPAC connector on the LTUCE board.

Upper Connector					
41	HDIPA	21	+5V	01	HDIPB
42	HDINA	22	GND	02	RGCL
43	HO0PA	23	HDINB	03	HO0PB
44	HO0NA	24	HDOPB	04	HO0NB
45	HO1PA	25	HDONB	05	HO1PB
46	HO1NA	26	HDOPA	06	HO1NB
47	HO2PA	27	HDONA	07	HO2PB
48	HO2NA	28	GND	08	HO2NB
49	HO3PA	29	SHRESPA	09	HO3PB
50	HO3NA	30	SHRESNA	10	HO3NB
51	HI0PA	31	SHRESPB	11	HI0PB
52	HI0NA	32	SHRESNB	12	HI0NB
53	HI1PA	33	GND	13	HI1PB
54	HI1NA	34	ACTPA	14	HI1NB
55	HI2PA	35	ACTNA	15	HI2PB
56	HI2NA	36	NC	16	HI2NB
57	HI3PA	37	ACTPB	17	HI3PB

Table 3-44 LTUCE Upper Connector PIN Assignments (Seite 1 von 2)

Upper Connector					
58	HI3NA	38	ACTNB	18	HI3NB
59	RCLKPA	39	GND	19	RCLKPB
60	RCLKNA	40	+5V	20	RCLKNB

Table 3-44 LTUCE Upper Connector PIN Assignments (Seite 2 von 2)

Table 3-45 lists the pin assignments for the lower SIVAPAC connector on the LTUCE board.

Lower Connector					
41	FMBPA	21	+5V	01	HDIL
42	FMBNA	22	GND	02	HDOL
43	CKAPA	23	RGD	03	CKAPB
44	CKANA	24	FMBPB	04	CKANB
45	RESET9	25	FMBNB	05	RESET8
46	WGSYN	26	RESET7	06	RESET6
47	RGSYN	27	RESET10	07	RCLK
48	RESET11	28	GND	08	RAC
49	RESET12	29	RESET5	09	RESET4
50	HO5	30	RESET13	10	HO2
51	HO6	31	HO3	11	HO1
52	HO7	32	HO4	12	HO0
53	RESET14	33	GND	13	HDOR
54	RESET15	34	RESET3	14	RESET2
55	CKAR	35	RESET16	15	CKAL
56	FMBR	36	RESET1	16	FMBL
57	HI5	37	HI3	17	HI2
58	HI6	38	HI4	18	HI1
59	HI7	39	GND	19	HI0
60	HDIR	40	+5V	20	RESET17

Table 3-45 LTUCE Lower Connector Pin Assignments

3.12.5 Removing the LTUCE Board

This procedure removes the LTUW or L80XF shelf from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

To remove the LTUCE board:

1. Remove power from the board by deactivating and turning off the shelf.
2. Using the board extractor, unseat the board and remove it from the shelf.

3.12.6 Replacing the LTUCE Board

To replace the LTUCE board:

1. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
2. Reapply power to the board by turning on and activating the shelf.

3.12.7 Verifying the LTUCE Board

To display the status of the LTUCE board:

1. Type **`DIS-SDSU`** and press **Enter**.
2. Type the following values, then press **Enter**.

Field	**Value**
LINK	<Blank>
LTG	<1 - 32>
LTU	<1 - 15>
SLOT	<slot number>
CCTNO	<1 - 63>

3. Ensure that the LTUCE shows a `READY` status.

3.13 LTUCX

The line trunk unit control extended (LTUCX) board has **twice the number of speech highways** as in the former LTUCE board. It is supported for a standard LTU shelf by adding new 2x4x2 MB highways (HWY bundle F = 256 TSL) to the already existing 2x4x2 megabit highways (HWY bundle A = 256 TSL). The result are 16x2 megabit HWYs = 512 TSL. (Time SLot) As an LTU shelf is devided into two shelf halfs, each shelf half supports 128TSL of bundle A and 128TSL of bundle F.

The additional speech highways can only be used by boards which support this feature (for example the DIU-N2 and DIU-N4 boards). Within the board configuration it is determined if the board uses the standard speech highways or the additional ones. Simultaneous use of all highways is not supported with this feature.

You can now use a few new boards (to access additional highways; reservation of many TSLs for every board; for example, DIU-N4 = 128 TSL) with a greater number of old boards (only access to the standard highways; reservation of few TSLs per board) together in the same shelf in a **non blocking configuration**.

3.13.1 Prerequisites

The LTUCX board is configured and plugged into a peripheral shelf. Additional speech highways are connected by means of an additional LTU cable from the common control unit (CC) to this LTUCX board.

For duplex systems, an additional cable is required from the active CC and from the standby CC to the LTUCX. Only the speech highways are used in the additional cables, not the HDLC signalling. The HDLC signalling is done only through the standard LTU cable.

To assign the additional LTU cables to the standard LTU an Overlay LTU is configured. The Overlay LTU reserves the additional LTU cables. Peripheral boards cannot be configured for the Overlay LTU.

The LTUCX board doubles the number of speech highways for a shelf.

Figure 3-31 shows the highway assignments of the LTUCX board.

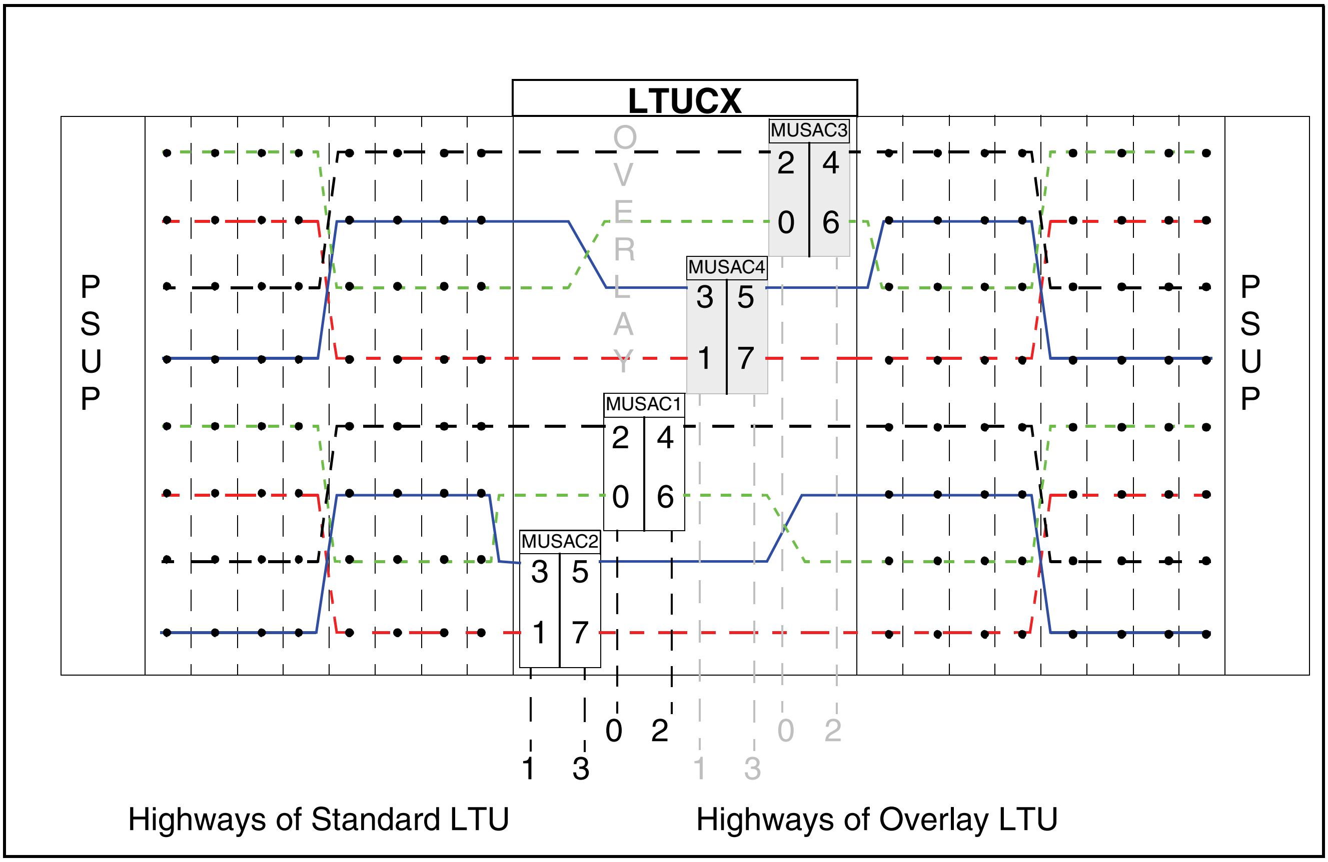


Figure 3-31   Highway Assignment of LTUCX Board

Figure 3-32 shows the overlay LTU assignment to the standard LTU.

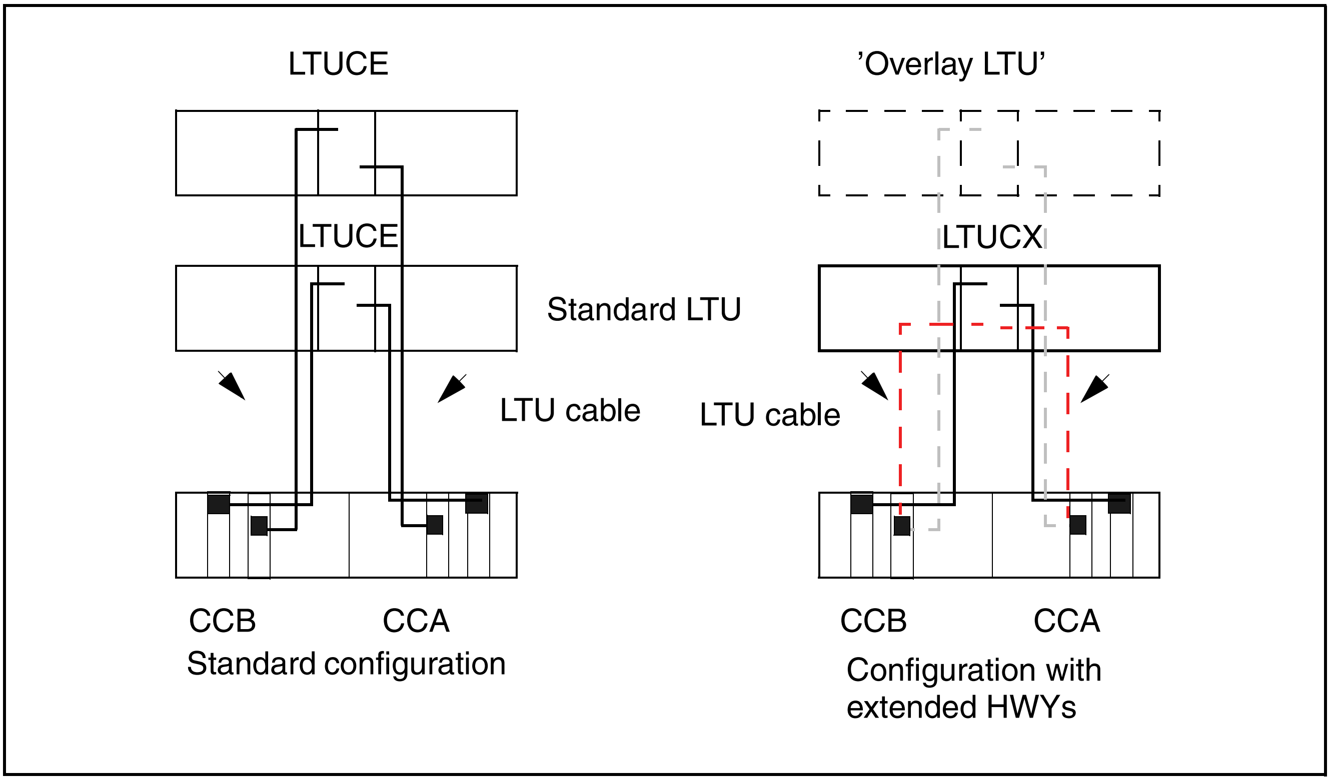


Figure 3-32 Assignment of Overlay LTU to Standard LTU

Figure 3-33 shows the standard configuration to highway bundle A.

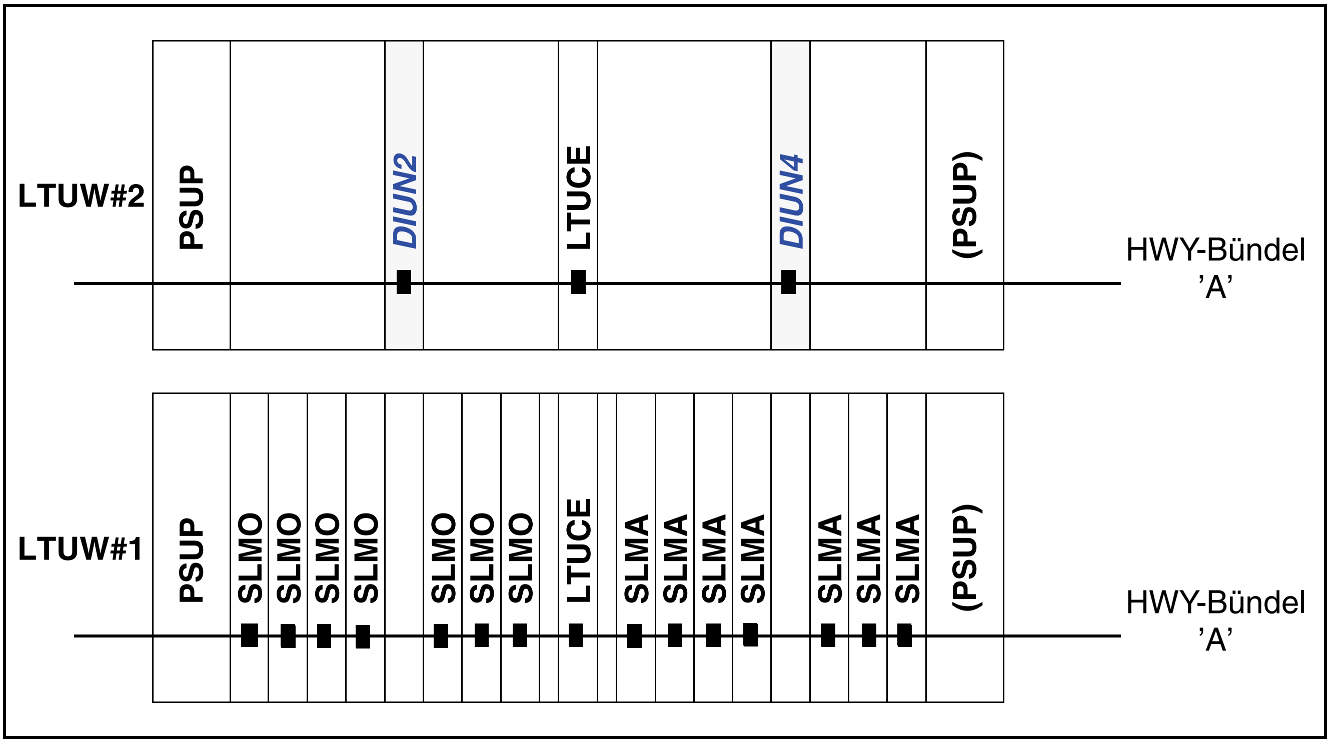


Figure 3-33 Standard Configuration with Access only to Highway Bundle A

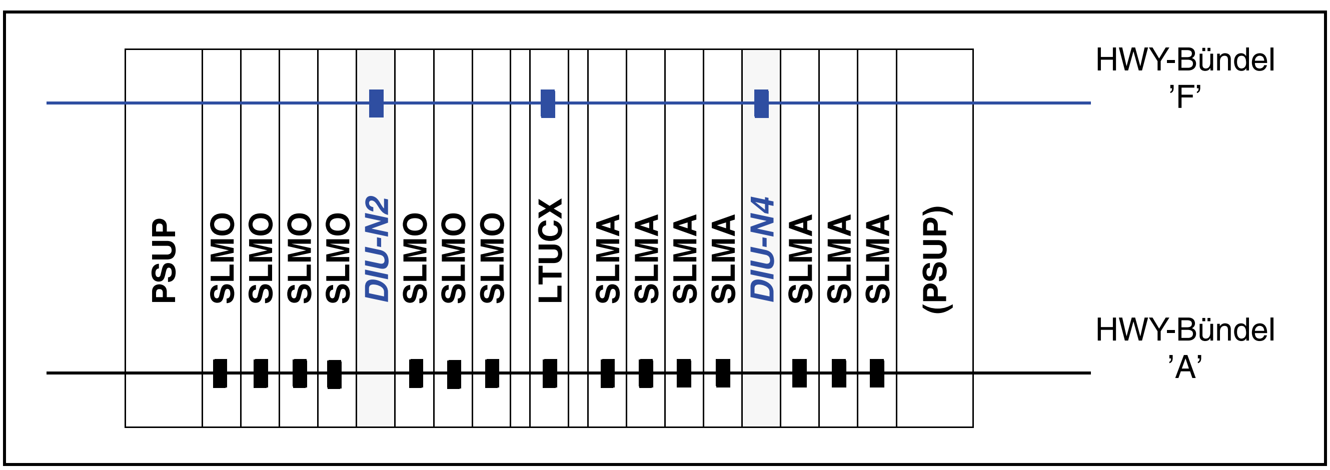


Figure 3-34 Overlay Configuration with Access to Standard HWY Bundle A and Additional HWY Bundle '

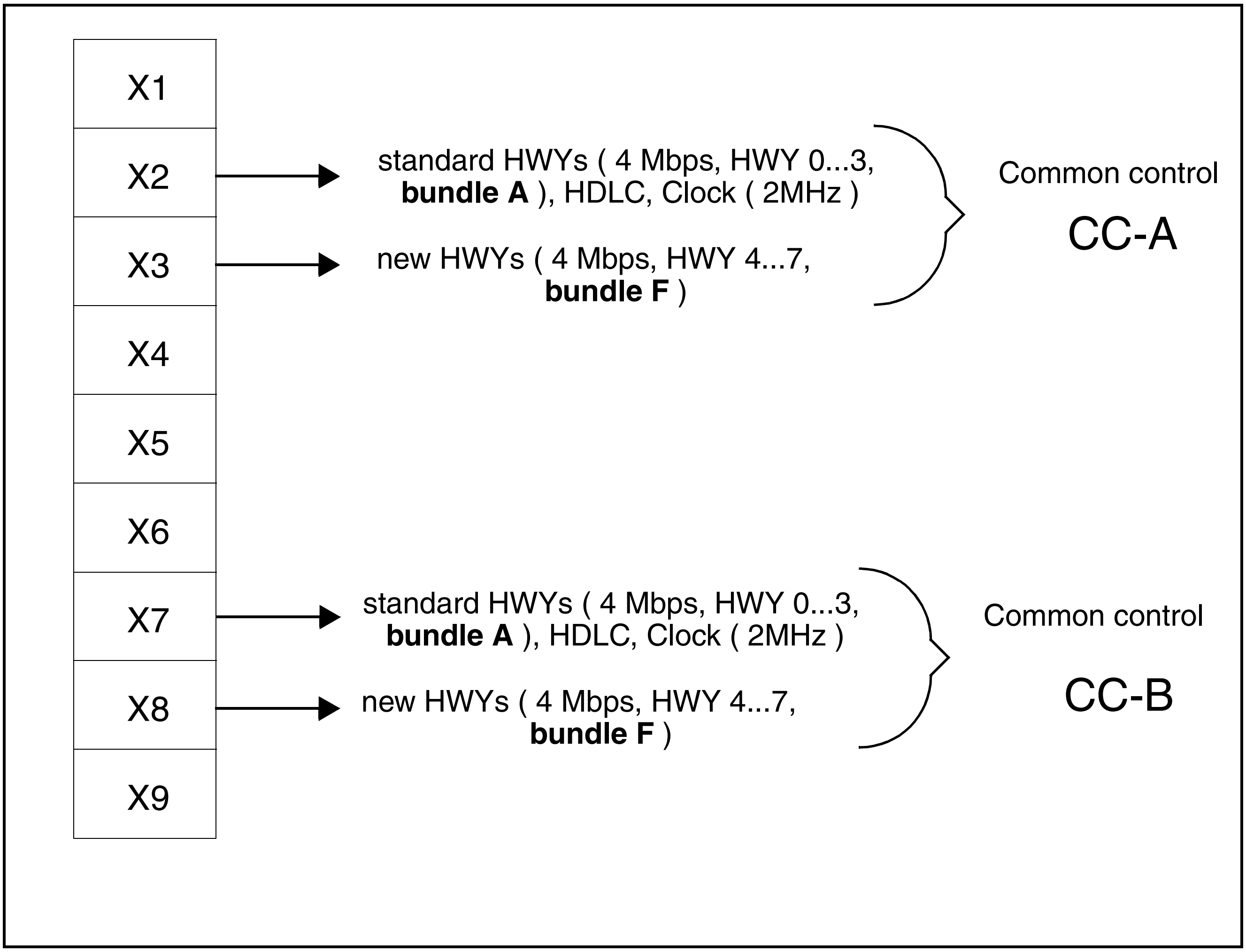


Figure 3-35 Connectivity of the Four LTU Cables at the LTUCX Connector

This feature is available with HiPath 4000 V1.0.

The following switch platforms are supported:

- HiPath 4300
- HiPath 4500

3.13.2 Feature Characteristics

- The LTU number for the Overlay LTU is derived automatically from the valid range or by user request (refer to Table 3-46).
- The board LTUCX is primarily designed to support the use of additional speech highways to double their number.

- The LTUCX is also able to replace the LTUCE board (LTUCE functionality without HWY extension).

Table 3-46 lists the possible PBX functions of the LTUCX board.

PBX Platform	LTUC-Type	Function
80 CMX	LTUCX	Only LTUCE, LTUCX replacement
80 CMX-DSC	LTUCX	Only LTUCE, LTUCX replacement
80 CXE	LTUCX	Extended use of LTU shelf +LTUCE, LTUCX replacement
600 ECX	LTUCX	Extended use of LTU shelf +LTUCE, LTUCX replacement
600 ECS	LTUCX	Extended use of LTU shelf +LTUCE, LTUCX replacement

Table 3-46 LTUCX Board Functionality on PBX Types

- The LTU cables which are additionally connected to a configured standard shelf (with Overlay functionality) are no longer available for another standard shelf. The assignment of the additional LTU cables to a standard shelf reduces the overall maximum number of available physical LTU shelves. The overall maximum number of LTU cables in the system remains unchanged.

Table 3-47 lists the maximum physical shelf configuration of the LTUCX board.i

Switch Platform	Maximum Number of Physical Shelf by using Maximum Number of Possible Overlay Configurations	Possible LTU numbers for the Overlay LTU
80 CXE (3 peripheral shelves; Basic shelf can not be extended)	3 Shelves (Standard + Overlay): if virtual shelf numbers 5-7 are used for overlay configuration	5-7
	1 Shelf (Standard + Overlay) 1 Shelf (only Standard): if shelf number 2, 3 or 4 is used for overlay configuration	2-4
600 ECX (7 peripheral shelves)	3 Shelves (Standard + Overlay) 1 Shelf (only Standard)	1-7

Table 3-47 Maximum Number of Physical Shelves

Switch Platform	Maximum Number of Physical Shelf by using Maximum Number of Possible Overlay Configurations	Possible LTU numbers for the Overlay LTU
600 ECS (7 peripheral shelves)	3 Shelves (Standard + Overlay) 1 Shelf (only Standard)	1-7
600ECX (15 peripheral shelves)	7 Shelves (Standard + Overlay) 1 Shelf (only Standard)	1-15
600ECS (15 peripheral shelves)	7 Shelves (Standard + Overlay) 1 Shelf (only Standard)	1-15

Table 3-47 Maximum Number of Physical Shelves

- Signaling of MUSAC_A error indicates a defective MUSAC_A device on the board. If highways are assigned to this MUSAC_A the LTUCX board has to be replaced immediately. If highways are not assigned to this MUSAC_A the error does not affect the system operation at the moment. The service people have to decide if the LTUCX board should be replaced immediately or if replacement will be done later when the highways should be assigned to the defective MUSAC_A.

3.13.3 Configuring the LTUCX Board Using AMOs

With following AMOs the configuration of the Overlay LTU will be done resp. the Overlay configuration is used:

AMO	Parameter	Language	Description
UCSU	OVERLAY	d	Zuweisen der Overlay-LTU zu der Standard-LTU (Zweig ÄNDERN) Löschen der Overlay-Konfiguration (Zweig LÖSCHEN)
	OVERLAY	e	Assign the overlay LTU to the standard LTU (action CHANGE) Delete overlay configuration (action DELETE)
BCSU	HWYBDL	d	Gibt das gewünschte HWY-Bündel ’A’ oder ’F’ an (Zweig EINRICHTEN, TYP=DIU oder TYP=PER)
	HWYBDL	e	Specifies the HWY bundle ’A’ or ’F’ (action ADD, MTYPE=DIU or MTYPE=PER)
SDSU		d	Ist in der gewünschten Ausgabe die Information über eine etwaige Overlay-Konfiguration vorhanden, bzw. passend zu den Auswahlkriterien, so wird diese in geeigneter Weise angezeigt.

AMO	Parameter	Language	Description
		e	If the information about an overlay configuration fits to the given output criterias the output will be done with this information.

Table 3-48 AMO Commands

The following examples will show how to use the AMOs to configure an Overlay LTU and how to configure boards accessing the different HWY bundles:

- Configuring the Overlay LTU in the HiPath 4500:
  - Configure the standard shelf (LTU 1) with one LTUCX (Q2166-X) as follows:

    ```
    ADD-UCSU:UNIT=LTU,LTG=1,LTU=1,LTPARTNO="Q2166-X  ",FRMTYPE=LTUW;
    ```

  - Assign an overlay LTU number to standard LTU 1automaticall as follows:

    ```
    CHANGE-UCSU:UNIT=OVERLAY,LTU=1;
    ```

    The highest available LTU number is assigned as an overlay LTU to the standard LTU (e.g. LTU15). The value of the highest LTU number, that will be used as an overlay LTU depends on the configured SIU. If a SIU Q2234-X (hardware-ID H’2E0) is used, the highest possible LTU number to be used as an overlay LTU is 15. If a SIU Q2234-X100 (hardware-ID H’2E1) is used, the highest possible LTU number to be used as an overlay LTU is 7.

  - Assign an explicit user-requested overlay LTU 2 to standard LTU 1 as follows:

    ```
    CHANGE-UCSU:UNIT=OVERLAY,LTU=1,OVERLAY=2;
    ```

    Now the LTU number 2 is assigned as overlay LTU to the standard LTU 1.
    LTU number 2 can not longer be used as standard LTU.

  - Delete the overlay LTU as follows:

    ```
    DELETE-UCSU:UNIT=OVERLAY,LTU=1;
    The overlay LTU, that is assigned to the standard LTU 1 was deleted.
    ```

  - Display the overlay LTU as follows:

    ```
    DISPLAY-UCSU:UNIT=LTU,LTG=1;
    ```

    The LTUs of LTG 1 will be displayed with the mutual references which overlay LTU is assigned to the displayed standard LTU and vice versa.

  - Regenerate an overlay LTU as follows:

    ```
    REGENERATE-UCSU:UNIT=LTU;
    ```

    All LTUs of the LTG is regenerated as follows:

```
ADD-UCSU:UNIT=LTU,LTG=1,LTU=1,LTPARTNO="Q2166-X    ",FRMTYPE=LTUW;
CHANGE-UCSU:UNIT=OVERLAY,LTU=1,OVERLAY=2;
```

> You can only regenerate the combination of standard- and overlay LTU. There is no possibility to regenerate only the standard LTUs or only the overlay LTUs.

- **80 CXE**:
  The procedure is the same as described above at the 600 ECX. The only difference is, that if an overlay LTU shall be assigned to a standard LTU and the user did not enter a value for parameter overlay LTU (automatic assignment), the search for the highest free LTU to be configured as overlay LTU starts at 7 down to 2.
  – Configure the standard shelf (LTU 2) with one LTUCX (Q2166-X) as follows:
  ```
  ADD-UCSU:UNIT=LTU,LTG=1,LTU=2,LTPARTNO="Q2166-X  ",FRMTYPE=L80XF;
  ```
  – Automatically assign the overlay LTU number to standard LTU 2 as follows:
  ```
  CHANGE-UCSU:UNIT=OVERLAY,LTU=2;
  ```
- Configure the DIU-N2/N4 as follows:
  – Configure the DIU-N2 board and assigning highway bundle F as follows:
  ```
  ADD-BCSU:MTYPE=PER,LTG=1,LTU=1,SLOT=49,PARTNO="Q2196-
  X",FCTID=1,LWVAR="0",HWYBDL=F;
  ```
  – Configure the DIU-N4 board and change the HWY bundle as follows:
  ```
  ADD-BCSU:MTYPE=PER,LTG=1,LTU=1,SLOT=37,PARTNO="Q2195-
  X",FCTID=1,HWYBDL=A;
  CHANGE-BCSU:TYPE=HWYBDL,LTG=1,LTU=1,SLOT=37,PARTNO="Q2195-
  X",FCTID1=1,HWYBDL=F;;
  ```
  The highway bundle of the DIU-N4 is changed from A to F.

3.14 MCM

The MCM (Management and Control Module) board (see Figure 3-36) is used as a fault and clock signalling board on the HiPath 4000 common architecture platform. It is connected to the backplane of the CSPCI shelf.

The board features the following control functions:

- Speed control and regulation for fan trays
- ALUM (power failure transfer)
- ALIN (alarm interface)
- Front reference clock

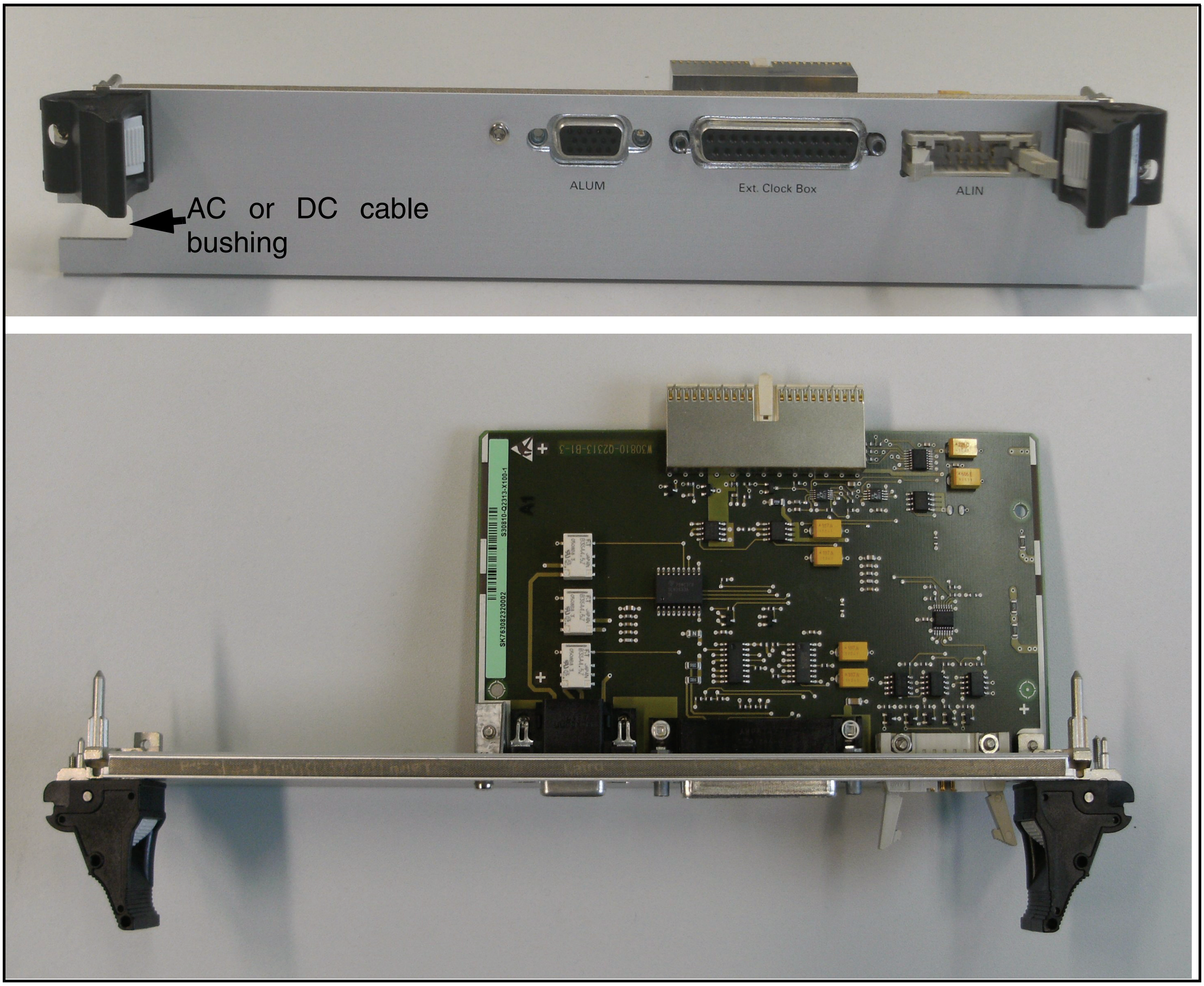


Figure 3-36 MCM board

3.14.1 Hardware Part Number

S30810-Q2313-X100-*

3.14.2 Interfaces

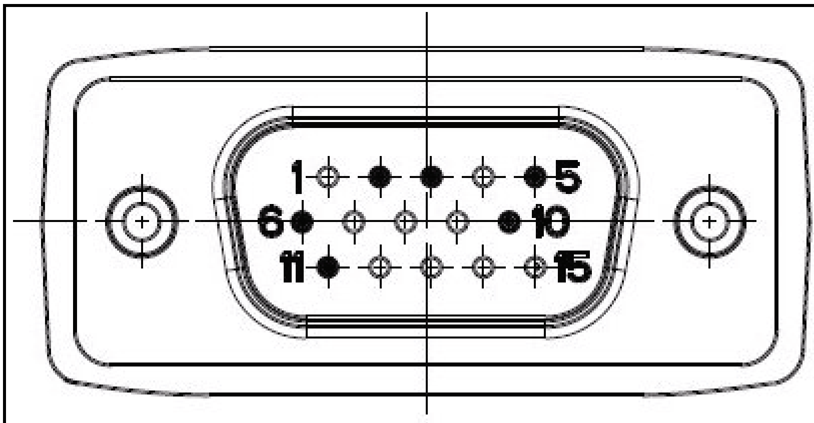
- ALUM
- ALIN
- Front reference clock
- Backplane

ALUM

The following three signals from the DSCXL board are routed over this interface:

- ALUM (max. 1A/30W)
- NAL (Not urgent Alarm)
- UAL (Urgent Alarm)

These signals are sent by relays to the front connector (15-point) which in turn is connected to the main distribution frame by the S39195-Z7612-A* cable (DSub open end).



11 = ALUM 1
06 = ALUM 2
02 = NAL 1
03 = NAL 2
10 = UAL 1
05 = UAL 2

Figure 3-37 ALUM Pin-Assignment

ALUM Cables

Part number	Type	Cable lengths
C39195-Z7612-A100	ASW cable to MDF (GER und IM)	10m
C39195-Z7612-A200	ASW cable to MDF (GER und IM)	20m
C39195-Z7612-A550	ASW cable to MDF (GER und IM)	55m
C39195-Z7612-A950	ASW cable to MDF (GER und IM)	90m
C39195-Z7613-A50	ASW cable to Patchpanel (IM)	5m
C39195-Z7614-A100	ASW cable to MDF (US)	10m
C39195-Z7614-A150	ASW cable to MDF (US)	15m

Table 3-49 ALUM Cables

ALIN (Alarm interface)

Table 3-50 lists the alarm signals that are routed over this interface (cable: C39195-Z7904-A25):

Signal	Designation
WRA	DC/AC converter failure
NGAR	PSU failure redundancy
NGA	PSU failure
PFNMI	Power supply failure
BAEXF	BAEX board fault
GND	Grounding

Table 3-50 Alarm Signals

WRA	1	2	PFNMI
NGA	3	4	NGAR
GND	5	6	BAEXF
nc	7	8	nc
nc	9	10	nc

Table 3-51 ALIN Pin Assignment

Front Reference Clock

This interface (SUB-D connector socket, 25-pin) is used to connect an **A**tlantic **E**xternal **C**Lock **B**ox (AECB: S30122-K5617-X).

The following cables are used for this:

S30267-Z304-A9 (int.) or S30267-Z304-A40 (ext.)

1	nc	14	FRONT_RCLK_N
2	nc	15	FRONT_RCLK_P
3	nc	16	CLK_OUT_P
4	nc	17	CLK_OUT_N
5	nc	18	(+5 V) for test only
6	nc	19	BACK_CLK_N

Table 3-52 Front Reference Clock Pin Assignment

7	GND	20	BACK_CLK_P
8	nc	21	GND
9	FMB_8K_P	22	nc
10	FMB_8K_N	23	Ext_Box_Plugged
11	(+5 V) for test only	24	nc
12	nc	25	GND
13	nc		

Table 3-52 Front Reference Clock Pin Assignment

Backplane

Table 3-54 lists the signals that are routed to the MCM board over the backplane interface.

Signal	Board connection	Designation
MCM_SEL_L	BP	MCM select
CLKBOX_L	RTM	Clock box present
SMB_CLK	DSCXL	SMBus clock
SMB_DATA	DSCXL	SMBus data
SMB_ALERT	DSCXL	Interrupt from MAX1609
NAL	DSCXL	Not urgent alarm
UAL	DSCXL	Urgent alarm
ALUM	DSCXL	Power failure transfer
PREF_CLK	RTM	Background clock
FREF_CLK	RTM	Front reference; external reference
FMB_OUT	RTM	Frame mark bit 8 kHz
CKA_OUT	RTM	2.048 MHz system clock
FAN_T1... FAN_T3	Fan	Fan tacho signals 1..4
FAN_FB	Fan	Fan feedback
+3.3 V, +5 V, +12 V	PSU	Power supply

Table 3-53 Backplane Signals

POS#	Row Z	Row A	Row B	Row C	Row D	Row E	Row F
25	GND	RSVD	+3.3 V	RSVD	RSVD	RSVD	GND
24	GND	RSVD	RSVD	GND	RSVD	GND	GND
23	GND	RSVD	RSVD	RSVD	GND	RSVD	GND
22	GND	RSVD	+5 V	+3.3 V	+3.3 V	RSVD	GND
21	GND	RSVD	RSVD	RSVD	+3.3 V	RSVD	GND
20	GND	RSVD	RSVD	RSVD	GND	RSVD	GND
19	GND	RSVD	+5 V	RSVD	GND	RSVD	GND
18	GND	RSVD	RSVD	RSVD	+5 V	RSVD	GND
17	GND	RSVD	RSVD	RSVD	GND	RSVD	GND
16	GND	RSVD	+3.3 V	RSVD	+5 V	RSVD	GND
15	GND	RSVD	RSVD	RSVD	MCM_SEL_L	RSVD	GND
14 13 12	KEY AREA						
11	GND	RSVD	RSVD	CLKBOX_L	RSVD	RSVD	GND
10	GND	RSVD	RSVD	RSVD	RSVD	PREF_CLK	GND
9	GND	RSVD	RSVD	RSVD	RSVD	FREF_CLK	GND
8	GND	RSVD	NAL	UAL	ALUM	RSVD	GND
7	GND	SMB_CLK	RSVD	RSVD	RSVD	FMB_OUT	GND
6	GND	SMB_DATA	RSVD	SMB_ALERT	RSVD	CKA_OUT	GND
5	GND	RSVD	FAN_T1	FAN_FB	RSVD	RSVD	GND
4	GND	RSVD	FAN_T2	FAN_FB	RSVD	RSVD	GND
3	GND	+12 V	FAN_T3	FAN_T4	RSVD	RSVD	GND
2	GND	RSVD	RSVD	RSVD	RSVD	RSVD	GND
1	GND	RSVD	RSVD	RSVD	RSVD	RSVD	GND

Table 3-54 Backplane Pin Assignment

3.15 MTSCG

The memory time switch with clock generator (MTSCG) board is a dual function board in HiPath 4000 systems which provides memory time switch and network clock generator functions.The clock frequency of the MTSCG is 10^{-6}.

> The MTS function is shared between the MTSCG board and the SICOE board.

The MTSCG board provides the voice data highway network switching function. The switching network controls the voice data highways that carry the flow of information through the system. Voice data highways provide the communication channels between the switching network, the LTUW shelves, and the service unit.

The SWU board and common control boards control the MTSCG board over the multibus.

The MTSCG provides:

- Four voice data highways to each of the first 7 L80XF or LTUW shelves
- One voice data highway to the SIU function of the SICOE board
- Three voice data highways to the conference function of the SICOE board
- Cross connect circuits that provide the SICOE board access to 32 highways for extending the switching network

> The SICOE board provides the highways and clocks for L80XF or LTUW 8 through LTUE 15.
>
> An external reference (stratum 3) clock source can be connected to the MTSCG board front panel port.

3.15.1 LED and SSD Indications

The MTSCG board has two LED indicators and an SSD (see Figure 3-38).

Figure 3-38 MTSCG Board Front Panel

Table 3-55 lists the MTSCG board LED indications.

LED Color	State	Indication
Green	On	Board is active and all channels are idle.
	Flashing	One or more channels are active.
	Off	Board is not initialized or has a major error.
Red	On	Initial board test is in progress or a major error is detected.
	Flashing	Board loadware is loading.
	Off	Normal operation.

Table 3-55 MTSCG Board LED Indications

Table 3-56 and Table 3-57 list the MTSCG board SSD indications.

8. in Reset	0. during register test	1. during test of data line	2. during test of address lines	3. during test of memory stack	4. during test of push and pop
5. after test of push and pop	0 during PROM test	1 during RAM test	2 during test of MCC0	3 during test of MCC1	4 not used
5 during test of clocks	6 during test of SICOE	7 test of clock distribution through SICOE	8 during initialization of CG part 1	9 during initialization of CG part 2	A during test of interrupts
C during test of VCXO	E during test of pulling range	H not used	F all tests o.k.	- locked status	

Table 3-56 TSCG, internal CG Displays During Start-Up/After Reset

If an error occurs during a test the display starts blinking with the test symbol.

In operation the individual segments are coded as follows:

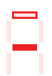
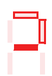
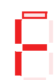
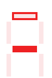
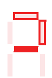
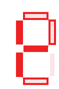
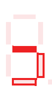
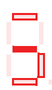
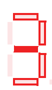
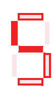
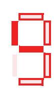
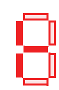
SSD Pattern	Indications
	Board ready
	Master/Slave switchover is enabled.
	Board is delivering clock (master).
	Partner reference frequency is detected.
	Normal operating indication for active switching unit clocking internally.
	Normal operating indication for standby switching unit clocking internally.
	Normal operating indication for active switching unit clocking externally (Decimal Point Flashes).
	Normal operating indication for standby switching unit clocking externally.
	Clock is synchronous with partner reference frequency.
	External frequency detected. (Only when connected to ISDN network.)

Table 3-57 MTSCG, Display Segments During Operation

SSD Pattern	Indications
	Clock is synchronous with external reference frequency. (Only when connected to ISDN network.)
	Decimal point flashes when external reference frequency source (LTU or external device) is the master.

Table 3-57 MTSCG, Display Segments During Operation

The thick painted segment shows the status of the CG, the thin painted segments show additional information.

	Locked slave status (locked status)			**Active slave status**			**Master status**		
	A	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
D									
E									
F									

A no external reference clock
B no phase lock to external reference clock
C phase lock with external reference clock; H-segment is blinking if the CG controls on the external reference clock
D no reference clock from partner
E not synchronous to partner reference clock
F synchronous to partner reference clock

In case of failure the whole display is blinking

Table 3-58 MTSCG, Display During Operation

3.15.2 Pinning of Front Panel Connector (Cannon 25-pin, female)

Pin	Signal	Input/Output	Description
1			not connected, to be kept free
2	(RXD)		not connected, to be kept free
3	(TXD)		not connected, to be kept free
4	(CTS)		not connected, to be kept free
5	(RTS)		not connected, to be kept free
6	(DSR)		not connected, to be kept free
7	(GND)		Ground Signal *
8	(DCD)		not connected, to be kept free
9	FMB_8K_P	Output	Frame Mark Bit, 8-kHz-pulse: 125 μsec
10	FMB_8K_N	Output	up to 244 ηsec, TTL-P and -N
11	(+5 V)	(Output)	+5 V testing purposes only (low power)
12	nc		not connected
13	RUN_BOOT_ONLY_L		testing purpose only!
14	FRONT_RCLK_N		front panel reference / external ref.
15	FRONT_RCLK_P	IN	8 kHz; 1.544; 2.048; 5.0; 10.0 MHz
16	CLK_OUT_P	Output	CKA / 2.048 MHz system clock
17	CLK_OUT_N	Output	for T3 generation, TTL-P and TTL-N
18	(+5 V)	Output	+5 V testing purposes only (low power)
19	BACKGROUND_CLK_N		background clock from OCXO, TTL-P and TTL-N
20	BACKGROUND_CLK_P	IN	background clock from OCXO
21	GND		ground
22	nc. (ACT_P)	(Output)	not connected *
23	External_Box_plugged_L		test line plugged for AECB
24	nc. (ACT_N)	(Output)	not connected *
25	GND		ground

Table 3-59 Pinning of Front Connector (Cannon 25-Pin)

* Not supported at the moment, pins are reserved for future use.

The V.24 controller is not located on the MTSCG board, it has to be provided externally. The serial interface is for test use only. The CG is the DTE side of the serial interface (1:1 cable).

3.15.3 Partner Interface IF2

The IF2 is the interface between the two CGs, necessary for a duplex system. Caused by the requests for duplex switching they have to correspond with each other by means ofby means of the ‘master xxx’ signals.

Signal	Description
MACTO	Master active signal output
MACTI	Master active input signal
MFMBO	Master Frame Mark Bit output signal (**1**kHz)
MFMBI	Master Frame Mark Bit input signal

Table 3-60 MTSCG, Partner Interface (IF2)

All master signals are terminated with 75 ohms.
The maximum length of the connection between the two duplex cards (MTSCG in A and B-shelf) is 2 m (6.6 ft.).

3.15.4 Removing the MTSCG Board

Warning
This procedure removes the system from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

Remove the MTSCG board from the HiPath 4000 as follows.

1. Deactivate and power off the defective SWU.
2. Remove power from the board as follows:
3. Using the board extractor, unseat the board and remove it from the shelf.

3.15.5 Replacing the MTSCG Board

Replace the MTSCG board in the HiPath 4000 as follows:

1. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
2. Power on and activate the SWU.
3. Reapply power to the board as follows:

3.15.6 Verifying the MTSCG Board

Verify the operation of the MTSCG board in the HiPath 4000 as follows:

1. Type **DIS-SDSU** and press **Enter**.
2. Type the following values, then press **Enter**.

Field	**Value**
STATUS	All
LINE	<blank>
TYPE	UNIT
PID	LTG

3.16 NCUI2+

The NCUI2+ (**N**BCS **C**ontrol **U**nit **IP 2** HiPath HG 3575) board functions as the common control unit for the IPDA and as the gateway unit for a local system connected to a distributed PBX system. The local system could be an LTU shelf or multiple 19" cabinets. Like the LTUCA board in a peripheral shelf, the NCUI2+ controls all peripheral boards in the local system and provides access to the 10/100Base-T Fast Ethernet network. The NCUI2+ is responsible for central functions, such as DCL-LP, SIU, CONF, MTS, and CG. The board features an interface for up to sixteen peripheral boards in the LTU shelf and an interface to support a 19" system. The board communicates with the common control unit in the HiPath 4000 over the Ethernet network. Within the local system, the NCUI2+ switches up to 256 time slots on eight highways at 2.048 Mbps. A subset of up to 30 time slots can be switched to external traffic over the IP network.

> **Warning**
> The NCUI2+ must **not** be plugged in and unplugged during live operation.

Figure 3-39shows the NCUI2+ board

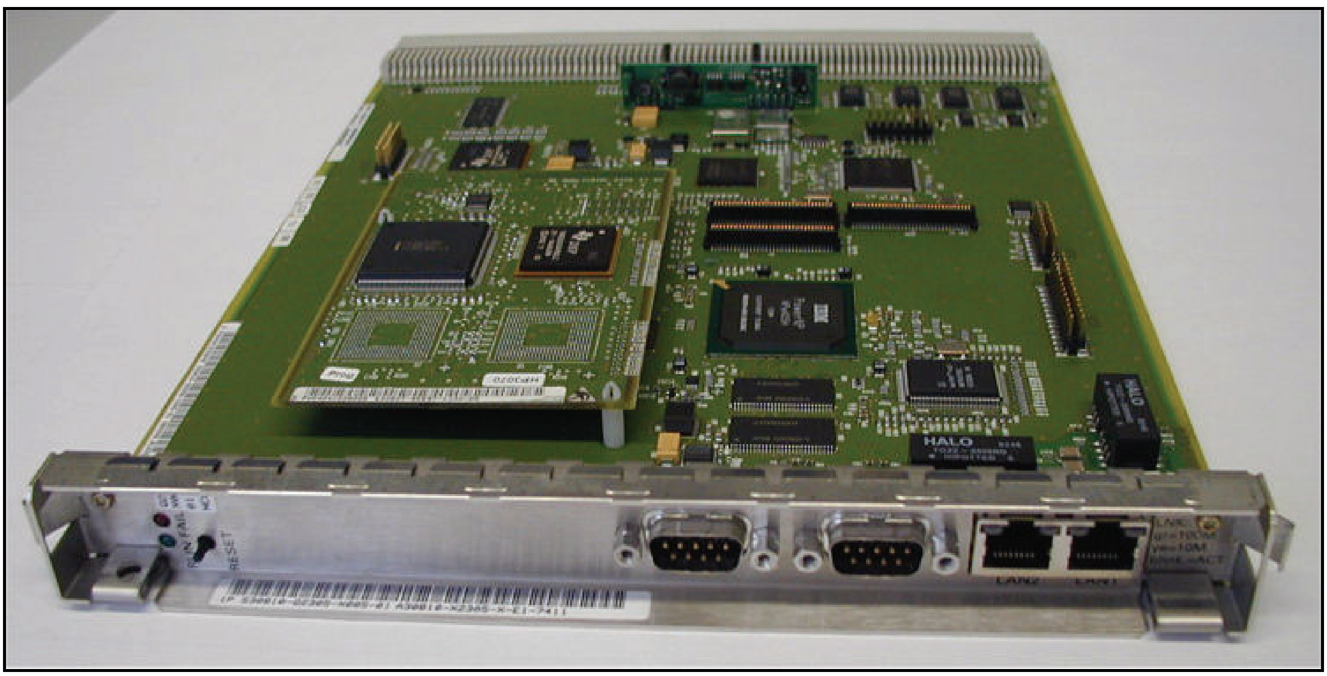


Figure 3-39 NCUI2+ board

3.16.1 System Diagram

Figure 3-40 shows the NCUI2+ board system diagram.

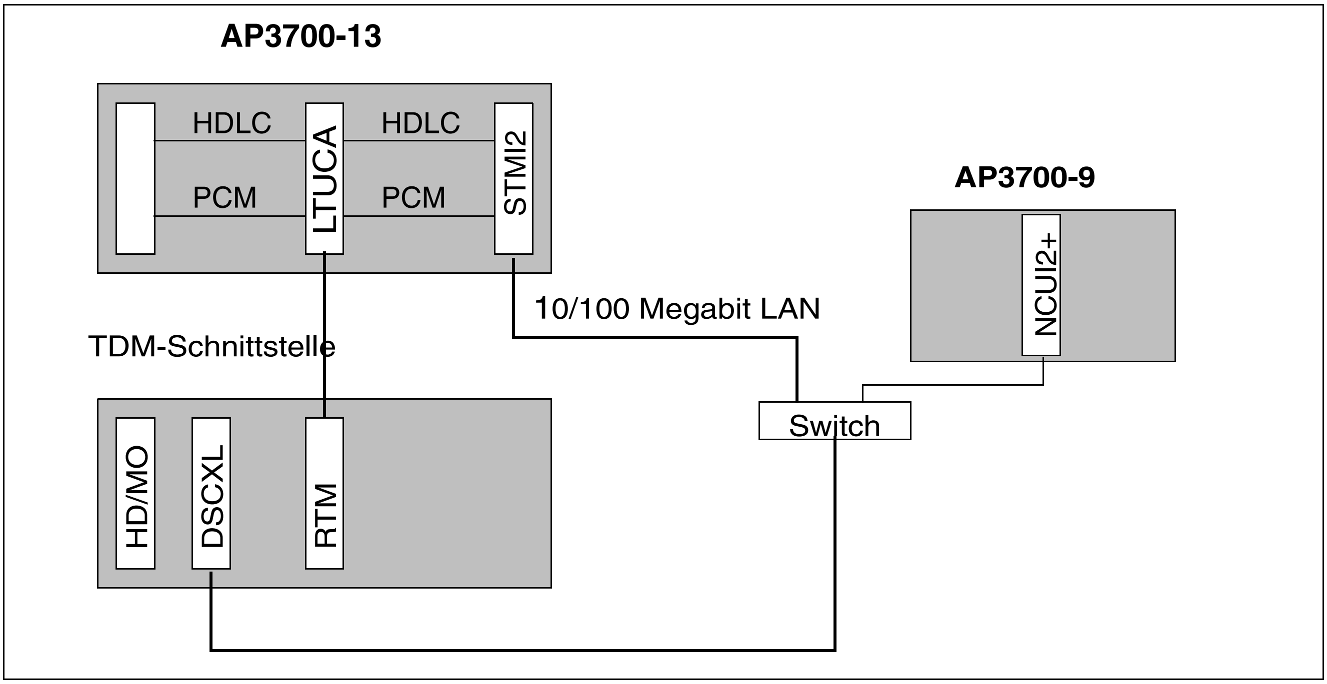


Figure 3-40 NCUI2+ Board System Diagram

3.16.2 Board Variants and Modules

NCUI2+ **with** an **underequipped** PDMX (**P**MC **D**SP **M**odule E**x**tended): **S30810-Q2305-X35-** (60-channel version)

NCUI2+ **with** a **fully equipped** PDMX (**P**MC **D**SP **M**odule E**x**tended): **S30810-Q2305-X40-** (120-channel version)

> The NCUI2+ has two **HiPath G**ateway **A**ccelerator (HGA) slots. One is for the PDMX DSP module and the other is for an optional plug-in module (currently are not used).

PMC = PCI **M**ezzanine **C**ard

3.16.3 LED Displays and Interfaces

Table 3-61 lists the LED displays and interfaces are configured on the front of the NCUI2+ board for service purposes:

Quantity	LEDs and Interfaces	Functions/Indications
2	V.24 9-pin SUB-D connector	Service terminal/modem
1 each	● Green (RUN) ● Red (FAIL) LED	Board status display
1	Reset key	Reset the board
2	LEDS	For each LAN interface (integrated in the RJ45 connector) ● LED1: green/yellow green = 100 Mbps online (link) yellow = 10 Mbps online (link) flashing = active ● LED2: green on = full-duplex (FDX) off = half-duplex

Table 3-61 LED displays and interfaces

Figure 3-41 shows the NCUI2+ board front panel.

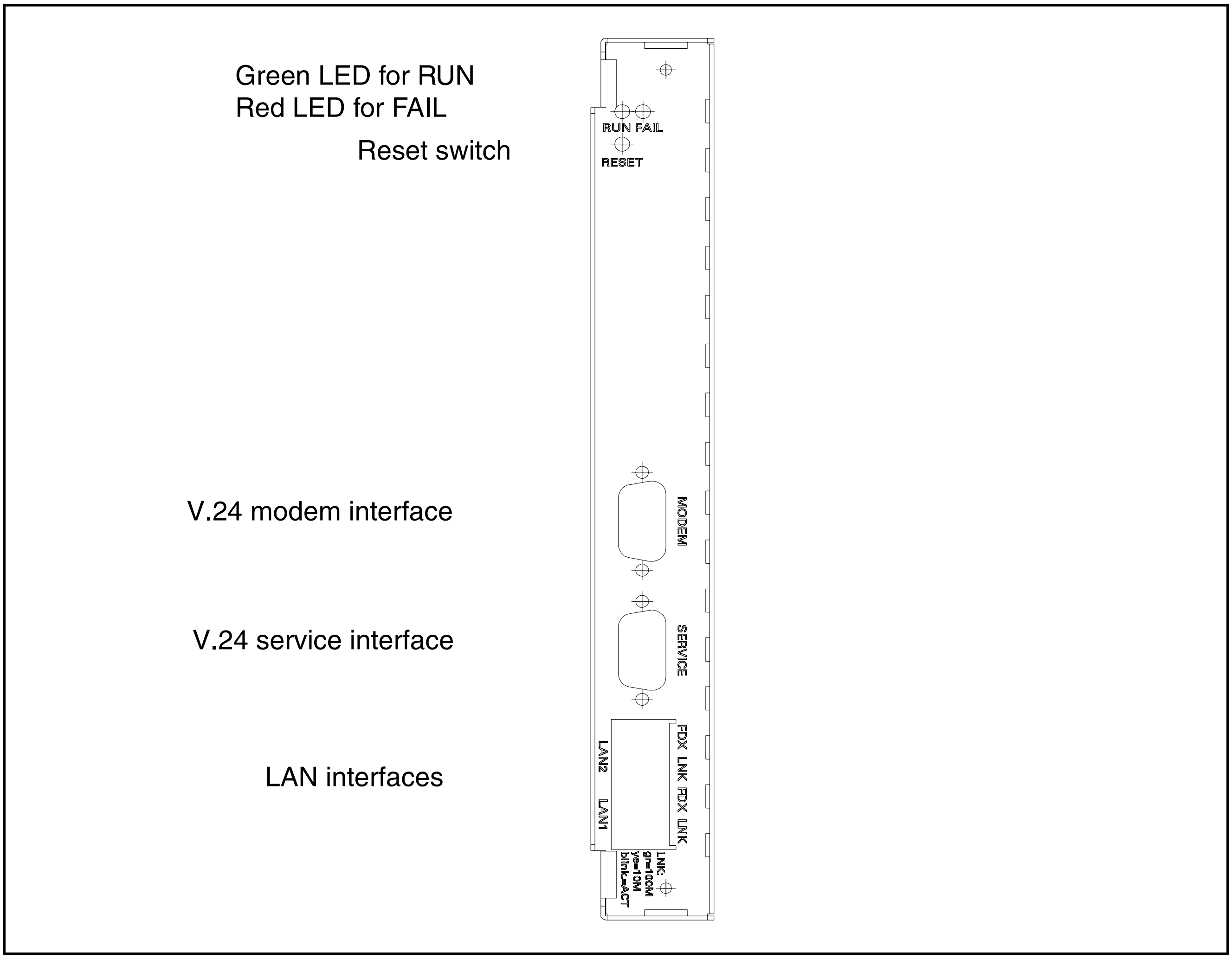


Figure 3-41 NCUI2+ Board Front Panel

3.16.4 Power Supply

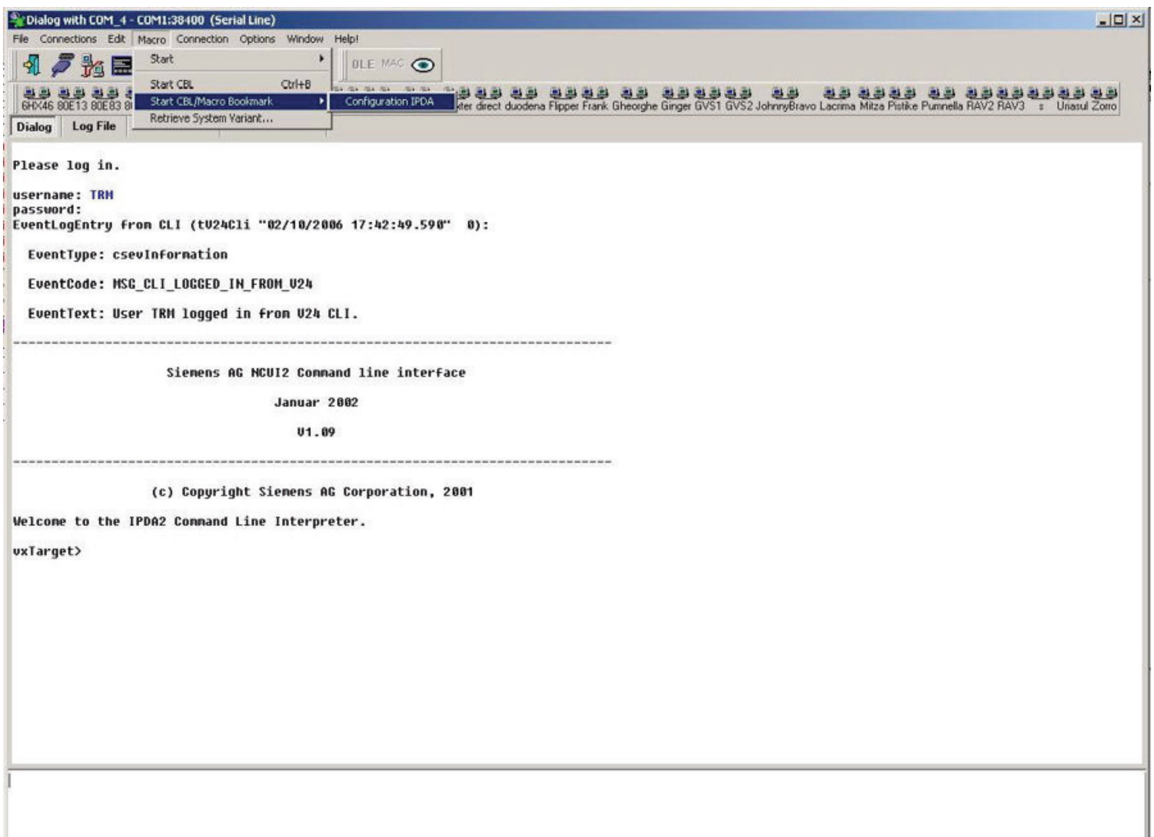
The NCUI2+ board receives a power supply voltage of +5 V over the backplane. The individual voltages required (+3.3 V, +2.5 V, +1.8 V, +1.5 V, and 1.2 V) are generated by the DC-to-DC converter on the board.

3.16.5 Upgrade NCUI2 board

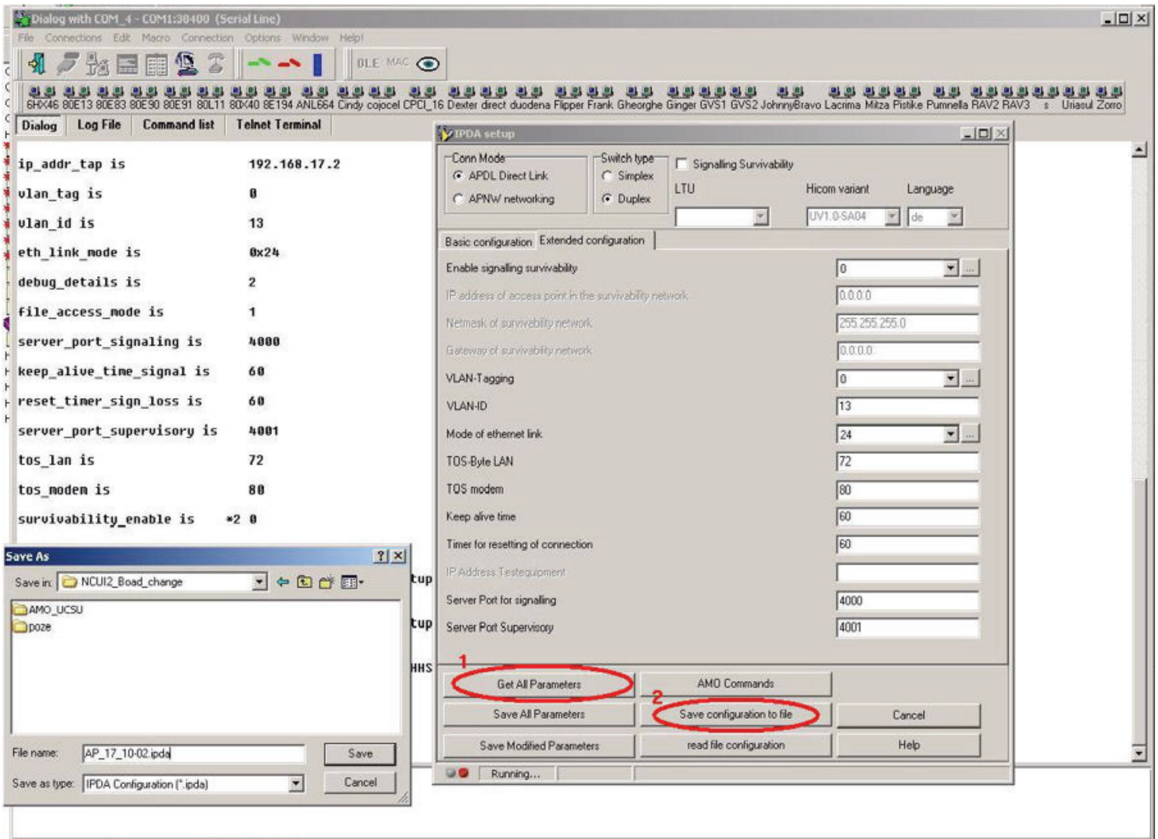
To upgrade the NCUI2 board with 64MB SDRAM/16MB Flash Memory (old) to the NCUI2+ board with 128MB SDRAM/32MB Flash Memory (new) following steps should be followed:

1. Connect the serial cable to the service interface panel and store board data from the old NCUI2 via CLI.

   Open the Configuration IPDA menu from ComWin.



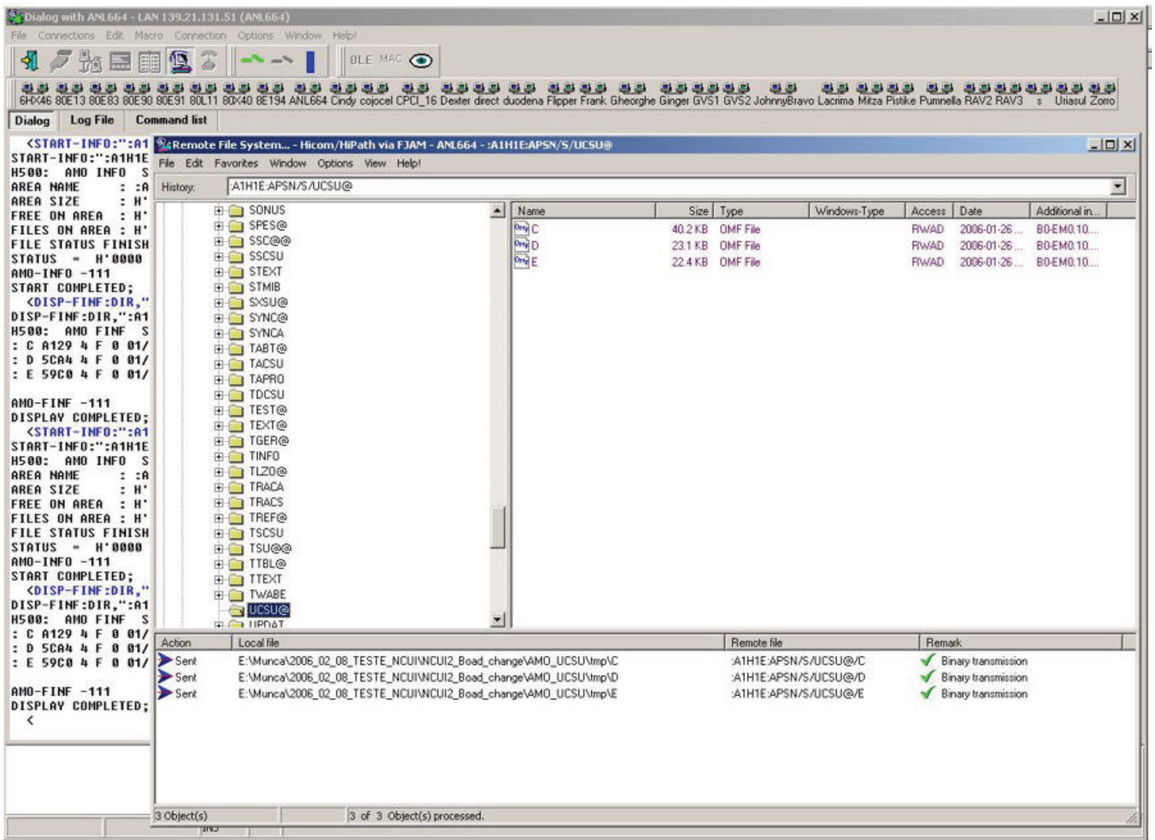
   1. Press the button **Get All Parameters** in order to get the data configuration from the old NCUI2 board.
   2. Press the button **SAVE configuration to file** and enter a name for the file where will be stored the old NCUI2 data.



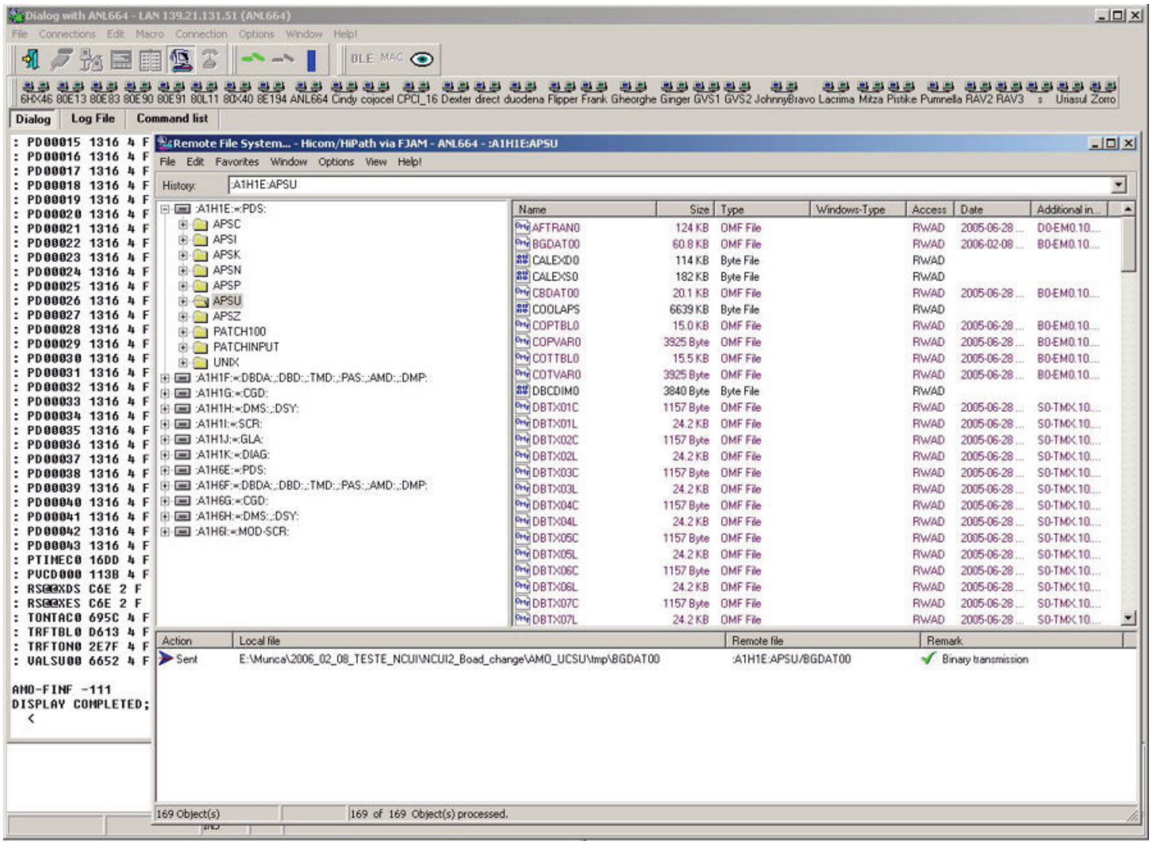
2. Copy via File Transfer the new version of AMO UCSU (APS: B0-EM0.10.048) in folder **:PDS:APSN/S/UCSU@** (C, D and E files) and execute the

   RELOVL;

   command



Copy the new version for the BGDAT00 file in the folder **:PDS:APSU/BGDAT00**.



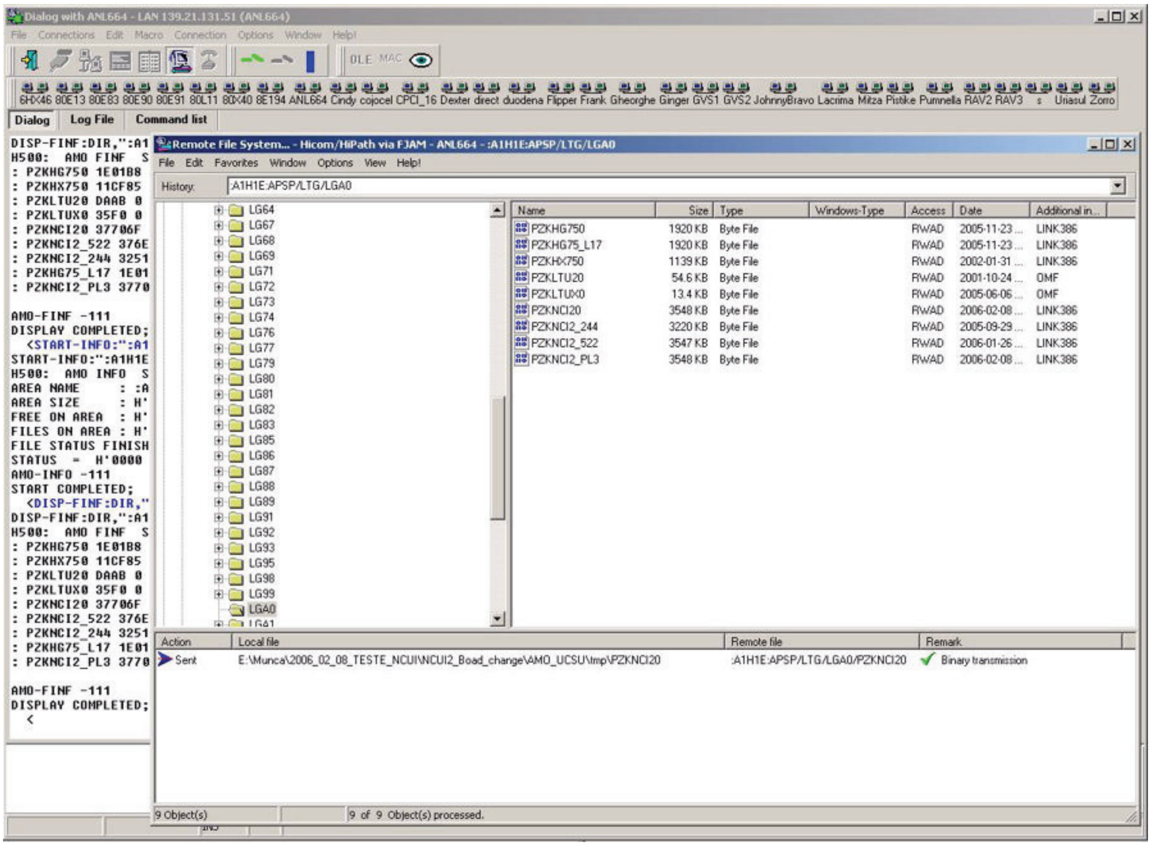
3. Deactivate the AP (for example AP 17)

   `DEACTIVATE-USSU:LTG=1,LTU=17;`

   Change the partnumber of the AP

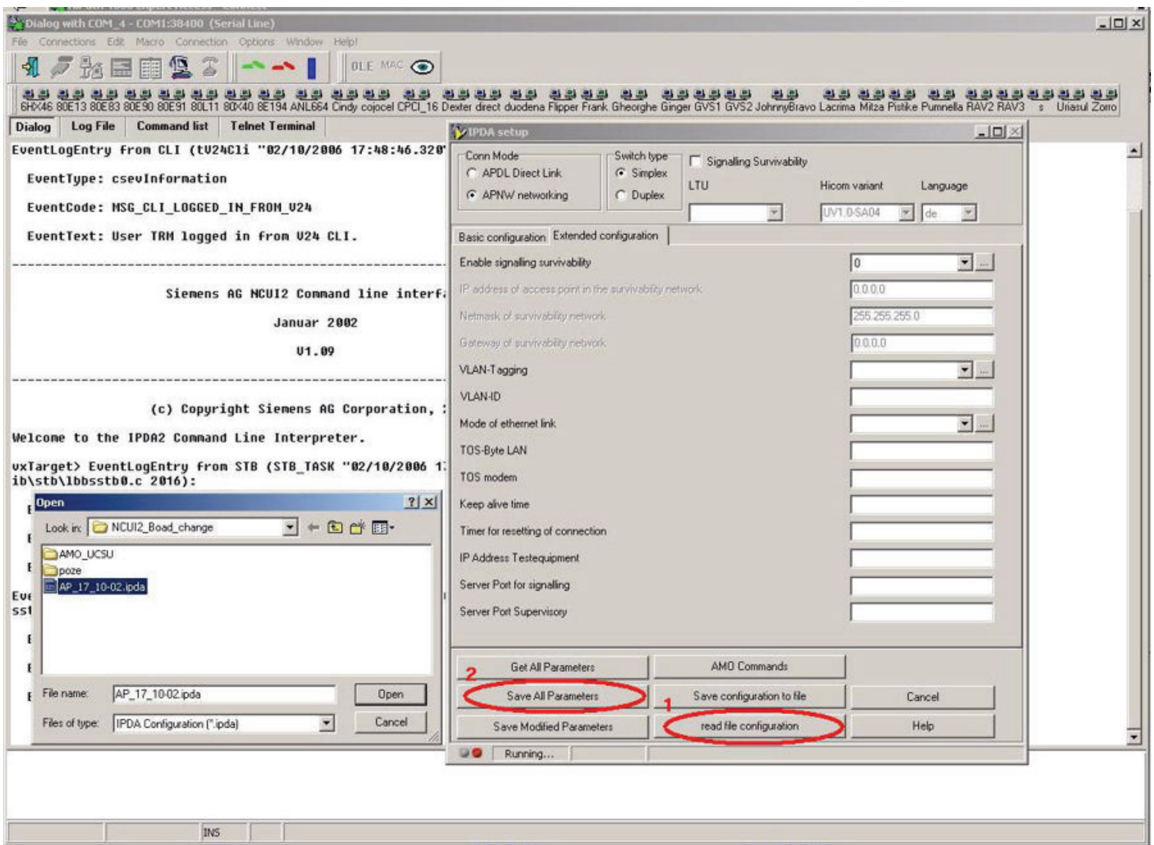
   `CHANGE-UCSU:UNIT=AP,LTG=1,LTU=17,LTPARTNO="Q2305-X40";`

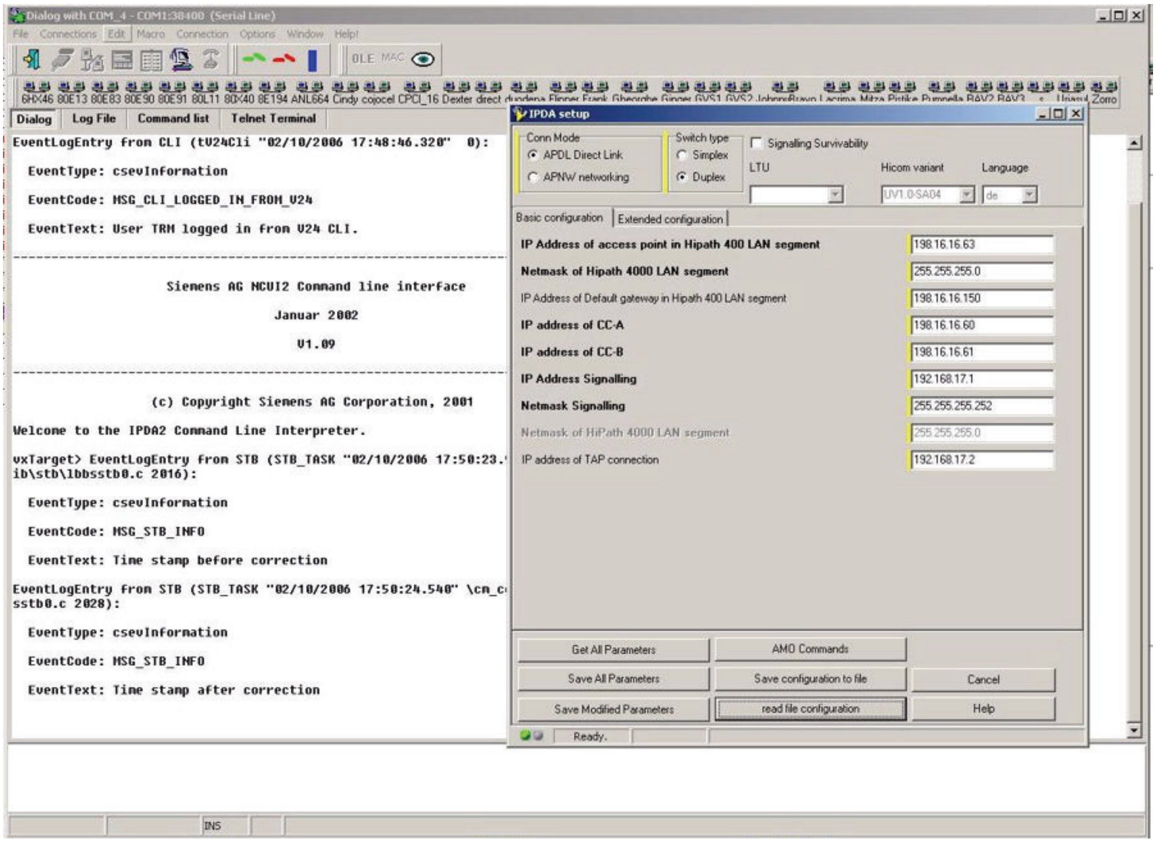
4. Power off the AP.
5. Replace old NCUI2 board with the new NCUI2+ board.
6. Copy the new LW for the new NCUI2+ board in the folder **:PDS:APSP/LTG/LGA0/PZKNCI20**.



7. Power on the AP.

8. Restore the board data saved at step 1 via CLI.
    1. Press the button **Read file configuration** and select the file (saved at step 1) in order to get the NCUI2 configuration data saved previous at step 1.
    2. Press the button **Save all Parameters** to save the configuration data to the new NCUI2+ board.





9. Activate the AP.

   `ACTIVATE-USSU:UNIT=LTG,LTG=1,LTU=17;`

10. Verify the LW version of the board in CLI with command:

    `show version`

    CLI output:

```
vxTarget> show version
Actual loadware:

Loadware ID : 02/08/06 16:07:09 no_label pzknci20

Summary of all loadware versions:

Loadware ID : 02/08/06 16:07:09 no_label pzknci20, /tffs/SW_IMAGE.001

Loadware file /tffs/SW_IMAGE.002 doesn't exist.

OK
```

11. If the board doesn't start, please reset the new NCUI board.

3.17 NCUI4 (S30810-Q2324-X00/X10)

The NCUI4 (**N**BCS **C**ontrol **U**nit **IP 4** HiPath HG 3575) board functions as the common control unit for the IPDA and as the gateway unit for a local system connected to a distributed PBX system. The local system could be an LTU shelf or multiple 19-inch cabinets. Like the LTUCA board in a peripheral shelf, the NCUI4 controls all peripheral boards in the local system and provides access to the 100 Base-T Fast Ethernet network. The NCUI4 is responsible for central functions, such as DCL-LP, SIU, CONF, MTS and CG. The board features an interface for up to sixteen peripheral boards in the LTU shelf and an interface to support a 19-inch system. The board communicates with the common control unit in the HiPath 4000 over the Ethernet network. Within the local system, the NCUI4 switches up to 256 time slots on eight highways at 2,048 Mbps.

> **Warning**
> The NCUI4 must **not** be plugged in or unplugged during live operation.

Figure 3-42 shows the NCUI4 board

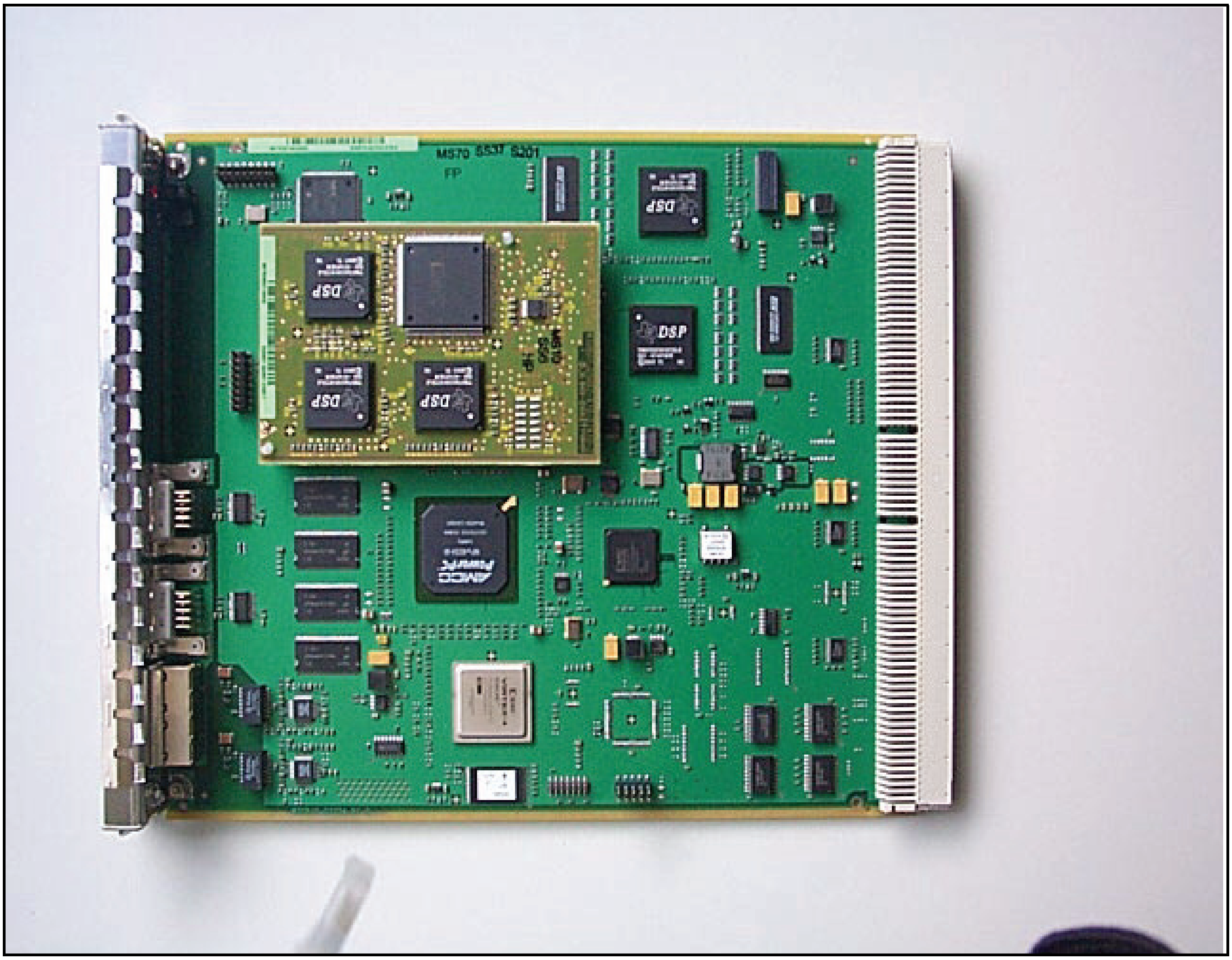


Figure 3-42 NCUI4 Board

3.17.1 System Diagram

Figure 3-43 shows the NCUI4 board system diagram.

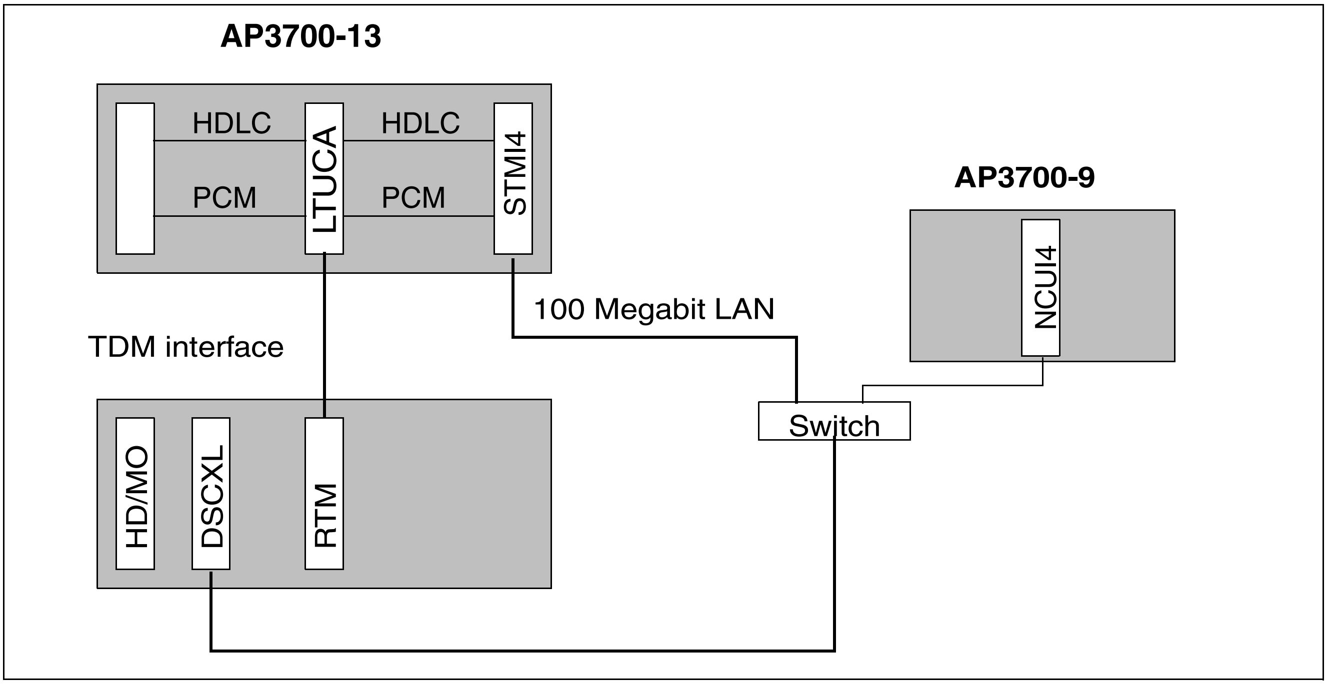


Figure 3-43 NCUI4 Board System Diagram

3.17.2 Board Variants and Modules

NCUI4 (256 MB SDRAM/32 MB flash memory) **without** a PDMX (**P**MC **D**SP **M**odule E**x**tended): **S30810-Q2324-X00** (60-channel version)

NCUI4 (256 MB SDRAM/32 MB Flash Memory) **with** an equipped PDMX (**P**MC **D**SP **M**odule E**x**tended): **S30810-Q2324-X10** (120-channel version)

> The NCUI4 features a **HiPath G**ateway **A**ccelerator (HGA) slot for the PDMX DSP module.

3.17.3 LED Displays and Interfaces

The LED displays and interfaces are configured on the front of the board for service purposes:

Quantity	LEDs and Interfaces	Functions/Indications
2	V.24 9-pin SUB-D connector	Service terminal/modem
One each	• Green (RUN) • Red (FAIL) LED	Board status display
1	Reset key	Reset the board
2	LEDS	For each LAN interface (integrated in the RJ45 connector) • LED1: green On = 100 Mbps • LED2: green Green = online (link) Wink = active

Table 3-62 LED Displays and Interfaces

Figure 3-44 shows the NCUI4 board front panel.

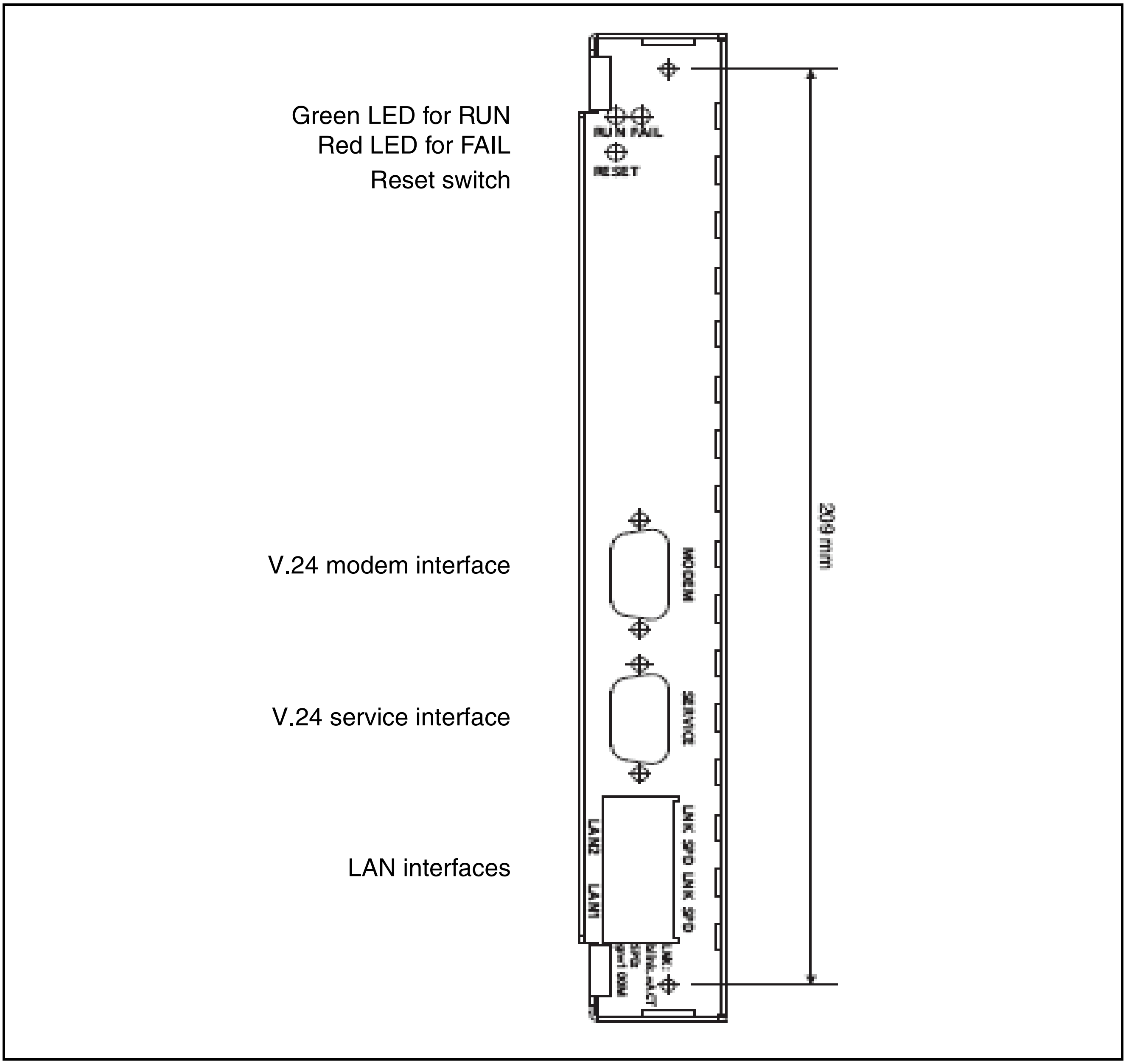


Figure 3-44 NCUI4 Board Front Panel

3.17.4 Power Supply

The NCUI4 board receives a power supply voltage of +5 V over the backplane. The individual voltages required (+3.3 V, +2.5 V, +1.8 V, +1.5 V, and 1.2 V) are generated by the DC-to-DC converter on the board.

3.18 PBXXX – Peripheral Board XXX

The PBXXX (Peripheral Board XXX) module can be used in HiPath 4000 to support different applications like PNE - Private Network Emulator or CDG - CorNet DPNSS Gateway.

The PBXXX Board provides two digital 2Mbit PCM interfaces and five serial ports V24.

Each digital 2Mbit interface carries 32 channels, which channels can be assigned to speech or to signaling channels. One channel (0) is fixed used for framing. The clock speed of both links is 2.048 MHz.

Four serial interfaces are used for connection to modems, while the last serial interface M is used for maintenance.

3.18.1 Hardware Partnumber

Hardware Partnumber: S30810-Q6401-X

3.18.2 Interfaces

The PBXXX Board has the following physical interfaces:

On the front:

- **7 Segment display** to indicate the status of the card.
- **Four V24 interfaces** routed to the front of the card via DB15 female mini connectors. On the synchronous V24 ports the following signals are provided: 102,103, 104, 105, 106, 107, (108/1, 108/2), 109, 113, 114, 115 (CCITT spec). The four V24 ports are programmed as DTE. The connection is done via a DB15 female mini connector. The maximum allowable cable load is 2500PF. This is nearly 15 meters for shielded cable.
- **One V24 interface** (M port at the bottom) is available for maintenance and loading of the initial program. This asynchronous V24 maintenance port can be connected to a local PC or to an external modem to do maintenance and or reloading of the ECG software. The following signals are provided on this interface: 102, 103, 104, 105, 106, 107, (108/1, 108/2), 109, 125 (CCITT spec). The connection is done via a DB15 female mini connector. The maximum allowable cable load is 2500PF. This is nearly 15 meters for shielded cable.

On the back:

Two connectors for connecting to the HiPath 4000 backplane board, providing power supply and the two 2Mbit PCM interfaces (E1/S2).

On the card:

DIP-switch with 8 selections.

Seven-segment Display

V.24 Port A - for modem connection

V.24 Port B - for modem connection

V.24 Port C - for modem connection

V.24 Port D - for modem connection

V.24 Port M - Maintenance Port, for connecting the service PC with the Maintenance tool.

Figure 3-45 PBXXX - Front Panel

3.18.3 Dip-switch

The PBXXX board has a switch for configuration purposes. The figure below shows this component.

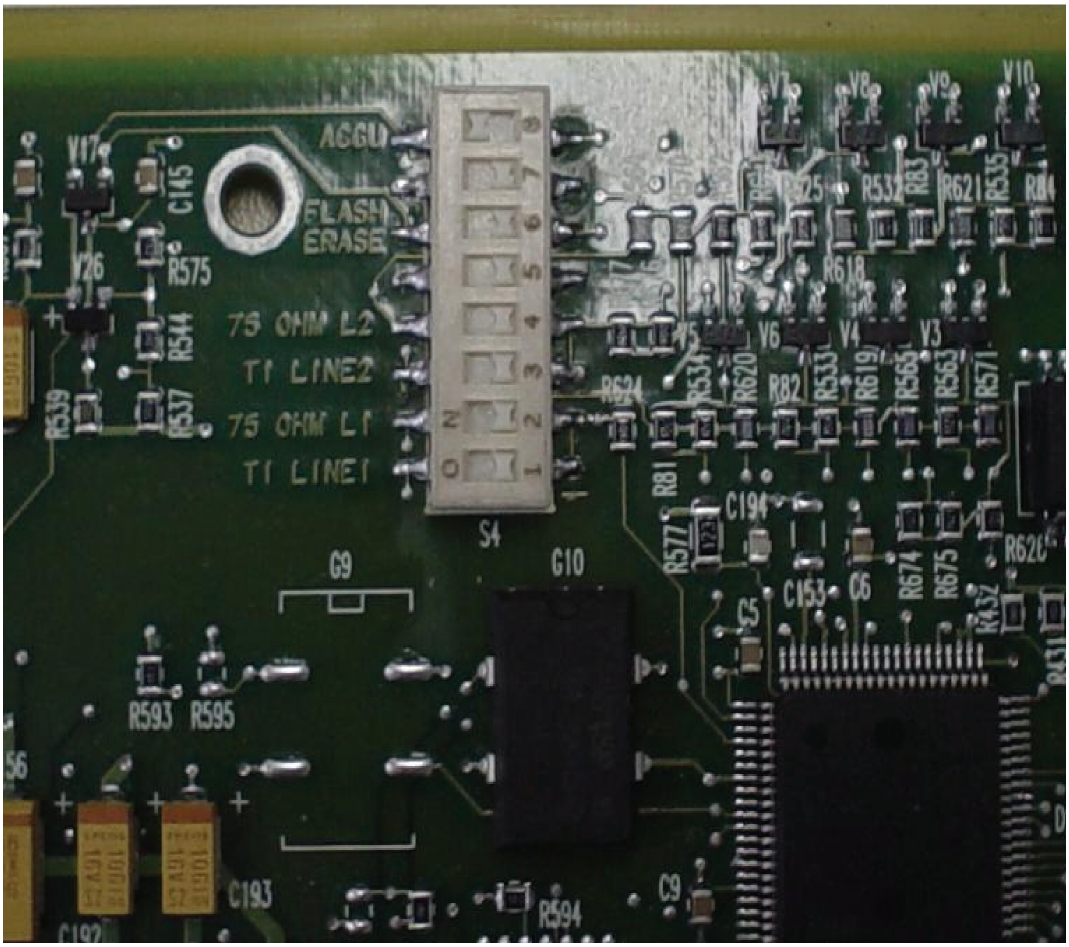


Figure 3-46 Dip-Switch on PBXXX

The first four switches shall be configured in pairs:

Impedance (ohms)	Switch 1	Switch 2
120	Off	Off
75 default	Off	On
Not used	On	Off
Not used	On	On

Table 3-63 Dip switch line 1 configuration

Impedance (ohms)	Switch 3	Switch 4
120	Off	Off
75 default	Off	On
Not used	On	Off
Not used	On	On

Table 3-64 Dip switch line 2 configuration

The next four switches shall be configured alone:

Switch	Function
5	Not used
6	Clears flash memory if ‘ON’ when board is powered up
6	Not connected
7	Always ON. Battery to Real Time Clock

Table 3-65 Dip switch configuration

3.18.4 Recommendations

- **V24 interface grounding:**
  Equipment connected directly to the V24 signaling port (synchronous or maintenance) must be connected to the same earthing point as the PBXXX – HiPath 4000.
  If this is not possible a converter for the V24 signaling leads should be used to achieve a galvanic separation between ECG V24 ports and the connected equipment.
- **Power Consumption:**
  The PBXXX has a power consumption of 13W.

3.18.5 PNE/PBXXX Application

The Private Network Emulator (PNE) is an application that can be loaded on the PBXXX board in order to provide the networking of different HiPath systems and systems of other manufacturers via public analog or digital/ISDN networks, supporting full end-end CorNet-N/Cor-Net-NQ functionality (or DPNSS1 for heterogeneous networks). When using the PNE there is no need for expensive leased circuits for tie-line connections between switching systems since the protocol is supported transparently.

With the PNE the private user network can provide the extended features of the company-wide network regardless of the features offered by the network operator. The features offered by network operators are minimal, so that even with the development of virtual private network services (VPN) that are offered by operators only a very few of the supplementary services of a state-of-the-art ISDN private network will be available. For global networking with HiPath 4000 systems the PNE supports the CorNet functionality independently of the "switched network" of the network operator and regardless whether the lines provided by the operator are analog, digital or ISDN lines.

3.18.5.1 Interfaces

The PNE over PBXXX has the following physical characteristics:

On the front:

- One 7 segment LED indicating the status of the card
- Four signaling ports for X.25 connections
- One maintenance port (M/A port at the bottom): Asynchronous connection

On the back:

Connector for connecting the HiPath 4000 backplane board or for connecting the S2 interface module

3.18.5.2 Physical Connections

In the Installation Instructions HiPath 4000 you can find some examples how connect the PBXXX board to the ISDN Mail.

3.18.6 CDG/PBXXX Application

The CDG application - CorNet DPNSS Gateway - is used to link the HiPath 4000 system to private systems and networks through Digital Private Network Signaling System No. 1 (DPNSS1) or public exchanges through Digital Access Signaling System No 2 (DASS2).

In connection with the DIUS2 board and an APPCU adapter plug, it is possible to link to the HiPath 4000 system as follows:

- iSLX, iSDX, EMS 601 systems through DPNSS1 protocol.
- Public exchanges through DASS2 protocol.
- Other HiPath systems with DPNSS1 protocol if certified.

3.18.6.1 Interfaces

The CDG over PBXXX has the following physical characteristics:

- Two E1 links (2Mbits PCM)
- One maintenance port (M port at the bottom) for asynchronous connection to the maintenance computer.

3.18.6.2 Physical Connections

In the Installation Instructions HiPath 4000 you can find some examples how connect the PBXXX board to the ISDN Mail.

3.19 QDCL

The quad data communication link (QDCL) board provides the signaling interface (HDLC protocol) between the LTU shelves and the central data processor (DP) in the HiPath 4500 system.

The HiPath 4500 SWUs (redundant and non-redundant) use the QDCL board to interface up to 15 LTUP or LTUE shelves respectively and provide a signaling interface to the service unit.

The QDCL board (Q2113-X100) has identical functionality to the Q2113-X and doubles the throughput.

The QDCL serves 16 bidirectional HDLC links (15 LTU + 1 SICOE). The communication interface to the DP is realized with a Dual Port RAM external (**DPRe**), which allows independent and asynchronous access from the DP by means of Multibus and from inside the QDCL by means of the Local Bus. See Figure 3-47.

This concept results in a partition of the QDCL board into one part which processes the Multibus interface (= **C**entral **M**essage **P**rocessor [**CMP]**) and a second part which processes the HDLC interface to the peripherals (= **L**ine **P**rocessor **LP**). The two processors (CMP and LP) communicate by means of a Dual Port RAM internal (**DPRi**).

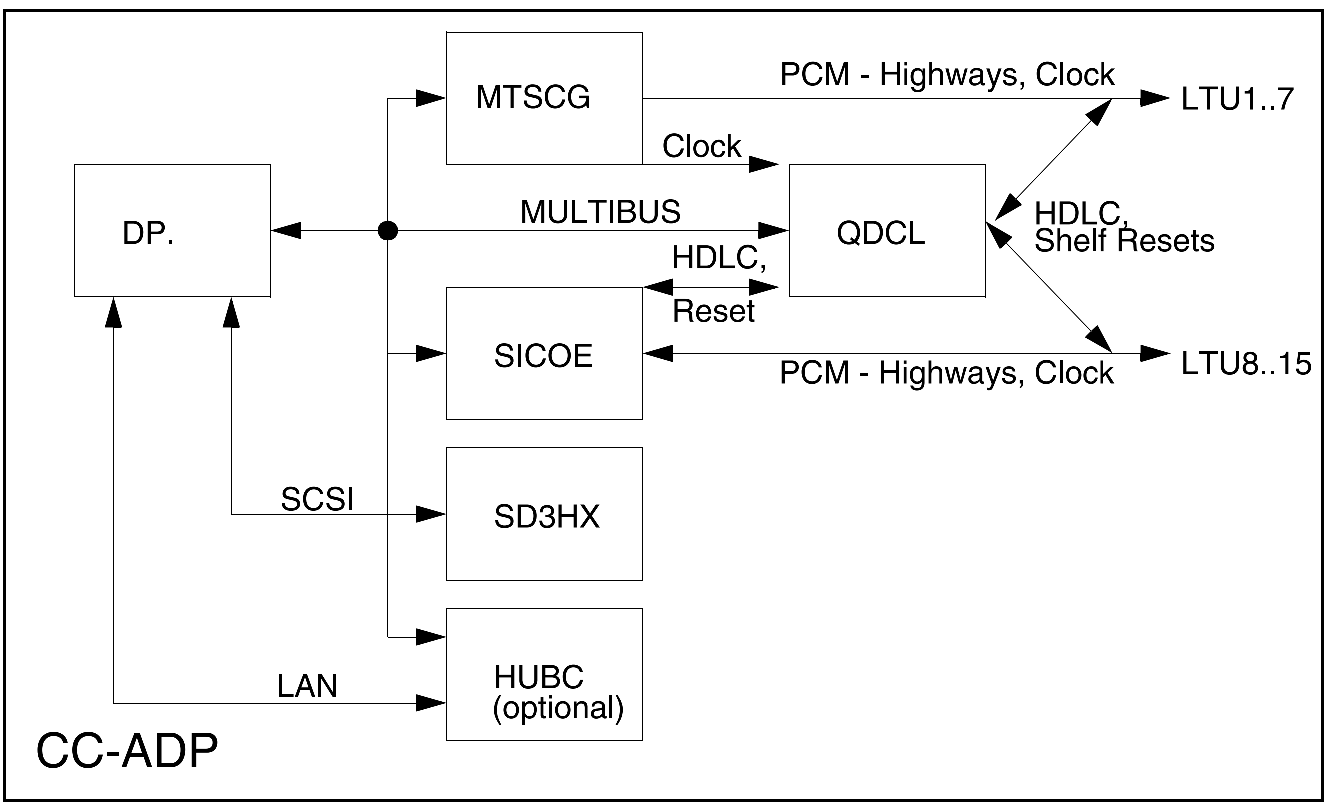


Figure 3-47 QDCL, Position in the HiPath 4500 (Simplex Mono) System

3.19.1 LED and Key Indications

- 1 Red LED (Alarm & Status)
- 1 Green LED (Status)
- CC-Restart Switch (not board Reset, but CC-Soft-Restart)

3.19.2 PCB Basic Layout

Figure 3-48 shows the basic board layout according to the logical division of the QDCL into the parts CMP, LP, DPRe and DPRi.

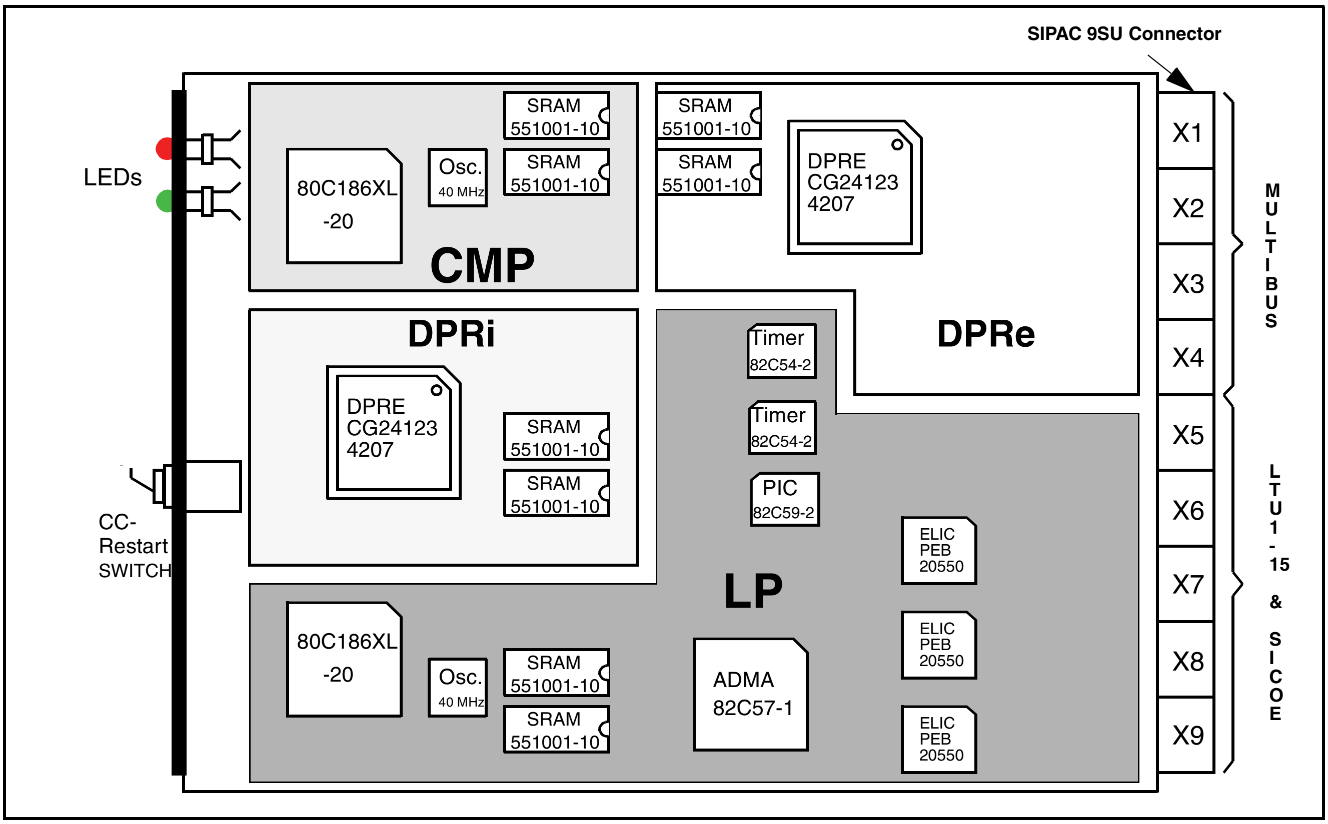


Figure 3-48 QDCL Board Basic Layout

PCB connector

The QDCL board has a SIPAC connector. The SIPAC connector consists of 9 sub-units (SUs) with a maximum of 344 pins.

The QDCL board uses 196 pins, which are distributed over all of the 9 SUs. All of these 196 pins (also test pins) are connected to the CCDAX shelf backplane.

There are no additional connectors on the front panel of the board.

Table 3-66 lists the pin descriptions and usage of the QDCL SIPAC connector.

		4 E	3 D	2 C	1 B	0 A
	1		not implemented			
	2	ADR0/	ADR1/	GND	ADR2/	
	3	ADR3/	ADR4/	ADR5/	ADR6/	
	4	ADR7/	ADR8/	ADR9/	ADRA/	
X1	5	ADRB/	ADRC/	ADRD/	ADRE/	
	6	ADRF/	ADR10/	ADR11/	ADR12/	
	7	ADR13/	ADR14/	ADR15/	ADR16/	
	8	ADR17/	BHEN/	GND	GND	
	9					
	10	+5V	+5V	+5V		
	1	DAT0/	DAT1/	DAT2/	DAT3/	
	2	DAT4/	DAT5/	GND	DAT6/	
	3	DAT7/	DAT8/	DAT9/	DATA/	
	4	DATB/	DATC/	DATD/	DATE/	
X2	5	DATF/				
	6					
	7					
	8	GND	GND	GND	GND	
	9	INIT/				
	10	NC	+5V	GND		
	1					
	2		ACTIV_O/	GND	ACTIV_P/	
	3					
	4		CMP_THRQ/	LP_THRQ/		
X3	5				TDI	
	6			TRST/		
	7	GND	TMS		TDO	
	8	TCK		GND	INH1/	
	9		CMP_TSTOUT		LP_TSTOUT	
	10	NC	+5V	GND		

Table 3-66 QDCL, SIPAC Connector Pins (Seite 1 von 3)

		4 E	3 D	2 C	1 B	0 A
	1	IORC/	IOWC/	MWTC/	MRDC/	
	2		XACK/	GND		
	3					
	4					
X4	5					
	6					
	7					
	8	INT5/		GND		
	9		not implemented			
	10	NC	+5V	+5V		
	1	SHRES1P	HDO1P		HDI1P	
	2	SHRES1N	HDO1N	GND	HDI1N	
	3	SHRES2P	HDO2P		HDI2P	
	4	SHRES2N	HDO2N		HDI2N	
X5	5					
	6	SHRES3P	HDO3P		HDI3P	
	7	SHRES3N	HDO3N		HDI3N	
	8	SHRES4P	HDO4P	GND	HDI4P	
	9	SHRES4N	HDO4N		HDI4N	
	10		+5V	+5V		
	1		not implemented			
	2	SHRES5P	HDO5P	GND	HDI5P	
	3	SHRES5N	HDO5N		HDI5N	
	4	SHRES6P	HDO6P		HDI6P	
X6	5	SHRES6N	HDO6N		HDI6N	
	6	SHRES7P	HDO7P		HDI7P	
	7	SHRES7N	HDO7N		HDI7N	
	8	SHRES8P	HDO8P	GND	HDI8P	
	9	SHRES8N	HDO8N		HDI8N	
	10		+5V	GND		
	1	SHRES9P	HDO9P		HDI9P	

Table 3-66 QDCL, SIPAC Connector Pins (Seite 2 von 3)

		4 E	3 D	2 C	1 B	0 A
	2	SHRES9N	HDO9N	GND	HDI9N	
	3	SHRES10P	HDO10P		HDI10P	
	4	SHRES10N	HDO10N		HDI10N	
X7	5					
	6	SHRES11P	HDO11P		HDI11P	
	7	SHRES11N	HDO11N		HDI11N	
	8	SHRES12P	HDO12P	GND	HDI12P	
	9	SHRES12N	HDO12N		HDI12N	
	10		+5V	GND		
	1	SHRES13P	HDO13P		HDI13P	
	2	SHRES13N	HDO13N	GND	HDI13N	
	3	SHRES14P	HDO14P		HDI14P	
	4	SHRES14N	HDO14N		HDI14N	
X8	5					
	6	SHRES15P	HDO15P		HDI15P	
	7	SHRES15N	HDO15N		HDI15N	
	8			GND		
	9					
	10	+5V	+5V	+5V		
	1					
	2		SCHDO	GND	SCHDI	
	3			SCRES/		
	4					
X9	5					
	6					
	7					
	8			GND	CKA	
	9		not implemented			

Table 3-66 QDCL, SIPAC Connector Pins (Seite 3 von 3)

Background Pattern	Type of Interface
	Interface to Power Supply Unit
	Multibus 1 Interface to DP
	LTU Interface (HDLC and Shelf Reset)
	Test Interface (Boundary-Scan and Module Test)
	Interface to MTSCG (Clock and Active)
	Interface to SICOE (HDLC and Reset)

Table 3-67 Background Pattern

The designation scheme for the pin signals are as follows:

- P / N at the end of the name for a balanced signal refers to positive or negative part of a two wire balanced connection.
- The slash at the end of a signals name indicates that the signal is active low.
- HDOx refers to a HDLC output to one of the 15 LTU shelves (x = 1-15).
  HDIx refers to a HDLC input from one of the 15 LTU shelves (x = 1-15).
- SHRESx refers to a shelf reset signal output to one of the 15 LTU shelves (x = 1 - 15).
- A *T* at the beginning of a signal name refers to a Test - Interface signal.
- An *SC* at the beginning of a signal name refers to a SICOE Interface signal.
- NC = Not Connected (Beware of other partial voltage as applied to other slot connectors).

3.19.3 Removing the QDCL Board

This procedure removes the non-redundant system from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

To remove the QDCL board:

1. Deactivate and turn off the CCDAX shelf as applicable.
2. Using the board removal and replacement tool, unseat the board and remove it from the shelf.

3.19.4 Replacing the QDCL Board

To replace the QDCL board:

1. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
2. Turn on and activate the CCDAX shelf as applicable.

3.19.5 Verifying the QDCL Board

To verify the operation of the QDCL board:

1. Wait approximately 15 minutes for the system to reinitialize.
2. Ensure that an A or S appear on the SWU DPC5.
3. Log on to the HiPath 4000.
4. Display the status of the QDCL board as follows:
   a) Type **`DIS-SDSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
STATUS	ALL
LINK	<blank>
TYPE	UNIT
PID	BP&LTG

5. Test the QDCL board as follows:

   Active QDCL board

   a) Type **`TES-TSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
UNIT	CLTG
LTG	<1 - 32>
HALF	<blank>

   Standby QDCL board

a) Type **`TES-TSU`** and press **Enter**.

a) Type the following values, then press **Enter**.

Field	**Value**
UNIT	CLTG
LTG	<1 - 32>
HALF	SBY

3.20 Ring Generator

The ring generator (RGMOD) can supply different ring currents depending on the country setting and a 150 Volt direct current (Vdc) message-waiting voltage to analog telephones attached to line interfaces in LTUW and L80X shelves.

> The RGMOD module is connected to the back of the shelf backplane. To comply with different country specifications and different voltage and frequency values at the ringer output, these settings are made by means of jumpers on the component side of the board.
> Ring generator boards reside in LTU shelves but are functionally part of the service unit. The ring generator board can provide ring voltage to other LTU shelves through power wires connecting the LTU shelf backplanes. Under no circumstances, however, can an LTU shelf receive ring voltage from two ring generator boards.

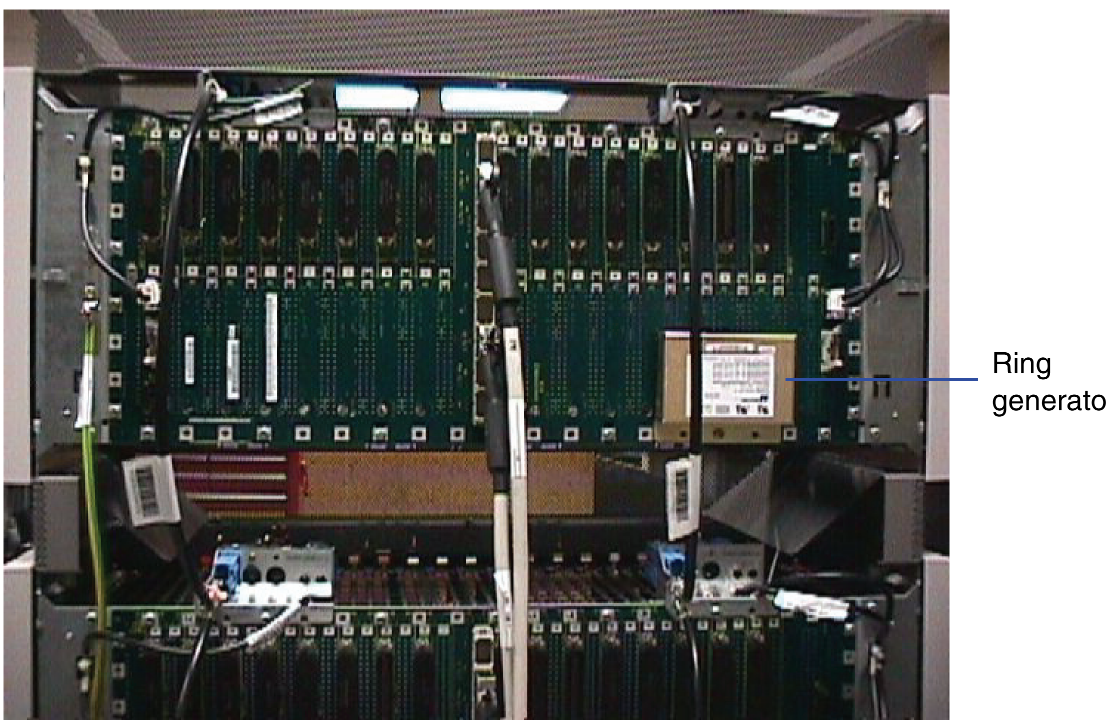


Figure 3-49 Ring Generator

3.20.1 LED Indications

The ring generator does not have any LED indications.

3.20.2 Ringer Module Types

- S30807-Q6141-X (Siemens)
- S30122-K5929-X (MagneTek)

3.20.3 Ringer Settings

Output	**Frequency**	**Regulierg.**	**Begrenzter Strom**	**Rest-welligkeit**	**Norm**
75Vrms	25Hz	5%	67mA	200mV	europ.Standard
65Vrms	25Hz	5%	77mA	200mV	Schweiz
75Vrms	50Hz	5%	67mA	200mV	Frankreich
85Vrms	20Hz	5%	59mA	200mV	USA

Table 3-68 Ringer Settings

Table 3-69 Ringer Settings

3.20.4 Jumper settings for Ring Voltages

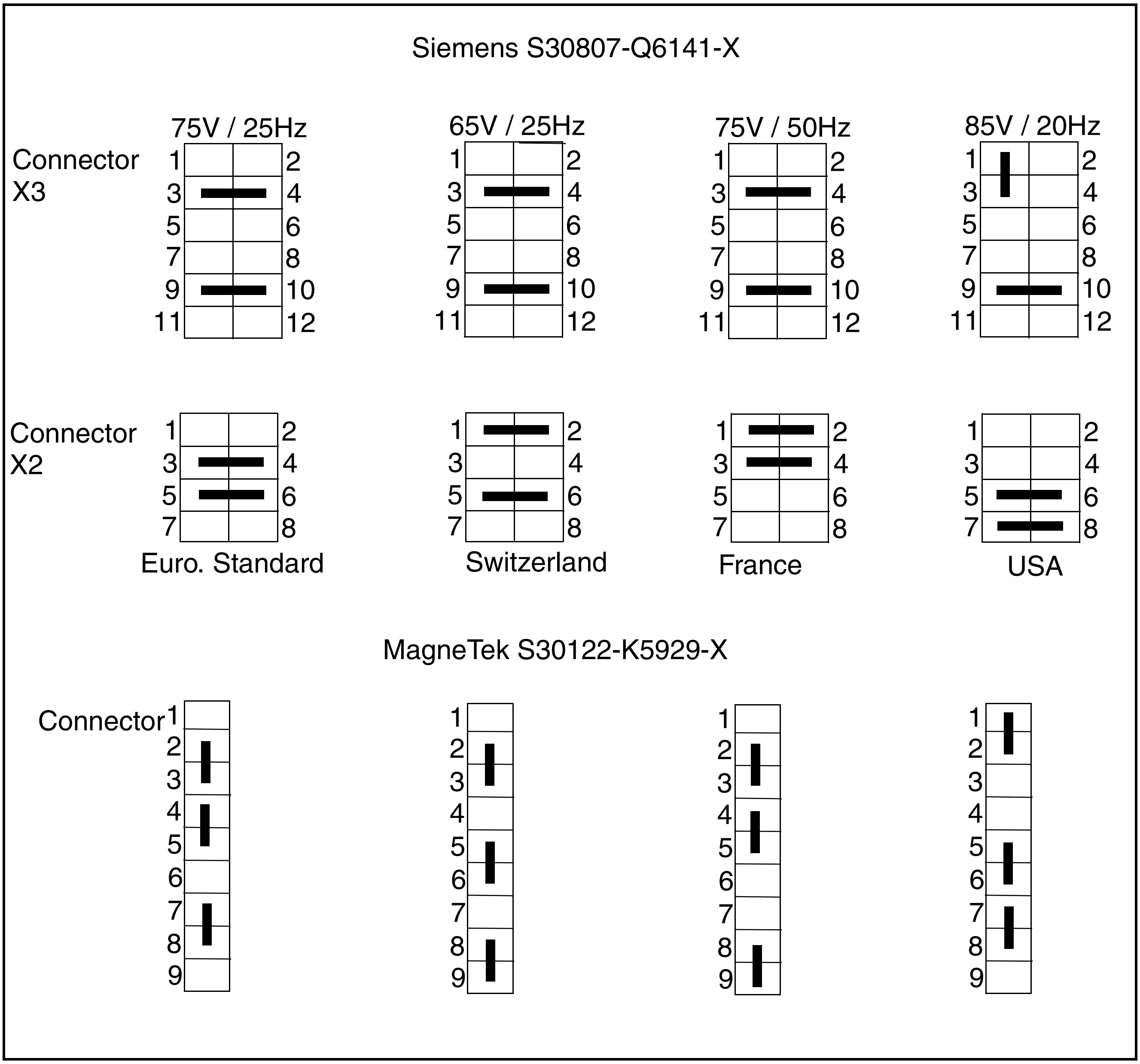


Figure 3-50 Jumper settings for Ring Voltages

3.20.5 Jumper Setting for AC Generator (only for S30810-Q6141-X)

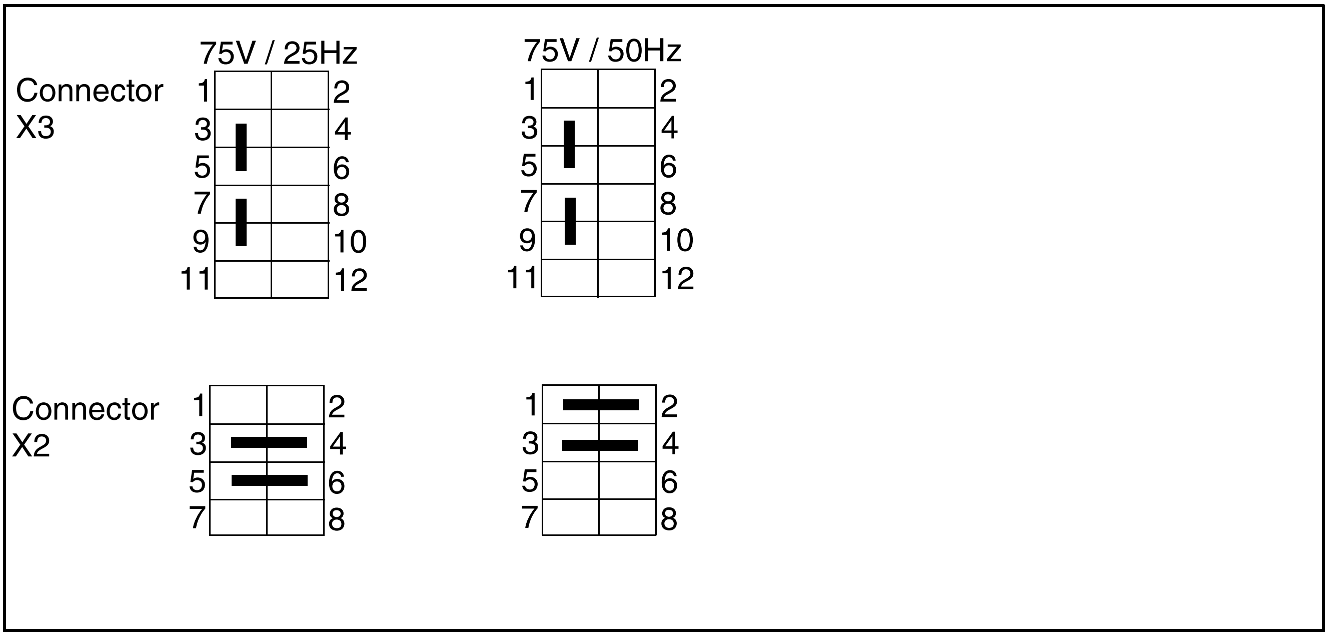


Figure 3-51 Jumper Setting for AC Generator (only for S30810-Q6141-X)

3.20.6 Removing the Ring Generator

Warning
The RG module must be switched off before it is inserted or removed.
The ring generator board has voltage levels ranging from +75 Volts (V) to -170 V during normal operation. Observe high-voltage electrical safety practices when working with or near this board.
If the ring generator is removed, analog telephones served by the ring generator does not ring for incoming calls.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

To remove the ring generator:

1. Remove the screw that attaches the ring generator to the backplane.
2. Unplug the ring generator from the 10-pin connector on the backplane.

3.20.7 Replacing the Ring Generator

To replace the ring generator:

1. Plug the ring generator to the 10-pin connector on the backplane.
2. Replace the screw to attach the ring generator to the backplane.

3.20.8 Verifying the Ring Generator

There is no easy way to verify the ring generator. If ringing is not present on a shelf, the system receives an LTUCX alarm for loss of ring-sync.

The USERG (Q2468-X) is an option on systems which have large amounts of message waiting and analog telephones. The USERG is installed in slot 19 of an LTU shelf.

3.21 RTM

The RTM (Rear Transition Module) board is implemented in the CompactPCI architecture in HiPath 4000 V2 and forms the interface between the central processor board (DSCXL) and the peripheral LTU shelf (see Figure 3-52). This board offers the same functions as its predecessor DSCX as well as the following improvements.

- It is integrated in the CompactPCI system
- It supports up to fifteen LTU shelves
- It replaces the existing LTU cables with standard CAT5, 8-pin, shielded cables, (RJ45)
- It provides a LAN-based interface to the DSCXL over the backplane

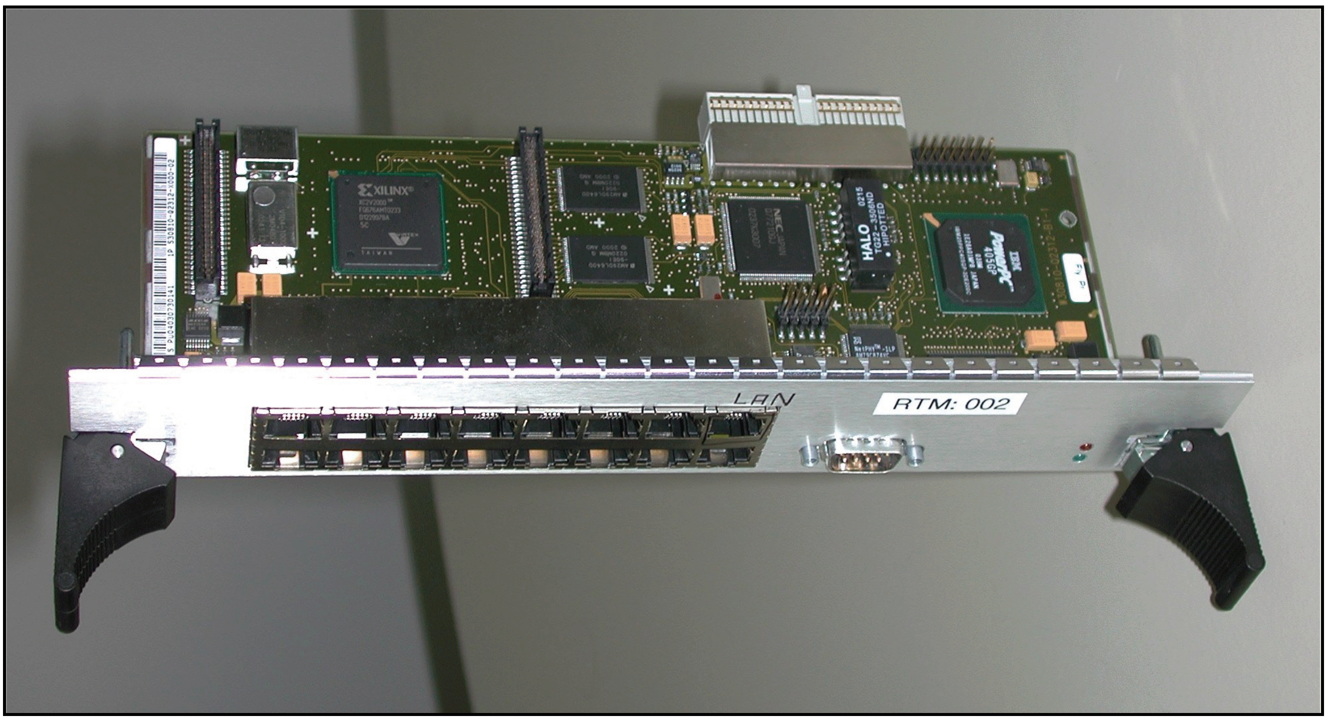


Figure 3-52 RTM Board

3.21.1 Hardware Part Number

S30810-Q2312-X-*

3.21.2 LED Indications

The front panel of the board features two LEDs.

LED	Indication
Red (FAIL)	This display is controlled by the software and loadware and should normally be off. If on, it indicates a real hardware or software error. The green RUN LED should be off.
Green (RUN or ACTIVE)	This display flashes during normal operation; the flashing rhythm indicates the MASTER/SLAVE status of the board (see Figure 3-53).

Table 3-70 RTM Board LED Indications

(

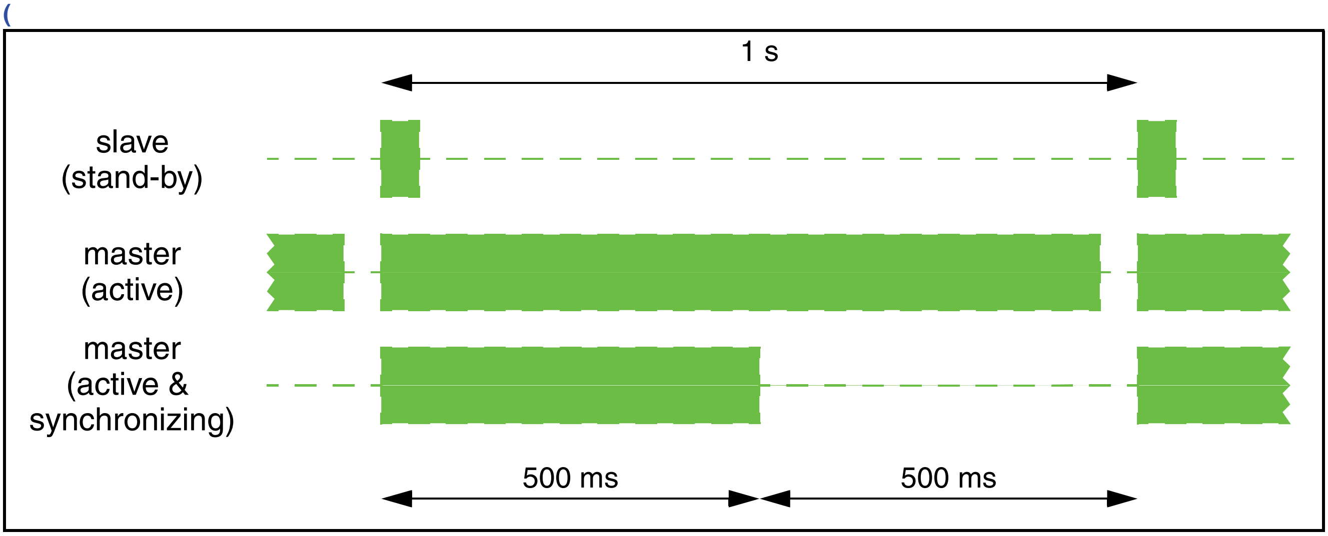


Figure 3-53 Master/slave status of the RTM board

- Short flashing signal (on/off approximately: 1:15) — board is a slave (stand-by mode)
- Long flashing signal (on/off approximately: 15: 1) — board is master; no external synchronization
- Symmetrical flashing signal (1:1) — board is master; external synchronization active

3.21.3 Interfaces

The RTM board consists of the following interfaces:

- CompactPCI backplane with:
  - Power supply
  - System clocks
  - Slot addresses
  - Control signals between partner boards

   – LAN 10/100Base-T (direct connection over the backplane to the DSCXL board)

- LTU 15 x RJ45 each with 32 Mbps (each of which has 1x HDLC channel with 2 Mbps and 4x PCM64s (256 B channels per LTU, max. 3840 B channels)
- V.24 9-pin SUB-D connector (service connector)
- Displays (LED)

CPCI - Backplane

The CPCI backplane routes the 3.3-V power supply, distributes the system clocks, and reads the slot addresses. In a duplex system, at least two RTM boards are implemented, connected to each other by a partner interface, and communicate with the appropriate DSCXL processor board over the backplane. The DSCXL board can determine the status of the RTM hardware or firmware on the basis of signals. The RTM can also recognize the status of the DSCXL boards.

A 10/100Base-T Ethernet connection to the DSCXL is also provided over the backplane.

Front Panel

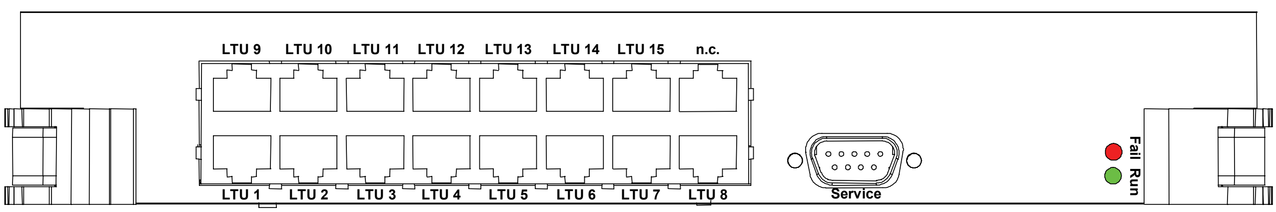


Figure 3-54 RTM Front Panel

- LTU interfaces

The front side of the RTM board features a block with sixteen RJ45 interfaces. A maximum of only fifteen of these are used, however, one interface remains unused because when a HiPath 4000 is fully configured, a maximum of only 15 LTUs are used. Pin assignment is based on the LAN so that standard LAN cables can be used. From an electrical perspective, LVDS drivers and receivers are used instead of Ethernet signals.

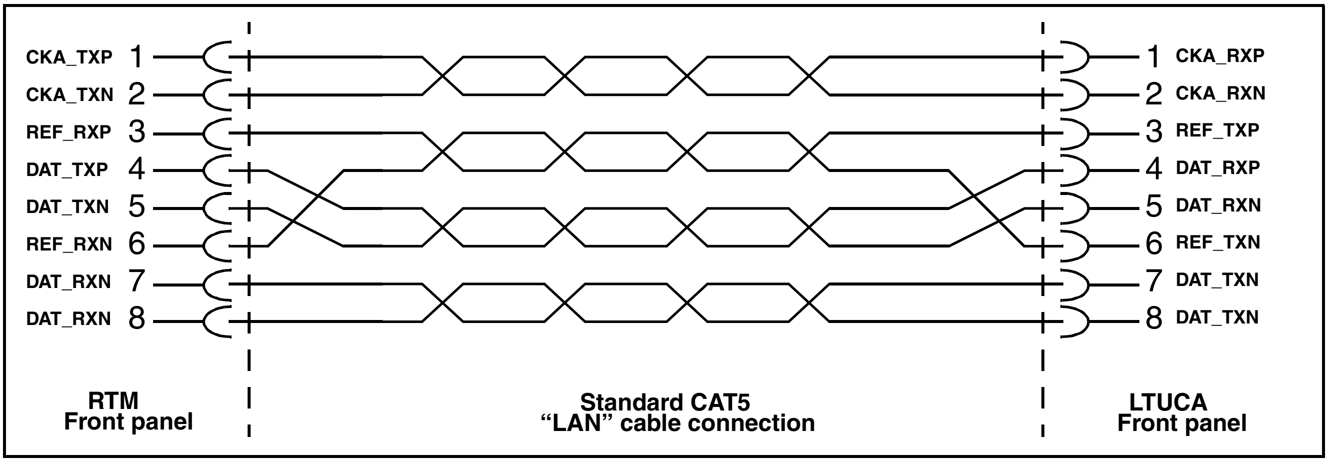


Figure 3-55 LAN Cable Connection

- V.24 interface

This interface is used by Service personnel for tests and diagnostics. A crossed cable (NULL modem) is used for connection. The baud rate is 38400 bps.

PIN No.	Signal	I/O	Remark
1	DCD	I	Internal pull-up
2	RXD	I	Internal pull-up
3	TXD	O	
4	DTR	O	
5	0 V		Ground
6	DSR	I	Internal pull-up
7	RTS	O	
8	CTS	I	Internal pull-up
9	RI	I	Internal pull-up

Table 3-71 V.24 Interface

3.21.4 Power Supply

The RTM board receives +3.3 V from the system’s backplane. The power supply voltages required for the various circuits on the RTM board are generated by the DC/DC voltage converter.

A "Hot Swap Controller" monitors the local voltage levels and disables the board:

- When 2.5 A power consumption exceeds 20µs
- Immediately when 7.5 A is reached

- In the case of critical voltage underflow; once disabled, the board automatically attempts to perform a reset after approximately 1.5 s.
- When the board is plugged in and unplugged.

The board can plugged in and unplugged during live operation (“Hot Swap”).

After swapping an RTM module, reload the associated processor (BPA or BPB) with:

```
EXEC-REST:UNIT,BPx,RELOAD;
```

This is the only way to ensure correct operation with current LW/SIU data in the RTM.

3.22 SCC

The SCC board provides the HDLC signaling in the common control unit and functions as the first LTUCE board in the system. The SCC board also provides the clocking function.

All coordinating functions between central and peripheral control for HiPath 4000, as performed by PCG/DCL/SIUCO/MTS/LTUC:

- Small Clock Generator (SCG)—synchronizes to the external clocks and supplies system clock to all internal components such as switching network, HDLC path, and peripheral boards.
- Data Communication Link (DCL)
  - Status indications are performed by the SSD; decimal point serves as RUN LED for DCL function
  - HDLC paths to integral LTU
  - HDLC paths to optional LTU80 expansion and to SIUCO
- Memory Time Switch (MTS)
- Signaling Unit and Conference functions (SIUCO)
  - 12 Tone generators
  - 6 Short announcements
  - Music-on-hold
  - Test transmitter
  - 4 DTMF receivers
  - 4 Dial tone receivers
  - Test receiver
  - Three-way conference
  - Override
  - Camp-on/knocking
- Functions in part of Line Trunk Unit Controller (LTUC)
  - Controller functions for integral LTU in same shelf

3.22.1 LED Indications

Table 3-72 lists the LED indications of the SCC board.

CLK	**ERR**	**Indications During Startup**
On	On	Immediately after power-up or reset
Off	Off	Board self-test
Off	On	Board cannot be initialized; awaits reset)
Blinking	Blinking	LEDs alternate; board awaits completion of startup
		LED Indications During Operation
On	Off	Board receives clock (CKA, FMB)
		Error Indications
Off		No clock (CKA, FMB)
	On	No reference clock (CKA or FMB)
	Blinking	Rapid pulsing of LED HDCL path failed, message was not transmitted

Table 3-72 SCC, LED Indications

3.22.2 SSD Indications

Controller link between central processor board DPC 5 and peripheral boards in HiPath 4300 systems.

Figure 3-56 shows the front panel of the SCC board.

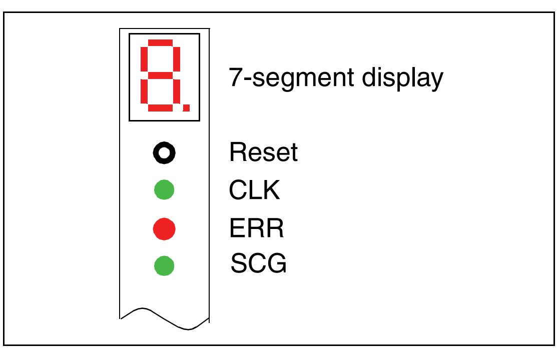


Figure 3-56 SCC Front Panel

Table 3-73 lists the SSD indications of the SCC board.

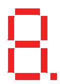
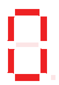
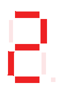
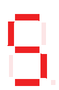
Seven Segment Display	Description
	Reset
	Board reset or startup procedure is run (OMS call)
	Reset procedure is completed
	Flashing display = error occurred in test Constant = INIT procedure is in progress
	BOARD READY, Dual-Port-RAM (DPR) awaits DPR-VALID
	DPR-VALID received; message exchange begins (board goes online)
	INIT message received from Error Analysis system (FA)
	INIT message received from Pre-Processing system (PP)
	Start Polling message is (SCC starts polling)
	SCC switches to slave polling; DPR overload imminent
	SCC stops polling
	Point indicates RUN status

Table 3-73 SCC SSD Indications

Always initiate a soft restart with the REST AMO! Do not press the RES key!
As of board status **F1**, soft restarts are also possible by means of the RES key.

Table 3-74 lists the LED indications of the SCG board.

SCG LED	Function
On (constant)	Reset - no error
Off	No reference clock
Pulsing slowly (1 s / 1 s)	Synchronizing to external reference clock
Pulsing rapidly (0,2 s on/0,5 s off)	Bad reference clock / reference clock will be evaluated (2 - 3 s, after clock applied)

Table 3-74 SCG Board LED Indications

3.22.3 Switches and Connectors

The front panel of the SCC board has a reset switch (see Figure 3-56).

3.22.4 Removing the SCC Board

This procedure removes the system from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

To remove the SCC board:

1. Deactivate and turn off the shelf.
2. Using the board extractor, unseat the board and remove it from the shelf.

3.22.5 Replacing the SCC Board

To replace the SCC board:

1. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
2. Turn on and activate the shelf.

3.22.6 Verifying the SCC Board

To verify the operation of the SCC board:

1. Wait approximately 15 minutes for the system to reinitialize.
2. Verify the SSD indications.
3. Display the status of the SWU as follows:
   a) Type **`DIS-SDSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
LINK	<blank>

3.23 SF2X8

The SF2X8 (Switch Fabric) board (see Figure 3-57) is used as a LAN switch on the HiPath 4000 common architecture platform. This LAN switch features two switches (Atlantic LAN and Customer LAN) that operate independently of one another.

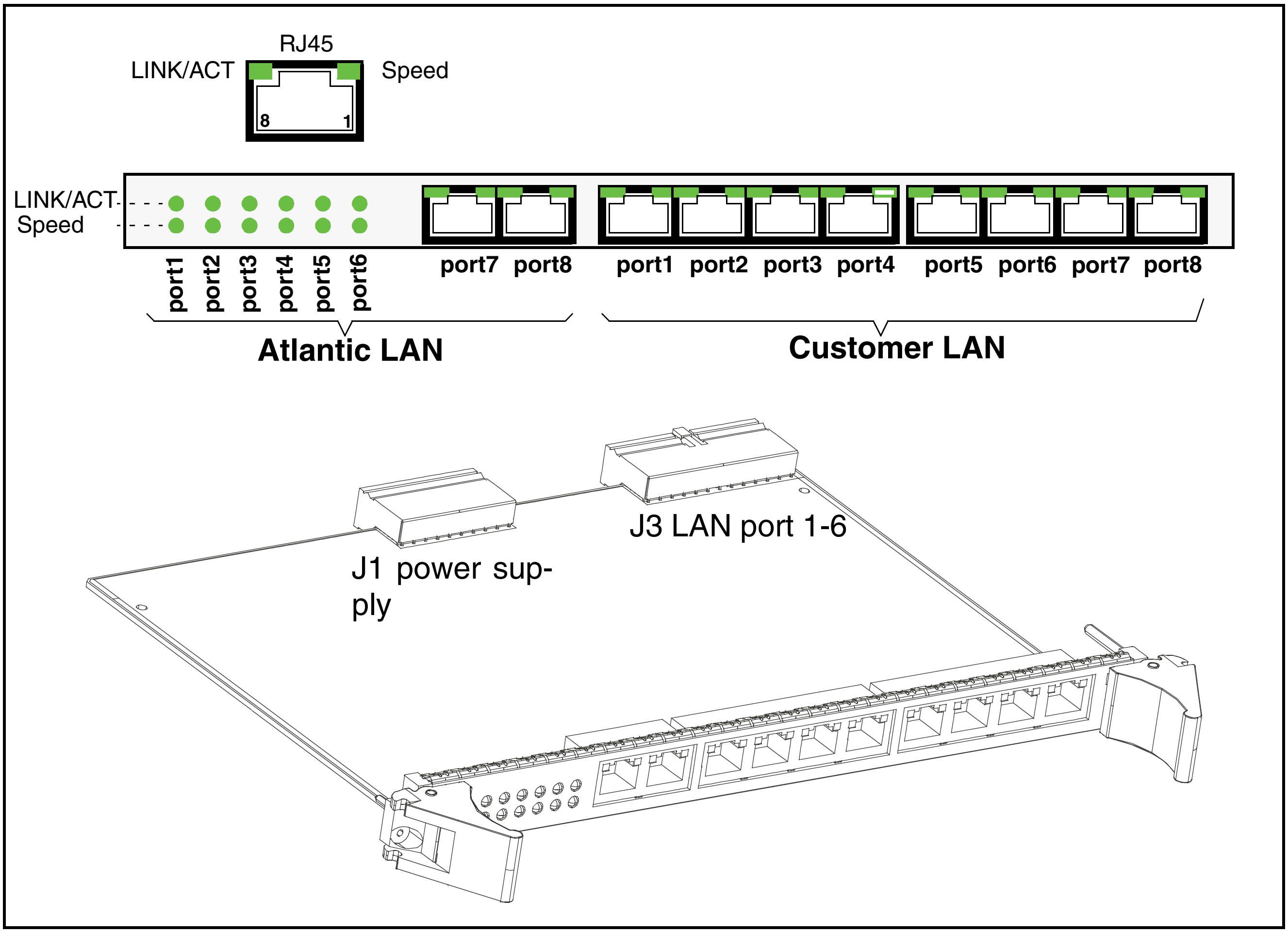


Figure 3-57 SF2X8 Board

3.23.1 Hardware Part Number

S30810-Q2309-X-*

3.23.2 LEDs

Two green LEDs are installed for every LAN interface. The LEDs for the LAN interfaces on the front panel are integrated in the RJ45 sockets. The LEDs for the back LAN interfaces are located on the front panel.

Table 3-75 lists the LED indications of the SF2X8 board.

LED Function	LED on	LED off	LED flashes
LINK/ACT (green)	There is Connection	No connection	Transferring or receiving signals
SPEED (green)	100 Mbps	10 Mbps	

Table 3-75 LED Indications

3.23.3 Block Diagram

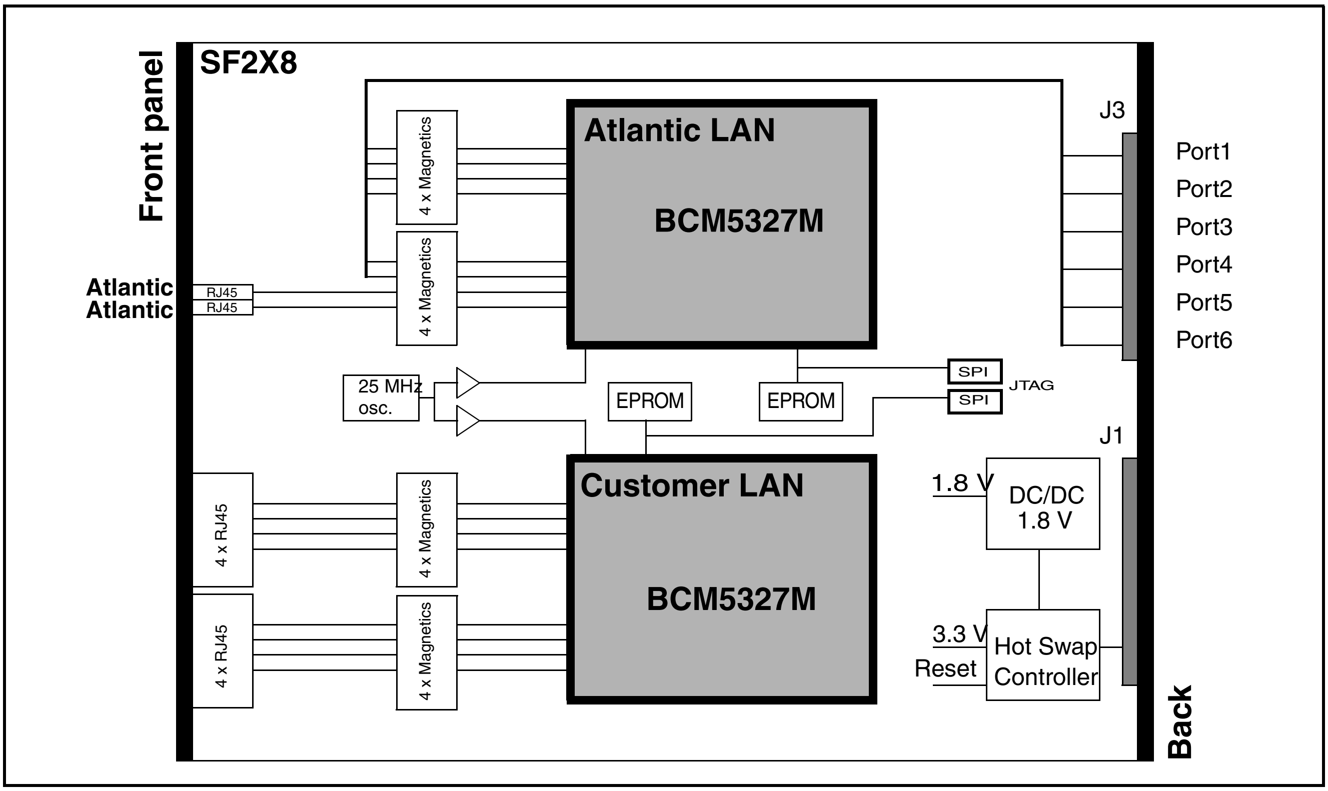


Figure 3-58 SF2X8 Block Diagram

3.23.4 Interfaces

- Atlantic LAN

The Atlantic LAN switch supports two external Ethernet interfaces on the front panel and six internal Ethernet interfaces on the back of the board. These are connected to the CSPCI backplane over the J3 connector.

- Customer LAN

The customer LAN supports eight external Ethernet interfaces on the front panel.

Pin #	Signal	I/O	Designation
1	RXP	I	Receive Data +
2	RXN	I	Receive Data -
3	TXP	O	Transmit Data +
4	(TERM1)		(Termination 1)
5	(TERM1)		(Termination 1)
6	TXN	O	Transmit Data -
7	(TERM2)		(Termination 2)
8	(TERM2)		(Termination 2)
Shield	GND		Grounding

Table 3-76 RJ45 Ethernet Interface (Pin Assignment)

J3 connector

POS#	Row Z	Row A	Row B	Row C	Row D	Row E	Row F
19	GND						GND
18	GND						GND
17	GND						GND
16	GND						GND
15	GND			GND			GND
14	GND			GND			GND
13	GND			GND			GND
12	GND	LP6_DA+	LP6_DA-	GND			GND
11	GND	LP6_DB+	LP6_DB-	GND			GND
10	GND	LP5_DA+	LP5_DA-	GND			GND
9	GND	LP5_DB+	LP5_DB-	GND			GND
8	GND	LP4_DA+	LP4_DA-	GND			GND
7	GND	LP4_DB+	LP4_DB-	GND			GND
6	GND	LP3_DA+	LP3_DA-	GND			GND
5	GND	LP3_DB+	LP3_DB-	GND			GND

Table 3-77 J3 (Pin Assignment) (Seite 1 von 2)

POS#	Row Z	Row A	Row B	Row C	Row D	Row E	Row F
4	GND	LP2_DA+	LP2_DA-	GND			GND
3	GND	LP2_DB+	LP2_DB-	GND			GND
2	GND	LP1_DA+	LP1_DA-	GND			GND
1	GND	LP1_DB+	LP1_DB-	GND			GND

Table 3-77 J3 (Pin Assignment) (Seite 2 von 2)

3.23.5 Power Supply

The SF2X8 board receives +3.3 V from the system’s backplane over the J1 connector. The 1.8-V power supply voltage required for the LAN circuits on the SF2X8 board is generated by the DC/DC converter.

The board can plugged in and unplugged during live operation. A "Hot Swap Controller" monitors the voltage levels (surge protection) and disables the board in the event of overvoltage or undervoltage. The board is reset after being disabled.

J1 connector

POS#	Row Z	Row A	Row B	Row C	Row D	Row E	Row F
25	GND				3.3 V		GND
24	GND						GND
23	GND	3.3 V					GND
22	GND		GND	3.3 V			GND
21	GND	3.3 V					GND
20	GND		GND				GND
19	GND	3.3 V			GND		GND
18	GND		GND	3.3 V			GND
17	GND	3.3 V			GND		GND
16	GND		GND				GND
15	GND	3.3 V			BD_SEL#		GND
14 13 12	KEY AREA						
11	GND				GND		GND
10	GND		GND	3.3 V			GND
9	GND				GND		GND

Table 3-78 J1 (Pin Assignment) (Seite 1 von 2)

POS#	Row Z	Row A	Row B	Row C	Row D	Row E	Row F
8	GND		GND				GND
7	GND				GND		GND
6	GND			3.3 V			GND
5	GND				GND		GND
4	GND						GND
3	GND						GND
2	GND						GND
1	GND						GND

Table 3-78 J1 (Pin Assignment) (Seite 2 von 2)

3.24 SICOE

This section describes the function of the signaling unit plus conference extended (SICOE) board. It also provides procedures for removing, replacing, and verifying this board.

3.24.1 Functional Description, Model Q2234-X100

The SICOE board, P/N Q2234-X100 in the HiPath 4500 combines the functions of the SIU board and conference call switching. The SICOE (Q2234-X100) board supports LTUE shelves 1 through 7 for smaller HiPath 4500 systems.

The board transmits and receives DTMF signals and generates or receives test tones to and from the system. The SICOE board also switches up to twenty 3-party or eight 8-party conferences.

The board functions are:

- DTMF tone generator (two channels)
- DTMF signal reception (two channels)
- Dial tone reception
- Generation supervisory tones
- Test tone generator and test tone receiver
- Conference bridging functions for:
  - Override
  - Camp-on
  - Silent monitoring
  - Conferences with variable numbers of subscribers

3.24.2 Functional Description, Model Q2234-X

The SICOE board, Q2234-X in the HiPath 4500 combines the functions of the SICOE (Q2234-X100) board and an extension of the MTSCG board. Memory switching and network clock functions are functions shared with the MTSCG board.

> Additional functions of the SICOE (Q2234-X) board are memory time switching (MTSCG board extension) and network clock generation (MTSCG board extension).

3.24.3 LED Indications and Connectors

The SICOE board does not have any LEDs or SSDs. They use the standard board edge connectors X1 and X2.

3.24.4 Removing the SICOE Board

Warning
This procedure removes the non-redundant system from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

Remove the board from the HiPath 4000 as follows:

1. Remove power from the board as follows:
   - Redundant system
     – Deactivate and power off the SWU.
   - Nonredundant system
     – Deactivate and power off the SWU.
2. Using the board extractor, unseat the board and remove it from the shelf.

3.24.5 Replacing the SICOE Board

Replace the board in the HiPath 4000 as follows:

1. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
   - Redundant system
     – Power on and activate the SWU.
   - Nonredundant system
     – Power on and activate the SWU.

3.24.6 Verifying the SICOE Board

Verify the operation of the board by displaying the status of all common control unit modules and testing the board as follows:

1. Type **`DIS-SDSU`** and press **Enter**.
2. Type the following value, and then press **Enter.**

Field	**Value**
STATUS	ALL
LINK	<blank>
TYPE	UNIT
PID	LTG

3. Type **`TES-TSU`** and press **Enter**.
4. Type the following values, and then press Enter.

Field	**Value**
UNIT	SIU
LTG	1

3.25 SIUX and SIUX2

The signaling interface unit peripheral extended (SIUX and SIUX2) boards transmit and receive DTMF or MFC signals on eight channels to and from trunks and subscriber equipment. They also perform line diagnostic tests. The SIUX and the SIUX2 have exactly the same functionality. The SIUX2 is the replacement for the older board.

Previous models of the SIUX board had SIVAPAC connectors. The New SIUX2 board has SIPAC connector. This board cannot be used as a central SIU.

This board has six operating modes, each using different loadware.

- Function ID 2 provides eight DTMF sender/receiver pairs for use in countries that employ DTMF signalling.
- Function ID 3 provides eight MFC sender/receiver pairs for use in countries that employ MFC signalling.
- Function ID 4 provides four DTMF sender/receiver pairs, plus one port containing the Telephony Diagnostic System (TDS).
- Function ID 5 provides MFC ANI services for use in Russia and other CIS countries.
- Function ID 6 provides MFC shuttle-packet services for use in Russia and other CIS countries.
- Function ID 7 provides four DTMF sender/receiver pairs, plus one port containing the Line check diagnostics.

The SIUX or SIUX2 board resides in an LTUW or L80XP shelf but are functionally part of the service unit.

3.25.1 LED Indications

The front panel of the SIUX and SIUX2 board (see Figure 3-59) has two LEDs: ERR (error) and RDY (ready).

Figure 3-59 SIUX Board Front Panel

Table 3-79 lists the LED indications of the SIUX board.

LED	State	Indication
Ready (Green)	On	Board is active.
	Off	Board is not initialized or has a fatal error.

Table 3-79 SIUX Board LED Indications (Seite 1 von 2)

LED	State	Indication
Error (Red)	On	Initial board test is in progress or a fatal board error is detected.
	Flashing	Board loadware is loading or the initial board test passed.
	Off	Board is functioning normally.

Table 3-79 SIUX Board LED Indications (Seite 2 von 2)

3.25.2 Removing the SIUX Board

Warning
All DTMF tones supported by the SIUX board are removed from service. If the first SIUX in the system is removed, the DTMF tones that support HSD are removed and HSD is unavailable.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

Remove the SIUX board as follows:

1. Deactivate the SIUX board as follows:
   a) Type **DEA-BSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
OFFTYPE	DC
LTG	1
SLOT	<slot number>
REOFF	<blank>

2. Display the telephony boards as follows:
   a) Type **DIS-BCSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
TYPE	TBL
LTG	1
SLOT	<slot number>

3. Using the board extractor, unseat the board and remove it from the shelf.

3.25.3 Replacing the SIUX Board

Replace the SIUX board as follows:

1. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
2. Activate the SIUX board as follows:
   a) Type **`ACT-BSSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
ONTYPE	AUL
LTG	1
SLOT	<slot number>

3.25.4 Verifying the SIUX Board

Verify the operation of the SIUX board by displaying the status of the L80F or LTUW shelf as follows:

1. Type **`DIS-SDSU`** and press **Enter.**
2. Type the following values, then press **Enter**.

Field	Value
STATUS	ALL
LINK	<blank>
TYPE	PEN
LTG	1
LTU	<ltu#>
SLOT	<slot#>

3.26 SL200 LAN

This section describes the functions and features of the SL200 board. It includes procedures for removing, replacing, and verifying this board.

3.26.1 Functional Description

The SL200 LAN board is an add-on board for the DSCX in the HiPath 4300 and the DPC5 in the HiPath 4500. In the HiPath 4300, the DSCX board operates as a part of the switching unit and the ADP. In the HiPath 4500, the SL200 board is used in the ADP only.

This board provides 10/100 Mbps connectivity to Unixware for service and administrative functions through a single RJ-45 connector.

The V.24 LAN interface (see Figure 3-60 and Figure 3-61) can be connected to the:

- Siemens LAN – LAN connector 1
- Service and administration LAN (can be used for the IPDA feature) – LAN connector 2

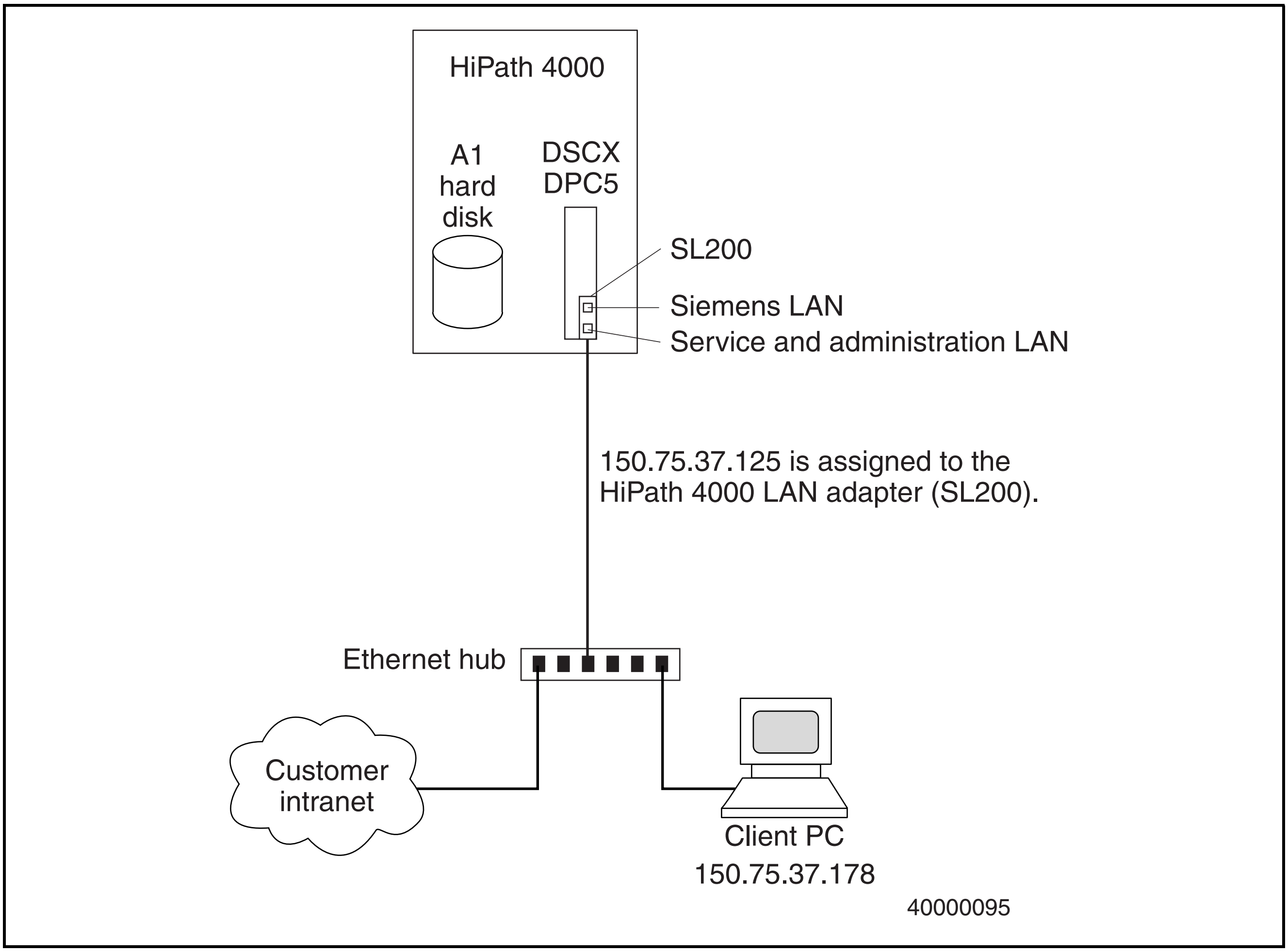


Figure 3-60 SL200 Board Block Diagram, Single HiPath 4000 Ethernet Environment

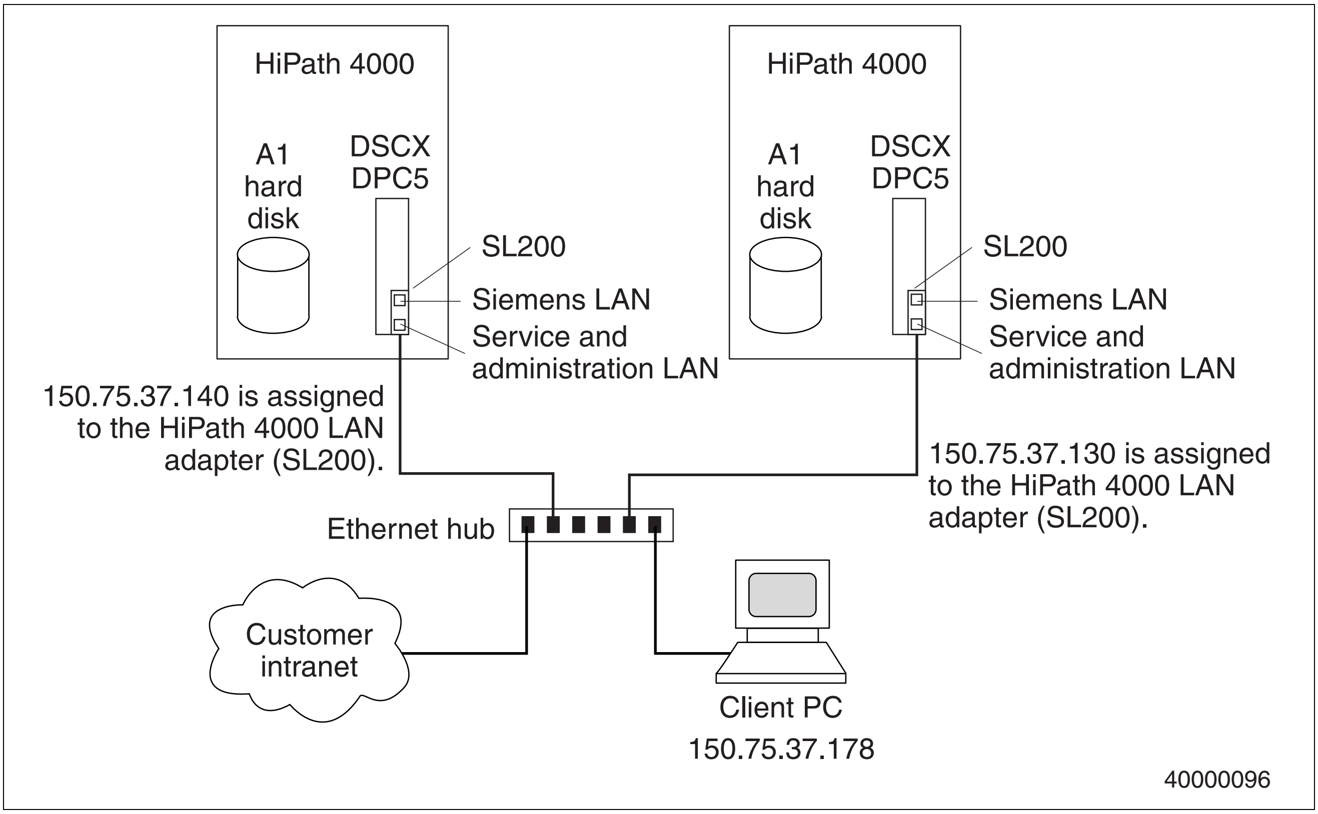


Figure 3-61 SL200 Board Block Diagram, Multiple HiPath 4000 Ethernet Environment

3.26.2 LED Indications and Connectors

The SL200 have two green LEDs on the front of the board (see Figure 3-62) that indicates whether the link is present during an ON state. There are two LAN connections on the front panel.

Figure 3-62 SL200 Board

3.26.3 Removing the SL200 LAN Board

1. Follow the procedures for removing the DSCX or DPC5 board.
2. Place the board on a sturdy static resistant surface.
3. Remove the four screws (two in front, two on the processor board) that secure in the SL200 in place.
4. Remove the SL200 by unseating it from the connectors on the processor board.
5. Slide the SL200 out.

3.26.4 Replacing the SL200 LAN Board

1. Insert the SL200 by seating it on the connectors on the processor board.
2. Tighten the four screws (two in front, two on the processor board) to secure in the SL200 in place. Be sure the screws are snug but not over tightened.
3. Follow the procedures for replacing the DSCX or DPC5 board.

3.26.5 Verifying the SL200 LAN Board

Verify the green LED on the front of the board is on, and that LAN connectivity can be established with the ADP.

3.27 SLC24 Subscriber Line CMI24

The “**S**ubscriber **L**ine Module **C**MI**24**” (SLC24) is an extension board for the following Hicom variants:

- Hicom 150 H Office Pro
- Hicom 300 E V3.0
- Hicom 300 E V3.1
- Hicom 300 H V1.0
- HiPath 4000

The SLC24 board used to connect up CMI base stations and to administer cordless subscribers. Existing SLC16 boards can be replaced with the SLC24 (in Hicom 150 H this is the SLC16n):

System	Old board		New board		$U_{P0/E}$ port	ADPCM channels *)
	Name	Part Number	Name	Part number		
Hicom 150H	SLC16	S30810-Q2922-*	SLC16n	S30810-Q2193-X100	16	32
Hicom 300	SLC16	S30810-Q2151-*	SLC24	S30810-Q2193-X200	24	48

Table 3-80 Assignment of Old and New Boards

ADPCM = Adaptive Difference Pulse Code Modulation

A maximum of 24 $U_{P0/E}$ ports are available for connecting up base stations or telephones.

The X200 version (Hicom 300) has a 10-pin plug contact strip with a serial port with TLL levels for connecting the existing GPS board SLCSM (**S**ubscriber **L**ine **C**MI **S**ynchronisation **M**odule; S30807-Q6194-*). A second plug contact strip with a I^2C bus, reset track and additional voltages is also provided for an SLCSS (**S**ubscriber **L**ine **C**MI **S**ynchronisation **S**mall; S30807-Q6714-*) that is yet to be developed. This can replace the SLCSM.

In contrast to the SLC16, SLC24 now provides an option for switching from 4 PCM highways (A trunk group) to a wideband connection (F trunk group) integrated on the backplane in V3.0 and higher with an additional 4 PCM highways. The system software assigns the highways. Only one trunk group at a time can be used for a single board. The use of wideband (2 x 4 PCM highways) means that a shelf can be used more efficiently when the traffic load on the SLC boards is high.

3.27.1 LED Indications

A "ready" (green) and a "fail" (red) LED have been integrated on the SLC24 for status control.

3.27.2 X200 Board Layout

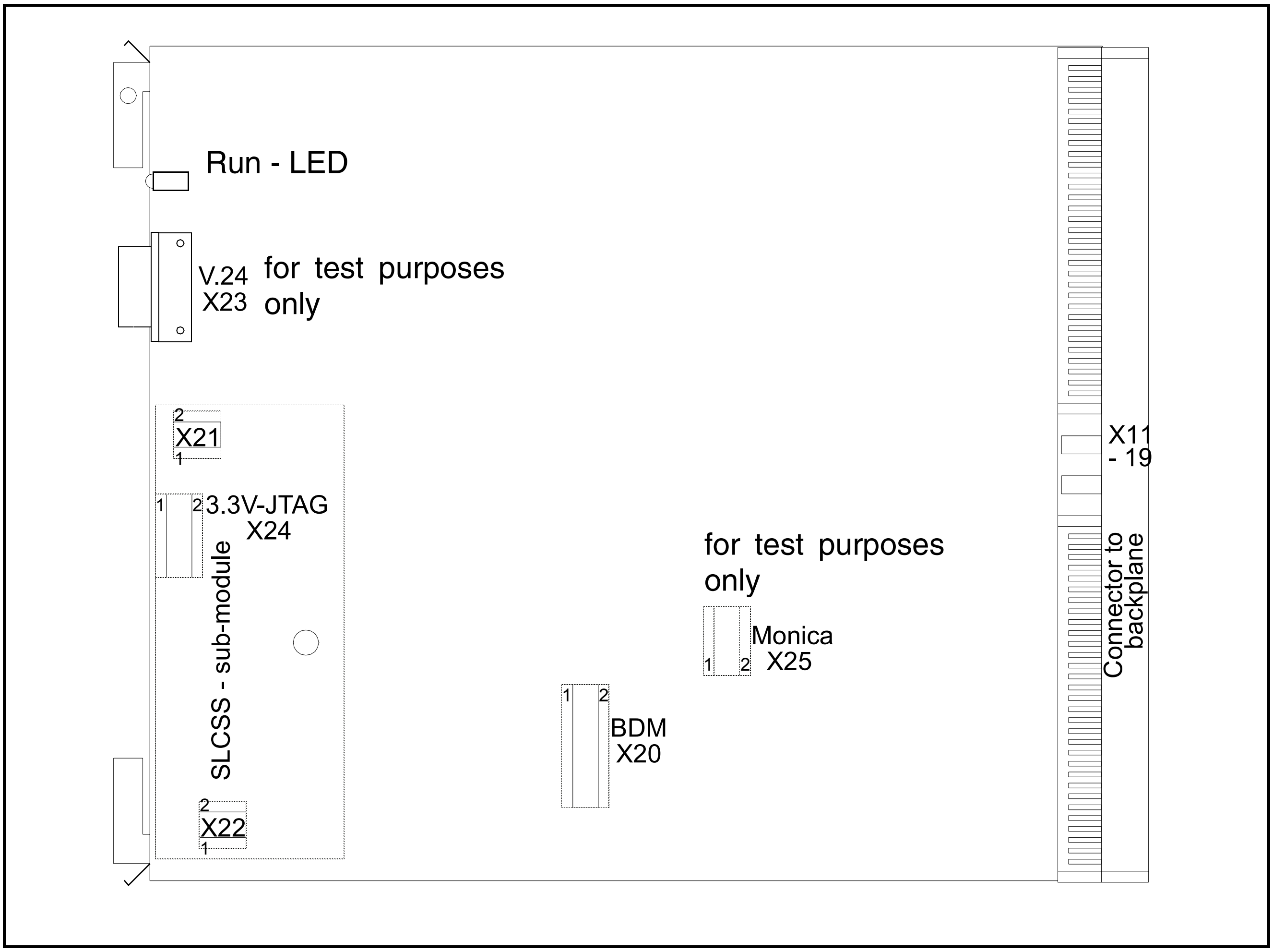


Figure 3-63 X200 Board Layout

3.27.3 Interfaces

- SLCSM Interface X21

  A serial interface with TTL levels is implemented on the SLC24. The SLC24 also has a 10-pin plug contact strip (X21) for connecting the SLCSM S30807-Q6194 board directly. A second 10-pin plug contact strip (X22) has also been fitted, which makes it possible to connect up a new SLCSS directly (not yet developed) as a sub-module.

X21	Signal	I/O	Description		X21	Signal	I/O	Description
Pin 1	N.C.		not connected		Pin 2	RXDA	I	receive data Ch A
Pin 3	TXDA	O	receive data Ch A		Pin 4	N.C.		not connected
Pin 5	0V		Ground		Pin 6	N.C.		not connected
Pin 7	RTSA	O	request to send Ch A		Pin 8	CTSA	I	request to send Ch A
Pin 9	+5V		+5V clock supply		Pin 10	N.C.		not connected

Table 3-81 SLCSM Interface X21 Pin Assignments

- SLCSS interface X22 (sub-module)

X22	Signal	I/O	Description		X22	Signal	I/O	Description
Pin 1	SCL	I/O	I2C bus clock		Pin 2	SDA	I/O	I2C bus data
Pin 3	HRES	O	Reset		Pin 4	P0	I/O	I/O port PP15 at ColdFire
Pin 5	+3.3V		+3.3V clock supply		Pin 6	+3.3V		+3.3V clock supply
Pin 7	CDLSSYN	O	2.4 s multiframe cycle		Pin 8	+5V		+5V clock supply
Pin 9	0V		Ground		Pin 10	0V		Ground

Table 3-82 SLCSS interface X22 (sub-module) Pin Assignments

- Interface to the backplane

  The connection is implemented using a five-row SIPAC socket contact strip. The power supply for the SLC24 is provided by means of this contact strip. All interface and signal lines (e.g. PCM bus, clock lines) are run to the SLC24 by means of the interface. In the X100 variant the interface and signal lines are run symmetrically; in the X200 variant they are run asymmetrically.

- $U_{P0/E}$ interface

  A total of 24 (16) $U_{P0/E}$ ports are available as digital subscriber line interfaces. The telephones are connected up by means of the backplane.

- PCM interface

  Four PCM highway pairs with wideband switch run to the SLC24 by means of the backplane (in the X100 variant this is two highways without wideband). The highways are divided into receive and transmit directions.

- HDLC interfaces (High Level Data Link Control)

  The SLC24 is controlled over an HDLC highway. The ’Extended Line Card Interface Controller’ (ELIC, PEB20550) is used to operate the interface.

3.27.4 Power Supply

The board receives its power supply by means of the backplane.

The SLC24 requires the following voltages:

– +5V (+/-3%), typical power consumption: 850mA

– +3.3V (+/-3%), locally generated from the +5V power supply, typical power consumption: 500mA

– +2.5V (+/-0.2V), locally generated from the +5V power supply, typical power consumption: 100mA

– -48V (+/-5%), typical power consumption depends on the base stations connected up

The +5V and ground connections are arranged on the SLC24 with leading heavy current contacts and normal contacts on the SIPAC contact strip.

3.27.5 Block Diagram

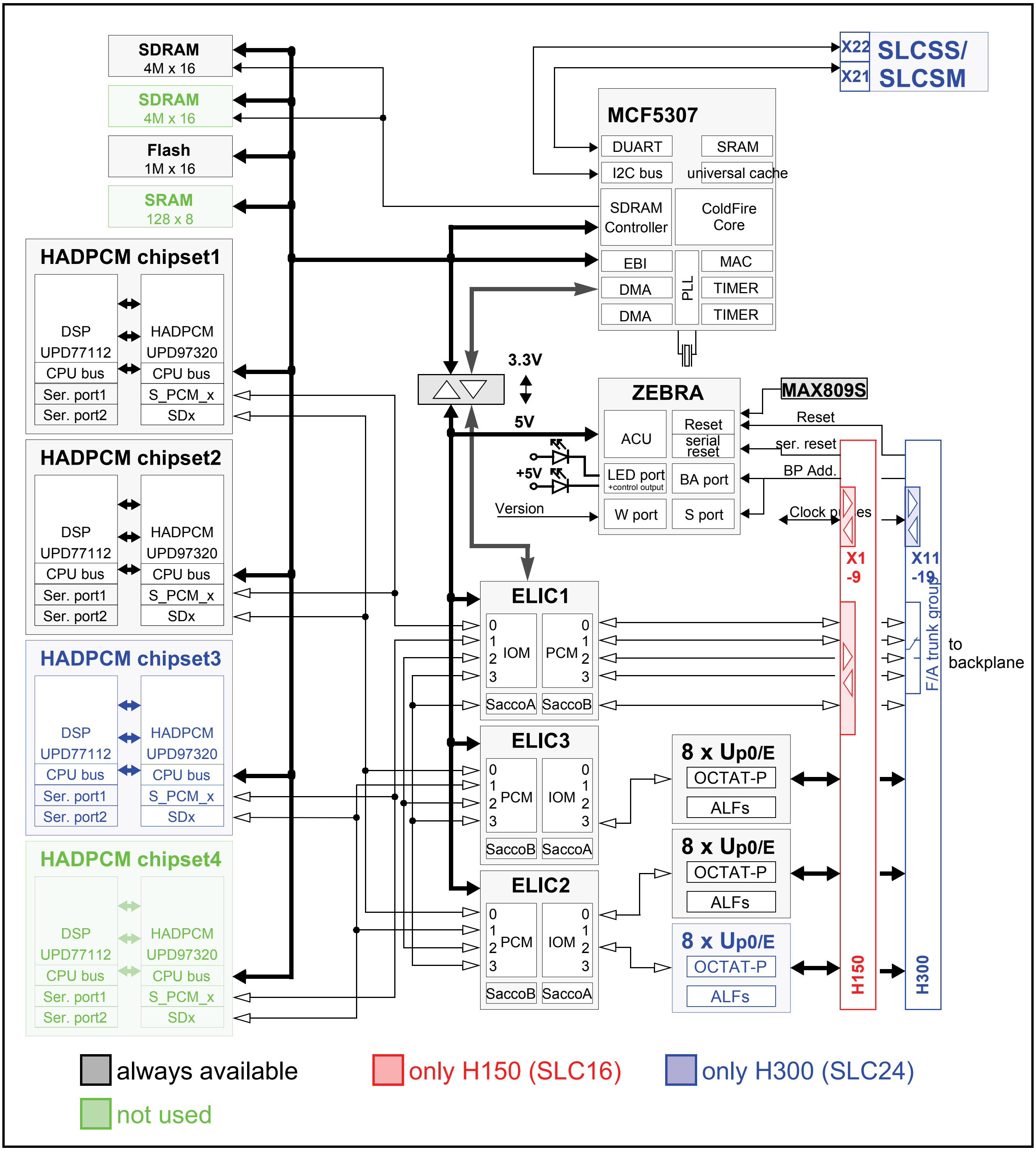


Figure 3-64 Block Diagram for SLC24

3.28 SLMA2

The SLMA2 board provides 24 analog subscriber lines and supports all functions of (on-line) analog telephone sets. The SLMA2 board provides upgraded functionality from the SLMA board. The SLMA2 board is compatible with the SLMA. In addition, with the help of a SIPAC/SIVAPAC adapter, the SLMA2 board can also be used in an LTU shelf without any modifications to existing hardware. However, the system software must be upgraded to V3.5. Any of the 24 lines can be connected to any of the 128 time slots available in the LTUE shelf.

The board functions are:

- Overvoltage protection
- Ringing the line
- Supervising and signaling the line
- Codec function
- Hybrid function 2W to 4W and 4W to 2W
- Test (loopback) capability

3.28.1 Module Variant

- SLMA2 Q2246-X

3.28.2 LED Indications

The SLMA board front panel contains two LEDs. Table 3-83 lists the LED indications for the SLMA2 board.

Board	Red LED	Green LED	Indications
SLMA2	On	Off	The board has initial power applied.
	Flashing	Off	The board is being loaded with hardware.
	On	Off	The board is defective or out of service.
	Off	On	The board is operational and all channels are inactive.
	Off	Flashing	The board is operational and one or more channels are active.

Table 3-83 SLMA2 Board LED Indications

3.28.3 Interface to the Administration

Shelf address identifier (interface to LTUE/LTUS):
The SLMA2 has an interface to LTUE or LTUS; if the card is used in an LTU-shelf, only the first 16 pairs of lines are accessible. The address information is coded within 7 bits. The SLMA2 reads only the first 6 bits (BA0....BA5), in parallel.

Figure 3-65 shows the system architecture of the SLMA2 board.

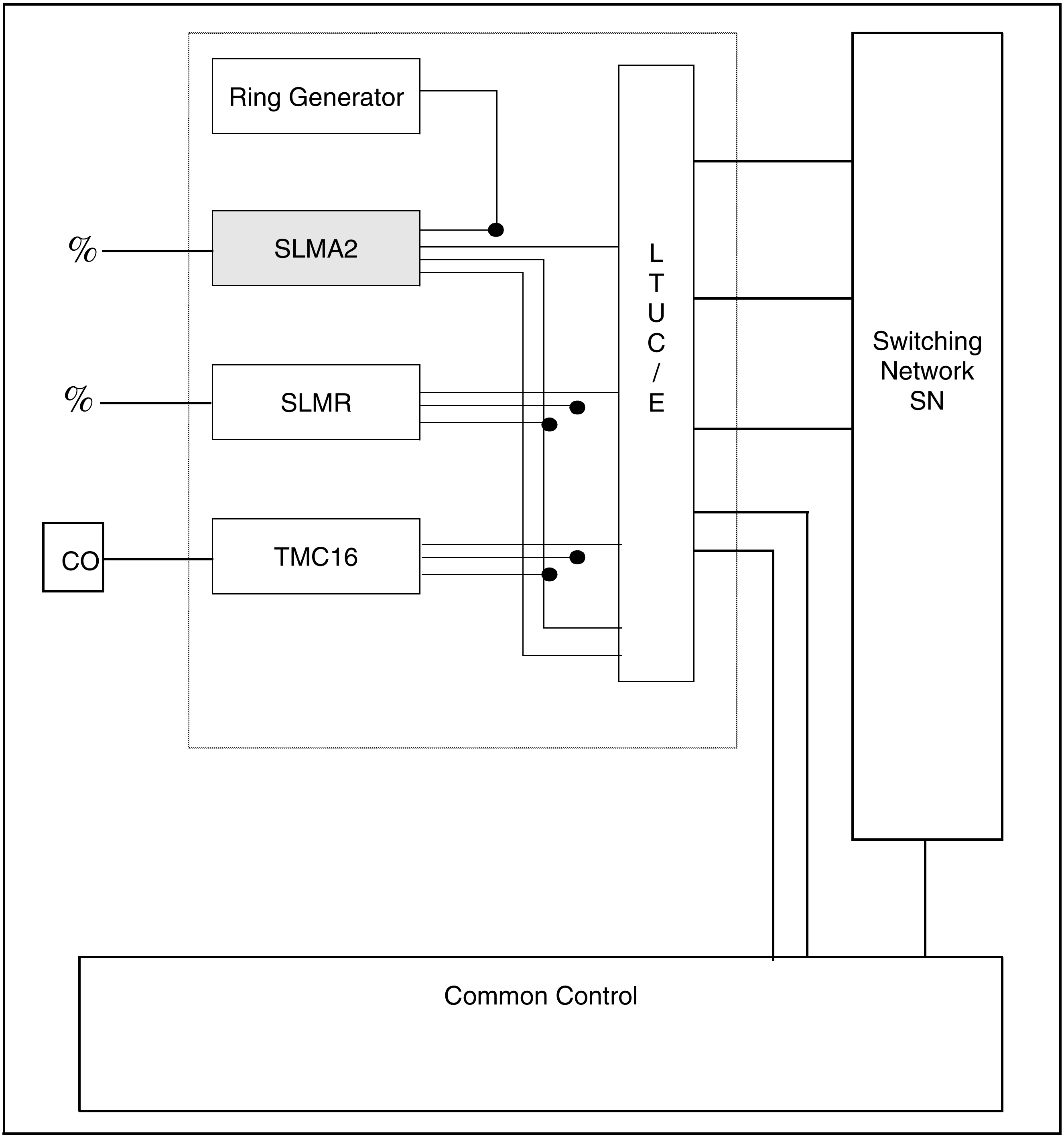


Figure 3-65 SLMA2 Board, System Architecture

3.28.4 Overvoltage Protection

Figure 3-66 shows a diagram longitudinal balance between the tip and ring conductors of the SLMA2 board.

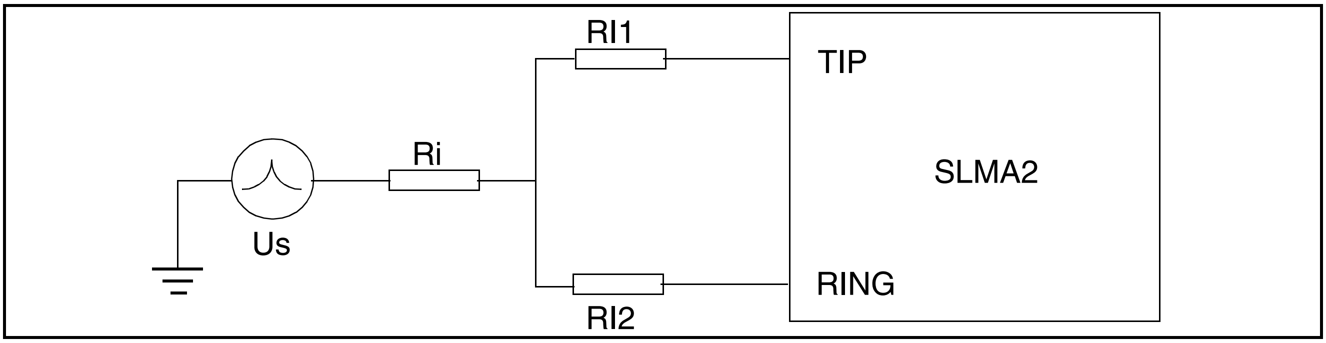


Figure 3-66 SLMA2 Board Longitudinal Balance

Table 3-84 lists the longitudinal balance on the circuit voltage of the SLMA2 board.

Idle circuit voltage Us	Ri	RI1	RI2	Time Response
+/- 2 kV	15 Ω	25 Ω	25 Ω	10/700 µsec
+/- 1,5 kV	8 Ω	0 Ω	0 Ω	10/160 µsec
+/- 1,0 kV	15 Ω	23 Ω	25 Ω	1,2/50 µsec

Table 3-84 Circuit Voltage, Longitudinal Balance

Figure 3-67 shows a diagram of the metallic voltage of the SLMA2 board.

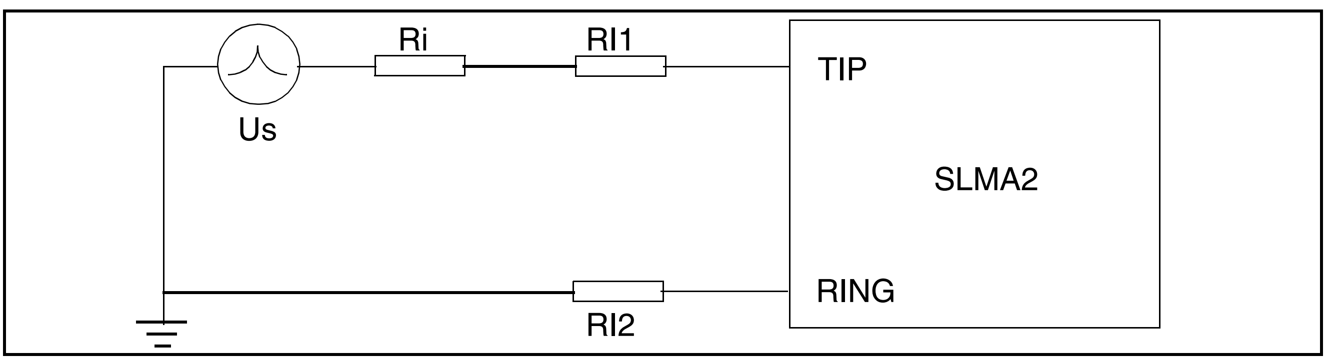


Figure 3-67 SLMA2 Board Metallic Circuit

Table 3-85 lists the metallic voltage of the SLMA2 board.

Idle circuit voltage Us	Ri	RI1	RI2	Time Response
+/- 2 kV *)	15 Ω	25 Ω	0 Ω	10/700 µsec

Table 3-85 Circuit Voltage (Metallic)

Idle circuit voltage Us	Ri	RI1	RI2	Time Response
+/- 2 kV *)	15 Ω	0 Ω	25 Ω	10/700 µsec
+/- 0,8 kV	15 Ω	23 Ω	0 Ω	1,2/50 µsec
+/- 0,8 kV	15 Ω	0 Ω	23 Ω	1,2/50 µsec
+/- 0,8 kV	8 Ω	0 Ω	0 Ω	10/560 µsec

Table 3-85 Circuit Voltage (Metallic)

3.28.5 Power Cable Crossing

Figure 3-68 shows the Consultative Committee on International Telegraphy and Telephony (CCITT K20) diagram of the SLMA2 board.

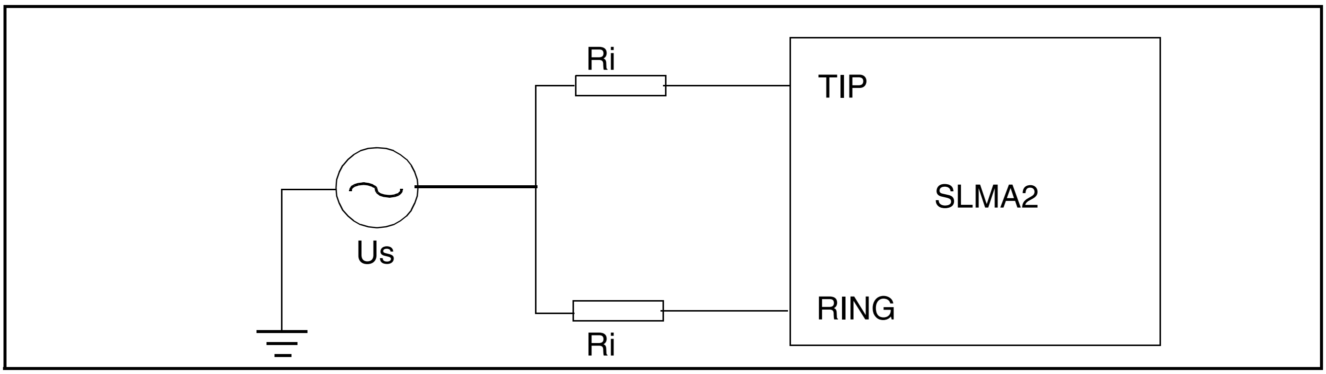


Figure 3-68 SLMA2 Board CCITT K20

Table 3-86 lists the CCITT K20 circuit voltage of the SLMA2 board.

Open circuit voltage Us	Ri	Time Response
230 Vrms	600 Ω	15 min
Functional failure is allowed during test; no fire or charring of the cheesecloth indicator is allowed.		

Table 3-86 Circuit Voltage (CCITT K20)

3.28.6 Power Supply Interface

The SLMA2 requires the following DC supply voltage from the system:

- +5 V (+/- 5%)
- -48 V (-42 V to -58 V)
- System ground

3.28.7 Battery Supply

- Open loop voltage between TIP and RING: less than max. battery voltage
- Current limiting

3.28.8 Interfaces

Interface to the Subscriber Line

The interface to the main distribution frame (MDF) consists of 24 pairs of lines. Each pair consists of TIP and RING line.

Interface to the Ring generator

Ringing signal:

The SLMA2 supplies a ringing signal (RING) to alert each subscriber line; this high-voltage signal is generated by an external ring generator. The ringing voltage can be either Ground or Battery referenced. The RING relay (K1) is set by means of the loadware. The ring generator also supplies the SLMA2 with a synchronization signal (RGSYN). The SLMA2 loadware controls the ring cadences per line. The SLMA2 supports two types of ringing. To make sure that the ringing signal produced by the RG is compatible with country-specific requirements, the ringing signal at the common system interface is supervised by a ringing control circuit on board.

Interface to the Switching Network

PCM Highways (interface to LTUCE):

The SLMA2 has access to 128 time slots on four PCM highway in the LTUCE shelf. Each highway has two unidirectional port HI0..HI3 / HO0..HO3. If the board is used in an LTU shelf, only 64 time slots are available and two PCM highways (HI 0/1, Ho 0/1) are connected to the system interface.

Interface to the Central Processor

HDLC-Highway (interface to central processor):

The data exchange between the central processor and the peripheral processor works on the HDLC-Highway. The transfer is a point to multipoint in normal response mode with a rate of 2,048 Mbps. The Highway has two unidirectional ports HDI / HDO.

Interface to the Clock Generator (System clock)

- Master clock
  For synchronization, the ELIC and the Q-SICOFIs requires a master clock signal CKA which is generated by an external Clock-Generator. Two types of frequency are available. Depending on the signal CLS: CKA = 2,048 MHz (CLS=low) or CKA = 4,098 MHz (CLS=high) The duty cycle is 50%.
  The SLMA2 works on CKA = 2,048 MHz.
- Synchronization pulse
  The signal FMB synchronizes the PCM transfer with a clock rate of 250 µsec (e.g. 4 kHz).

Wink off mode

The line is in high impedance state.

Dialing recognition methods

The 2 W - interface supports two types of dialing methods: rotary dialing and DTMF dialing. The timings are configurable and depends on the requirements for different country specifications. In case of DTMF dialing, the SLMA2 line is in voice transmission mode and is connected to the DTMF receiver of an external SIU.

Ring supply

The 2 W - interface provides the line with two types of ringing. The SLMA2 only feed in and controls the ringing signal, which comes from an external ring generator; for different ringing signals, different ring generators are necessary. The timing for ringing is configurable and part of LW data. The RING Signal Supply path reference potential is chosen by the RING-Relay (K1).

The two types of ringing are specified as:

- Battery referenced ringing: typ 85Vrms, 20 Hz
- Ground referenced ringing: typ 85Vrms, 25 Hz or typ 65 Vrms, 25 Hz

The line is fed with 1310 Ω source impedance

The ring voltage is applied to and turned off from each subscriber line near the zero-voltage crossing point by the LW to minimize the impulse noise.

Message waiting indication function (MWI)

Two types of message-waiting methods are supported.

North American standard:
Message-waiting signal with a DC-voltage of to -150 Vdc between TIP and RING, is switched in to illuminate the neon lamp in the telephone sets.

The ring and message-waiting cadences are controlled by the external ring generators and the LW control.

- COMTEL3 method:
  The ringing signal is controlled in such a way, that the 2 W - interface fulfills the specification of message-waiting.

Indication / Signalling

- Supervision/Signalling

Each pair of lines is individually controlled in order to detect switch hook (SHD), ground key (GKD) and fault conditions. The signals are LOW active.

If a line goes off-hook during ringing or message-waiting, the ringing/message-waiting voltage will automatically be disconnected from the line (PD is active).

Threshold of the different types of signalling:

- SHD: 5-10 mA (SHD-output), to indicate the loop-current
- GKD: 10-20 mA (GKD-output), to indicate the current to the ground

Quad-SICOFI

A Quad Signal Processing Codec Filter (QSICOFI) converts voice signal A/D and D/A, controls the gain, matches the impedance, and does the hybrid balancing. A board-specific LW has to be loaded. By means of a 2.048 MHz HDLC highway, the system controller and the SLMA2 can exchange messages. The digitized voice data is sent and received on up to four 2.048 Mbps PCM highways. The time slot switching is done on-board.

The Quad-SICOFI integrates four channels. The data transfer is made by the IOM2 interface.

The function of the the Quad-SICOFI:

- Demultiplexing the signalling information from IOM2-C/I-channel to the SICOFI output pins.
- Multiplexing the indication information from the SICOFI input pins to the IOM2-C/I-channel.
- A/D and D/A conversion.
- Input impedance matching (resistive or complex), additional gain setting and hybrid balancing (on resistive or complex termination impedances) are fully programmable.

3.28.9 Connector Pin Assignment

Table 3-87 lists connector pin assignment of the SLMA2 board.

Signal name	Connector Pin	Signal description	Direction
+5 V	X1-21, X1-40, X2-21, X2-40, X3	power supply +5 Vdc	Input
-48 V	X2-03	power supply -48 Vdc	Input
GND	X1-22, X1-28, X1-33, X1-39, X2-22, X2-23, X2-28, X2-33, X2-39, X3	ground return for the +5 V and -48 V power supply	Input / Output
HO0...HO3	X2-32, X2-31, X2-53, X2-52	PCM Highways	Input
HI0...HI3	X2-32, X2-31, X2-53, X2-52	PCM Highways	Output
HDI	X2-19	HDLC Highways	Output
HDO	X2-13	HDLC Highways	Input
RGSYN	X2-27	Ring synchronization signal	Input
PRS	X2-29	System reset	Input
BA0...BA5	X2-09, X2-30, X2-34, X2-35, X2-18, X2-14	Shelf address identifier	Input
FBPE	X2-46	Flash boot programming enable signal	Input
FMB	X2-37	Clock synchronizing signal	Input
RING	X2-01	Ringing/message-waiting signal	Input
CKA	X2-15	System clock	Input
CLS	X2-16	Clock select	Input
TOUT	X2-45	Shelf-test result output	Output
TRST	X2-47	Boundary scan: Test reset (not used)	Input
TCK	X2-48	Boundary scan: Test clock	Input
TMS	X2-49	Boundary scan: Test mode select	Input
TDI	X2-50	Boundary scan: Test data input	Input
TDO	X2-51	Boundary scan: Test data output	Output

Table 3-87 SLMA2 Board Connector Pin Assignment

Table 3-88 lists the tip and ring termination of the SLMA2 board.

Signal name	Connector Pin	Signal description
00A	X1-01	channel 0
00B	X1-02	
01A	X1-03	channel 1
01B	X1-04	
02A	X1-05	channel 2
02B	X1-06	
03A	X1-07	channel 3
03B	X1-08	
04A	X1-09	channel 4
04B	X1-10	
05A	X1-11	channel 5
05B	X1-12	
06A	X1-13	channel 6
06B	X1-14	
07A	X1-15	channel 7
07B	X1-16	
08A	X1-17	channel 8
08B	X1-18	
09A	X1-19	channel 9
09B	X1-20	
10A	X1-24	channel 10
10B	X1-25	
11A	X1-26	channel 11
11B	X1-27	
12A	X1-29	channel 12
12B	X1-30	
13A	X1-31	channel 13
13B	X1-32	
14A	X1-34	channel 14
14B	X1-35	

Table 3-88 SLMA2 Board TIP/RING Termination Wires (Seite 1 von 2)

Signal name	Connector Pin	Signal description
15A	X1-37	channel 15
15B	X1-38	
16A	X1-43	channel 16
16B	X1-44	
17A	X1-45	channel 17
17B	X1-46	
18A	X1-47	channel 18
18B	X1-48	
19A	X1-49	channel 19
19B	X1-50	
20A	X1-51	channel 20
20B	X1-52	
21A	X1-53	channel 21
21B	X1-54	
22A	X1-55	channel 22
22B	X1-56	
23A	X1-57	channel 23
23B	X1-58	

Table 3-88 SLMA2 Board TIP/RING Termination Wires (Seite 2 von 2)

3.28.10 Removing SLM Boards

This procedure removes up to 24 analog voice, OPS, and message-waiting channels from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

To remove SLMA2 board:

1. Deactivate all channels on the board as follows:
   a) Type `DEA-DSSU` and press **Enter.**
   b) Type the following values, then press **Enter**.

Field	Value
OFFTYPE	DC
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

> PEN1 is the pen of the first channel and PEN2 is the pen of the last channel on the board.

2. Display the status of the board until all channels are free as follows:

   a) Type **`DIS-SDSU`** and press **Enter**.

   b) Type the following values, then press **Enter**.

Field	Value
STATUS	ALL
LINK	<blank>
TYPE	PEN
LEVEL	PER3
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
CCT	<0 - 15>

3. When all channels are free, deactivate the board as follows:

   a) Type **`DEA-BSSU`** and press **Enter**.

   b) Type the following values, then press **Enter**.

Field	Value
OFFTYPE	DC
LTG	<1>
LTU	<1 - 8>
SLOT	<1 - 121>
REFOFF	<blank>

4. Using the board removal and replacement tool, unseat the board and remove it from the shelf.

3.28.11 Replacing SLMA2 Board

To replace SLMA2 board:

1. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
2. Activate the SLMA2 board as follows:
   a) Type **ACT-BSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>

3. Activate the channels on the board as follows:
   a) Type ACT-DSSU and press **Enter**.
   b) Type the following values, then press enter.

Field	**Value**
ONTYPE	AUL
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

> PEN1 is the pen of the first channel and PEN2 is the pen of the last channel on the board.

3.28.12 Verifying the SLMA2 Board

To verify the operation of SLMA2 boards by displaying the status of the board:

1. Type **DIS-SDSU** and press **Enter**.
2. Type the following values, then press **Enter**.

Field	**Value**
STATUS	ALL
LINK	<blank>
TYPE	PEN
LEVEL	PER3
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
CCT	<0 - 15>

> The SLM board is automatically tested on activation.

3.29 SLMA3

This section describes the functions and features of the subscriber line module analog (SLMA3) board. It also provides procedures for removing, replacing, and verifying this board.

3.29.1 Functional Description

An SLMA3 board interfaces between the system and analog devices. These boards convert signals from analog-to-digital and from digital-to-analog. They support the following analog devices:

- Announcement recorders
- Dial pulse or DTMF analog single-line telephones
- Fax machines
- Modems
- Music-on-hold equipment
- Paging equipment

The SLMA3 board provides 24 analog channels. This board can receive instructions from the operating system through the LTUCX board. It supports a line loop resistance of 1000 Ohms, which includes the resistance of the terminal equipment. It allows stations to be 2.6 cable kilometers (1.6 cable-miles of #26 American Wire Gauge [AWG] cable) from the system.

The SLMA3 board generates its own ringing voltage and does not require an external ring generator. It supports V.90 (56K) modems with data transmission rates up to 50 kilobits per second (Kbps)

The SLMA3 board has SIPAC shelf connectors.

Red LED

Green LED

Figure 3-69 SLMA3 Board Front Panel

3.29.2 LED Indications

Table 3-89 provides the LED indications for each SLM board. The SLM board front panel contains two LEDs (see Figure 3-69).

Red LED	Green LED	Indications
On	Off	The board has initial power applied.
Flashing	Off	The board is being loaded with loadware.

Table 3-89 SLMA3 Board LED Indications (Seite 1 von 2)

Red LED	Green LED	Indications
On	Off	The board is defective or out of service.
Off	On	The board is operational and all channels are in the on-hook state.
Off	Flashing	The board is operational and one or more channels are in the off-hook state.

Table 3-89 SLMA3 Board LED Indications (Seite 2 von 2)

3.29.3 Country Spread for SLMA3 and SLMA24 Utilization

Country	Max. loop resistance (Ohm)	Loop current (mA)	Directive	SLMA3	SLMA24
Germany (EU)	600 incl. terminal	18	EC 201 185 §6.1	X	X
	-	20/60	(BAPT 221 ZV MÜ 2a)	X	X
Switzerland	1000 incl. terminal	22	PTT 692.05 No. VD1 A.0.5	X	X
	1000 - 1600 incl. terminal	22 - 15	PTT 692.05 No. VD1 A.0.5		X
Austria (EU)	600 incl. terminal	18	EC 201 185 §6.1	X	X
Belgium (EU)	600 incl. terminal	18	EC 201 185 §6.1	X	X
Netherlands (EU)	600 incl. terminal	18	EC 201 185 §6.1	X	X
	700 incl. terminal	16	T11-50 (edition of 27.11.89)	X	X
Spain (EU)	600 incl. terminal	18	EC 201 185 §6.1	X	X
	900 incl. terminal	20	KD 3 Chapter 3/ §1.1.2	X	X
Great Britain (EU)	600 incl. terminal	18	EC 201 185 §6.1	X	X
	Loop current characteristic in Figure 19 must be fulfilled.	25 permitted (recommended)	BS6450: Part 4 1993	X	X
Luxembourg (EU)	600 incl. terminal	18	EC 201 185 §6.1	X	X

Table 3-90 Country spread for Board Utilization Based on the DC Functional Range (Seite 1 von 4)

Country	Max. loop resistance (Ohm)	Loop current (mA)	Directive	SLMA3	SLMA24
		20/60	(BAPT 221 ZV MÜ 2a)	X	X
USA OPS interface	800 incl. terminal	16	EIA/TIA464B-1995 §4.5.2.2 (SLMA3 26mA version for USA)	X	X
USA ONS interface	Loop current characteristic must lie in Region A (+B) in Figure 7	20	EIA/TIA464B-1995 §4.5.2.1 (SLMA3 26mA version for USA)	X	X
Portugal (EU)	600 incl. terminal	18	EC 201 185 §6.1	X	X
	1800 w/o terminal	15	Derived from pr NP-3247 (1986) §5.5.4.7		X
China	> or = 1000 incl. terminal	18	GB/T 14381-93 §5.7.1.2	X	X
Brazil	600 incl. terminal	18	EC 201 185 §6.1	X	X
Italy (EU)	600 incl. terminal	18	EC 201 185 §6.1	X	X
Poland	optional 1200 (incl. terminal resistance of max. 600)	17.5	PABX-05.1994 §3.3.1	X	X
Argentina	600 incl. terminal	18	EC 201 185 §6.1	X	X
Singapore	600 incl. terminal	18	EC 201 185 §6.1	X	X
	N.A.	20	IDA TS PSTN1 §6.2.2.1 indirect	X	X
South Africa	100 w/o terminal	20	DPT-SWS-001 2.8.5.1i	X	X
Chile	600 incl. terminal	18	EC 201 185 §6.1	X	X
Denmark (EU)	600 incl. terminal	18	EC 201 185 §6.1	X	X
India	1600 incl. terminal	30	NO. SA 300 MY 90 (May 1990)		X
Greece (EU)	600 incl. terminal	18	EC 201 185 §6.1	X	X
	N.A.	20	TZD/TZV 02-89 §8.4.1.3	X	X
Finland (EU)	600 incl. terminal	18	EC 201 185 §6.1	X	X

Table 3-90 Country spread for Board Utilization Based on the DC Functional Range (Seite 2 von 4)

Country	Max. loop resistance (Ohm)	Loop current (mA)	Directive	SLMA3	SLMA24
	1200/500 incl. terminal (500 > inside a building)	N.A.	TPL 23 (6/87) §6.1 e, f	X	X
France (EU)	600 incl. terminal	18	EC 201 185 §6.1	X	X
	250 incl. terminal	Constant current not permitted	ST/PAA/TPA/ STP/1063 §2.1.2		X
Hungary	Specified by manufacturer plus 400 terminal resistance	20	Hungarian Telekom AG spec. used for testing controlled PABX parameters (March 1996)	X	X
Ireland (EU)	600 incl. terminal	18	EC 201 185 §6.1	X	X
	N.A.	22	Derived from TTE 10 (11/97)	X	X
Malaysia	1200 incl. terminal	15	Feature requirements for Malaysia (PN VG I 11/PN Singapore 12.11.1991)		X
Thailand	1800 incl. terminal	20	Feature requirements for Thailand (PN VG I 11/PN Thailand 09.11.1991)		X
Sweden (EU)	600 incl. terminal	18	EC 201 185 §6.1	X	X
	1600 incl. terminal	20	SS 63 63 26 §4 (12/91) for informative only		X
Mexico	1600 incl. terminal with max. 370	N.A.	Derived from NOM-EM-151-SCT1-1998 §5.1.12.1		X

Table 3-90 Country spread for Board Utilization Based on the DC Functional Range (Seite 3 von 4)

Country	Max. loop resistance (Ohm)	Loop current (mA)	Directive	SLMA3	SLMA24
Czech Republic	1600 w/o terminal	15	Requirements table for HICOM 150 E Modular (24.5.1996)		**X**
Philippines	1900 incl. terminal	19	EWSD project folder PHI version 4.2/ 4.6W (6/90)		**X**
Australia	Inside a building: 600 incl. terminal (recommended value: 1200) Outside a building: 1800	20	AUSTEL TS003-1994 §5.3.1.2 + 5.3.2.3	**X** (indoors only)	**X** (if outdoors necessary)
CIS	1800 incl. terminal	15	PABX HICOM 300 Technical Terms and Conditions for Public Switch Telephone Network (TT&C) version 2.0 1992 Chapter 2.4§1.2		**X**

Table 3-90 Country spread for Board Utilization Based on the DC Functional Range (Seite 4 von 4)

> In accordance with the R&TTE directive, all national directives have been withdrawn, that is, are no longer legally prescribed. They can still be used for orientation purposes. The new internationthat is,al directive for the subscriber line interface is EC 201 185 V1.1.1 (1999-02).
>
> EU Directive EC 201 185 and the national directive (if available) are specified for EU countries. The applicable national directive is specified for non-EU countries. The EU Directive was entered if the national directive was unavailable.
>
> The selection criteria for SLMA3 are: max. loop resistance 1000 ohms incl. terminal (300 ohms) and minimum loop current 22mA (USA: 26mA) at maximum resistance. Higher loop resistance and loop current values are selection criteria for SLMA24.

3.29.4 SLMA24 (SLMA2) Properties/Restrictions Compared to SLMA3

	SLMA3	**SLMA24**
Part number	S30810-Q2191-C	S30810- Q2246-X
Implemented in system versions	E V3.0, E V3.1, H V1.0, HiPath 4000 V1.0	E V1.0, E V2.0, E V3.0, E V3.1, H V1.0, HiPath 4000 V1.0
SLMA24 and SLMA can be implemented in mixed mode		
DC functional range	Subscriber line resistance 2 x 500 ohms incl. terminal with 300 ohms. Max. loop current 26mA.	Subscriber line resistance 2 x 750 ohms incl. terminal with 300 ohms. Max. loop current < 41mA I_{loop} at max. loop resistance: 20mA.

Table 3-91 SLMA24 (SLMA2) Properties/Restrictions Compared to SLMA3

	SLMA3	SLMA24
Ring current	Ring current generator is integrated on the board. Setting by AMO ZAND. 25Hz/45V_{rms} : (DEU, AUT, CHE, BEL, LUX, ESP, PRT, GBR, NLD, BRA, ITA, POL, ARG, CHL, SGP, ZAF, CHN, GRC, FIN, CZE, DNK, HUN, IRL, SWE, MEX, THA, MYS). 50Hz/45V_{rms} :FRA 20Hz/45V_{rms} :USA Performance: 35 REN (Ringer Equivalence Number) for the entire board. Max. 3 REN (DEU/IM), 2 REN (USA) per port. Typical values for REN: Telephone with electromechanical ringer: 1 REN. Telephone with electronic ringer: 0.1 - 0.4 REN. Symmetrical ring current (a/b)	An additional ring current generator is necessary. RGE: Performance 10 VA, 65 V or 75 V with 25 Hz/50 Hz. RG module: Performance 5 VA or 10 VA, 65 V or 75 V with 25 Hz, 75 V/50 Hz or 85 V/ 20 Hz. 25 Hz: (DEU, AUT, CHE, BEL, LUX, ESP, PRT, GBR, NLD, BRA, ITA, POL, ARG, CHL, SGP, ZAF, CHN, GRC, FIN, CZE, DNK, HUN, IRL, SWE, MEX, THA, MYS). 50 Hz: FRA 20 Hz: USA Reference value for RGE/RG module dimensioning: At 10 VA, approx. 320 analog stations can be operated with a traffic value of 0.15 erl. (without group/parallel ringing). However, only max. 1 RGE/RG module is permitted per shelf. Ring current asymmetrical, grounded.
Message Waiting Indication (MWI)	Comtel-3 MWI with glow lamps not supported.	

Table 3-91 SLMA24 (SLMA2) Properties/Restrictions Compared to SLMA3

3.29.5 Removing the SLMA3 Board

⚠	**Warning** This procedure removes up to 24 analog voice channels from service.

	Attention: Static Sensitive Devices Observe all precautions for electrostatic discharge.

Remove SLMA3 board as follows:

1. Deactivate all channels on the board as follows:
   a) Type **`DEA-DSSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
OFFTYPE	DC
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

> PEN1 is the pen of the first channel and PEN2 is the pen of the last channel on the board.

2. Display the status of the board until all channels are free as follows:
   a) Type **`DIS-SDSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
STATUS	ALL
LINK	<blank>
TYPE	PEN
LEVEL	PER3
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
CCT	<0 - 15>

3. When all channels are available, deactivate the board as follows:

a) Type **DEA-BSSU** and press **Enter**.

b) Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	**DC**
LTG	**<1>**
LTU	**<1 - 8>**
SLOT	**<1 - 121>**
REFOFF	**<blank>**

4. Using the board extractor, unseat the board and remove it from the shelf.

3.29.6 Replacing SLMA3 Board

Replace the SLMA3 board as follows:

1. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
2. Activate the SLMA3 board as follows:

a) Type **ACT-BSSU** and press **Enter**.

b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>

3. Activate the channels on the board as follows:

a) Type **ACT-DSSU** and press **Enter**.

b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	**AUL**
TYPE	**PEN**
PEN1	**<PEN1>**
PEN2	**<PEN2>**

> PEN1 is the pen of the first channel and PEN2 is the pen of the last channel on the board.

3.29.7 Verifying the SLMA3 Board

Verify the operation of the SLMA3 board by displaying the status of the board as follows:

1. Type **DIS-SDSU** and press **Enter**.
2. Type the following values, then press **Enter**.

```
Field          Value
STATUS           ALL
LINK           <blank>
TYPE           PEN
LEVEL           PER3
LTG            <1 - 32>
LTU            <1 - 8>
SLOT           <1 - 151>
CCT            <0 - 15>
```

> The SLMA3 board is automatically tested on activation.

3.29.8 MDF Assignments

Table 3-92 shows the SLMA3 board punch-down sequence at the MDF. Cable punch-down is standard. Each channel uses one tip and ring pair. Label the block from channel 00 through 15 or 23, as appropriate.

> For SLMA3 boards requiring overcurrent protection devices, refer to the Siemens Secondary Protection Guide, G281-0070.

Pair No.	Wire Color	Channel No.	Pair No.	Wire Color	Channel No.
1	WHT-BLU BLU-WHT	00	14	BLK-BRN BRN-BLK	13
2	WHT-ORG ORG-WHT	01	15	BLK-SLT SLT-BLK	14
3	WHT-GRN GRN-WHT	02	16	YEL-BLU BLU-YEL	15
4	WHT-BRN BRN-WHT	03	17	YEL-ORG ORG-YEL	16

Table 3-92 Standard Punch-Down Sequence (Seite 1 von 2)

Pair No.	Wire Color	Channel No.	Pair No.	Wire Color	Channel No.
5	WHT-SLT SLT-WHT	04	18	YEL-GRN GRN-YEL	17
6	RED-BLU BLU-RED	05	19	YEL-BRN BRN-YEL	18
7	RED-ORG ORG-RED	06	20	YEL-SLT SLT-YEL	19
8	RED-GRN GRN-RED	07	21	VIO-BLU BLU-VIO	20
9	RED-BRN BRN-RED	08	22	VIO-ORG ORG-VIO	21
10	RED-SLT SLT-RED	09	23	VIO-GRN GRN-VIO	22
11	BLK-BLU BLU-BLK	10	24	VIO-BRN BRN-VIO	23
12	BLK-ORG ORG-BLK	11	25	VIO-SLT SLT-VIO	Not used.
13	BLK-GRN GRN-BLK	12			

Table 3-92 Standard Punch-Down Sequence (Seite 2 von 2)

3.30 SLMAC

This section describes the functions and features of the subscriber line module analog Clip (SLMAC) board. It also provides procedures for removing, replacing, and verifying this board.

3.30.1 Functional Description

An SLMAC board interfaces between the system and analog devices. These boards convert signals from analog-to-digital and from digital-to-analog. They support the following analog devices:

- Announcement recorders
- Dial pulse or DTMF analog single-line telephones
- Fax machines
- Modems
- Music-on-hold equipment
- Paging equipment

The SLMAC board provides 24 analog channels. This board can receive instructions from the operating system through the LTUCX board. It supports a line loop resistance of 1500 Ohms, which includes the resistance of the terminal equipment with 300 ohms. With a line cross-section of 0.4 mm, this corresponds to a line length of 5.6 km, and, with a line cross-section of 0.6mm, to a line length of 12.6km.

The SLMAC board generates its own ringing voltage and does not require an external ring generator. It supports V.90 (56K) modems with data transmission rates up to 50 kilobits per second (Kbps)

Analog and digital subscriber lines are protected using protection up to 2kV longitudinal voltage and 1kV transverse voltage against high-energy overvoltage in pulses from 10/700us and 1,2/50us which can be induced by a lightening strike. The protection implemented on the boards is only effective if the systems are grounded in accordance with the mounting guidelines. With this is mind, check the assembly and the low-impedance grounding of the system via the ground wire of the power supply circuit/permanent grounding to the grounding of the building/power supply system.

With lines over 500m and if the lines leave the building, analog and digital subscriber boards must be protected by external lightening protection in the MDF. This type of lightening protecting is called the primary protection and can be implemented using surge arrestors with 230V nominal voltage where a surge arrestor for each lead is ground. It makes sense to do this either on the MDF or on the entry point of the line into the building.

Without this external lightening protection, lightening which exceeds the voltage values described above can lead to the destruction of the boards or overheating of the components . This can lead to smoldering or charring of the motherboard with the associated smoke developing and then to a complete system failure.

The SLMAC board has SIPAC shelf connectors.

> ⚠ The board SLMAC may not be used for external subscribers. Due to simple safety protection the board could be destroyed.
> For these use cases the SLMAE board has to be applied.

Figure 3-70 SLMAC Board Front Panel

3.30.2 LED Indications

Table 3-93 provides the LED indications for each SLMA boards. The SLMAC board front panel contains two LEDs (red and green).

Red LED	Green LED	Indications
On	Off	The board has initial power applied.
Flashing	Off	The board is being loaded with loadware.
On	Off	The board is defective or out of service.
Off	On	The board is operational and all channels are in the on-hook state.
Off	Flashing	The board is operational and one or more channels are in the off-hook state.

Table 3-93 SLMAC Board LED Indications

3.30.3 Properties/Restrictions SLMAC

Properties/Restrictions	SLMAC
Part number	S30810-Q2191-C
Implemented in system versions	E V3.0, E V3.1, H V1.0, HiPath 4000 V1.0, HiPath 4000 V2.0
DC functional range	Subscriber line resistance 2 x 750 ohms incl. terminal with 300 ohms. Max. loop current 32mA.

Tabelle 3-94 Properties and Restrictions for the SLMAC Board

Properties/Restrictions	**SLMAC**
Ring current	Ring current generator is integrated on the board. Setting by AMO ZAND. The ring current depends on the load and has a maximum value of 45Vrms. Performance: 35 REN (Ringer Equivalence Number) for the entire board. Max. 3 REN (GER/MAL) Typical values for REN: Telephone with electromechanical ringer: 1 REN. Telephone with electronic ringer: 0.1 - 0.4 REN. Symmetrical ring current (a/b) Devices which require groundstart ringers are not supported. OPS interfaces in U.S. are not supported.
Caller ID	Released for all countries exepting for Japan
Message Waiting Indication (MWI)	Comtel-3 MWI with glow lamps not supported.

Tabelle 3-94 Properties and Restrictions for the SLMAC Board

3.30.4 Removing the SLMAC Board

> ⚠ **Warning**
>
> This procedure removes up to 24 analog voice channels from service.

> **Attention: Static Sensitive Devices**
>
> Observe all precautions for electrostatic discharge.

Remove SLMAC board as follows:

1. Deactivate all channels on the board as follows:
   a) Type **`DEA-DSSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
OFFTYPE	DC
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

> PEN1 is the pen of the first channel and PEN2 is the pen of the last channel on the board.

2. Display the status of the board until all channels are free as follows:
   a) Type **`DIS-SDSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
STATUS	ALL
LINK	<blank>
TYPE	PEN
LEVEL	PER3
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
CCT	<0 - 15>

3. When all channels are available, deactivate the board as follows:
   a) Type **`DEA-BSSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
OFFTYPE	**DC**
LTG	**<1>**
LTU	**<1 - 8>**
SLOT	**<1 - 121>**
REFOFF	**<blank>**

4. Using the board extractor, unseat the board and remove it from the shelf.

3.30.5 Replacing SLMAC Board

Replace the SLMA3 board as follows:

1. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
2. Activate the SLMAC board as follows:
   a) Type **ACT-BSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>

3. Activate the channels on the board as follows:
   a) Type **ACT-DSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	**AUL**
TYPE	**PEN**
PEN1	**<PEN1>**
PEN2	**<PEN2>**

> PEN1 is the pen of the first channel and PEN2 is the pen of the last channel on the board.

3.30.6 Verifying the SLMAC Board

Verify the operation of the SLMAC board by displaying the status of the board as follows:

1. Type **DIS-SDSU** and press **Enter**.
2. Type the following values, then press **Enter**.

Field	**Value**
STATUS	ALL
LINK	<blank>
TYPE	PEN
LEVEL	PER3
LTG	<1 - 32>

```
LTU             <1 - 8>
SLOT            <1 - 151>
CCT             <0 - 15>
```

> The SLMAC board is automatically tested on activation.

3.30.7 MDF Assignments

Table 3-95 shows the SLMAC board punch-down sequence at the MDF. Cable punch-down is standard. Each channel uses one tip and ring pair. Label the block from channel 00 through 15 or 23, as appropriate.

> For SLMAC boards requiring overcurrent protection devices, refer to the Siemens Secondary Protection Guide, G281-0070.

Pair No.	Wire Color	Channel No.	Pair No.	Wire Color	Channel No.
1	WHT-BLU BLU-WHT	00	14	BLK-BRN BRN-BLK	13
2	WHT-ORG ORG-WHT	01	15	BLK-SLT SLT-BLK	14
3	WHT-GRN GRN-WHT	02	16	YEL-BLU BLU-YEL	15
4	WHT-BRN BRN-WHT	03	17	YEL-ORG ORG-YEL	16
5	WHT-SLT SLT-WHT	04	18	YEL-GRN GRN-YEL	17
6	RED-BLU BLU-RED	05	19	YEL-BRN BRN-YEL	18
7	RED-ORG ORG-RED	06	20	YEL-SLT SLT-YEL	19
8	RED-GRN GRN-RED	07	21	VIO-BLU BLU-VIO	20
9	RED-BRN BRN-RED	08	22	VIO-ORG ORG-VIO	21

Table 3-95 Standard Punch-Down Sequence (Seite 1 von 2)

Pair No.	Wire Color	Channel No.	Pair No.	Wire Color	Channel No.
10	RED-SLT SLT-RED	09	23	VIO-GRN GRN-VIO	22
11	BLK-BLU BLU-BLK	10	24	VIO-BRN BRN-VIO	23
12	BLK-ORG ORG-BLK	11	25	VIO-SLT SLT-VIO	Not used.
13	BLK-GRN GRN-BLK	12			

Table 3-95 Standard Punch-Down Sequence (Seite 2 von 2)

3.31 SLMAE

The SLMAE (**S**ubscriber **L**ine **M**odule **A**nalog **E**nhanced) board is an analog T/R interface for use in HiPath 4000 V2.0 or later and replaces the SLMAC (S30810-Q2191-C), SLMA (S30810-Q2041-X/S30810-Q 2157-X) and SLMA2 (S30810-Q2246-X) boards:

- SLMAE (S30810-Q2225-X) = 24 analog T/R interfaces

The features are the same with one exception:

- The connection of external extensions via OPS (Off-Premises Station) signaling is no longer supported on SLMA2 (for U.S. only) but on SLMAR.

A code receiver is available for each analog interface (permits DTMF dialing at analog telephones). This guarantees that all analog terminals connected are fully accessible.

The SLMAE board supports calling name identification presentation (CLIP).

This board generates its own ring voltages (71 V_{eff}) and does not require an external ring voltage generator.

3.31.1 Touch Guard

> **Caution**
> The board is fitted with a touch guard because the onboard heat sinks are energized. Do not remove this touch guard.

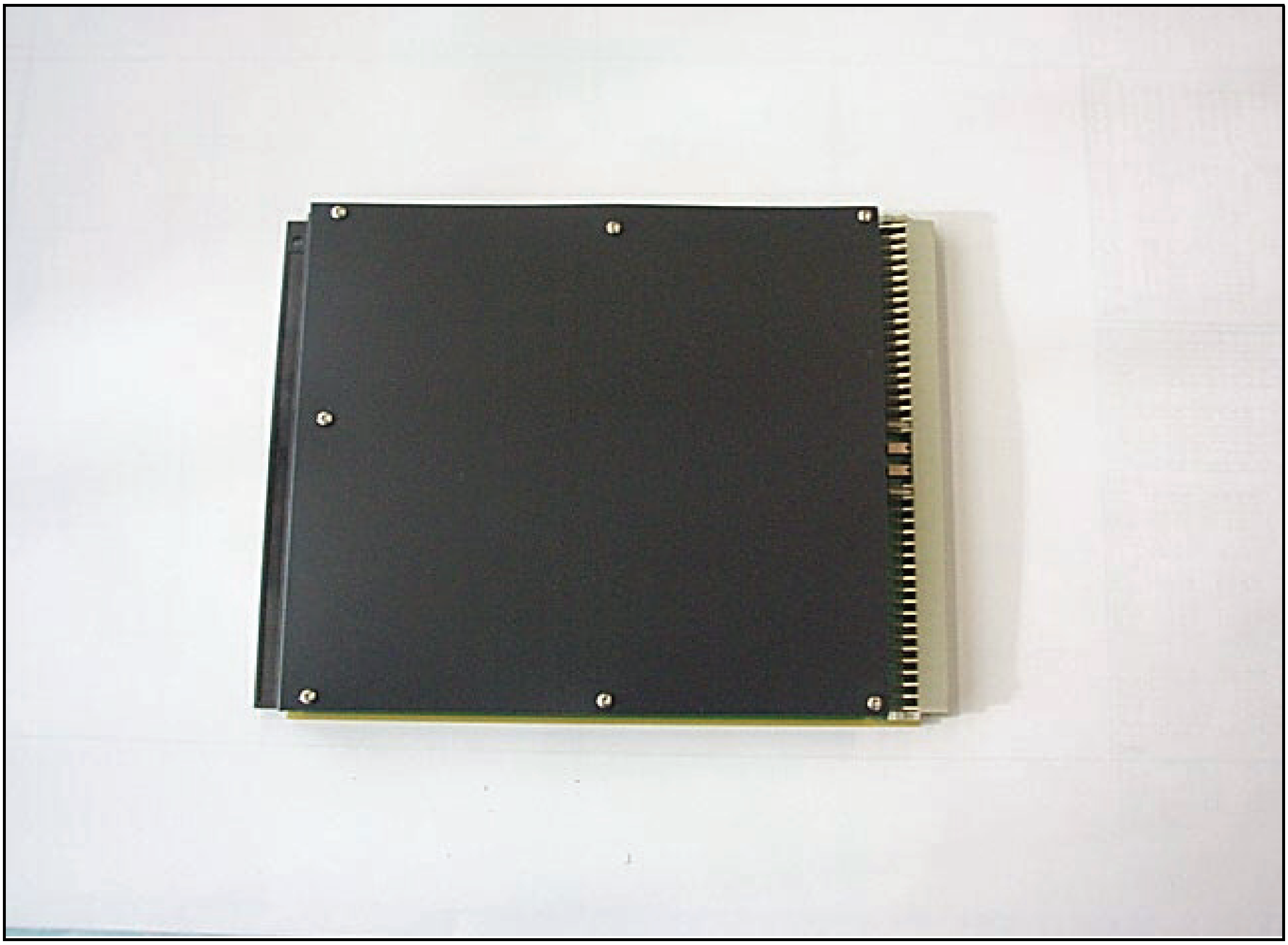


Figure 3-71 SLMAE with Tough Guard

3.31.2 Front Panel

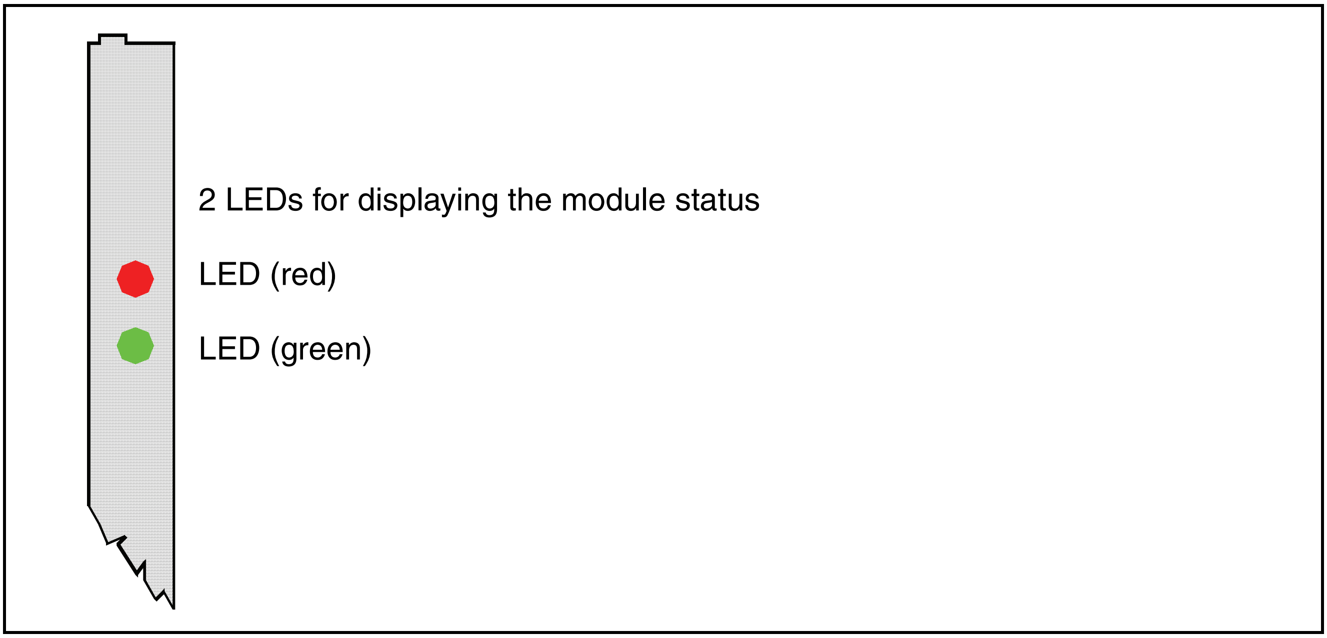


Figure 3-72 SLMAE - Front Panel

To ensure sufficient shielding, provide the board with a shielding panel.

3.31.3 LED Statuses and Their Meanings

Red LED	Green LED	Status	Action
Off	Off	Board not receiving power or not plugged in correctly. Board is out of order.	Check plug contact on board.
On	Off	Board is receiving power and board test is in progress. Board is defective if status remains unchanged (board test unsuccessful).	Replace board.
		Loadware loading not successfully completed. Board is faulty.	Replace board.
		Error detected on board. Board is deactivated (not applicable to errors detected by test loops) or board was deactivated using HiPath 4000 Manager E.	Check whether the board was deactivated using HiPath 4000 Manager E. If not, replace board.
Flashing	Off	Loadware is being loaded.	
Off	On	Board test completed successfully. Board is OK (idle state).	
Off	Flashing	At least one subscriber line circuit is activated.	

Table 3-96 LED Statuses and Their Meanings

3.31.4 Cable and Connector Assignment

- For connecting to the SIVAPAC connector on the backplane: Table 3-97
- For connecting to the connector panels using RJ45 jacks: Table 3-98
- For U.S. only: For connecting to the connector panels with a CHAMP jack: Table 3-99

Pair	a-Wire (Tip)	b-Wire (Ring)	SIVAPAC Connector	SLMAE8, SLMAE		MDFU-E	Notes
1	wht/blu		1	1a	Port 1	1a	
		blu/wht	23	1b		1b	
2	wht/ora		3	2a	Port 2	2a	
		ora/wht	4	2b		2b	

Pair	a-Wire (Tip)	b-Wire (Ring)	SIVAPAC Connector	SLMAE8, SLMAE		MDFU-E	Notes
3	wht/grn		5	3a	Port 3	3a	
		grn/wht	6	3b		3b	
4	wht/brn		7	4a	Port 4	4a	
		brn/wht	8	4b		4b	
5	wht/gry		9	5a	Port 5	5a	
		gry/wht	10	5b		5b	
6	red/blu		11	6a	Port 6	6a	
		blu/red	12	6b		6b	
7	red/ora		13	7a	Port 7	7a	
		ora/red	14	7b		7b	
8	red/grn		15	8a	Port 8	8a	
		grn/red	16	8b		8b	
9	red/brn		17	9a	Port 9	9a	Not used for SLMAE8 (HiPath 3000)
		brn/red	18	9b		9b	
10	red/gry		19	10a	Port 10	10a	
		gry/red	20	10b		10b	
11	blk/blu		24	11a	Port 11	11a	
		blu/blk	25	11b		11b	
12	blk/ora		26	12a	Port 12	12a	
		ora/blk	27	12b		12b	
13	blk/grn		29	13a	Port 13	13a	
		grn/blk	30	13b		13b	
14	blk/brn		31	14a	Port 14	14a	
		brn/blk	32	14b		14b	
15	blk/gry		34	15a	Port 15	15a	
		gry/blk	35	15b		15b	
16	yel/blu		37	16a	Port 16	16a	
		blu/yel	38	16b		16b	

Pair	a-Wire (Tip)	b-Wire (Ring)	SIVAPAC Connector	SLMAE8, SLMAE		MDFU-E	Notes
17	yel/ora		43	17a	Port 17	17a	Not used for SLMAE8 (HiPath 3000)
		ora/yel	44	17b		17b	
18	yel/grn		45	18a	Port 18	18a	
		grn/yel	46	18b		18b	
19	yel/brn		47	19a	Port 19	19a	
		brn/yel	48	19b		19b	
20	yel/gry		49	20a	Port 20	20a	
		gry/yel	50	20b		20b	
21	vio/blu		51	21a	Port 21	21a	
		blu/vio	52	21b		21b	
22	vio/ora		53	22a	Port 22	22a	
		ora/vio	54	22b		22b	
23	vio/grn		55	23a	Port 23	23a	
		grn/vio	56	23b		23b	
24	vio/brn		57	24a	Port 24	24a	
		brn/vio	58	24b		24b	

Table 3-97 SLMAE - SIVAPAC Connector Assignment on the Backplane

RJ45 jack		SLMAE8, SLMAE	Notes
No.	Pin		
1	4	1a	
	5	1b	
2	4	2a	
	5	2b	
3	4	3a	
	5	3b	
4	4	4a	
	5	4b	
5	4	5a	
	5	5b	
6	4	6a	
	5	6b	
7	4	7a	
	5	7b	

RJ45 jack		SLMAE8, SLMAE	Notes
No.	Pin		
8	4	8a	
	5	8b	
9	4	9a	Not used for SLMAE8 (HiPath 3000)
	5	9b	
10	4	10a	
	5	10b	
11	4	11a	
	5	11b	
12	4	12a	
	5	12b	
13	4	13a	
	5	13b	
14	4	14a	
	5	14b	
15	4	15a	
	5	15b	
16	4	16a	
	5	16b	
17	4	17a	Not used for SLMAE8 (HiPath 3000)
	5	17b	
18	4	18a	
	5	18b	
19	4	19a	
	5	19b	
20	4	20a	
	5	20b	
21	4	21a	
	5	21b	
22	4	22a	
	5	22b	
23	4	23a	
	5	23b	
24	4	24a	
	5	24b	

Table 3-98 SLMAE - Connector Panel Assignment with RJ45 Jacks

CHAMP jack	SLMAE8, SLMAE			Notes
1	1a	1 Ring	Port 1	
26	1b	1 Tip		
2	2a	2 Ring	Port 2	
27	2b	2 Tip		
3	3a	3 Ring	Port 3	
28	3b	3 Tip		
4	4a	4 Ring	Port 4	
29	4b	4 Tip		
5	5a	5 Ring	Port 5	
30	5b	5 Tip		
6	6a	6 Ring	Port 6	
31	6b	6 Tip		
7	7a	7 Ring	Port 7	
32	7b	7 Tip		
8	8a	8 Ring	Port 8	
33	8b	8 Tip		
9	9a	9 Ring	Port 9	Not used for SLMAE8 (HiPath 3000)
34	9b	9 Tip		
10	10a	10 Ring	Port 10	
35	10b	10 Tip		
11	11a	11 Ring	Port 11	
36	11b	11 Tip		
12	12a	12 Ring	Port 12	
37	12b	12 Tip		
13	13a	13 Ring	Port 13	
38	13b	13 Tip		
14	14a	14 Ring	Port 14	
39	14b	14 Tip		
15	15a	15 Ring	Port 15	
40	15b	15 Tip		
16	16a	16 Ring	Port 16	
41	16b	16 Tip		

CHAMP jack	SLMAE8, SLMAE			Notes
17	17a	17 Ring	Port 17	Not used for SLMAE8 (HiPath 3000)
42	17b	17 Tip		
18	18a	18 Ring	Port 18	
43	18b	18 Tip		
19	19a	19 Ring	Port 19	
44	19b	19 Tip		
20	20a	20 Ring	Port 20	
45	20b	20 Tip		
21	21a	21 Ring	Port 21	
46	21b	21 Tip		
22	22a	22 Ring	Port 22	
47	22b	22 Tip		
23	23a	23 Ring	Port 23	
48	23b	23 Tip		
24	24a	24 Ring	Port 24	
49	24b	24 Tip		

Table 3-99 SLMAE - Connector Panel Assignment with a CHAMP Jack (for U.S. only)

3.32 SLMAR

The subscriber line module analog, rural (SLMAR) board (S30810-Q2480-X) provides 8 analog subscriber lines supporting the basic analog line features as well as the three major features (extended loop, pulse metering and line testing) required for the rural marketplace.

3.32.1 Feature Overview

The SLMAR board provides the following functions:

- Overvoltage protection
- Ringing (balanced) the line
- Supervising and signalling the line
- Codec function
- Hybrid function (2W to 4W and 4W to 2W)
- Self-tests, report errors under the following conditions:
  - DC-to-DC converter failure.
  - Loop too long if configured for pulse metering with tones (refer to Payphones and Short/Long Loops).
  - Loop fault which may cause excessive loop current or unusual signalling events
- Extended loop capability (up to 3000 Ohms including telephone set)
- Pulse metering using tones, battery reversal or a combination of both
- Support of Line Test feature
- COMTEL3 supervision
- The SLMAR interfaces to four PCM highways on the backplane, giving access to 128 time slots. Each highway has two uni-directional ports (HI0 - HI3 / HO0 - HO3)
- Communicates with the central processor over the 2.048 Mbps HDLC highway through uni-directional ports HDO and HDI

3.32.2 LED Indications

The SLMAR board has a green LED and a red LED. The green LED indicates card status and channel activity; the red LED indicates card status and results of self-test.

Table 3-100 lists the LED indications of the SLMAR board.

Red LED	Green LED	Indication
Off	Off	Dead card
On	Off	Initial power on
Flashing	Off	Loading
On	Off	Defective board
Off	On	The board is working but does not have any no activity
Off	Flashing	The board is working and has an active channel.

Table 3-100 SLMAR LED Indications

3.32.3 Subscriber Interface

Battery Feed, refer to Payphones and Short/Long Loops.

The subscriber interface of the SLMAR board is equipped with the following:

- Constant off hook current (talk state): 21mA nominal (18mA minimum).
- Current limiting in any state: 100mA nominal.
- Maximum on hook current: 5mA (refer to Payphones and Short/Long Loops).
- On hook voltage: V (wire a) = -61VDC nominal; V (wire b)= -2VDC nominal.
- Off hook voltage (no boosted battery; loop =1200 Ohm): Va= -44VDC nominal; Vb= -19VDC nominal.
- Offhook voltage (boosted battery; loop = 3000 Ohm): Va= -32 VDC nominal; Vb= +32VDC nominal.
- Reverse battery polarity configurable for signalling applications.

Ringing Signal:

The SLMAR board does not use ringing signal or ring synchronization (RGSYNG) from the backplane. The ring signal applied to the subscriber line is generated in the interface circuitry. Ring signal amplitude and frequency is configured by country specific coefficients in loadware. Cadencing is under control of loadware.

The SLMAR supplies balanced ring signal with nominal 22VDC offset.

Hookswitch Detection:

- Off hook threshold: 10mA nominal.
- On hook threshold: 6.5mA nominal.
- Ring trip: 6.5mA nominal.
- Ring signal is automatically removed within two cycles after off hook occurs.

Dialling Recognition:

- Rotary dialing is supported. Timing requirements are configurable based upon country requirements.
- DTMF dialling recognition is accomplished by voice path connection to an external DTMF receiver in a SIU.

Wink Off:

- The line is placed in a high impedance mode.
- No on hook current is supplied during wink off.

Ground Key Detect/Ground Fault Detect:

Ground key detect is not supported on loops requiring boosted battery. These are loops with dc resistance, including the telephone set, exceeding approximately 2150 Ohms (refer to Payphones and Short/Long Loops). The difference between ground key detection and ground fault detection is in timing, this is controlled in loadware.

> Ground key/fault conditions are not guaranteed on all operating conditions and tolerances of hardware. Under absolute worst case hardware and environment conditions the ground current required to assert GKD may exceed the loop current.

- Maximum current to ground to assert GKD = 24mA.
- Minimum current to ground to unassert GKD = 9mA.

Message Waiting:

- Message waiting is supported on the COMTEL3 telephone by means of the ring signal interface.
- Due to the on hook current requirements there is a limit of two telephones per port on non-boosted battery loops, and one telephone per port on boosted battery loops.
- COMTEL3 Messaging Format:

Function	RING signal Cadence
Synchronization or Clear	~------
Ringing	~~~~~~~
Forwarding	~-~----
Testing	~--~---
Message Waiting	~---~--
Operating Mode	~----~-
Forwarding and Message Waiting	~-~-~--
Legend: ~ = one cycle of RING signal – = one cycle of space	

Table 3-101 COMTEL3 Messaging Format

Pulse Metering (refer to “Payphones and Short/Long Loops”)**:**

- The SLMAR board supports pulse metering with either 12KHz tones, 16KHz tones, battery reversal or a combination of tones and battery reversal. Charge pulses using these methods are created on the card by the interface circuitry; no external circuitry or sources are required.
- Tone amplitude, pulse cadencing and mix of tones and battery reversal is country specific and configurable by AMO by means of loadware (refer also to AMO SCSU).
- Soft battery reversal is not supported.

3.32.4 Hardware Integrity

The SLMAR board incorporates the same self-test features as the SLMA2 board. In addition to the self-tests performed by the SLMA2 the SLMAR boards, it reports errors as follows:

- DC-to-DC converter failure.
- Loop is too long if configured for pulse metering with tones (refer to Payphones and Short/Long Loops).
  The error message reported is: DC LOOP PROBLEMS (CHECK DEVICE/LINE).

Payphones and Short/Long Loops

Payphones

Some models of terminal devices (payphones and other *smart phones*) draw loop current while on hook to support resident electronics. They may have rechargeable batteries or capacitors which require charging before the device becomes operational.

These devices should be pre-charged before connection to the SLMAR card to bring the device into service without a long charging interval because the SLMAR card cannot supply high charge current. Some devices, such as the ELASA TPM P/S payphone, may require several hours to recharge using the SLMAR on-hook loop current. During this time the port is not functional.

If a port has been disabled or taken out of service for an extended period of time then the terminal device may require recharging before becoming operational. In extreme cases the terminal device may have lost configuration data and may require re-configuration.

Short/Long Loops

There are three functions which are dependent upon loop length: pulse metering, dc loop current, and voice frequency gain. The crossover loop length between *short* and *long* for each function is different, and confusing.

Loop length is defined in terms of dc resistance. This is not a totally accurate way to define the effects of loop length upon the performance of the feature but it is the most easy to measure in the field. The maximum loop resistance supported by the SLMAR board is 3000 Ohms. Because the telephone is not purely resistant, the loop resistance should be calculated using measured values of voltage across the a, b leads at the PBX, and the loop current (Rloop = Va-b/Iloop)

Port Initialization

The loadware resident on the card must determine, through testing, if the loop is too long to support pulse metering with tones (if configured), and if the boosted battery is required to maintain minimum loop current. **This test is performed on the first off hook after the port is activated.** If any configuration changes are made to a port or if any wiring changes are made which may affect the loop resistance, **the port must be deactivated and then activated in order to rerun the test. If this is not done, the port may not be correctly configured.**

Pulse Metering

Pulse Metering using 12KHz or 16KHz tones is only supported up to a loop resistance of 1640 Ohms. Above that attenuation of the tones is too great to guarantee proper performance, and battery polarity reversal must be used for signalling. If a port is configured for pulse metering with tones and the loop resistance is too high a configuration error message is sent by loadware to the switch. Selection of pulse metering using tones, battery reversal or both is made using AMO-SCSU.

DC Loop current

The loop current is a constant current feed. If the loop resistance is too high to maintain the programmed constant current using the default -63VDC battery (minimum of 18mA) then boosted battery of +63VDC is switched on. The available DC supply is then +63VDC and –63VDC. The loop resistance with boosted battery that is required is nominally 2150 Ohms.

When referring to the DC loop feed, *short loops* of less than 2150 Ohms require regular battery and *long loops* of over 2150 Ohms require boosted battery of +63VDC and – 63VDC.

Transmission gain

On loops with significant losses the transmission gains or losses are adjusted to ensure correct signalling and voice levels at the PBX and the terminal equipment. This is typically required on loops of greater than 1500-1800 Ohms. The SLMAR ports are configured for *short loop* transmission gains by default. If the craftsperson determines that the loop is too loss-making then the *long loop* transmission gains may be configured by AMO.

3.32.5 Backplane Pin Assignments

Table 3-102 lists the upper connector backplane pin assignments of the SLMAR board.

Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name
X1-42	NC	X1-22	+5V	X1-2	00A
X1-44	NC	X1-24	GND	X1-4	NC
X1-46	NC	X1-26	00B	X1-6	01A
X1-48	NC	X1-28	NC	X1-8	01B
X1-50	NC	X1-30	NC	X1-10	02A
X2-42	NC	X2-22	NC	X2-2	02B
X2-44	NC	X2-24	NC	X2-4	03A
X2-46	NC	X2-26	GND	X2-6	03B
X2-48	NC	X2-28	NC	X2-8	04A
X2-50	NC	X2-30	NC	X2-10	04B
X3-42	NC	X3-22	NC	X3-2	05A
X3-44	NC	X3-24	NC	X3-4	05B
X3-46	NC	X3-26	GND	X3-6	06A
X3-48	NC	X3-28	NC	X3-8	06B
X3-50	NC	X3-30	NC	X3-10	07A

Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name
X4-42	NC	X4-22	-5V	X4-2	07B
X4-44	NC	X4-24	NC	X4-4	NC
X4-46	NC	X4-26	NC	X4-6	NC
X4-48	NC	X4-28	GND	X4-8	NC
X4-50	NC	X4-30	+5V	X4-10	NC

Table 3-102 Pin Assignments Upper Connector

Table 3-103 lists the pin names for the pre-leading pins.

Pin #	Signal Name
23	GND
27	+5V

Table 3-103 Pre-leading Pins

Table 3-104 lists the lower connector backplane pin assignments for the SLMAR board.

Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name
X5-50	NC	X5-30	+5V	X5-10	NC
X6-42	NC	X6-22	GND	X6-2	NC
X6-44	NC	X6-24	GND	X6-4	-48V
X6-46	NC	X6-26	NC	X6-6	NC
X6-48	TOUT*	X6-28	NC	X6-8	NC
X6-50	FBPE	X6-30	NC	X6-10	NC
X7-42	TRST*	X7-22	NC	X7-2	NC
X7-44	TCK*	X7-24	GND	X7-4	NC
X7-46	TMS*	X7-26	PRS	X7-6	BA0
X7-48	TDI*	X7-28	BA1	X7-8	NC
X7-50	TDO*	X7-30	HO1	X7-10	NC
X8-42	HO3	X8-22	HO0	X8-2	NC
X8-44	HO2	X8-24	GND	X8-4	HD0
X8-46	NC	X8-26	BA2	X8-6	BA5

Pin #	**Signal Name**	**Pin #**	**Signal Name**	**Pin #**	**Signal Name**
X8-48	NC	X8-28	BA3	X8-8	CKA
X8-50	NC	X8-30	-5V	X8-10	CLS
X9-42	HI3	X9-22	FMB	X9-2	HI1
X9-44	HI2	X9-24	HI0	X9-4	BA4
X9-46	NC	X9-26	GND	X9-6	HDI
X9-48	NC	X9-28	+5V	X9-8	NC

Table 3-104 Pin Assignments Lower Connector

3.33 SLMAR2

The SLMAR2 (**S**ubscriber **L**ine **M**odule **A**nalog, **R**ural) board provides eight analog subscriber lines supporting the basic analog line features as well as the three major features (extended loop, pulse metering and line testing) required for the rural marketplace.

3.33.1 Hardware Part Number

- SLMAR2 (S30810-Q2199-X) = 8 analog T/R interfaces

> The system software must be updated because the board has been assigned new HW IDs and new code numbers.

3.33.2 Features

The features are the same as for SLMAR (S30810-Q2480-X) with the exception that the connection of external extensions via OPS (Off-Premises Station) signaling is no longer supported on SLMA2 (for U.S. only) but on SLMAR2.
The new SLMAR2 requires the following external ring generators to satisfy requests for different ring tones for the U.S. market: RGE, RGMOD, RG USA, and RG Korea.

- Overvoltage protection
- Ringing (balanced) the line
- Supervising and signalling the line
- Codec function
- Hybrid function (2W to 4W and 4W to 2W)
- Self-tests, report errors under the following conditions:
  - DC-to-DC converter failure.
  - Loop too long if configured for pulse metering with tones (refer to Payphones and Short/Long Loops).
  - Loop fault which may cause excessive loop current or unusual signalling events
- Extended loop capability (up to 3000 Ohms including telephone set)
- Pulse metering using tones, battery reversal or a combination of both
- Support of Line Test feature
- COMTEL3 supervision

- The SLMAR2 interfaces to four PCM highways on the backplane, giving access to 128 time slots. Each highway has two unidirectional ports (HI0 - HI3/HO0 - HO3).
- Communicates with the central processor over the 2.048 Mbps HDLC highway through unidirectional ports HDO and HDI

3.33.3 Touch Guard

Caution
The board is fitted with a touch guard because the onboard heat sinks are energized. Do not remove this touch guard.

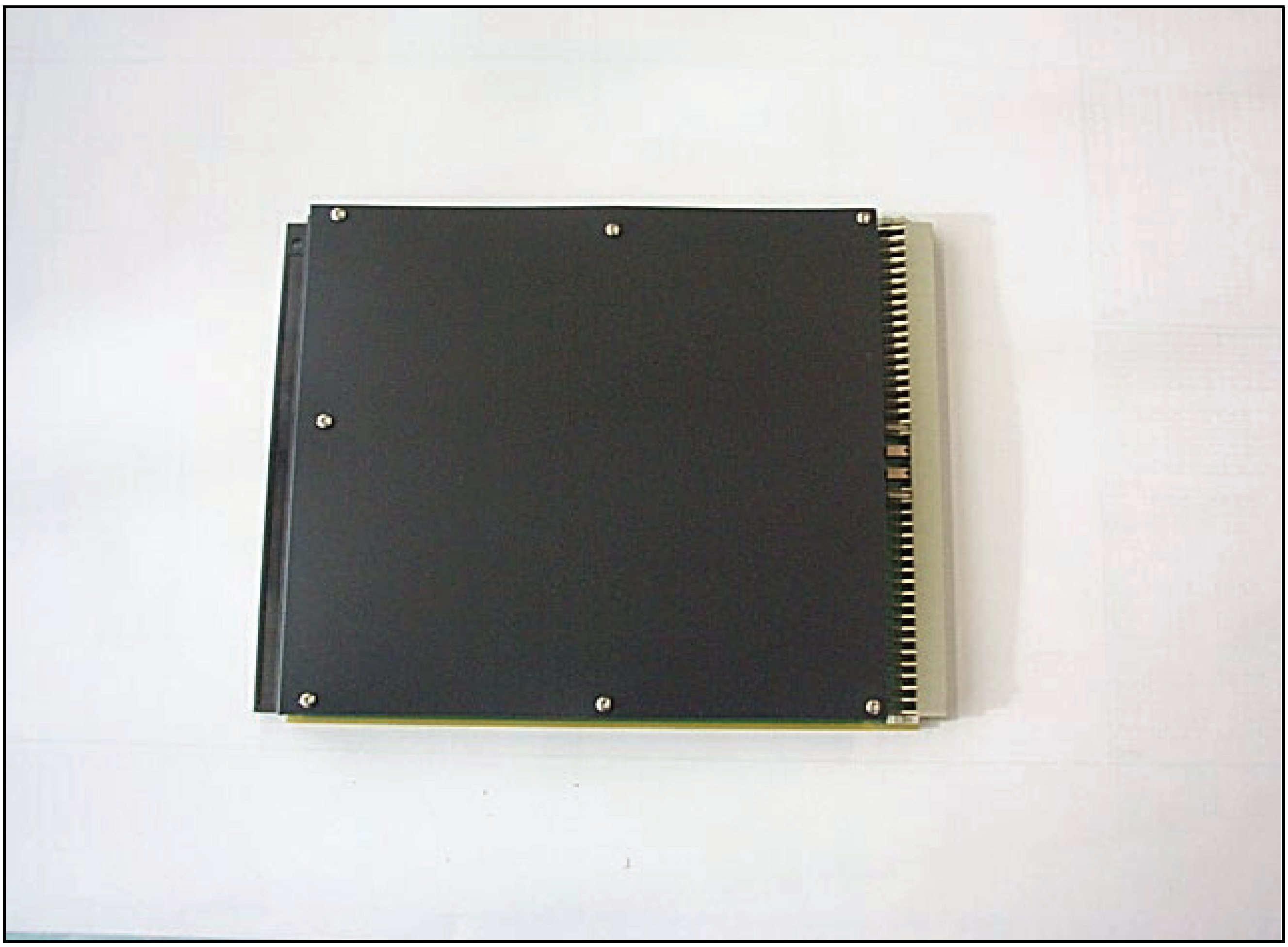


Figure 3-73 SLMAR2 with Touch Guard

3.33.4 LED Indications

The SLMAR2 board has a green LED and a red LED. The green LED indicates card status and channel activity; the red LED indicates card status and results of self-test.

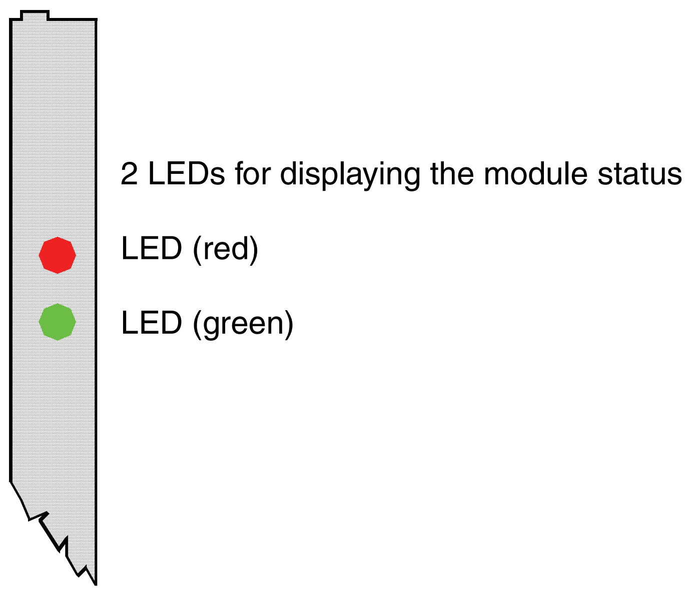


Figure 3-74 SLMAR2 - Front Panel

To ensure sufficient shielding, provide the board with a shielding panel.

Table 3-105 lists the LED indications of the SLMAR2 board.

Red LED	Green LED	Indication
Off	Off	Dead card
On	Off	Initial power on
Flashing	Off	Loading
On	Off	Defective board
Off	On	The board is working but does not have any no activity
Off	Flashing	The board is working and has an active channel.

Table 3-105 LED Indications

3.33.5 Subscriber Interface

Battery Feed, refer to Payphones and Short/Long Loops.

The subscriber interface of the SLMAR2 board is equipped with the following:

- Constant off hook current (talk state): 21mA nominal (18mA minimum).
- Current limiting in any state: 100mA nominal.
- Maximum on hook current: 5mA (refer to Payphones and Short/Long Loops).
- On hook voltage: V (wire a) = -61Vdc nominal; V (wire b)= -2Vdc nominal.
- Off hook voltage (no boosted battery; loop =1200 Ohm): Va= -44Vdc nominal; Vb= -19Vdc nominal.
- Offhook voltage (boosted battery; loop = 3000 Ohm): Va= -32 Vdc nominal; Vb= +32Vdc nominal.
- Reverse battery polarity configurable for signalling applications.

Ringing Signal:

The SLMAR2 board does not use ringing signal or ring synchronization (RGSYNG) from the backplane. The ring signal applied to the subscriber line is generated in the interface circuitry. Ring signal amplitude and frequency is configured by country specific coefficients in loadware. Cadencing is under control of loadware.

The SLMAR2 supplies balanced ring signal with nominal 2Vdc offset.

Hookswitch Detection:

- Off hook threshold: 10mA nominal.
- On hook threshold: 6.5mA nominal.
- Ring trip: 6.5mA nominal.
- Ring signal is automatically removed within two cycles after off hook occurs.

Dialling Recognition:

- Rotary dialing is supported. Timing requirements are configurable based upon country requirements.
- DTMF dialling recognition is accomplished by voice path connection to an external DTMF receiver in a SIU.

Wink Off:

- The line is placed in a high impedance mode.
- No on hook current is supplied during wink off.

Ground Key Detect/Ground Fault Detect:

Ground key detect is not supported on loops requiring boosted battery. These are loops with dc resistance, including the telephone set, exceeding approximately 2150 Ohms (refer to Payphones and Short/Long Loops). The difference between ground key detection and ground fault detection is in timing, this is controlled in loadware.

> Ground key/fault conditions are not guaranteed on all operating conditions and tolerances of hardware. Under absolute worst case hardware and environment conditions the ground current required to assert GKD may exceed the loop current.

- Maximum current to ground to assert GKD = 24mA.
- Minimum current to ground to unassert GKD = 9mA.

Message Waiting:

- Message waiting is supported on the COMTEL3 telephone by means of the ring signal interface.
- Due to the on hook current requirements there is a limit of two telephones per port on non-boosted battery loops, and one telephone per port on boosted battery loops.
- COMTEL3 Messaging Format:

Function	RING signal Cadence
Synchronization or Clear	~------
Ringing	~~~~~~~
Forwarding	~-~----
Testing	~--~---
Message Waiting	~---~--
Operating Mode	~----

Function	RING signal Cadence
Forwarding and Message Waiting	~-~-~--
Legend: ~ = one cycle of RING signal – = one cycle of space	

Table 3-106 COMTEL3 Messaging Format

Pulse Metering (refer to "Payphones and Short/Long Loops"):

- The SLMAR2 board supports pulse metering with either 12 kHz tones, 16 kHz tones, battery reversal or a combination of tones and battery reversal. Charge pulses using these methods are created on the card by the interface circuitry; no external circuitry or sources are required.
- Tone amplitude, pulse cadencing and mix of tones and battery reversal is country specific and configurable by AMO by means of loadware (refer also to AMO SCSU).
- Soft battery reversal is not supported.

3.33.6 Hardware Integrity

The SLMAR2 board incorporates the same self-test features as the SLMA2 board. In addition to the self-tests performed by the SLMA2 boards, it reports errors as follows:

- DC-to-DC converter failure.
- Loop is too long if configured for pulse metering with tones (refer to Payphones and Short/Long Loops).
  The error message reported is: DC LOOP PROBLEMS (CHECK DEVICE/LINE).

Payphones and Short/Long Loops

Payphones

Some models of terminal devices (payphones and other *smart phones*) draw loop current while on hook to support resident electronics. They may have rechargeable batteries or capacitors which require charging before the device becomes operational.

These devices should be pre-charged before connection to the SLMAR2 card to bring the device into service without a long charging interval because the SLMAR2 card cannot supply high charge current. Some devices, such as the ELASA TPM P/S payphone, may require several hours to recharge using the SLMAR2 on-hook loop current. During this time the port is not functional.

If a port has been disabled or taken out of service for an extended period of time then the terminal device may require recharging before becoming operational. In extreme cases the terminal device may have lost configuration data and may require re-configuration.

Short/Long Loops

There are three functions which are dependent upon loop length: pulse metering, dc loop current, and voice frequency gain. The crossover loop length between *short* and *long* for each function is different, and confusing.

Loop length is defined in terms of dc resistance. This is not a totally accurate way to define the effects of loop length upon the performance of the feature but it is the most easy to measure in the field. The maximum loop resistance supported by the SLMAR2 board is 3000 Ohms. Because the telephone is not purely resistant, the loop resistance should be calculated using measured values of voltage across the a, b leads at the PBX, and the loop current (Rloop = Va-b/Iloop)

Port Initialization

The loadware resident on the card must determine, through testing, if the loop is too long to support pulse metering with tones (if configured), and if the boosted battery is required to maintain minimum loop current. **This test is performed on the first off hook after the port is activated.** If any configuration changes are made to a port or if any wiring changes are made which may affect the loop resistance, **the port must be deactivated and then activated in order to rerun the test. If this is not done, the port may not be correctly configured.**

Pulse Metering

Pulse Metering using 12KHz or 16KHz tones is only supported up to a loop resistance of 1640 Ohms. Above that attenuation of the tones is too great to guarantee proper performance, and battery polarity reversal must be used for signalling. If a port is configured for pulse metering with tones and the loop resistance is too high a configuration error message is sent by loadware to the switch. Selection of pulse metering using tones, battery reversal or both is made using AMO-SCSU.

DC Loop current

The loop current is a constant current feed. If the loop resistance is too high to maintain the programmed constant current using the default -63Vdc battery (minimum of 18mA) then boosted battery of +63Vdc is switched on. The available DC supply is then +63Vdc and –63Vdc. The loop resistance with boosted battery that is required is nominally 2150 Ohms.

When referring to the DC loop feed, *short loops* of less than 2150 Ohms require regular battery and *long loops* of over 2150 Ohms require boosted battery of +63Vdc and – 63Vdc.

Transmission gain

On loops with significant losses the transmission gains or losses are adjusted to ensure correct signalling and voice levels at the PBX and the terminal equipment. This is typically required on loops of greater than 1500-1800 Ohms. The SLMAR2 ports are configured for *short loop* transmission gains by default. If the craftsperson determines that the loop is too loss-making then the *long loop* transmission gains may be configured by AMO.

3.33.7 Backplane Pin Assignments

Table 3-107 lists the upper connector backplane pin assignments of the SLMAR2 board.

Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name
X1-42	NC	X1-22	+5V	X1-2	00A
X1-44	NC	X1-24	GND	X1-4	NC
X1-46	NC	X1-26	00B	X1-6	01A
X1-48	NC	X1-28	NC	X1-8	01B
X1-50	NC	X1-30	NC	X1-10	02A
X2-42	NC	X2-22	NC	X2-2	02B
X2-44	NC	X2-24	NC	X2-4	03A
X2-46	NC	X2-26	GND	X2-6	03B
X2-48	NC	X2-28	NC	X2-8	04A
X2-50	NC	X2-30	NC	X2-10	04B
X3-42	NC	X3-22	NC	X3-2	05A
X3-44	NC	X3-24	NC	X3-4	05B
X3-46	NC	X3-26	GND	X3-6	06A
X3-48	NC	X3-28	NC	X3-8	06B
X3-50	NC	X3-30	NC	X3-10	07A
X4-42	NC	X4-22	-5V	X4-2	07B
X4-44	NC	X4-24	NC	X4-4	NC
X4-46	NC	X4-26	NC	X4-6	NC
X4-48	NC	X4-28	GND	X4-8	NC
X4-50	NC	X4-30	+5V	X4-10	NC

Table 3-107 Pre-Leading Pins

Table 3-108 lists the pin names for the pre-leading pins.

Pin #	Signal Name
23	GND
27	+5V

Table 3-108 Pin Assignments Upper Connector

Table 3-109 lists the lower connector backplane pin assignments for the SLMAR2 board.

Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name
X5-50	NC	X5-30	+5V	X5-10	NC
X6-42	NC	X6-22	GND	X6-2	NC
X6-44	NC	X6-24	GND	X6-4	-48V
X6-46	NC	X6-26	NC	X6-6	NC
X6-48	TOUT*	X6-28	NC	X6-8	NC
X6-50	FBPE	X6-30	NC	X6-10	NC
X7-42	TRST*	X7-22	NC	X7-2	NC
X7-44	TCK*	X7-24	GND	X7-4	NC
X7-46	TMS*	X7-26	PRS	X7-6	BA0
X7-48	TDI*	X7-28	BA1	X7-8	NC
X7-50	TDO*	X7-30	HO1	X7-10	NC
X8-42	HO3	X8-22	HO0	X8-2	NC
X8-44	HO2	X8-24	GND	X8-4	HD0
X8-46	NC	X8-26	BA2	X8-6	BA5
X8-48	NC	X8-28	BA3	X8-8	CKA
X8-50	NC	X8-30	-5V	X8-10	CLS
X9-42	HI3	X9-22	FMB	X9-2	HI1
X9-44	HI2	X9-24	HI0	X9-4	BA4
X9-46	NC	X9-26	GND	X9-6	HDI
X9-48	NC	X9-28	+5V	X9-8	NC

Table 3-109 Pre-Leading Pins

3.34 SLMO24

The SLMO24 board has 24 U_P0/E interfaces. Up to 3 devices can be connected to the same station line (maximum of three message sources).

The terminals can be supplied with remote power feed by means of the U_P0/E-interfaces. The feed voltage can be activated and deactivated separately for every port. Current overload causes an overload protection chip to switch the power off automatically (short-circuit-proof).

The SLMO24 board supports line termination (LT) for two-wire digital interfaces in accordance with the U_P0/E method. Each U_P0/E interface is an ISDN basic access (BA) with two B-channels (64 Kbps each) for voice and data transmission and one D-channel (16 Kbps). Terminals with U_P0/E interfaces can be connected directly and terminals with S_0 interface can be connected by means of a TA-S_0 (terminal adapter S_0). A maximum of two U_P0/E terminals plus supplementary equipment can be connected to each port.

The two B-channels can be switched through to any time slot of the system-side PCM highways. Of all possible D-channel data types (s, p, t), only the s-data (signaling) is processed. It is not planned to support p-data (packet switching) or t-data (telemetry).

The SLMO24 board provides the 24 U_P0/E-interface required to support the Optiset E telephones. By using an adapter in the Masterphone (Repeater), you can connect:

- An additional Optiset E telephone (slave phone or terminator) and a LAP-D terminal

OR

- Two LAP-D terminals.

The terminals can be supplied with remote power feed by means of the U_P0/E-interfaces.

Figure 3-75 shows terminals which are connected to the SLMO24 board directly by means of the U_P0/E interface or indirectly through an integrated NT.

The system-to-terminal distance depends on the type of cable used. The 1000 m provided in this diagram is considered to be the maximum loop length specified by the Integrated Communications Cabling System (ICCS) without taking power feeding into account.

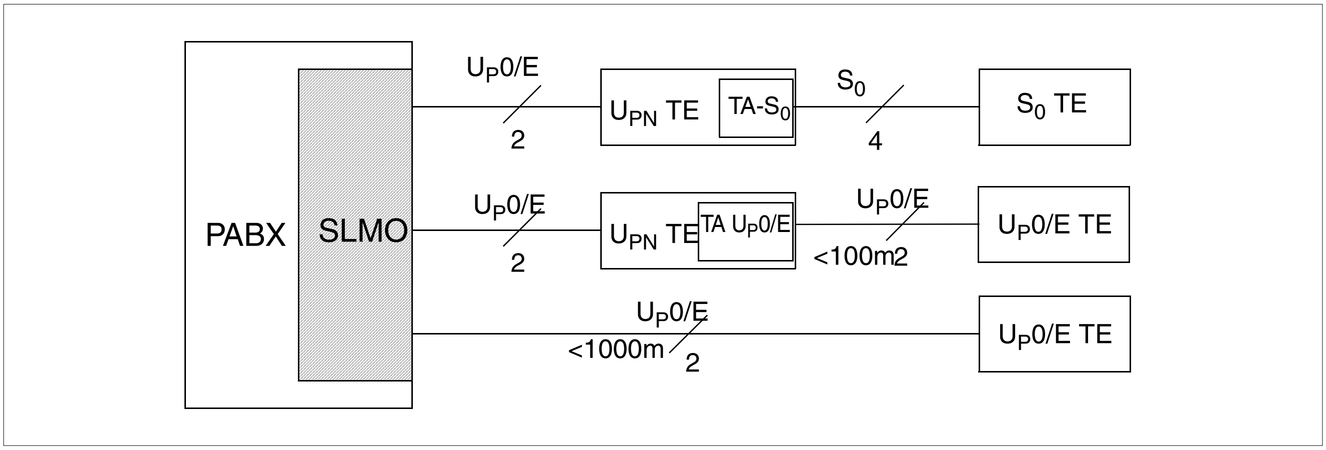


Figure 3-75 Example of an SLMO Terminal Configuration

3.34.1 Board Variants

SLMO24 (24 ports) S30810-Q2168 (predecessor: -Q2158)

SLMOP (24 ports; every line has its own HDLC controller) S30810-Q2169-X100

AMO PETRA

The administration and maintenance operation PETRA enables trace jobs to be installed or stopped for each ACCESS (circuit) on the peripheral SLMO boards. The trace job results can be displayed with the AMO PETRA. In addition this AMO has a memory dump function for the board memories.

3.34.2 LED Indications

Table 3-110 provides the LED indications for the SLMO24 board.

The SLMO24 board front panel has two LEDs.

Board	Red LED	Green LED	Indications
SLMO24	On	Off	The board has initial power applied.
	Flashing	Off	The board is being loaded with loadware.
	On	Off	The board is defective or out-of-service.
	Off	On	The board is operational and all channels are inactive.
	Off	Flashing	The board is operational and one or more channels are active.

Table 3-110 SLMO24 Board LED Indications

3.34.3 Removing the SLMO24 Board

This procedure removes up to 24 ISDN channels (Optiset E telephones) from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

To remove the SLMO24 board:

1. Deactivate all channels on the board as follows:
   a) Type **DEA-DSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
OFFTYPE	DC
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

PEN1 is the pen of the first channel and PEN2 is the pen of the last channel on the board.

2. Display the status of the board until all channels are free as follows:
   a) Type **DIS-SDSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
STATUS	ALL
LINK	<blank>
TYPE	PEN
LEVEL	PER3
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
CCT	<0 - 15>

3. When all channels are free, deactivate the board as follows:

a) Type **`DEA-BSSU`** and press **Enter**.

b) Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	DC
LTG	<1>
LTU	<1 - 8>
SLOT	<1 - 121>
REFOFF	<blank>

4. Using the board removal and replacement tool, unseat the board and remove it from the shelf.

3.34.4 Replacing the SLMO24 Board

To replace the SLMO24 board:

1. Install the board as follows:

   a) On an LTUE shelf only, install the Adapter 2 on the replacement board (refer to Section 6.7.2, “Installing the Adapter 2”).

   b) Use one hand to move and hold open the bottom retainer.

   c) Slide the board into the appropriate slot until you seat it firmly into the backplane connector. Do *not* use the board removal and replacement t tool.

2. Activate the SLM board as follows:

   a) Type **`ACT-BSSU`** and press **Enter**.

   b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>

3. Activate the channels on the board as follows:

   a) Type **`ACT-DSSU`** and press **Enter**.

   b) Type the following values, then press **Enter**.

Field	Value
ONTYPE	AUL
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

PEN1 is the pen of the first channel and PEN2 is the pen of the last channel on the board.

3.34.5 Verifying the SLM024 Board

To verify the operation of the SLMO24 board, display the status of the board as follows:

1. Type **DIS-SDSU** and press **Enter**.
2. Type the following values, then press **Enter**.

Field	Value
STATUS	ALL
LINK	<blank>
TYPE	PEN
LEVEL	PER3
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
CCT	<0 - 15>

The SLM board is automatically tested on activation.

3.34.6 SLMO24 Board MDF Assignments, U.S.

Table 3-111 shows the standard SLM board punch-down sequence at the MDF.

Cable punch-down is standard. Each channel uses one tip and ring pair. Label the block from channel 00 through 15 or 23, as appropriate.

Pair No.	Wire Color	Channel No.	Pair No.	Wire Color	Channel No.
1	WHT-BLU BLU-WHT	00	14	BLK-BRN BRN-BLK	13

Table 3-111 Standard Punch-Down Sequence (Seite 1 von 2)

Pair No.	Wire Color	Channel No.	Pair No.	Wire Color	Channel No.
2	WHT-ORG ORG-WHT	01	15	BLK-SLT SLT-BLK	14
3	WHT-GRN GRN-WHT	02	16	YEL-BLU BLU-YEL	15
4	WHT-BRN BRN-WHT	03	17	YEL-ORG ORG-YEL	16
5	WHT-SLT SLT-WHT	04	18	YEL-GRN GRN-YEL	17
6	RED-BLU BLU-RED	05	19	YEL-BRN BRN-YEL	18
7	RED-ORG ORG-RED	06	20	YEL-SLT SLT-YEL	19
8	RED-GRN GRN-RED	07	21	VIO-BLU BLU-VIO	20
9	RED-BRN BRN-RED	08	22	VIO-ORG ORG-VIO	21
10	RED-SLT SLT-RED	09	23	VIO-GRN GRN-VIO	22
11	BLK-BLU BLU-BLK	10	24	VIO-BRN BRN-VIO	23
12	BLK-ORG ORG-BLK	11	25	VIO-SLT SLT-VIO	Not used.
13	BLK-GRN GRN-BLK	12			

Table 3-111 Standard Punch-Down Sequence (Seite 2 von 2)

3.35 SLMOP Digital Subscriber Line Circuit, U_P0/E Interface, Improved Performance

Subscriber Line Module Optimized Performance $U_{P0/E}$

The SLMOP board (SLMO-HP boards) is used to solve performance problems in connection with the SLMO24 boards (Q2158 or Q2168) and features such as call pickup group and key functionality.

The SLMO24 board has been implemented since version V3.4 for connecting Optiset E telephones to the Hicom 300 system. At the moment performance problems occur when call pickup groups with more than 10 subscribers are configured on one board. It is expected that similar restrictions will occur in the future with other signal-intensive features such as key functionality, for example.

The new board will make it possible to improve performance using modified software and by increasing the processor clock pulse. An appropriate hardware concept with faster µP and dedicated HDLC controllers for each port means that the new board will make data throughput 24 times faster.

The only difference between the SLMOP board and the SLMO24 board is the hardware. They are compatible with the SLMO24. The board can be used in Hicom 300 E V1.0 and later and can also replace the SLMO24 boards.

- Advantages
  - More than 10 subscribers per board on one call pickup group
  - High usage rate of integrated key functionality
  - High performance
- Basic configuration
  - One HDLC controller per port -> terminal units can be connected up with exclusive access to the D channel
  - High-performance processor
  - Memory, 512 Kbyte flash memory, 236 Kbyte RAM memory for data

3.35.1 SLMOP board (SK-8 and higher also E V1.0, E V2.0, E V3.0 and H V1.0 IM)

- Range of features
- 24 U_P0/E interfaces with -48V power supply

- Function: PABX <---> subscriber telephone
- Power consumption: 4-15 watts (depending on telephone type)
- Module width: 30 mm
- LEDs: 2
- SIPAC backplane connector
- Interface to the MDF
- DELPHI (24 HDLC Controller) and VIP chips (for implementation of the U_P0/E interfaces)

- General operation
  - The SLMOP has 24 $U_{P0/E}$ ports and is compatible with the SLMO (-Q2168-X)
  - 2-wire interface with a range of at least 1 km:
  - Each connection comprises 2 B channels and 1 D channel
  - The maximum number of wire pairs that can be connected up is 24
- Board variants
  - S30810-Q2169-X100

3.35.2 Subscriber Line Module, U_P0/E Interface

A maximum of 3 devices can operate on the one subscriber line circuit (maximum of three signal sources).

A remote power supply to the telephones is made possible by means of the U_P0/E connections. The supply voltage can be switched on and off for each port. The power is switched off automatically (chip) in the event of an overload (permanent short circuit protection).

The SLMO board has interfaces for 2-wire digital subscriber lines to the U_P0/E standard. Each U_P0/E interface has a basic ISDN connection with 2 B channels (64 Kbps each) for the transmission of user data as well as a D channel (16 Kbps) for signal data. Telephones with U_P0/E interfaces (direct) and telephones with S_0 interfaces (with a TA-S_0) can be connected to the D channel. A maximum of 2 U_P0/E telephones can be connected with their respective auxiliary units for each port.

The B channels can be switched through to any channel (timeslot) of the PCM highways on the system side. Of all D channel signals available (s, p, t), only signaling data is processed. Packet transmission data (p = packet switching) or telemetry (t signals) are not supported.

24 U_P0/E interfaces for Symphony telephones. An adapter in the master phone (repeater) can be used to connect up

- Either one additional Symphony telephone (slave phone or terminator) and one LAP-D telephone

OR

- Two LAP-D telephones.

It is possible to supply power from a remote source by means of the U_P0/E interfaces.

Figure 3-76 illustrates the direct connection of telephones to the SLMO by means of the U_P0/E interfaces, as well as by means of an integrated network terminal (NT).

The length of the telephone connection lines depends on the type of cable used. The 1000 m specified in the figure below is the maximum loop length in accordance with ICCS (Integrated Communications Cabling System). However, the remote power supply is not taken into account here.

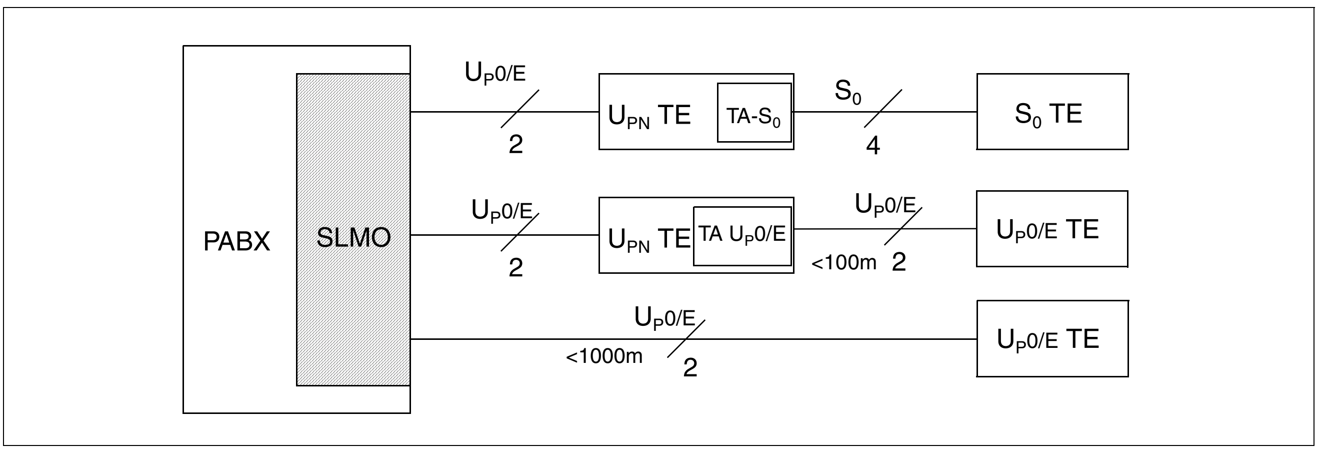


Figure 3-76 Example of possible SLMO telephone connections

AMO PETRA

Trace processes can be configured or stopped and trace results can be displayed (TRACE) on the peripheral board SLMO and SLMQ for each ACCESS (circuit) with the AMO PETRA. The AMO PETRA also makes it possible to display the contents of the memory on the board (DUMP).

3.36 SLMQ

> The current linecard for ANSI-U is the SLMQ Q2153 (2 LEDs, 1 red and 1 green). It replaces the old SLMQ Q2133 (only 1 green LED).

The SLMQ board provides 16 two-wire digital line interfaces according to ANSI-U specifications.

The SLMQ board also provides ISDN basic access for stations with extremely long lines (5.5 - 9 km). One ANSI-U interface can accommodate either one direct terminal connection, using the appropriate interface plug, or up to 8 S0 terminals. The S0 bus must be connected by means of a *PNTQ* terminator. An ANSI-U terminal with an integrated PNTQ can accommodate an additional 7 S0 terminal connections.

If the local feed voltage fails, one ANSI-U terminal or one PNTQ plus one S0 terminal per connection can operate on the (remote) emergency feed voltage. Each ANSI-U interface offers ISDN Basic Access with a transmission capacity of 64 Kbps on each of the two B-channels (voice and data) and 16 Kbps on the D-channel (signaling). The two B-channels can be switched through to any available timeslots of the PCM30 highways in the system. The D-channel only transmits signaling data, exchanged between the ANSI-U interface and the common control (CC).

Figure 3-77 shows the SLMQ-PNTQ connectivity.

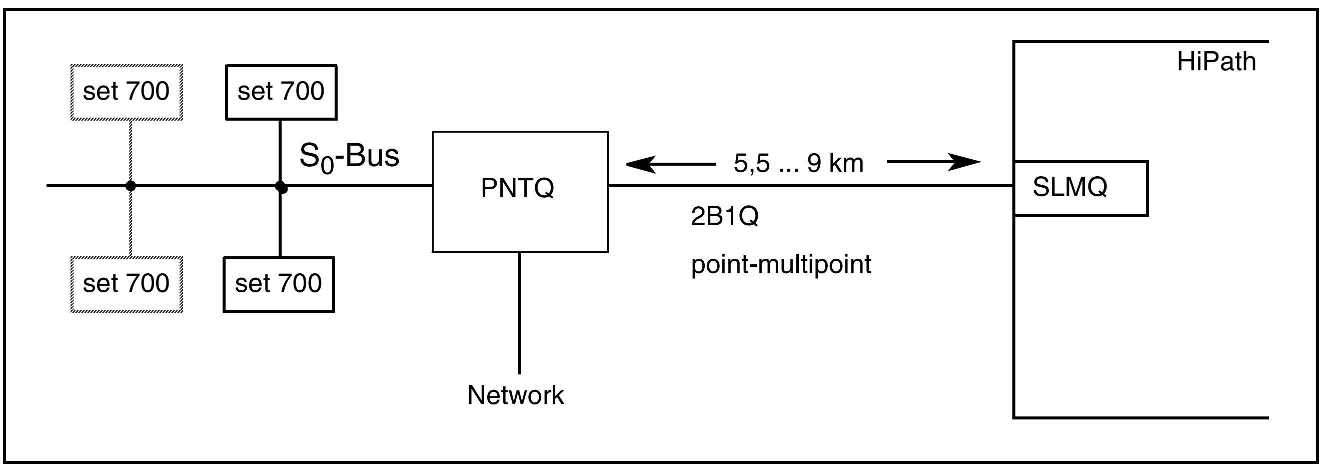


Figure 3-77 SLMQ, Connecting S_0 Terminals By Means of PNTQ Adapter

3.36.1 U_{K0}-2B1Q Interfaces

The following terminal types can be connected by means of adapters:

- S_0 terminals (by means of PNT-Q)

OR

- One Optiset E telephone for every port (using UCON converter). This is restricted by the UCON adapter.

The U_{K0}-2B1Q interfaces allow remote power feed. The feed voltage can be activated and deactivated per port, and is automatically deactivated if overload current is detected by the control chip (short-circuit proof).

3.36.2 SLMQ Board LED Indications

Table 3-112 provides the LED indications for the SLMQ board.

The SLMQ board front panel contains one LED.

Board	Green LED	Indications
SLMQ	On	The board is loaded; loadware is running.
	Off	The board is not operational or not configured.
	Flashing	Loadware run is completed (120/120 ms, up to 10 mins.)

Table 3-112 SLMQ Board LED Indications

3.36.3 Removing the SLMQ Board

This procedure removes up to 16 ISDN channels from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

To remove the SLMQ board:

1. Deactivate all channels on the board as follows:
   a) Type **`DEA-DSSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	DC
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

PEN1 is the pen of the first channel and PEN2 is the pen of the last channel on the board.

2. Display the status of the board until all channels are free as follows:
   a) Type **DIS-SDSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
STATUS	ALL
LINK	<blank>
TYPE	PEN
LEVEL	PER3
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
CCT	<0 - 15>

3. When all channels are free, deactivate the board as follows:
   a) Type **DEA-BSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	DC
LTG	<1>
LTU	<1 - 8>
SLOT	<1 - 121>
REFOFF	<blank>

4. Using the board removal and replacement tool, unseat the board and remove it from the shelf.

3.36.4 Replacing the SLMQ Board

To replace the SLMQ board:

1. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
2. Activate the SLM board as follows:
   a) Type **ACT-BSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>

3. Activate the channels on the board as follows:
   a) Type **ACT-DSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

> PEN1 is the pen of the first channel and PEN2 is the pen of the last channel on the board.

3.36.5 Verifying the SLMQ Board

To verify the operation of the SLMQ board, display the status of the board as follows:

1. Type **DIS-SDSU** and press **Enter**.
2. Type the following values, then press **Enter**.

Field	**Value**
STATUS	ALL
LINK	<blank>
TYPE	PEN
LEVEL	PER3
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
CCT	<0 - 15>

> The SLM board is automatically tested on activation.

3.36.6 SLMQ MDF Assignments, U.S.

Table 3-113 shows the standard SLM board punch-down sequence at the MDF.

Cable punch-down is standard. Each channel uses one tip and ring pair. Label the block from channel 00 through 15 or 23, as appropriate

Pair No.	Wire Color	Channel No.	Pair No.	Wire Color	Channel No.
1	WHT-BLU BLU-WHT	00	14	BLK-BRN BRN-BLK	13
2	WHT-ORG ORG-WHT	01	15	BLK-SLT SLT-BLK	14
3	WHT-GRN GRN-WHT	02	16	YEL-BLU BLU-YEL	15
4	WHT-BRN BRN-WHT	03	17	YEL-ORG ORG-YEL	16
5	WHT-SLT SLT-WHT	04	18	YEL-GRN GRN-YEL	17
6	RED-BLU BLU-RED	05	19	YEL-BRN BRN-YEL	18
7	RED-ORG ORG-RED	06	20	YEL-SLT SLT-YEL	19
8	RED-GRN GRN-RED	07	21	VIO-BLU BLU-VIO	20
9	RED-BRN BRN-RED	08	22	VIO-ORG ORG-VIO	21
10	RED-SLT SLT-RED	09	23	VIO-GRN GRN-VIO	22
11	BLK-BLU BLU-BLK	10	24	VIO-BRN BRN-VIO	23
12	BLK-ORG ORG-BLK	11	25	VIO-SLT SLT-VIO	Not used.

Table 3-113 Standard Punch-Down Sequence (Seite 1 von 2)

Pair No.	Wire Color	Channel No.	Pair No.	Wire Color	Channel No.
13	BLK-GRN GRN-BLK	12			

Table 3-113 Standard Punch-Down Sequence (Seite 2 von 2)

3.37 SLMQ3

This section describes the function of the subscriber line module U2B1Q (SLMQ3) board. It also provides procedures for removing, replacing, and verifying this board.

3.37.1 Functional Description

The SLMQ3 board is a 16-channel board that supports the National ISDN 2 (NI-2) protocol. It provides the U2B1Q interface required to support the connection of the following types of devices:

- Optiset NI-1200U telephone
- Distance adapter, which permits the connection of the Optiset E
- A network termination 1 (NT-1) device

The SLMQ3 board can also support the connection of the Optiset NI-1200S by way of:

- A TA/ST module installed in the NI-1200U
- An NT-1 device

The SLMQ3 board uses the standard punch-down sequence

Figure 3-78 and Figure 3-79 show examples of SLMQ3 connectivity.

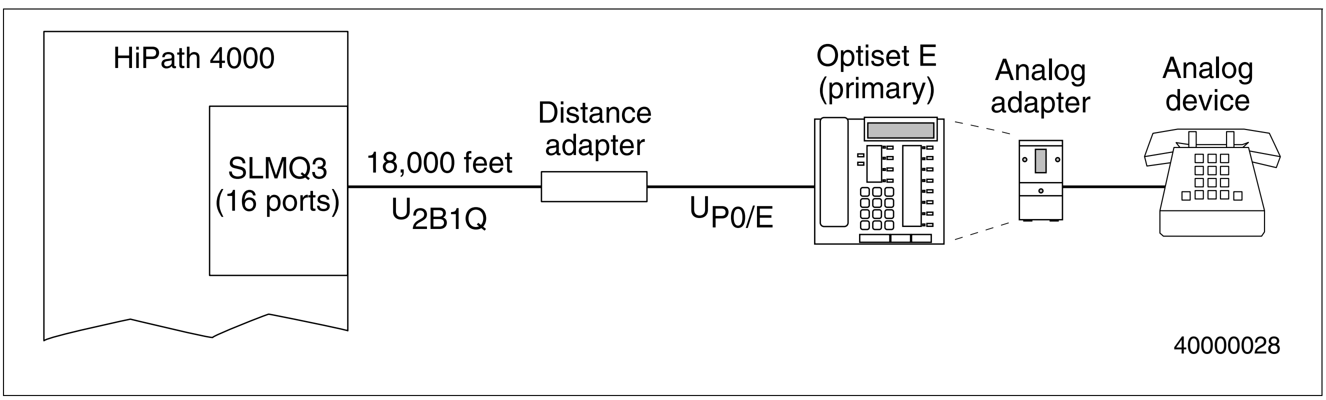


Figure 3-78 SLMQ3 Connectivity Example 1

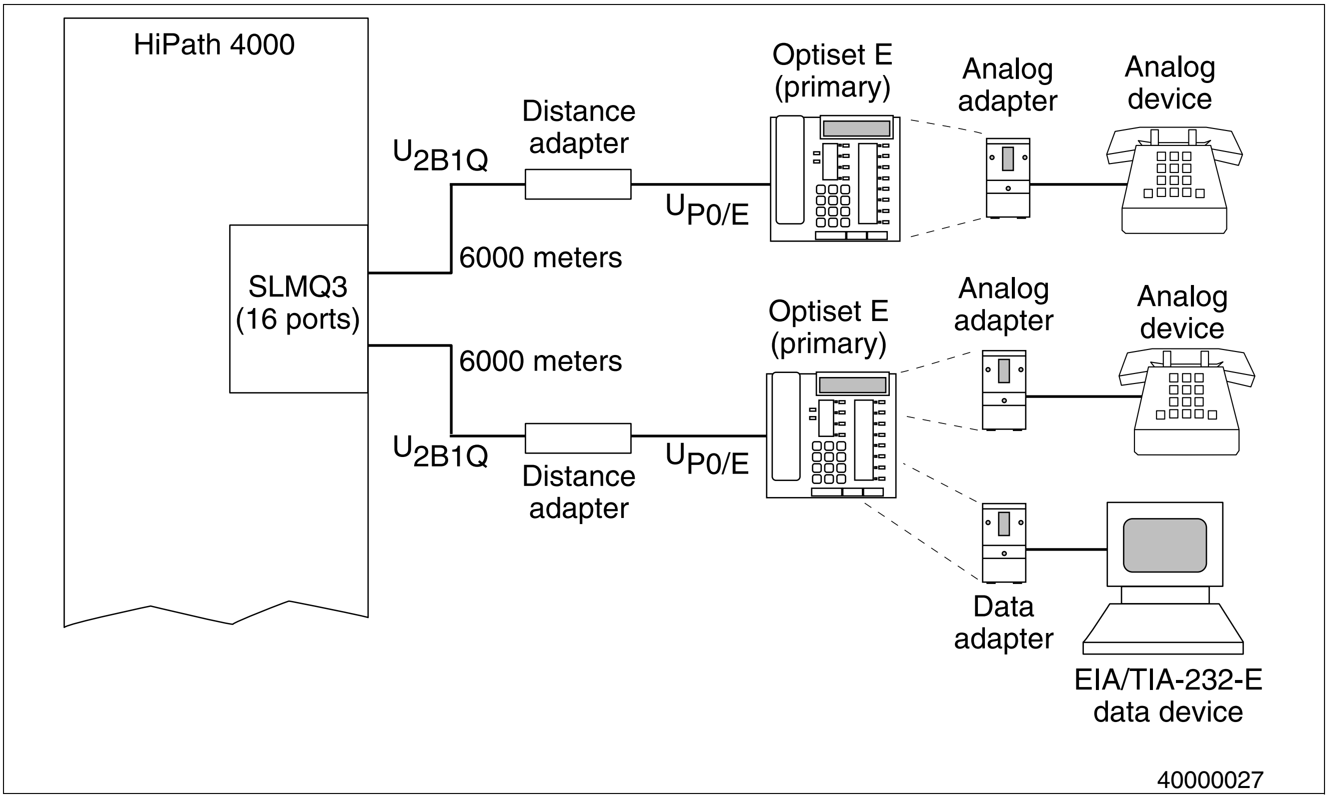


Figure 3-79 SLMQ3 Connectivity Example 2

3.37.2 LED Indications

The SLMQ3 board front panel contains two LEDs.Table 3-114 lists the LED indications for the SLMQ3 board.

Board	Red LED	Green LED	Indications
SLMQ3	On	Off	The board has initial power applied.
	Flashing	Off	The board is being loaded with loadware.
	On	Off	The board is defective or out-of-service.
	Off	On	The board is operational and all channels are inactive.
	Off	Flashing	The board is operational and one or more channels are active.

Table 3-114 SLM Board LED Indications

3.37.3 Removing the SLMQ3 Board

Warning
This procedure removes up to 16 ISDN channels from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

Remove the SLMQ3 board as follows:

1. Deactivate all channels on the board as follows:
   a) Type **DEA-DSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
OFFTYPE	DC
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

PEN1 is the pen of the first channel and PEN2 is the pen of the last channel on the board.

2. Display the status of the board until all channels are free as follows:
   a) Type **DIS-SDSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
STATUS	ALL
LINK	<blank>
TYPE	PEN
LEVEL	PER3
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
CCT	<0 - 15>

3. When all channels are free, deactivate the board as follows:
   a) Type **DEA-BSSU** and press **Enter**.

4. Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	DC
LTG	<1>
LTU	<1 - 8>
SLOT	<1 - 121>
REFOFF	<blank>

3.37.4 Replacing SLMQ3 Board

Replace the SLMQ3 board as follows:

1. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
2. Activate the SLMQ3 board as follows:
   a) Type **`ACT-BSSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>

3. Activate the channels on the board as follows:
   a) Type **`ACT-DSSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

> PEN1 is the pen of the first channel and PEN2 is the pen of the last channel on the board.

3.37.5 Verifying the SLMQ3 Board

Verify the operation of SLM boards by displaying the status of the board as follows:

1. Type **`DIS-SDSU`** and press **Enter**.

2. Type the following values, then press **Enter**.

```
Field        Value
STATUS       ALL
LINK         <blank>
TYPE         PEN
LEVEL        PER3
LTG          <1 - 32>
LTU          <1 - 8>
SLOT         <1 - 151>
CCT           <0 - 15>
```

> The SLM board is automatically tested on activation.

3.37.6 MDF Assignments

The SLMQ3 board punch-down sequence is standard. Each channel uses one tip and ring pair. Label the block from channel 00 through 15 or 23, as appropriate.

Table 3-115 lists the standard SLM board punch-down sequence at the MDF.

> The SLMQ3 board supports the connection of NI-2 telephones at distances up to 18,000 ft. Digital stations in a campus environment that require the use of exposed wiring (aerial cable or buried cable) must include overcurrent protective wiring systems. For installation requiring overcurrent protection refer to the *HiPath 4000 OfficePoint Secondary Protection Guide*, G281-0732.

Pair No.	Wire Color	Channel No.	Pair No.	Wire Color	Channel No.
1	WHT-BLU BLU-WHT	00	14	BLK-BRN BRN-BLK	13
2	WHT-ORG ORG-WHT	01	15	BLK-SLT SLT-BLK	14
3	WHT-GRN GRN-WHT	02	16	YEL-BLU BLU-YEL	15
4	WHT-BRN BRN-WHT	03	17	YEL-ORG ORG-YEL	16
5	WHT-SLT SLT-WHT	04	18	YEL-GRN GRN-YEL	17

Table 3-115 Standard Punch-Down Sequence (Seite 1 von 2)

Pair No.	Wire Color	Channel No.	Pair No.	Wire Color	Channel No.
6	RED-BLU BLU-RED	05	19	YEL-BRN BRN-YEL	18
7	RED-ORG ORG-RED	06	20	YEL-SLT SLT-YEL	19
8	RED-GRN GRN-RED	07	21	VIO-BLU BLU-VIO	20
9	RED-BRN BRN-RED	08	22	VIO-ORG ORG-VIO	21
10	RED-SLT SLT-RED	09	23	VIO-GRN GRN-VIO	22
11	BLK-BLU BLU-BLK	10	24	VIO-BRN BRN-VIO	23
12	BLK-ORG ORG-BLK	11	25	VIO-SLT SLT-VIO	Not used.
13	BLK-GRN GRN-BLK	12			

Table 3-115 Standard Punch-Down Sequence (Seite 2 von 2)

3.38 STHC

The subscriber trunk hybrid card (STHC) board has the combined functionality of the STMD and SLMO boards.

3.38.1 Feature Characteristics

The STHC board optimizes peripheral cards for small configuration and combines the functionality of several cards into one card to free up slots. You can operate the STMD and SLMO cards with the new STHC. The STHC requires 4 S_0 and 16 U_{P0E} interfaces. The assignment of ports to the STMD and SLMO24 functions are defined and can be configured.

Figure 3-80 shows a connectivity diagram of the terminals to the STHC board.

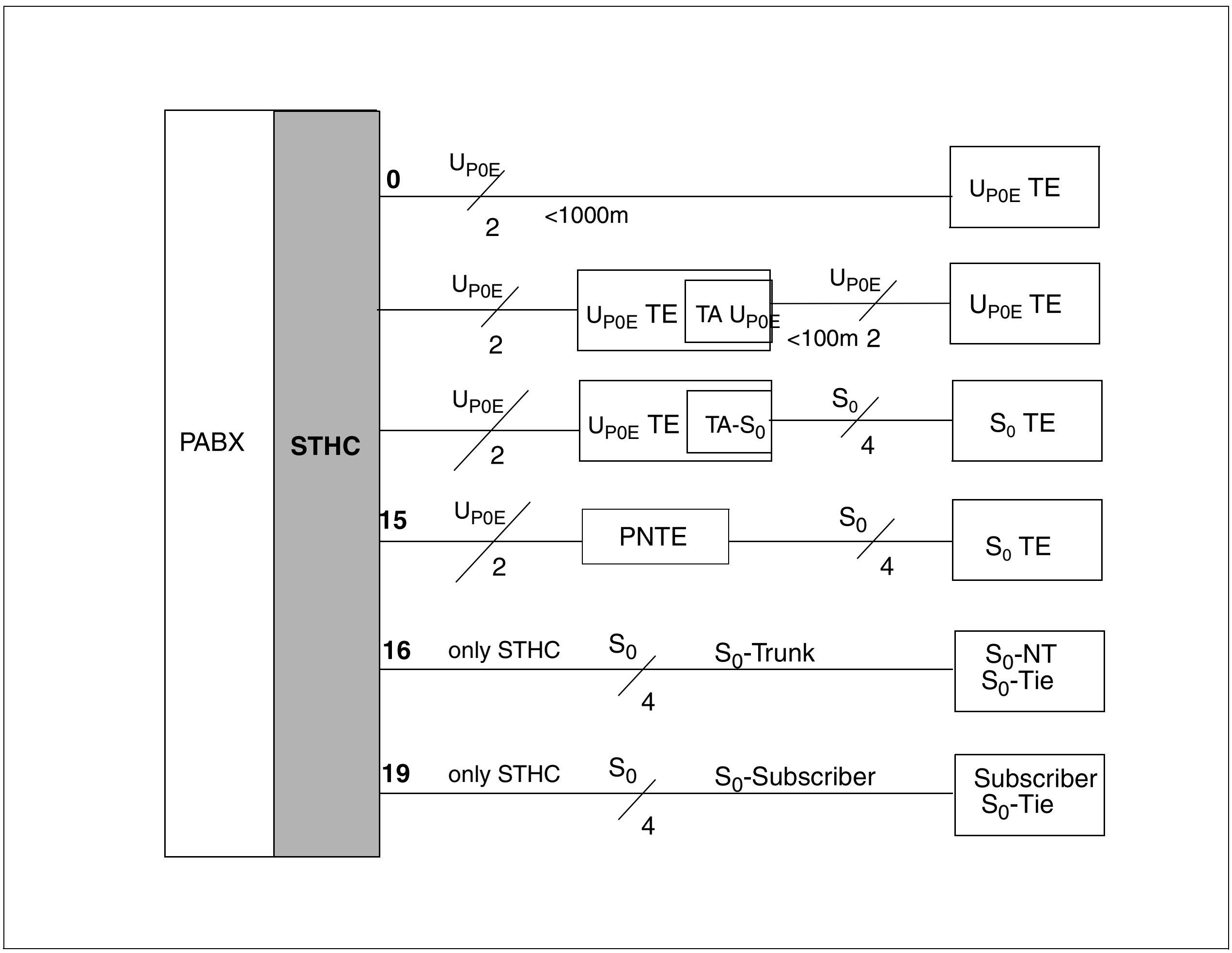


Figure 3-80 Connection of Terminals to the STHC Board

The STHC board provides digital U_{P0E} and S_0 interfaces.

3.38.2 U_{P0E} Interface

The STHC board is equipped with the following:

- Digital 2-wire interface
- Terminal with U_{P0E} or S_0 can be connected by means of TA-S_0
- -48V remote feeding by means of U_{P0E}
- Maximum cable length approximately 1000 m
- High performance capability
- Only function ID 1 is supported (no routing and remote functionality)

3.38.3 S_0 Interface

The STHC board is equipped with the following:

- Digital 4-wire interface
- Trunk/subscriber mode
  - Details in the trunk mode:

    Maximum cable length in trunk mode for approximately 1000 m

    Reference clock derived in the trunk mode (TMD) at any selected S_0 interface

    No -40-V feeding

    Only point-to-point traffic is supported.
  - Details in the subscriber mode:

    Maximum cable length in the subscriber mode

    Extended bus: approximately 500 m

    Short bus: approximately 150 m

    Both traffic types, point to point and point to multipoint are supported.

3.38.4 Board Variants

S30810-Q2177-X (will be replaced by Q2169-X)

S30810-Q2169-X

3.39 STMA

The subscriber trunk module asynchronous transfer mode (STMA) board provides connectivity between a HiPath 4000 or V6.5 or later U.S. Hicom 300E/H and an ATM network. Depending on which STMA board feature is implemented, a system equipped with an STMA board uses either the CorNet-N or CorNet-NQ private networking protocol to interface with the ATM network. The system does not limit the number of STMA boards it can support except for the limits imposed by the performance capacity of the system.

An STMA board:

- Requires a HiPath 4000 or Hicom 300 E/H V6.5 or later system software
- Uses SIPAC connectors. Use an Adapter 2 (SIPAC-to-SIVAPAC adapter) to adapt an STMA board for a SIVAPAC shelf.
- Provides 92 configurable channels. The STMA board has the capacity of four TMDN boards (96 channels), but only 92 channels are configurable.
- Plugs into any peripheral slot. An STMA board is not supported on an RCM or RCMX shelf.
- Provides fiber optic ATM connectivity. An STMA provides a fiber optic interface for connectivity to an ATM network.

An STMA board comes in two orderable variants. The variants differ only in the type of fiber optic interface they use. Both boards have OC-3C fiber optic devices that serially transmit at 155 Mbps, but the transmission ranges for the two devices differ. The variants are as follows:

- STMA board with single-mode fiber optic interface (STMA-S)

  This variant provides a maximum range of 15.5 miles (25 km) for fiber optic transmissions.
- STMA board with multimode fiber optic interface (STMA-M)

  This variant provides a maximum range of 1.24 miles (2 km) for fiber optic transmissions.

3.39.1 Features

An STMA board has the following configurable features:

- Backboning

  Using CorNet-N protocol, the backboning feature enables an ATM network backbone to be used as a link between V6.5 or later systems. A V6.5 or later system can use this feature for transparent call connections with other systems across an ATM network. Each STMA board provides four backboning ports. Figure 3-81 shows an example of the backboning feature.
- Interworking

Using CorNet-NQ protocol, the interworking feature enables service-specific dial-up connections between V6.5 or later system subscribers and ATM subscribers. In addition, it can provide individual transit connections between V6.5 or later system subscribers over an ATM network. Calls are limited to basic call functions; consequently, call features are not supported. Each STMA board provides four interworking ports. Figure 3-82 shows an example of the interworking feature.

Each STMA board can support only one feature at a time, depending on how the board is configured. Both the backboning and the interworking features can reside in the same system, but individual STMA boards cannot be shared between the two features.

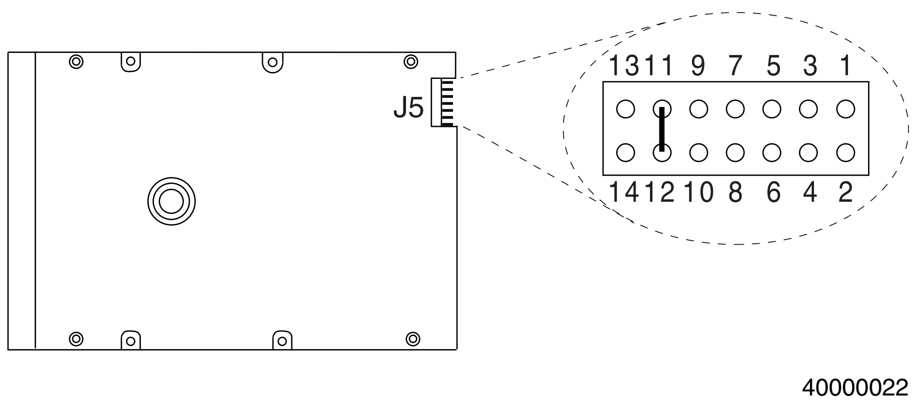


Figure 3-81 Example of the Backboning Feature

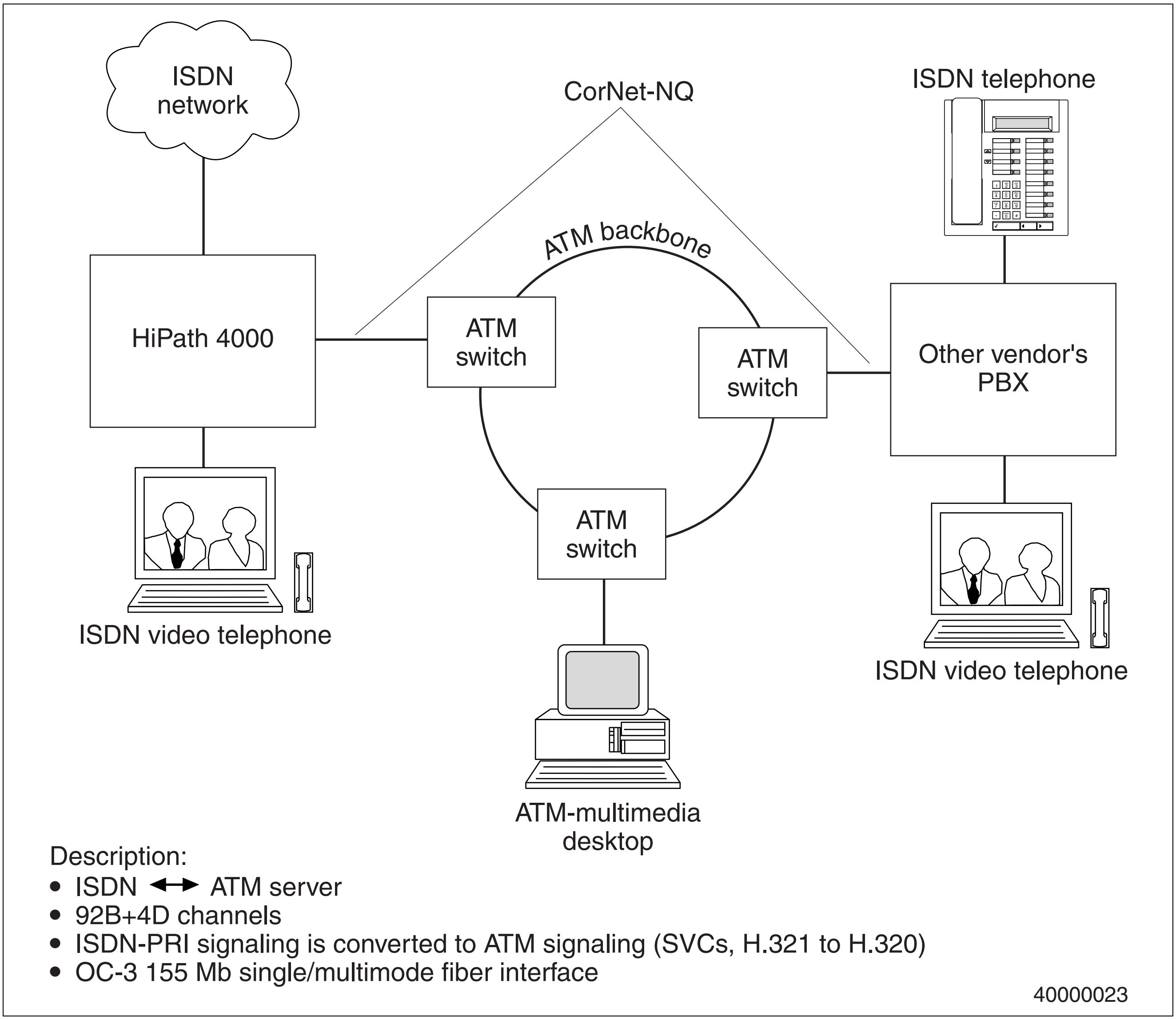


Figure 3-82   Example of the Interworking Feature

3.39.2 LED Indications and Connector

The front panel of the STMA board (see Figure 3-83) has LED indicators and a fiber optic connector.

- Red and green LED indicators provide error and status information (for details, refer to Table 3-116).
- The fiber optic connector provides connectivity to the ATM network

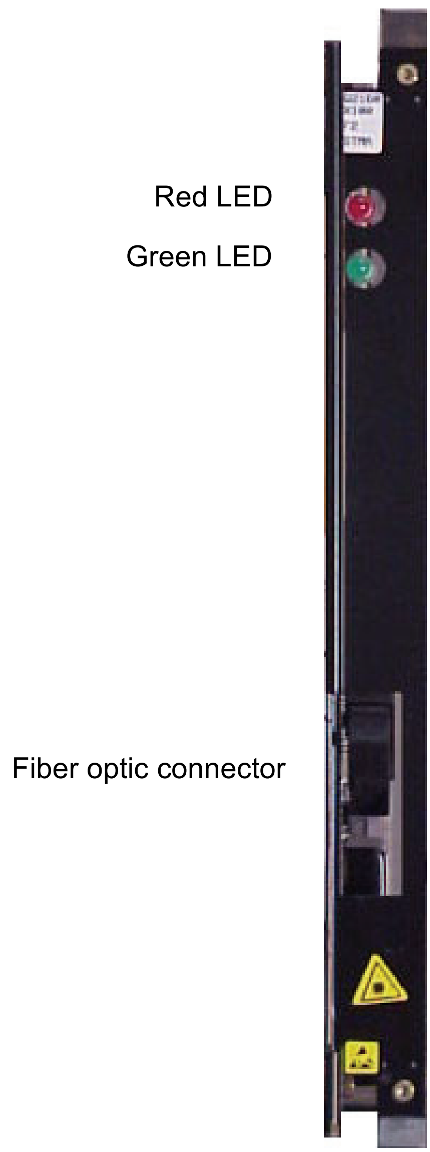


Figure 3-83 STMA Board Front Panel

Table 3-116 lists the LED indications for an STMA board.

Red LED	Green LED	Indication
On	Off	The board has initial power applied.
Flashing	Off	The board is being loaded with loadware.
On	Off	The board is defective or out-of-service

Table 3-116 STMA Board LED Indications (Seite 1 von 2)

Red LED	Green LED	Indication
Off	On	The board is operational and all channels are inactive.
Off	Flashing	The board is operational and one or more channels are active.

Table 3-116 STMA Board LED Indications (Seite 2 von 2)

3.39.3 Removing the STMA Board

Danger
Do not look directly at the fiber optic receptacle on the STMA board with single-mode fiber optic interface when the board is powered on. This device uses laser technology that can cause eye damage when looked at directly.

Caution
Fiber optic cable can easily be damaged. Do not bend the cable sharply or tie it down too tightly.

Warning
Because this procedure removes the STMA board from service it prevents clients dependent on this board from using the ATM networking feature.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

You must use the board removal and replacement tool for boards installed in metal card guides.

To remove the STMA board from a HiPath 4000:

1. Deactivate all channels on the board as follows:
   a) Type **`DEA-DSSU`**, then press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
OFFTYPE	DC
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

> PEN1 is the PEN of the required D channel, and PEN2 is not used. If all four spans are used, then all four D channels must be deactivated. The D channels are numbered as 24, 49, 74, and 99. Using the PEN2 parameter to indicate a range of PENS is not allowed.

2. Display the status of the board until all channels are free as follows:

   a) Type **DIS-SDSU**, then press **Enter**.

   b) Type the following values, then press **Enter**.

Field	Value
LINK	<blank>
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
CCT	<0 - 15>

3. When all channels are free, deactivate the board as follows:

   a) Type **DEA-BSSU**, then press **Enter**.

   b) Type the following values, then press **Enter**.

Field	Value
OFFTYPE	D1
LTG	<1>
LTU	<1 - 15>
SLOT	<1 - 121>
REFOFF	<blank>
SPAN	<1 - 4>

> All four spans, if configured, must be deactivated.

4. Disconnect the ATM network cable from the fiber optic interface receptacle on the front of the board.

5. Using the board extractor, unseat the board and remove it from the shelf.

3.39.4 Replacing the STMA Board

> **Caution**
> Fiber optic cable can easily be damaged. Do not bend the cable sharply or tie it down too tightly.

> **Danger**
> Do not look directly at the fiber optic receptacle on the STMA board with single-mode fiber optic interface when the board is powered on. This device uses laser technology that can cause eye damage when looked at directly.

To replace the STMA board in a HiPath 4000:

1. Slide the board into the appropriate slot until it seats firmly into the backplane connector.
2. Plug the ATM network cable into the fiber optic interface receptacle on the front of the board.
3. Activate the board as follows:
   a) Type `ACT-BSSU` and press **Enter.**
   b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
LTG	<1>
LTU	<1 - 15>
SLOT	<1 - 121>
SPAN	<1 - 4>

> All four spans, if configured, must be deactivated.

4. Activate the channels on the board as follows:
   a) Type `ACT-DSSU` and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

> PEN1 is the PEN of the required D channel, and PEN2 is not used. If all four spans are used, then all four D channels must be activated. The D channels are numbered as 24, 49, 74, and 99. Using the PEN2 parameter to indicate a range of PENS is not allowed.

3.39.5 Verifying the STMA Board

To verify the operation of the STMA board, display the status of the board as follows:

1. Type `DIS-SDSU` and press **Enter**.
2. Type the following values, then press **Enter**.

Field	**Value**
LINK	<blank>
LTG	<1 - 32>
LTU	<1 - 15>
SLOT	<1 - 151>
CCT	<blank>

The board is automatically tested on activation.

3.40 STMD

The current line card for S_0 is the STMD2 Q2163.

There are 2 variants:
Q2163-X without powerfeeding, it replaces the old STMD Q2174
Q2163-X100 with powerfeeding, it replaces the old SMD Q2117

The STMD2 has only 2 LEDs, one red and one green.

The subscriber trunk module digital S_0 (STMD) board comprises the trunk module digital (TMD) and station line module digital (SMD) function on one single board. It contains eight trunks with S_0 interfaces.

- TMD Mode

  In TMD mode, the board allows the HiPath 4000 to connect to standardized, four-wire S_0 interfaces which may either be fed by an ISDN exchange or an ISDN PABX.

  In TMD mode, the STMD provides a reference clock (derived from the S_0 path clock) which can be used to synchronize the system clock generator.

- SMD Mode

  In SMD mode, the board implements the basic ISDN S_0 access for terminal equipment (TE). The behavior corresponds to that of the network terminator (NT). Only point-to-point operation is supported. Feeding of connected terminals is not provided.

  Each S_0 port is a basic access with a transmission capacity of two B-channels (64 Kbps each) for voice/data and one D-channel (16 Kbps).

  The two B-channels can be optionally switched to time slots of the system PCM highways. s data (signaling) and p data (packet switching) of the available D-channel data types (s, p, t) is handled. They are exchanged between S_0 interface and common control or packet handler. Maximum line length (to NT): 1000 m (3281 ft.).

3.40.1 LED Indications

The front panel of the board contains 8 LEDs. Table 3-117

Startup

Table 3-117 STMD Board LED Indications

All LEDs on All LEDs blink (120/120 ms, max. 10 min) All LEDs off	After loading board: loadware startup End of loadware startup Loading the line data
Operating State	
LED on LED off LED blinks slowly (1, 2/1, 2 s)	Layer 2 (L2) active Layer 2 (L2) deactivated Trunk providing reference clock
Error Events	
LED blinks rapidly (300/900 ms) LED double blinking (300/300/300/900 ms) All LEDs blink rapidly (300/900 ms)	Layer 1 (L1) error Layer 2 (L2) error Board error

Table 3-117 STMD Board LED Indications

3.40.2 Board Functions

Integrity counters maintain statistics for layer 2 protocols on the S0/S2 interface. The statistics can be analyzed using AMO BSSU.

3.40.3 Configuring the STMD Board Using AMOs

The AMOs used for configuring the STMD board are as follows:

- AMO SBSU
- AMO BSSU
- AMO DIMSU
- AMO REFTA
- AMO PRODE

Figure 3-84 and Figure 3-85 shows STMD board connectivity diagrams.

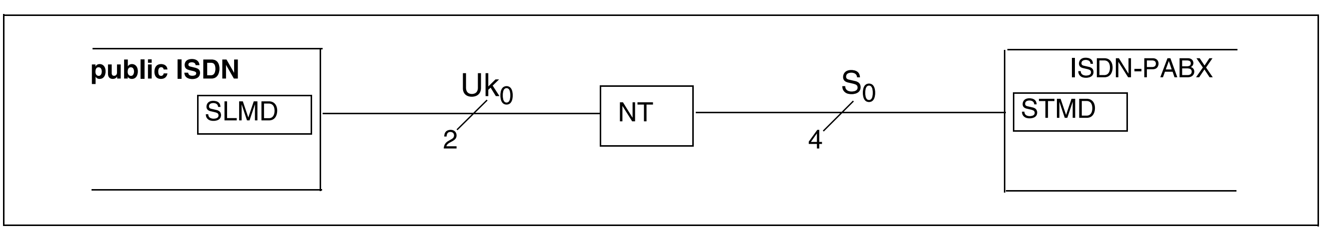


Figure 3-84 Connection PABX - Exchange (STMD)

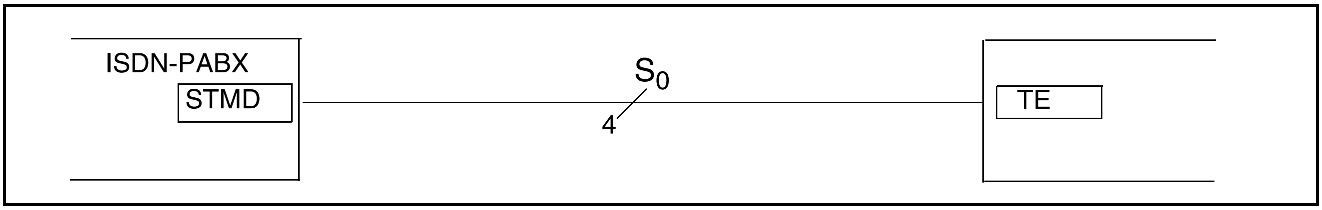


Figure 3-85 Connection PABX - Terminal (STMD)

3.40.4 PIN Assignments

Table 3-118 lists the pin assignments for the upper connector of the STMD board. The third row of the upper and the lower connector is not used.

Pin no.	Designation	Description
01 X	A0	a-wire 0 (STMD0) -r-
02	+12 V	positive electronic voltage
03 X	A1	a-wire 1 (STMD0) -t-
04 X	B1	b-wire 1 (STMD0) -t-
05 X	A2	a-wire 2 (STMD1) -r-
06 X	B2	b-wire 2 (STMD1) -r-
07 X	A3	a-wire 3 (STMD1) -t-
08 X	B3	b-wire 3 (STMD1) -t-
09 X	A4	a-wire 4 (STMD2) -r-
10 X	B4	b-wire 4 (STMD2) -r-
11 X	A5	a-wire 5 (STMD2) -t-
12 X	B5	b-wire 5 (STMD2) -t-
13 X	A6	a-wire 6 (STMD3) -r-
14 X	B6	b-wire 6 (STMD3) -r-
15 X	A7	a-wire 7 (STMD3) -t-
16 X	B7	b-wire 7 (STMD3) -t-
17 X	A8	a-wire 8 (STMD4) -r-
18 X	B8	b-wire 8 (STMD4) -r-
19 X	A9	a-wire 9 (STMD4) -t-
20 X	B9	b-wire 9 (STMD4) -t-

Table 3-118 Upper STMD connector (Seite 1 von 2)

Pin no.	Designation	Description
X Pins seized by the STMD board -t- transmit -r- receive		

Table 3-118 Upper STMD connector (Seite 2 von 2)

Table 3-119 lists the pin assignments for the lower connector of the STMD board.

Pin Number	Designation	Description
201	RING	25 Hz AC voltage
202	+12 V	Positive electronic voltage
203	-48 V	Feed voltage
204	-60 V	Feed voltage
205	+60 V	Positive feed or signaling voltage
206		
207 X	RCLK	Reference clock line
208 X	RAC	Reference clock activation line
209 X	BA0	Board address bit no. 0
210	UW1-S	Presence 25 Hz
211	UW1-T	Presence 50 Hz
212 X	BA6	Board address bit no. 6
213 X	HD0	HDCL channel output from system
214 X	BA5	Board address bit no. 5
215 X	CKA	System clock, (2,048 od. 4,096 MHz)
216 X	CLS	Clock select (CKA selektion)
217 X	SPHIB	Voice channel B-input to system
218 X	BA4	Board address bit no. 4
219 X	HDI	HDCL channel input to system
220	-12 V	Negative electronic voltage
221 X	+5 V	Positive elektronic voltage
222 X	GNDE	Electronic ground
223	GNDB	System ground
224	UA1-T	50 Hz AC voltage
225	UA2-T	(Without ground reference)

Table 3-119 Lower STMD connectors (Seite 1 von 2)

Pin Number	Designation	Description
226	SYNR. 50 Hz	Synchronization signal 50 Hz
227	SYNR. 25 Hz	Synchronization signal 25 Hz
228 X	GNDE	Electronic ground
229 X	PRS	Reset/peripheral reset
230 X	BA1	Board address bit 1
231 X	SPHO B	Speech channel B-output from system
232 X	SPHO A	Speech channel A-output from system
233 X	GNDE	Electronic ground
234 X	BA2	Board address bit 2
235 X	BA3	Board address bit 3
236	-5 V	Negative electronic voltage
237 X	FMB	Frame synchronization pulse
238 X	SPHIA	Speech channel A-input to system
239 X	GNDE	Electronic ground
240 X	+5 V	Positive electronic voltage
X Pins seized by the STMD module		

Table 3-119 Lower STMD connectors (Seite 2 von 2)

Auf die Verdrahtungsplatte gesehen/as seen from backplane

oberer Stecker/upper plug

Pin	Pin	Signal	Pin	Signal
41	21	+5 V	01	A0
42	■ 22	GNDA	02	A1
43	23	B0	03	B1
44	24	A10	04	A2
45	25	B10	05	B2
46	26	A11	06	A3
47	27	B11	07	B3
48	■ 28	GNDA	08	A4
49	29	A12	09	B4
50	30	B12	10	A5
51	31	A13	11	B5
52	32	B13	12	A6
53	■ 33	GNDA	13	B6
54	34	A14	14	A7
55	35	B14	15	B7
56	■ 36		16	A8
57	37	A15	17	B8
58	38	B15	18	A9
59	■ 39	GNDA	19	B9
60	40	+5V	20	

unterer Stecker/lower plug

Pin	Pin	Signal	Pin	Signal
241	221	+5 V	201	
242	■ 222	GNDE	202	
243	223		203	
244	224		204	
245	225		205	
246	226		206	
247	227		207	RCLK
248	■ 228	GNDE	208	RAC
249	229	PRS	209	BA0
250	230	BA1	210	
251	231	SPHO B	211	
252	232	SPHO A	212	BA6
253	■ 233	GNDE	213	HD0
254	234	BA2	214	BA5
255	235	BA3	215	CKA
256	236		216	CLS
257	237	FMB	217	SPHIB
258	238	SPHIA	218	BA4
259	■ 239	GNDE	219	HDI
260	240	+5 V	220	

■ Voreilender Stift/longer pins

Figure 3-86 STMD Connector Assignment

3.41 STMD2/STMD3

(STMD2/STMD3 Station/Trunk Module Digital S_0+SLMS2 Station Line Module Digital S_0)

STMD2 provides the STMD and SLMS functions on a single board. STMD2 provides all of the features offered by predecessor modules. It features eight trunks with S_0 interfaces. Each S_0 interface (4-wire) provides basic access with two B channels (each with 64 kbit) for voice/data transmission and one D channel (16 kbit).

The STMD3 and STMD2 boards are identical in terms of function. A new board with a new source number has been introduced because new components are being used.

Restrictions with STMD3:

The range with a short bus (1..8 TEs distributed on the cable) is limited to about 60 meters. If the customer does not require longer cables, no further parameter changes are needed.

To enable the use of greater cable lengths, set the parameter EXTBUS=YES in AMO SBCSU. With this setting, a cable length of up to 160 meters is possible.

STMD2/STMD3 board description

- Moreover the new boards use SIPAC connector to the backplane.
- The front panel of the board contains 2 LEDs.
- Flashprotection is on board.
- The cabling to the MDF differs to the SLMS and STMD solution. STMD2 use a 24-twisted-wire cable with no protection.

3.41.1 Board Variants

- STMD2

The two existing modules STMD and SLMS are substituted by the two variants of the new board STMD2:

Q2163-X Trunk/Subscriber card for STMD2 function (without power feeding)

Q2163-X100 Subscriber card for SLMS2 function (with power feeding)

- STMD3

The two variants for the STMD3 board are:

Q2217-X trunk/subscriber card for STMD2 (without power supply)

Q2217-X100 subscriber card for SLMS2 (with power supply)

3.41.2 LED Indications

Flashing: 500ms on - 500ms off

Red-LED (Top)	Green-LED (Lower)	Indications
On	Off	Initial power on
Flashing	Off	Loading
On	Off	Defective
Off	On	All circuits idle (no circuit has established a Layer2 connection)
Off	Flashing	At least one circuit busy (at least one circuit has established a Layer2 connection)

Table 3-120 LED Indications

3.42 STMI2 (S30810-Q2316-X-*)

From HiPath 4000 V4 on the STMI2 (Subscriber Trunk Module IP) board is used as Common HiPath Gateway HG 3500 V4.

The STMI2 board offers the following central and peripheral functions:

- Two network accesses to 10/100Base-T Fast Ethernet, comparable with HiPath RG2500
- Voice encoding functions (based on DSP), comparable with HiPath RG2500
- Backplane interface for a default peripheral board
- V.24 interface for test access (service interface)

> The STMI2 must not be plugged in and unplugged during live operation.

Figure 3-87 shows the STMI2 board.

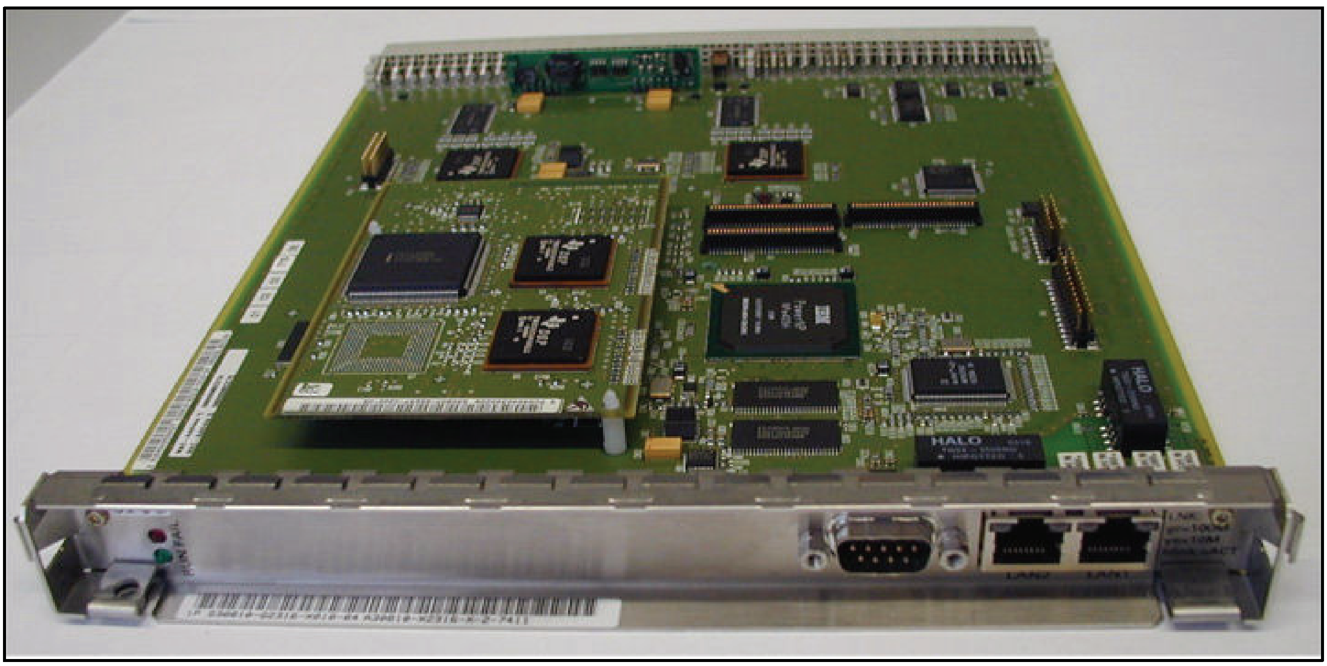


Figure 3-87 STMI2 board

3.42.1 System Diagram

Figure 3-88 shows a system diagram of the STMI2 board.

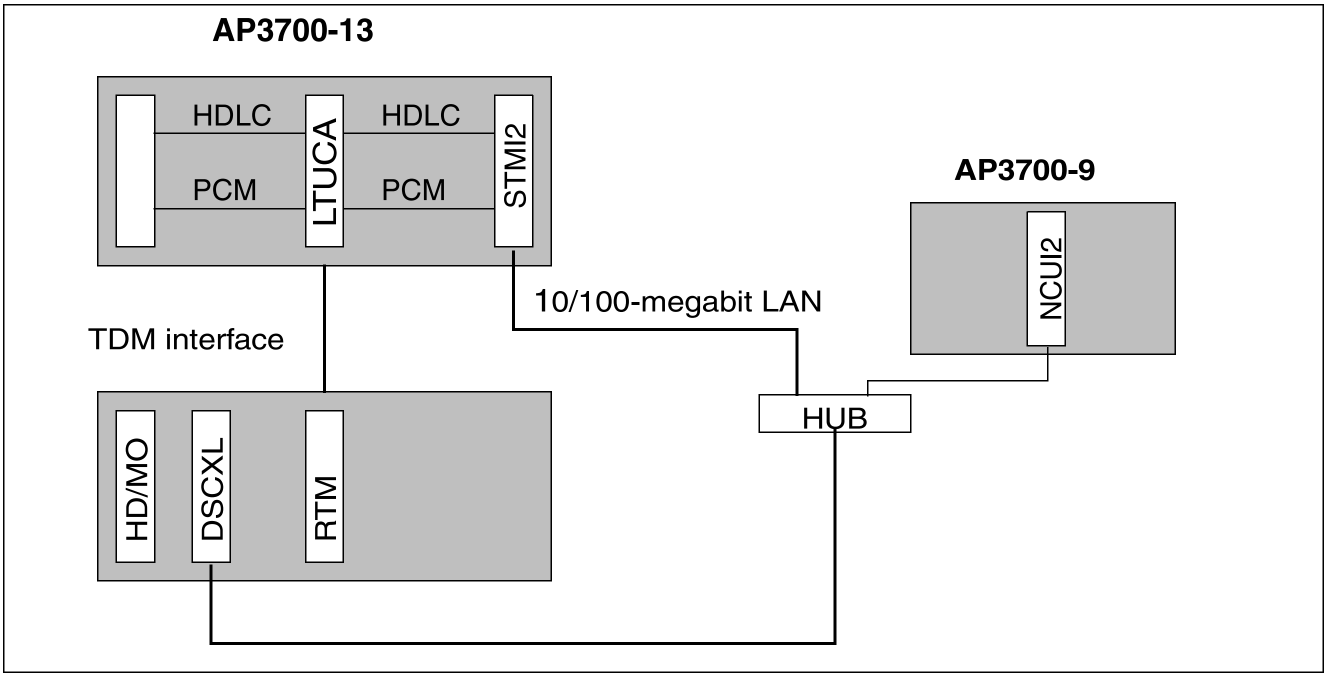


Figure 3-88 STMI2 Board, System Diagram

3.42.2 Board Variants and Modules

STMI2 **without** PDMX (**P**MC **D**SP **M**odule E**x**tended): **S30810-Q2316-X-*** (60-channel version)

STMI2 **with** an PDMX (**P**MC **D**SP **M**odule E**x**tended): **S30810-Q2316-X10-*** (120-channel version)

> The STMI2 has two **HiPath G**ateway **A**ccelerator (HGA) slots. One is for the PDMX DSP module and the other is for an optional plug-in module (currently are not used).

PMC = PCI **M**ezzanine **C**ard

3.42.3 LED Displays and Interfaces

Table 3-121 lists the STMI20 board LED displays and interfaces that are configured on the front of the board for service purposes:

Quantity	LEDs and Interface	Indications and Purpose
1	V.24 9-pin SUB-D connector	For testing

Table 3-121 STMI20 LED Indications

Quantity	LEDs and Interface	Indications and Purpose
1	Green LED	Run or Active status
1	Red LED	Fail status
2	LEDs: LED1: green/yellow green = 100 Mbps online (link), yellow = 10 Mbps online (link), flashing = active	For each LAN interface (integrated in the RJ45 connector
	LED2: green	On = full-duplex (FDX); Off = half-duplex

Table 3-121 STMI20 LED Indications

Figure 3-89 shows the STMI2 board front panel.

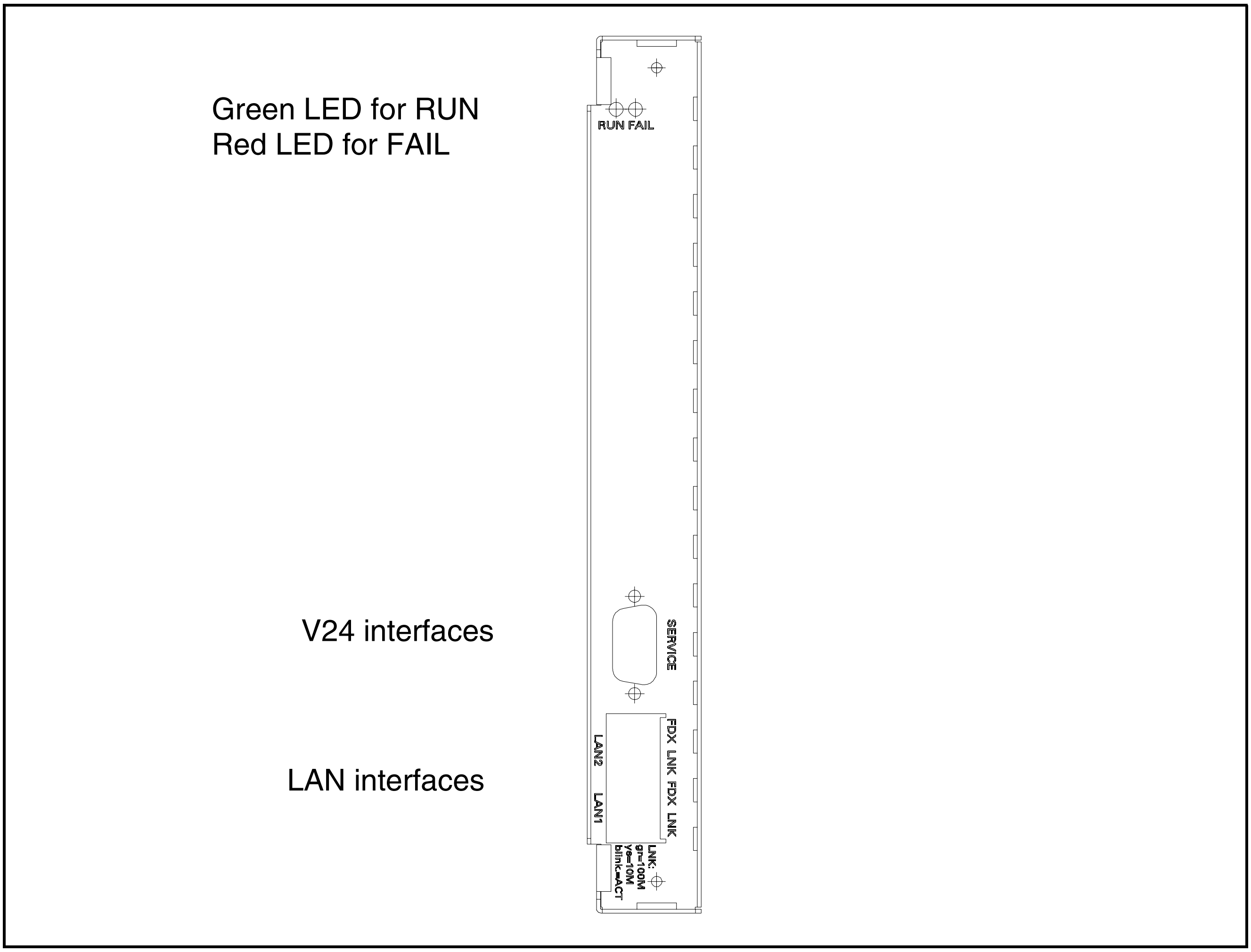


Figure 3-89 STMI2 Board, Front Panel

3.42.4 Power Supply

The STMI2 board receives a power supply voltage of +5 V over the backplane. The individual voltages required (+3.3 V, +2.5 V, and 1.2 V) are generated by the DC/DC converter on the board. The board is automatically reset if one of the voltages falls below the critical value.

3.42.5 Low level format flash for STMI2-Board

This is only possible with the Firmware Version FW: Jul 21 2004 or higher.

The Following steps have to be executed for the low level format flash:

1. Connect your PC with the STMI2-board using a V.24 null-modem-cable
2. Open a terminal session with the following settings 38400 8-N-1
3. Insert the STMI2-Board and press CTRL+W continuously at the terminal during the initialization of the STMI2-board
4. If the following message is displayed, then please release the keyboard:
   – Input password for low level TFFS format
     release the keyboard!!!!
     Wait 6 seconds
5. Enter the password "STMI2!”

   Now the firmware will display the boot cli prompt [STMI2 Boot CLI]:

   If you enter "?" , then you can see the possible Boot CLI commands.

   y - format TFFS
   <CTRL> x - reboot (warm)
6. Enter "y" to format the flash of the STMI2-board. The formatting of the flash can take some minutes. Do not pull the STMI2-Board during the format flash process.

   The following output is produced:

   [STMI2 Boot CLI]: y
   Format the flash file system, all files will be deleted.

   Do you want to format the flash file system y/[n]? y

   Do you want to low-level format the flash file system y/[n]? y

   Formatting the flash file system!

   Format ok!

If the Format is OK, enter <CTRL> x. Now the STMI2-board will reboot.

Complete V.24 output of the format flash process

```
FW: Jul 21 2004


Loader: Check ID: LW_ID does not match -> Neg. load ackn.



FW: Jul 21 2004



RS232 initialized for Output: 38400,8,n,1


loading FPGA:                 Load O.K.
testing SACCO Registers:      Test O.K.
testing Checksum Firmware:    Test O.K.
testing Data-Bus DRAM:        Test O.K.
testing Address-Bus DRAM:     Test O.K.
testing Pattern 0x55555555:   Test O.K.
testing Pattern 0xAAAAAAAA:   Test O.K.
testing ELIC Registers:       Test O.K.
FPGA Registers access:        Test O.K.
testing PHY identifier value: Test O.K.

Board Selftest complete



Input password for low level TFFS format
```

```
release the keyboard!!!!
Wait 6 seconds


password:******


                    VxWorks System Boot


Copyright 1984-2001  Wind River Systems, Inc.


CPU: IBM PowerNP NPe405H Rev. A
Version: 5.4.2
BSP version: 1.2/0
Firmware version: Jul 21 2004

/tffs/  - disk check in progress ...
dosChkLib : CLOCK_REALTIME is being reset to TUE AUG 31 13:48:56 2004
Value obtained from file system volume descriptor pointer: 0x66c96a8
The old setting was THU JAN 01 00:00:01 1970
Accepted system dates are greater than THU DEC 27 00:00:00 1990
/tffs/  - Volume is OK
```

```
          total # of clusters:  1,918
           # of free clusters:  1,560
            # of bad clusters:  0
             total free space:  3,120 Kb
     max contiguous free space:  3,190,784 bytes
                   # of files:  261
                 # of folders:  6
         total bytes in files:  407,124
             # of lost chains:  0
   total bytes in lost chains:  0

*******************************************
/tffs - directory Entries:

Type:           Size:     Name:
dir              2048     data
file                0     Version.000
file                0     ssl.on
file            12882     pmlog1.txt
dir              2048     admlog
dir              2048     ppplog
dir              2048     trace
dir              2048     evtlog

Total TFFS size: 3928064 bytes   /   free: 3194880 bytes
```

```
[STMI2 Boot CLI]: ?

 --- File & Dir ---
 y      - format TFFS
 --- Misc. ---
 ?, h   - print this list
 <CTRL> x       - reboot (warm)

[STMI2 Boot CLI]: y
Format the flash file system, all files will be deleted.
Do you want to format the flash file system y/[n]? y

Do you want to low-level format the flash file system y/[n]? y
Formatting the flash file system!
Format ok!
[STMI2 Boot CLI]:
```

3.43 STMI4 (S30810-Q2324-X500/X510)

From HiPath 4000 V4 on the STMI4 (**S**ubscriber **T**runk **M**odule **IP 4**) board is used as Common HiPath Gateway HG 3500 V4.

The STMI4 board offers the following central and peripheral functions:

- Two network accesses to 100 Base-T Fast Ethernet
- Voice encoding functions (based on DSP)
- Backplane interface for a default peripheral board
- V.24 interface for test access (service interface)

> The STMI4 is allowed to be hot plugged.

Figure 3-90 shows the STMI4 board.

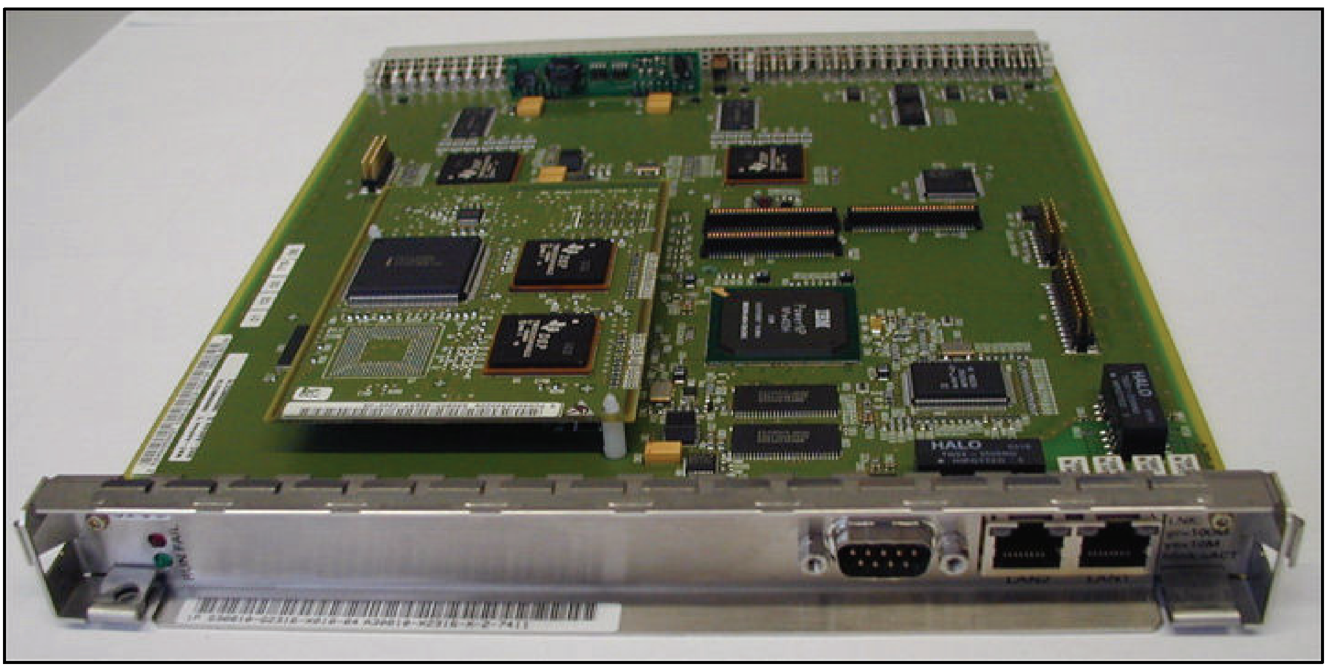


Figure 3-90 STMI4 Board

3.43.1 System Diagram

Figure 3-91 shows a system diagram of the STMI4 board.

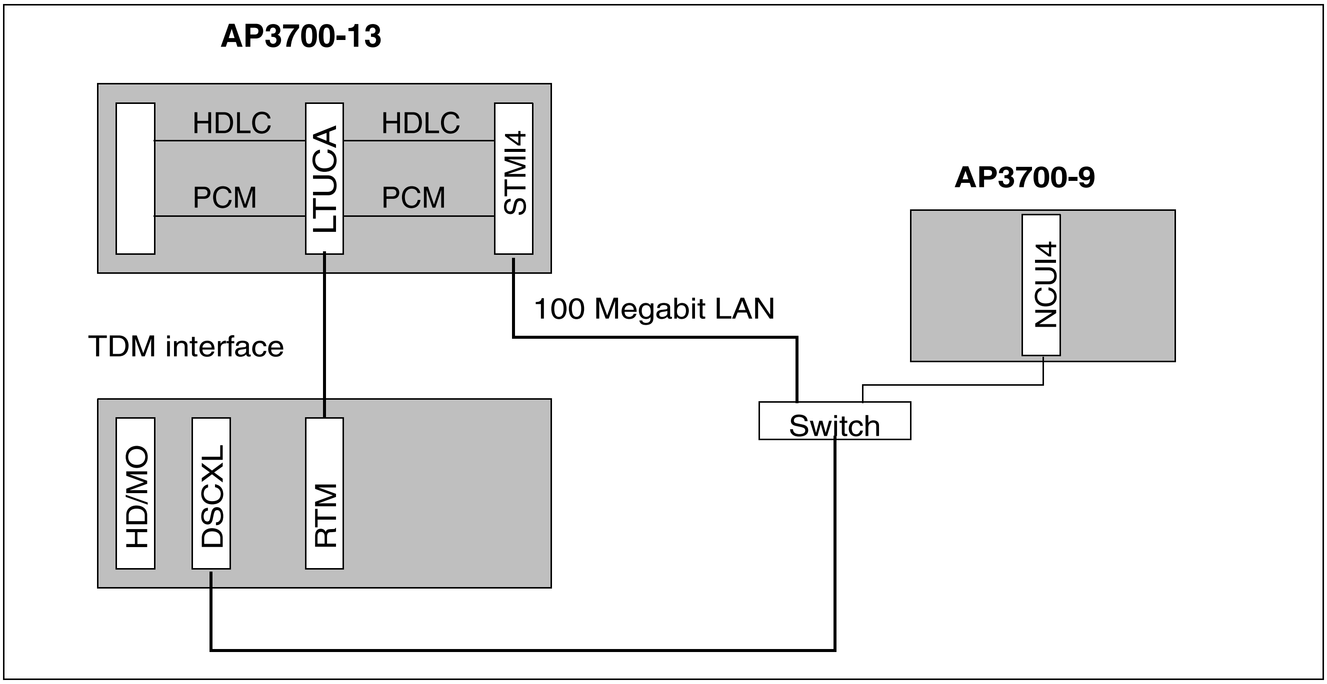


Figure 3-91 STMI4 Board, System Diagram

3.43.2 Board Variants and Modules

STMI4 **without** a PDMX (**P**MC **D**SP **M**odule E**x**tended):	**S30810-Q2324-X500** (60-channel version)
STMI4 **with** a PDMX (**P**MC **D**SP **M**odule E**x**tended):	**S30810-Q2324-X510** (120-channel version)

> The STMI4 features one **HiPath G**ateway **A**ccelerator (HGA) slot.

PMC = PCI **M**ezzanine **C**ard

3.43.3 LED Displays and Interfaces

Table 3-122 lists the LED displays and interfaces that are configured on the front of the board for service purposes:

Quantity	LEDs and interfaces	Indications and Purpose
1	V.24 9-pin SUB-D connector	For testing
1	Green LED	Run or Active status
1	Red LED	Fail status
2	LEDs: LED1: green On = 100 Mbps	For each LAN interface (integrated in the RJ45 connector)
	LED2: green green = online (link) wink = active	On = full-duplex (FDX); Off = half-duplex

Table 3-122 LED Displays and Interfaces

Figure 3-92 shows the STMI4 board front panel.

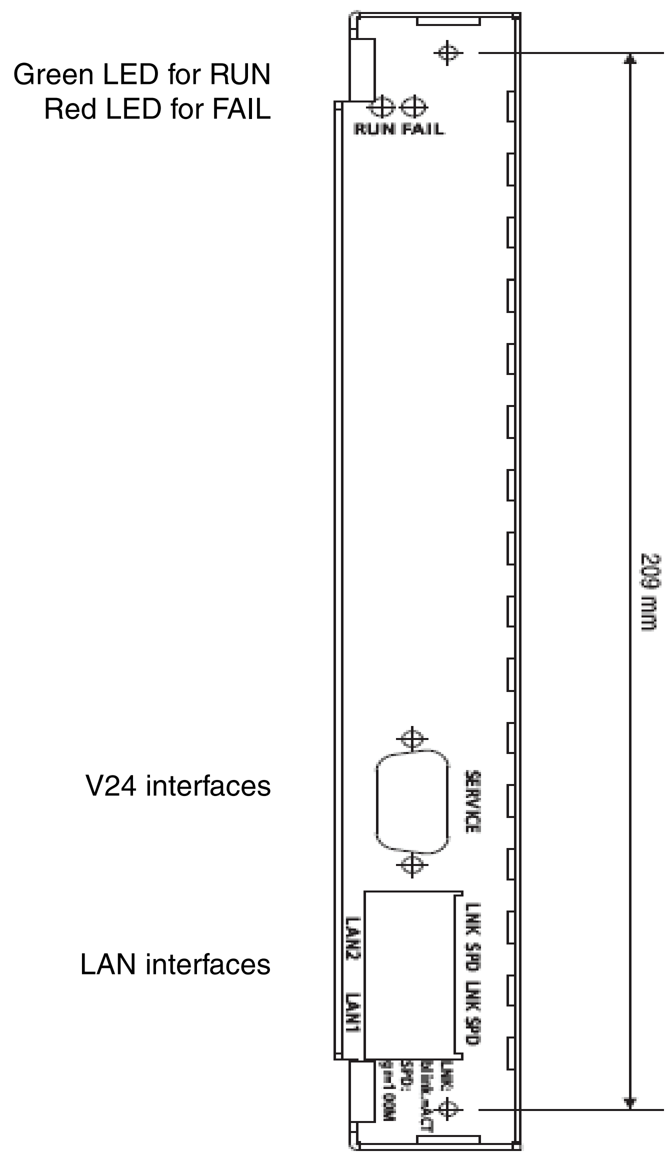


Figure 3-92 STMI4 Board, Front Panel

3.43.4 Power Supply

The STMI4 board receives a power supply voltage of +5 V over the backplane. The individual voltages required (+3.3 V, +2.5 V, +1.8 V and 1.2 V) are generated by the DC-to-DC converter on the board. The board is automatically reset if one of the voltages falls below the critical value.

3.44 TM2LP

The universal analog trunk module (TM2LP) board offers a twin-wire interface to analog public trunks and operates using the loop procedure.

- Outgoing traffic: direct
- Incoming traffic: by means of attendant console (MSI), direct inward dialling (DID)
- Bothway traffic
- Dial Signalling method: DP, DTMF and MFC-R2 (method configurable per circuit)

The TM2LP board has access to four highways, two of which are supported by loadware. The board includes the necessary circuitry to support loop closure or monitoring for call detection (loop or reversal polarity) and call charge detection for up to 8 ports.

The analog speech paths are converted to the internal HiPath digital display (and vice-versa) using an A/D Converter and analog elements implemented in accordance with country-specific transmission technology providing a large range of interface matching for each standard of countries.

A µP MC68340 with 512 KB Flash EPROM and 256 KB SRAM, together with two C509-L as preprocessors are used for interpreting system commands and processing line signals changing the old 8051 platform as CPU to the 16-bit data bus and 24-bit adress bus microprocessor platform.

Selection of the call charge frequency to be detected depends on the board variant.

- 50 Hz call detail recording: variants X130, X140, X160 -X190.
- 12 kHz call detail recording: variants X160 and X180.
- 16 kHz call detail recording: variants X130 - X150 and X190.
- Special variants for DID/DOD signaling: X100 - X120.

The following essential properties characterize the new TM2LP board:

- Same functionality as the discontinued board in each case (refer to Table 3-123)
- Eight ports per board
- Protection on the board
- SIPAC backplane connector
- Two LEDs

The board gradually replaces the following boards and variants:

TMCOW	Q2288	All variants	MSI
TMLRP	Q2131	One variant	MSI
TMLRP	Q2134	Two variants	MSI
TMLSL	Q2073	One variant	DID Belgium
TMGSR	Q2075	One variant	MSI
TMLRS	Q2188	One variant	MSI
TMAS8	Q2167	One variant	DID/DOD Austria
TMLSR	Q2173	One variant	DID Italy

Table 3-123 Boards Replaced by the TM2LP Board

Table 3-124 lists the boards that have already been replaced by various TMCOW variants:

TMLRW	Q2088	One variant
TMEDG	Q2172	One variant
TMELS	Q2272	One variant

Table 3-124 Boards Replaced by TMCOW Variants

3.44.1 Board Variants

Q2159-X100; ... X110-X190

The individual hardware variants meet country-specific standards for AC connection.

Variants X180 (with 12 kHz call detail recording) and X190 (with 16 kHz call detail recording) comply with European TBR21 guidelines.

3.44.2 Loadware Variants

No Variants: PZGTM2L0

In analog interfaces normaly each country or customer uses a private protocol to connect to Central Office. Thus the Loadware provides a possibility to adapt the signaling protocol specific for each country.

With the new HW platform using a Motorola microprocessor and a new LW Plattform this analog interface offers a greater flexibility to comply the previous boards functionality converging in one.

3.44.3 Configuration Example for Switzerland

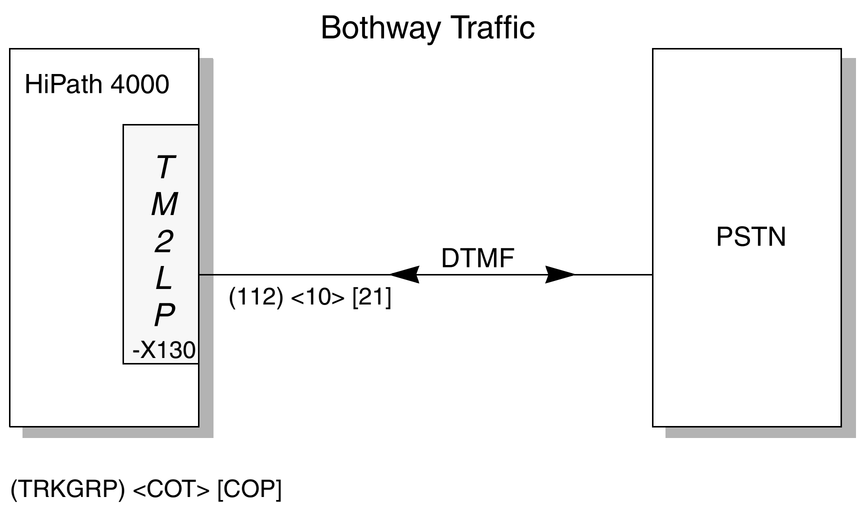


Figure 3-93 Configuration Example for Switzerland

The following steps show an example of configuring the TM2LP Card. It is not valid for all conditions.

AMO-BCSU:

- Configuring Mounting Locations for TM2LP (Q2159-X130) module in the SWU:

```
ADD-BCSU: PER, <LTG>, <LTU>, <SLOT>, "Q2159-X130",0;
```

- SIU2 configuration for DTMF outgoing Traffic:

```
ADD-BCSU:SIUP, <LTG>, <LTU>, <SLOT>, "Q2031-X  1"
```

AMO-BUEND:

```
ADD-BUEND: 112, "HKZ-DTMF ",10,N;
```

AMO-WABE:

```
ADD-WABE: 131, , , TIE;
```

AMO-COSSU:

```
ADD-COSSU: ,10,  TA &       (Auth. for unrestricted long-distance service)
                 TNOTCR &   (Tie trunk without  toll code restriction)
                 CDRC;      (Central call charge registration)
```

AMO-ZAND

```
CHA-ZAND: LOADWARE, TM2L, 0;
```

AMO-COT:

- For DTMF-Dial:

ADD-COT: 10,	IEVT &	(Registration of implausible events)
	NTON;	(No Tone)

AMO-COP:

- For DTMF-Dial

ADD-COP: 21,	DTMF &	(Dual tone multiple frequency)
	DTM1 &	(Make/Break Ratio for DTMF 1)
	LSUP &	(Line supervision)
	RLSA &	(Backward Release after Release)
	NO1A &	(Outgoing digits not withheld)
	TIM1 &	(Supervision timer 1)
	NSDL;	(Line with no start dial signal)

AMO-PTIME

```
COPY-PTIME: 87, 16 ;
```

CHA-PTIME: REST,16,PARA,16,16,0,2,0,**P6**,0,0,0,5,32,36,17,**P14**;

P6=0	Without dial tone supervision
P6=1	With dial tone supervision
P14	See table in chapter 2.1

```
CHA-PTIME: REST,16,LONG,200,10000,100,400,400,120,5000;
CHA-PTIME: REST,16,SHORT,40,90,0,0,0,0,10,0,0,2,2,0,0,36;
```

The meaning and the value for each parameter depends on the protocol used,

AMO TACSU

- Configuration for Trunk groups for DTMF

ADD-TACSU:

<LAGE>	<ltg>-<ltu>-<slot>-2,
<NO>	,

```
<COTNO>        10,
<COPNO>        21,
<DPLN>         0,
<ITR>          0,
<COS>          10,
<LCOS>         1,
<LCOSD>        1,
<INIGHT>       ,
<TGRP>         112,
<COFIDX>       0,
<CCT>          "DTMF",
<DESTNO>       0,
<ORDNO>        0,
<ALARMNO>      0,
<CARRIER>      ,
<ZONE>         ,
<INS>          YES,
<DEVTYP>       TC,
<DEV>          ANMOSIG,
<MFCVAR>       0,
<DGTRP>        *,
<SUPRESS>      0,
<DGTCNT>       0,
<TESTNO>       1,
<CIRCIDX>      17,
<CDRINT>       1,
<CCTINFO>      0,
<DIALTYPE>     MOSIG-DTMF,
<DIALVAR>      0-0,
<COEX>         0,
```

AMO-LODR:

```
ADD-LODR:ODR=10,,,ECHO,2;
```

```
ADD-LODR:ODR=10,,,END;
```

AMO-RICHT:

```
ADD-RICHT:MODE=LRTENEW, LRTE=03, LSVC=VCE, TGRP=112, DNNO= *;
```

* ≠ node number in AMO-ZAND

AMO-LDAT:

```
ADD-LDAT:LROUTE=03, LSVC=VCE, LVAL=1, TGRP=112, ODR=10, LAUTH=1;
```

AMO-LDPLN:

```
ADD-LDPLN:LDP=131-X, LROUTE=03, LAUTH=1;
```

For Pseudo-DID additional:

AMO-TACSU:

```
CHA-TACSU:<ltg>-<ltu>-<slot>-<satz>,DEVTYP=TC,DIALTYPE=DTMF-DTMF,DIALVAR=4-
0;
```

AMO-COP:

```
CHA-COP:20,COPADD,DTN;
```

AMO-COT:

```
CHA-COT:10,COTADD,IBSY&IVAC&INAU&ITB&IFR&INDG&IIDL&DTNE[&DTNI];
```

AMO-FEASU:

```
CHA-FEASU:A,ICPTDID;
```

3.45 TM3WI/TM3WO

The trunk module 3 wires incoming/outgoing (TM3WI/TM3WO) are analog trunks. The TM3WI/TM3WO are 2 separate 4-channel interface cards providing connectivity between PBX and Central Office.

TM3WI interface card provides incoming whereas TM3WO provides outgoing signalling functions. Both cards provide circuits for the PCM encoding or decoding of the voice signals.

The TM3WI/TM3WO is designed to meet all applicable signalling, transmission, and product safety requirements for countries stated in TM3WI/TM3WO.

3.45.1 Board Variants

TM3WI: S30810-Q2477-X000

TM3WO: S30810-Q2476-X000

3.45.2 LED Indications

The front panel of the board contains one red and one green LED.

Figure 3-94 shows a single channel circuit diagram of the TM3WI board.

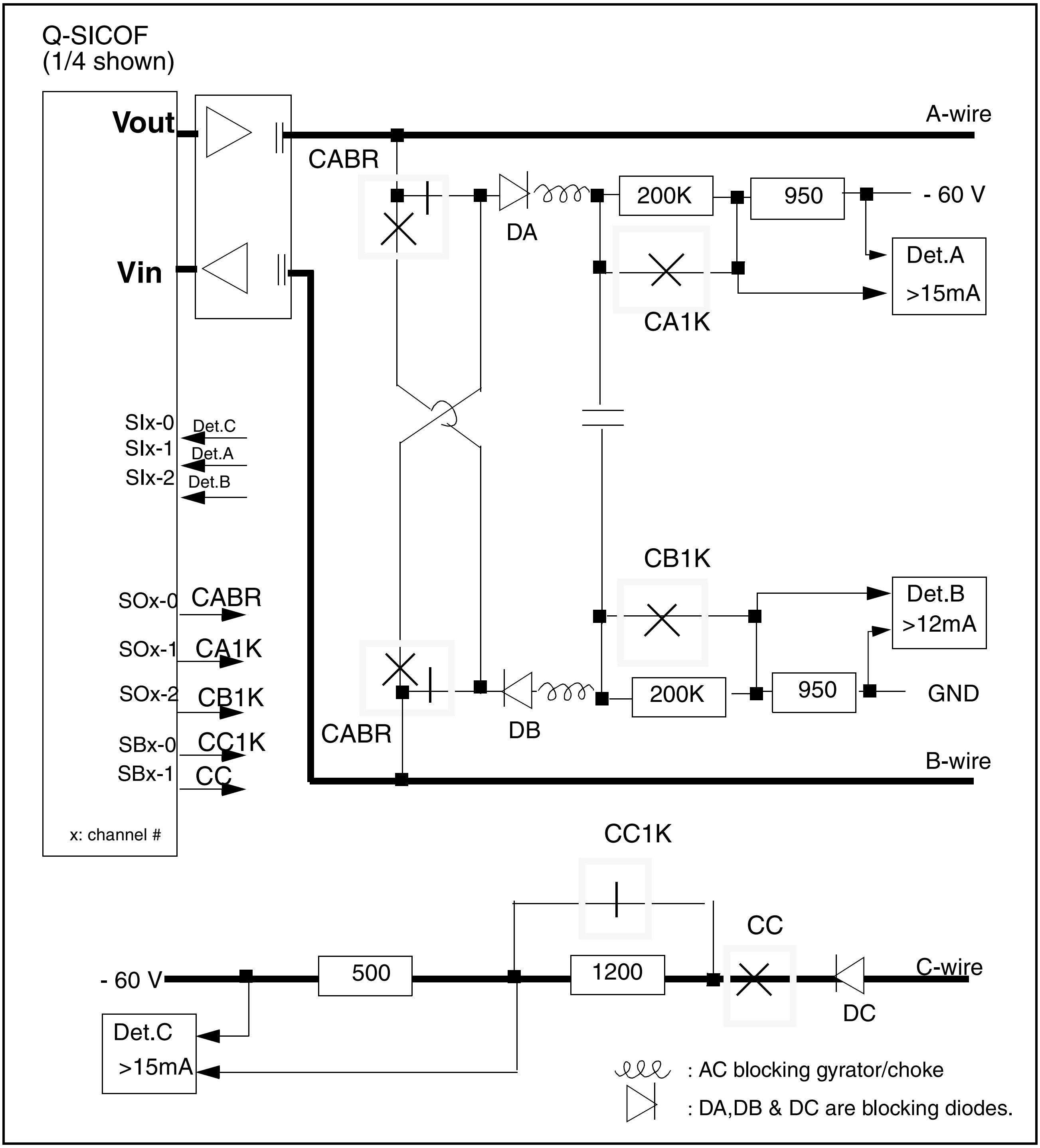


Figure 3-94 TM3WI Board Trunk interface Circuit Diagram (Single Channel Example)

CABR: Connect A & B wires with Reverse polarities.
CA1K: Connect A wire with 1K and Detector Det.B. CB1K: Connect B wire with 1K and Detector Det.A.
CC1K: Connect C wire with 1K. CC: Connect C wire.

The Table 3-125 lists the edge-to-edge presentation between the CO and the line card on the three wires for any particular dc signaling protocol.

Release Control	**Signal**	**Direction PBX-Co**	**A-Wire (PBX)**	**B-Wire (PBX)**	**C-Wire (PBX)**	**A-Wire (Co)**	**B-Wire (Co)**	**C-Wire (Co)**	**Voice Path**
--	Idle	---	-1K	+1K	-(500-550)	isol	isol	+(3K7-12K)	==
--	Seizure	<---	-1K	+1K	-(500-550)	-(2K5-43K)	+1K	+(0-300)	==
--	Seizure Ack.	--->	-1K	+1K	-1700	-(2K5-43K)	+1K	+(0-300)	Dial Tone
--	Dialing	<---	-1K	+1K	-1700	+(0-500)/ isol	-(40-500)/ isol	+(0-300)	==
--	Wait for answer	---	-1K	+1K	-1700	-(2K5-43K)	+1K	+(0-300)	Ring Back
--	Answer	--->	+1K	-200K	-1700	-(12K-43K)	+1K	+(0-300)	Speech
Bilateral	Clear Forward	<---	+1K	-200K	-1700	-1K	+(20-1K)	+(0-300)	==
Bilateral	Clear Backward (Busy B)	--->	+200K	-1K	-1700	-1K	+(20-1K)	+(0-300)	==
Bilateral	Release Forward	<---	+200K	-1K	-1700	isol	isol	+(3K7-12K)	==
Bilateral	Release Guard	--->	-1K	+1K	-(500-550)	isol	isol	+(3K7-12K)	==

Table 3-125 Edge to Edge Electrical Presentation for Incoming Local Call

Release Control	Signal	Direction PBX-Co	A-Wire (PBX)	B-Wire (PBX)	C-Wire (PBX)	A-Wire (Co)	B-Wire (Co)	C-Wire (Co)	Voice Path
Unilateral (A-On hook)	Release Forward	<---	X (p)	X(p)	-1700	isol	isol	+(3K7-12K)	==
Unilateral	Release Guard	--->	-1K	+1K	-(500-550)	isol	isol	+(3K7-12K)	==
Unilateral (B-On hook)	Clear Backward or busy (B) Congestion	--->	+200K	-1K	-1700	-(12K-43K)	+1K	+(0-300)	Busy
Unilateral (when A-On hook	Release Forward	<---	+200K	-1K	-1700	isol	isol	+(3K7-12K)	==
Unilateral	Release Guard	--->	-1K	+1K	-(500-550)	isol	isol	+(3K7-12K)	==
--	Blocking	--->	X(-1K)	X(+1K)	isol	isol	isol	+(3K7-12K)	==

Explanation:

+xyK: Ground is presented along with xyK Ohms

xyK: –60V is presented along with xyK Ohms

X(xyK): Default is xyK

X(p): Kept at its previous state

isol: DC signalling path is open

==: Voice path is connected.

(C0): Connected to the Central Office or PBXI

For the relays the 0 indicates that the relay is not activated and the 1 indicates activation of the relay. For the current detectors the a 0 indicates NO DETECTION and a 1 indicates DETECTION. X(0) indicates “not relevant” but sets to 0 X(p) indicates “not relevant” but kept in its previous state p.

Table 3-125 Edge to Edge Electrical Presentation for Incoming Local Call

Detection.A for A wire; Detection B for B wire; Detection C for C wire unless otherwise stated.

Table 3-126 lists the signal sense and control presentation for an incoming local call.

Release control	Signal		DETECTOR STATUS			RELAY CONTROLS					Tone
			DET.A	DET.B	DET.C	CABR	CA1K	CB1K	CC1K	CC	
--	Idle	---	0	0	0	0	1	1	0	1	
--	Seizure	in	0	0	1	0	1	1	0	1	
--	Seizure Ack.	out	0	0	1	0	1	1	1	1	Dial Tone
--	Dialing	in	P(1/0)	P(1/0)	1	0	1	1	1	1	
--	Wait for answer	---	0	0	1	0	1	1	1	1	Ring Back
--	Answer	out	0 (DET. A for B wire)	0 (DET. B for A wire)	1	1	0	1	1	1	Speech
Bilateral	Clear Forward	in	0 (DET. A for B wire)	1 (DET. B for A wire)	1	1	0	1	1	1	Busy (from CO)
Bilateral	Clear Backward (Busy B)	out	1 (DET. A for B wire)	0 (DET. B for A wire)	1	1	1	0	1	1	Busy (present)
Bilateral	Release Forward	in	0 (DET. A for B wire)	0 (DET. B for A wire)	0	1	0	1	1	1	
Bilateral	Release Guard	out	0	0	0	0	1	1	0	1	
Unilateral (A-On hook)	Release Forward	in	0	0	0	0	X(p)	X(p)	1	1	

Table 3-126 Signal Sense and Control for Incoming Local Call

Release control	Signal		DETECTOR STATUS			RELAY CONTROLS					Tone
			DET.A	DET.B	DET.C	CAB R	CA1 K	CB1 K	CC1 K	CC	
Unilateral	Release Guard	out	0	0	0	0	1	1	0	1	
Unilateral (B-On hook)	Clear Backward or busy (B) Congestion	out	1 (DET. A for B wire)	0 (DET. B for A wire)	1	1	1	0	1	1	Busy (present)
Unilateral (when A-On hook	Release forward	in	0 (DET. A for B wire)	0 (DET. B for A wire)	0	1	1	0	1	1	
Unilateral	Release Guard	out	0	0	0	0	1	1	0	1	
--	Blocking (also the start up state before circuit is configured)	out	0	0	0	0	X(1)	X(1)	X(0)	0	

Table 3-126 Signal Sense and Control for Incoming Local Call

Table 3-127 lists the edge-to-edge presentation for an incoming toll call.

Release control	Signal	Direction PBX---Co	A-Wire (PBX)	B-Wire (PBX)	C-Wire (PBX)	A-Wire (Co)	B-Wire (Co)	C-Wire (Co)	Voice path
--	Idle	---	-1K	+1K	-(500-550)	isol	isol	+(3K7-12K)	==
--	Seizure	<---	-1K	+1K	-(500-550)	-(15K-200K)	+(12K8-40K)	+(0-300)	==
--	Seizure Ack.	--->	-1K	+1K	-1700	-(15K-200K)	+(12K8-40K)	+(0-300)	Dial Tone

Table 3-127 Edge to Edge Electrical Presentation for Incoming Toll Call

Release control	Signal	Direction PBX---Co	A-Wire (PBX)	B-Wire (PBX)	C-Wire (PBX)	A-Wire (Co)	B-Wire (Co)	C-Wire (Co)	Voice path
--	Dialing	<---	-1K	+1K	-1700	+(0-500)/ isol	-(40-500)/ iso,	+(0-300)	==
--	Extension Free (B Free)	--->	+1K	-1K	-1700	-(15K-200K)	+(12K8 -40K)	+(0-300)	Ring Back
--	Extension Busy (B Busy)	--->	+200K	-1K	-1700	-(12K8 -200K)	+(12K8 -40K)	+(0-300)	Busy
--	Ring Trunk Signal (control ring cadence) Ring Request & Ring Removal	<---	+1K	-1K	-1700	-(12K8-45K)	+(0-60)	+(0-300)	Ring Back
						-(40-500)	+(12K8 -40K)	+(0-300)	
--	Answer	--->	+200K	-200K	-1700	-(15K-200K)	+(12k8 -40K)	+(0-300)	Speech
Unilateral (A-On hook)	Release Forward	<---	X(p))	X(p))	-1700	isol	isol	+(3K7-12K)	==
Unilateral	Release Guard	--->	-1K	+1K	-(500-550)	isol	isol	+(3K7-12K)	==
Unilateral (B-On hook)	Clear Backward or busy (B)	--->	+200K	-1K	-1700	-1K	+(20-1K)	+(0-300)	==
Unilateral (when A-On hook	Release Forward	<---	+200K	-1K	-1700	isol	isol	+(3K7-12K)	==
Unilateral	Release Guard	--->	-1K	+1K	-(500-550)	isol	isol	+(3K7-12K)	==

Table 3-127 Edge to Edge Electrical Presentation for Incoming Toll Call

Release control	Signal	Direction PBX---Co	A-Wire (PBX)	B-Wire (PBX)	C-Wire (PBX)	A-Wire (Co)	B-Wire (Co)	C-Wire (Co)	Voice path
--	Blocking	--->	X(-1K)	X(+1K)	isol	isol	isol	+(3K7-12K)	==
--	Reset	<---	+200K	-1K	-1700	-(12K8-200K)	+(0-500)	+(0-300)	==

Table 3-127 Edge to Edge Electrical Presentation for Incoming Toll Call

Explanation:

+xyK: Ground is presented along with xyK Ohms

xyK: –60V is presented along with xyK Ohms

X(xyK): Default is set to xyK

X(p): Kept in its previous state

isol: Dc signaling path is open

==: Voice path is connected.

Reset has no impact on the PBX ring trunk signal,. It is ignored in the HiPath4000 due to automatic ringing.

Table 3-128 lists all criteria presented in the particular protocol. .X(0) indicates not relevant but set to 0X(p) indicates not relevant but kept to its previous state.

Detection.A for A wire; Detection B for B wire; Detection C for C wire unless otherwise stated.

Release control	Signal		DETECTOR STATUS			RELAY CONTROLS					Tone
			DET.A	DET.B	DET.C	CABR	CA1K	CB1K	CC1K	CC	
--	Idle	---	0	0	0	0	1	1	0	1	
--	Seizure	in	0	0	1	0	1	1	0	1	
--	Seizure Ack.	out	0	0	1	0	1	1	1	1	Dial Tone
--	Dialing	in	P(1/0)	P(1/0)	1	0	1	1	1	1	

Table 3-128 Signal Sense and Control for Incoming Toll Call

Release control	Signal		DETECTOR STATUS			RELAY CONTROLS					Tone
			DET.A	DET.B	DET. C	CAB R	CA1 K	CB1 K	CC1 K	CC	
--	Extension Free (B Free)	out	0 (DET. A for B wire)	0 (DET. B for A wire)	1	1	1	1	1	1	Ring Back
--	Extension Busy (B Busy)	out	0 (DET. A for B wire)	0 (DET. B for A wire)	1	1	1	0	1	1	Busy
--	Ring Trunk Signal	in	1 (DET. A for B wire)	0 (DET. B for A wire)	1	1	1	1	1	1	Ring Back
			0 (DET. A for B wire)	1 (DET. B for A wire)							
--	Answer	out	0 (DET. A for B wire)	0 (DET. B for A wire)	1	1	0	0	1	1	Speech
Unilateral (A-On hook)	Release Forward	in	0	0	0	X(p)	X(p)	X(p)	1	1	
Unilateral	Release Guard	out	0	0	0	0	1	1	0	1	
Unilateral (B-On hook)	Clear Backward or busy (B)	out	1 (DET. A for B wire)	0 (DET. B for A wire)	1	1	1	0	1	1	Busy
Unilateral (A-On hook)	Release Forward	in	0 (DET. A for B wire)	0 (DET. B for A wire)	0	1	1	0	1	1	
Unilateral	Release Guard	out	0	0	0	0	1	1	0	1	

Table 3-128 Signal Sense and Control for Incoming Toll Call

Release control	Signal		DETECTOR STATUS			RELAY CONTROLS					Tone
			DET.A	DET.B	DET. C	CAB R	CA1 K	CB1 K	CC1 K	CC	
--	Blocking	out	X(0)	X(0)	X(0)	X(0)	1	1	X(0)	0	
--	Reset	in	1 (DET. A for B wire)	0 (DET. B for A wire)	1	1	1	0	1	1	

Table 3-128 Signal Sense and Control for Incoming Toll Call

Figure 3-95 shows a circuit diagram of the TM3WO board.

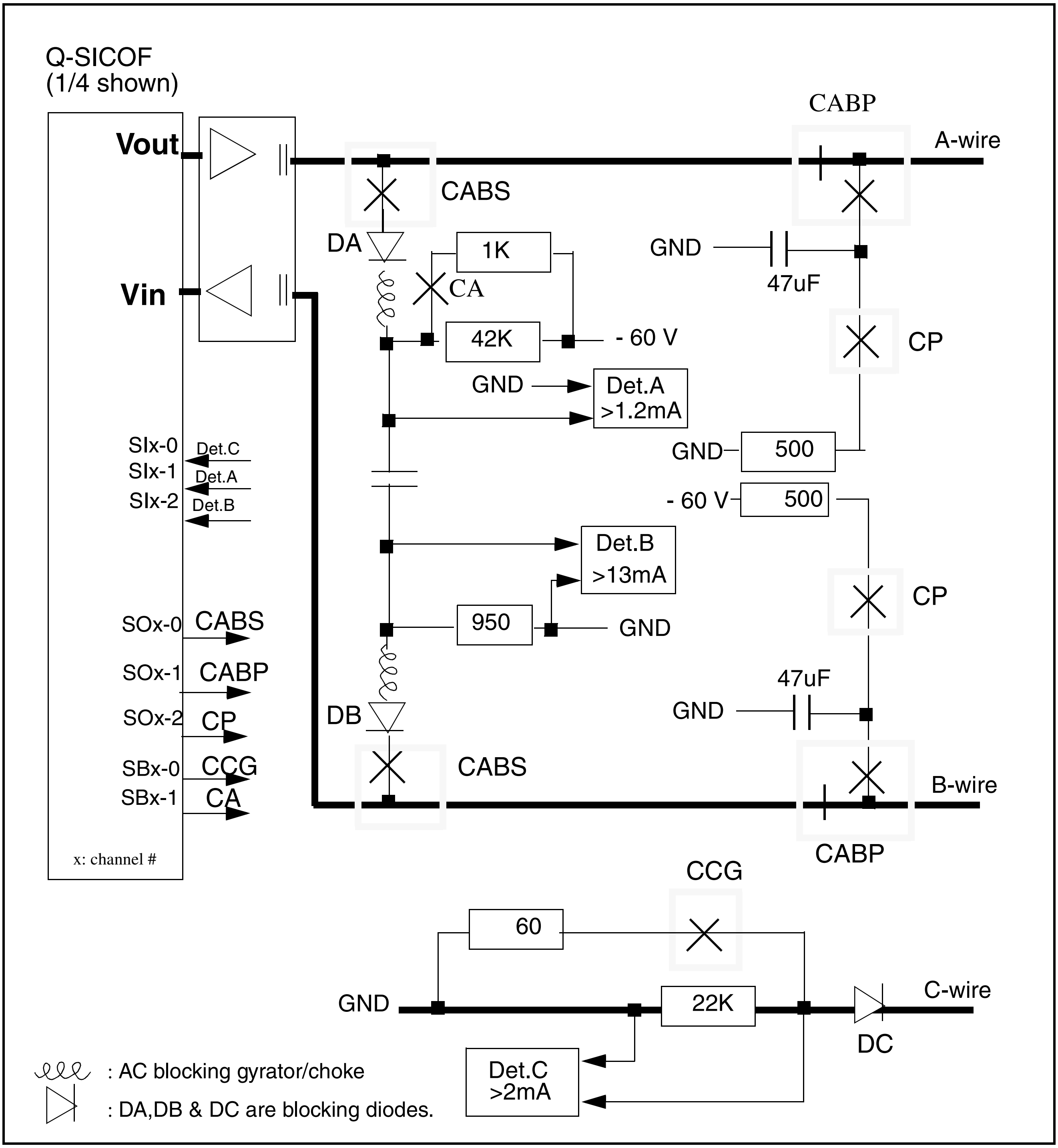


Figure 3-95 TM3WO Board Trunk interface Circuit Diagram (Single Channel Example)

CABS: Connect A & B wires for DC Signalling.
CABP: Connect A & B wires ready for dial Pulsing. CA: Connect A wire to 1K ohm.
CP: Dial pulsing A & B wires. CCG: Connect C wire to Ground.

Table 3-129 lists the edge-to-edge electrical presentation for an outgoing call.

Release control	Signal	Direction PBX--Co	A - Wire (PBX)	B - Wire (PBX)	C - Wire (PBX)	A-Wire (Co)	B-Wire (Co)	C-Wire (Co)	Voice path
--	Idle	---	isol	isol	+22K	isol	isol	-(550-1300)	==
--	Seizure	--->	-42K	+1K	+60	isol	isol	-(550-1300)	==
--	Seizure Ack. (or Ans removal)	<---	-42K	+1K	+60	-1K	+1K	-(1150-1700)	Dial Tone
--	Dialing	--->	+(0-500)/ isol	-(0-500)/ isol	+60	-1K	+1K	-(1150-1700)	##
--	Extension Busy (B Busy)	<---	-42K	+1K	+60	+200K	-1K	-(1150-1700)	Busy tone
--	Extension Free (B Free)	<---	-42K	+1K	+60	-1K	+1K	-(1150-1700)	Ring Back tone
--	Answer/ (ANI Reques+500Hz)	<---	-42K	+1K	+60	+1K	-200K	-(1150-1700)	Speech
Bilateral (A-On hook)	Clear Forward	--->	-1K	+1K	+60	+1K	-200K	-(1150-1700)	==
Bilateral	Clear Backward (When B Onhook)	<---	-1K	+1K	+60	+200K	-1K	-(1150-1700)	==

Table 3-129 Edge to Edge Electrical Presentation for Outgoing Local Call

Release control	Signal	Direction PBX--Co	A - Wire (PBX)	B - Wire (PBX)	C - Wire (PBX)	A-Wire (Co)	B-Wire (Co)	C-Wire (Co)	Voice path
Bilateral	Release Forward	--->	isol	isol	+22K	+200K	-1K	-(1150-1700)	==
Bilateral	Release Guard	<---	isol	isol	+22K	isol	isol	-(550-1300)	==
Unilateral (A-On hook)	Release Forward	--->	isol	isol	+22K	X	X	-(1150-1700)	==
Unilateral	Release Guard	<---	isol	isol	+22K	isol	isol	-(550-1300)	==
Unilateral (B-On hook)	Clear Backward	<---	-42K	+1K	+60	+200K	-1K	-(1150-1700)	Busy tone
Unilateral (A-On hook)	Release Forward	--->	isol	isol	+22K	+1K	-200K	-(1150-1700)	==
Unilateral	Release Guard	<---	isol	isol	+22K	isol	isol	-(550-1300)	==
--	Blocking	<--	isol	isol	+22K	X	X	isol	==
--	False Signal	<---	-42k	+1K	+60	+1K	-1K	-(1150-1700)	==

Explanation:
+xyK: Ground is presented along with xyK Ohms
xyK: –60V is presented along with xyK Ohms
X: Ignore
isol: Dc signalling path is open
==: Voice path is connected
##: Voice path is disconnected
(Co): Connection to Central Office or PBX also
To control relays, 0 indicates that the relay is not activated and 1 indicates activation of the relay. For the current detectors, 0 indicates NO DETECTION and 1 indicates DETECTION.

Table 3-129 Edge to Edge Electrical Presentation for Outgoing Local Call

Release control	Signal		DETECTOR STATUS			RELAY CONTROLS					Tone
			DET. A	DET. B	DET. C	CAB S	CAB P	CP	CC G	CA	
--	Idle	---	X(0)	X(0)	1	0	0	0	0	0	
--	Seizure	out	0	0	1	1	0	0	1	0	
--	Seizure Ack.	in	0	0	1	1	0	0	1	0	Dial Tone (optional)
--	Dialing	out	X(0)	X(0)	1	0	1	P(1/0)	1	0	
--	Extension Busy (B Busy)	in	0	1	1	1	0	0	1	0	Busy (speech path connected)
--	Extension Free (B Free)	in	0	0	1	1	0	0	1	0	Ring Back (speech path connected)
--	Answer	in	1	0	1	1	0	0	1	0	Speech
Bilateral	Clear Forward	out	X	0	1	1	0	0	1	1	
Bilateral (B On hook)	Clear Backward	in	0	1	1	1	0	0	1	1	
Bilateral	Release Forward	out	X(0)	X(0)	1	0	0	0	0	0	
Bilateral	Release Guard	in	X(0)	X(0)	1	0	0	0	0	0	
Unilateral (A-On hook)	Release Forward	out	X(0)	X(0)	1	0	0	0	0	0	

Table 3-130 Signal Sense and Control for Outgoing Local Call

Release control	Signal		DETECTOR STATUS			RELAY CONTROLS					Tone
			DET. A	DET. B	DET. C	CAB S	CAB P	CP	CC G	CA	
Unilateral	Release Guard	in	X(0)	X(0)	1	0	0	0	0	0	
Unilateral (B-On hook)	Clear Backward or busy (B)	in	0	1	1	1	0	0	1	0	Busy (from CO)
Unilateral (A-On hook)	Release Forward	out	X(0)	X(0)	1	0	0	0	0	0	Busy
Unilateral	Release Guard	in	X(0)	X(0)	1	0	0	0	0	0	
--	Blocking	in	X(0)	X(0)	0	0	0	0	0	0	
--	False Signal	in	1	1	1	1	1	0	1	0	

Table 3-130 Signal Sense and Control for Outgoing Local Call

3.45.3 Functions and Features for GUS

The TM3WI/TM3WO board has the following analog trunk interface functions:

- Three wires used for dc signalling and supervision.
- Programmable selection of signalling methods.
- Programmable transmit and receive gains
- Combined voice pair with dc signalling.- 2 wires.
- Optional 2-wire voice path is available for future target countries application.

The TM3WI/TM3WO has the following system features:

- Companding of the voice signal
  (Voice compression used in the PCM encoding/decoding to adapt non-linear characteristics in the Analog-Digital Conversion)
- Access to PCM highways with flexible time slot channel selection
- HDLC link to communicate with the PBXs switching unit.

3.45.4 Interfaces

There are three main functional boundaries to the TM3WI/TM3WO:

- Three wires DC signalling trunk interface
- Channel and voice-path interface
- Common control interface

3.45.5 Connector Pin Assignments

Table 3-131 lists the pin assignments for the upper connector of the TM3WI/TM3WO board.

Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name
41	NC	21	+5V	01	A-1
42	NC	22	GND	02	+12V
43	NC	23	B-1	03	A-2
44	NC	24	C-3	04	B-2
45	NC	25		05	A-3
46	NC	26	C-4	06	B-3
47	NC	27		07	A-4
48	NC	28	GND	08	B-4
49	NC	29	C-5	09	A-5
50	NC	30		10	B-5
51	NC	31	C-6	11	A-6
52	NC	32		12	B-6
53	NC	33	GND	13	A-7
54	NC	34	C-7	14	B-7
55	NC	35		15	A-8
56	NC	36	-5V	16	B-8
57	NC	37	C-8	17	C-1
58	NC	38		18	
59	NC	39	GND	19	C-2
60	NC	40	+5V	20	

Table 3-131 TM3WI/TM3WO Board Upper Connector X1-X4

Table 3-132 lists the pin assignments for the lower connector of the TM3WI/TM3WO board.

Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name
41	NC	21	+5V	01	RING
42	NC	22	GND	02	+12V
43	NC	23	GND	03	-48V
44	NC	24	DIAL1	04	-60V
45	TOUT*	25	DIAL2	05	+60V
46	FBPE	26	WGSYN	06	U-SLIC
47	TRST*	27	RGSYN	07	RCLK
48	TCK*	28	GND	08	RAC
49	TMS*	29	PRS	09	BA0
50	TDI*	30	BA1	10	RGCL
51	TDO*	31	HO1	11	RGD
52	HO3	32	HO0	12	BA6
53	HO2	33	GND	13	HD0
54	NC	34	BA2	14	BA5
55	NC	35	BA3	15	CKA
56	NC	36	-5V	16	CLS
57	HI3	37	FMB	17	HI1
58	HI2	38	HI0	18	BA4
59	NC	39	GND	19	HDI
60	NC	40	+5V	20	-12V

Table 3-132 TM3WI/TM3WO Board Lower Connector X1-X4

Table 3-133 lists the pin assignments for the middle connector of the TE3WI/TM3WO board.

Pin #	Signal Name
1	GND
2	+5VL

Table 3-133 TM3WI/TM3WO Board Middle Connector X3

Table 3-134 lists some connectivity information about the TE3WI/TM3WO board.

Part Number	HW ID Number	Country	Line Resistance	Operation Type	Number of total Channels	Number of Wires For Every Channel
TM3WI: Q2477-X000	EEFXH	Russia	2 x 1500 ohms	3 wires incoming (local & toll)	4	3
TM3WO: Q2476-X000	EEEXH	Russia	2 x 1500 ohms	3 wire outgoing (local)	4	3

Table 3-134 TM3WI/TM3WO Board MDF Connectivity Information

Table 3-135 lists the wire designation for TM3WI/TM3WO board

Part Number	-----MDF -CABLE A/B Numbering-----															
	Set Number For Every Board															
	A & B & C wire designation								Not Used							
	1	**3**	**5**	**7**	**9**	**11**	**13**	**15**	**2**	**4**	**6**	**8**	**10**	**12**	**14**	**16**
TM3WI: Q2477-X000	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
	A_B	C_	A_B	C_	A_B	C_	A_B	C_	A_B	C_	A_B	C_	A_B	C_	A_B	C_
TM3WO: Q2476-X000	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	A_B	C_	A_B	C_	A_B	C_	A_B	C_	A_B	C_	A_B	C_	A_B	C_	A_B	C_

Table 3-135 TM3WI/TM3WO Board HiPath 4000 MDF A & B Wire Designation

3.45.6 Line Signaling Flow Diagrams

Figure 3-96 through Figure 3-105 shows line signaling diagrams. These diagrams show a dependency on the resistance (OTLOC).

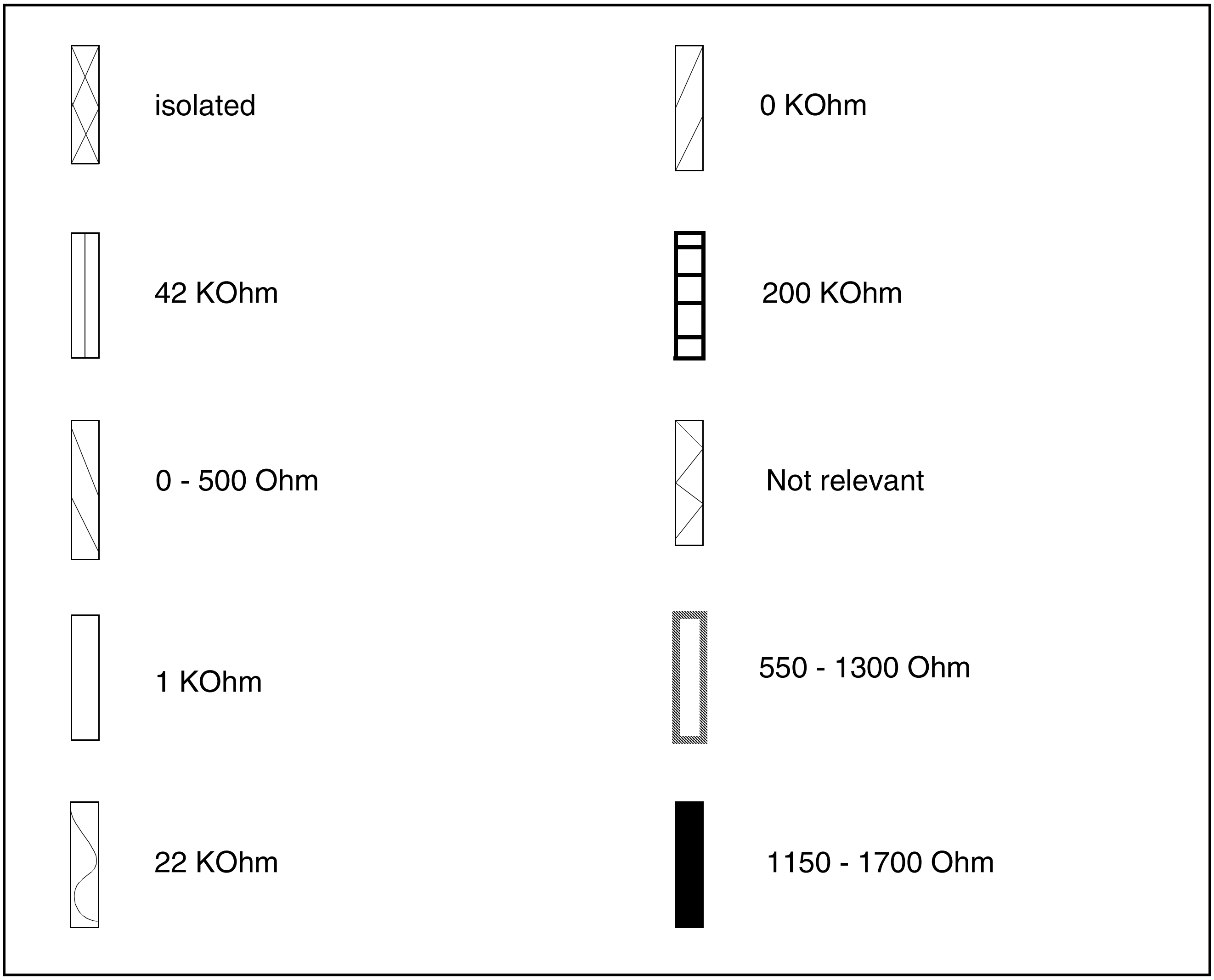


Figure 3-96 Symbols for the Resistance on A-, B- or C-Wire

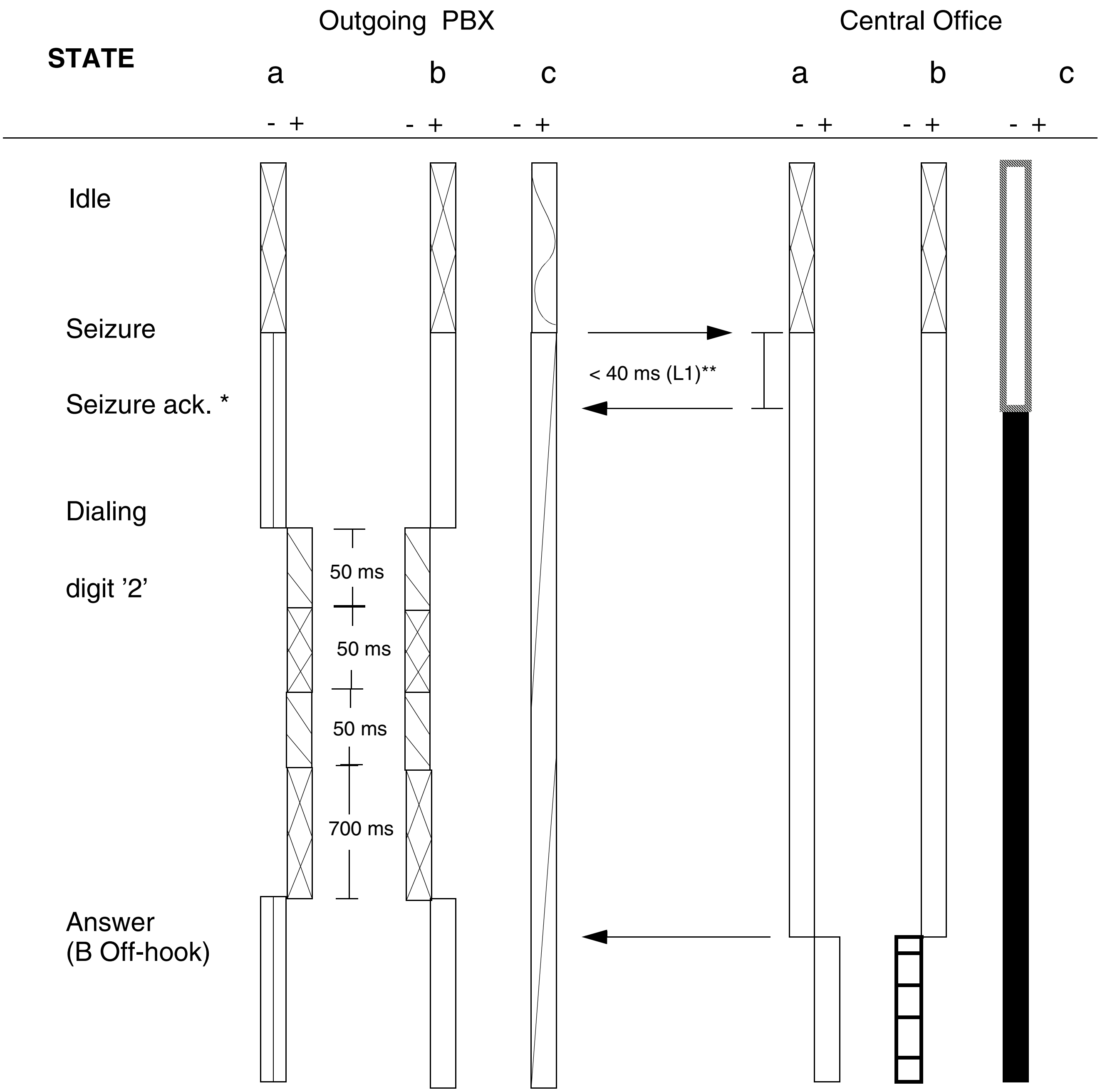


Figure 3-97 Seizure, Pulse Dial, B-Subscriber Free, Answer

* Due to the insignificant current changing, the seizure ack. line signal cannot be detected.

** L1: Long timer 1 (see PTIME)

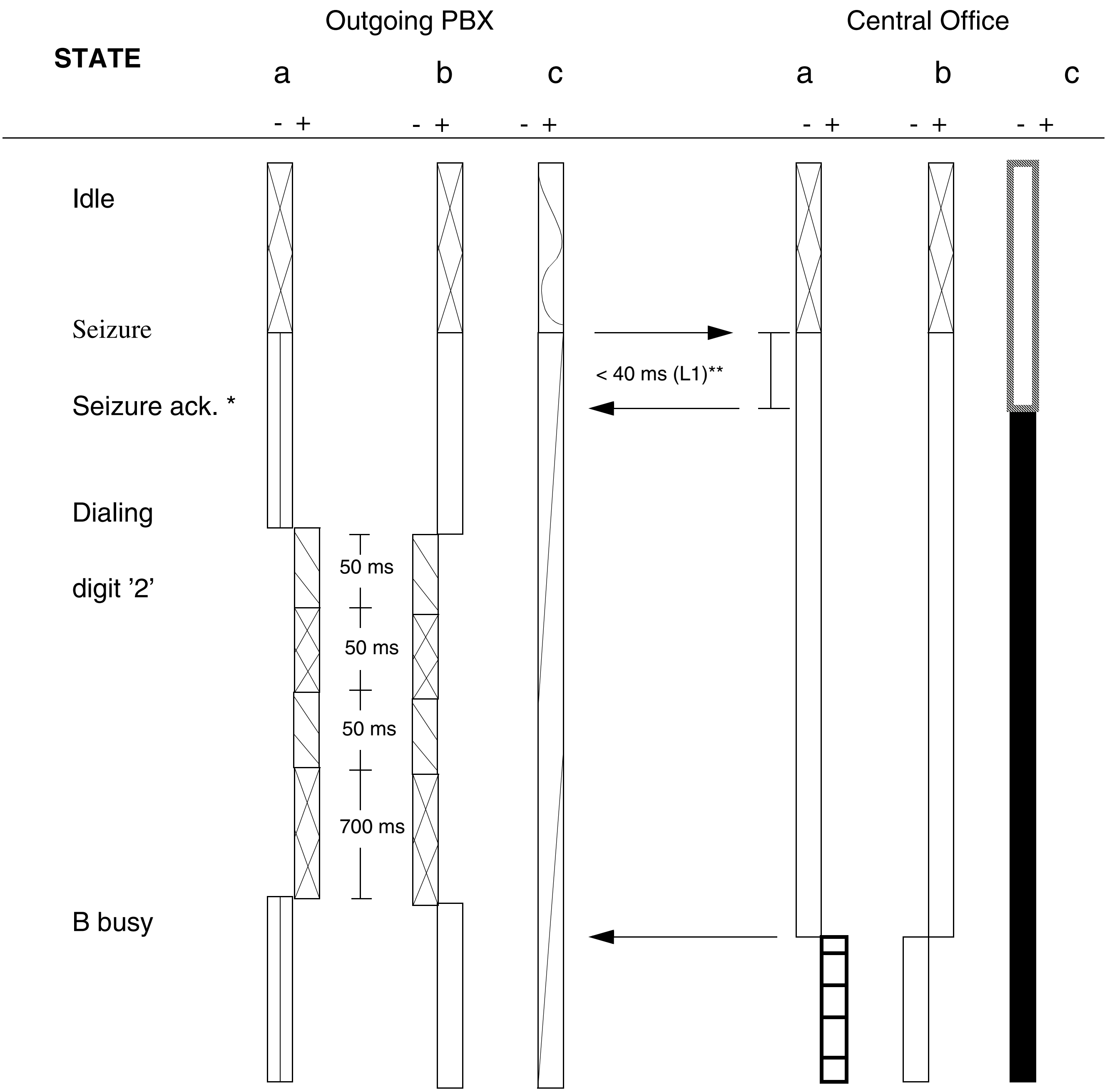
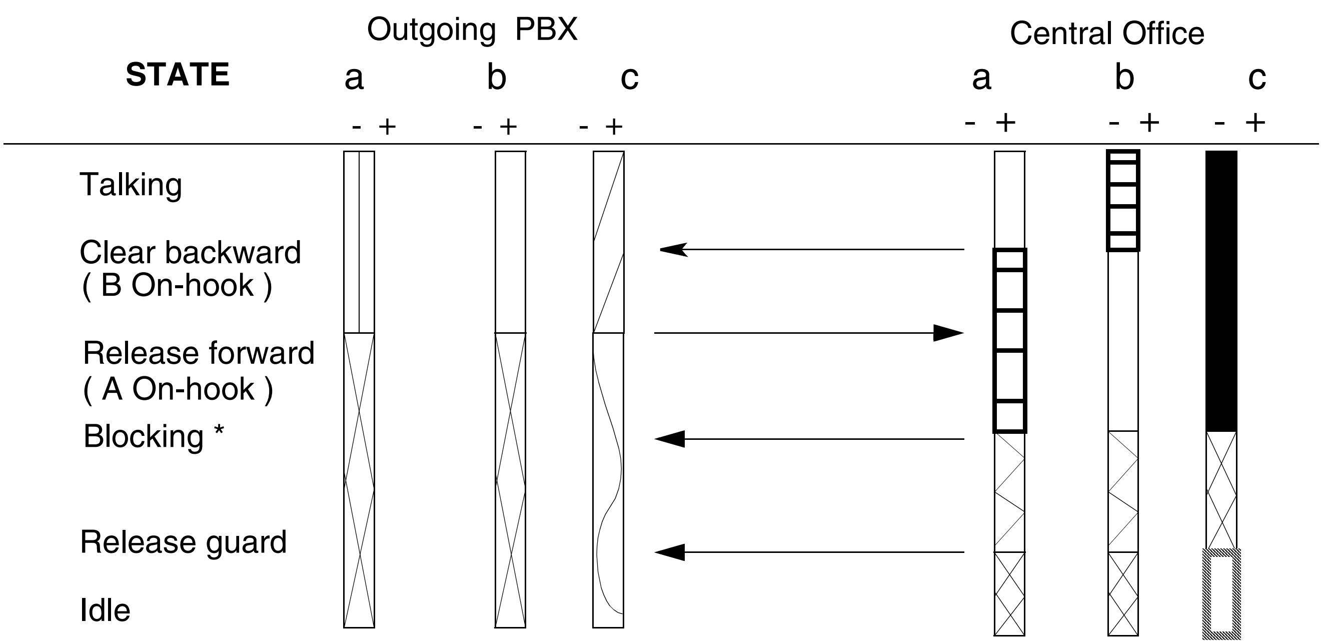


Figure 3-98 Seizure, Pulse Dial, B-Subscriber Busy

* Due to the insignificant current changing, the seizure ack.line signal can not be detected.

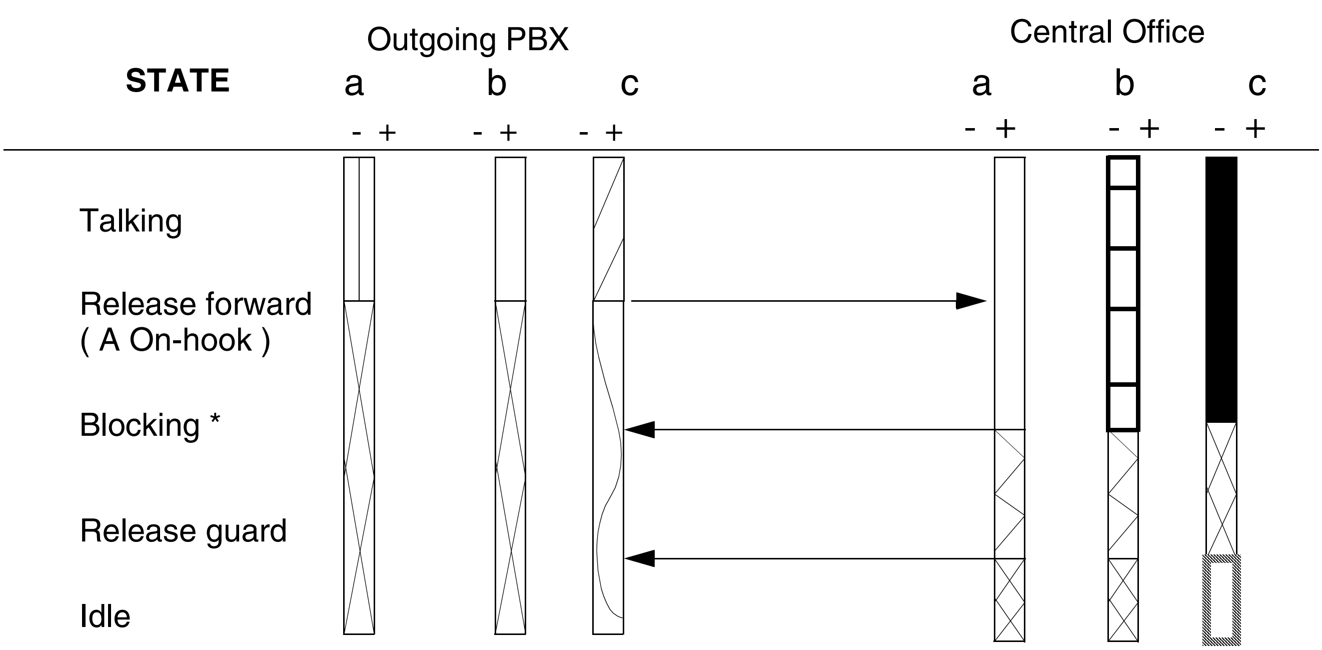
** L1: Long timer 1 (see PTIME)

3.45.7 First Party Release Control (MGTS)



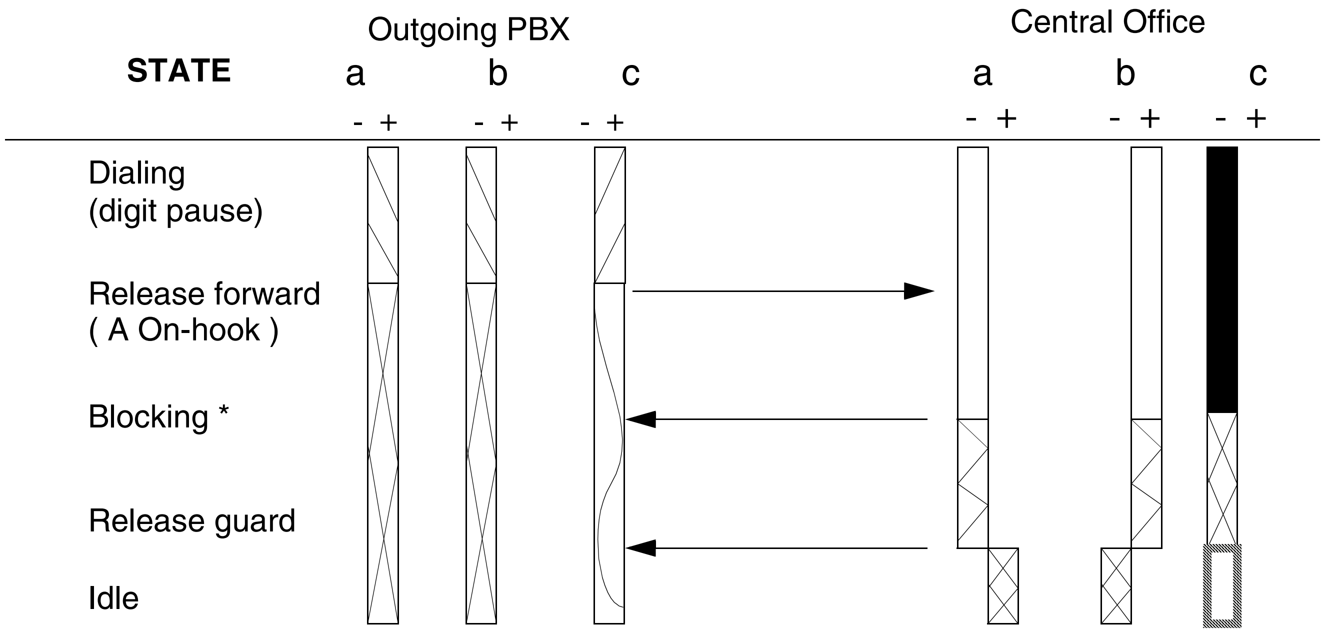
* Optional, because some central offices do not send this signal

Figure 3-99 B goes On-Hook After Answer



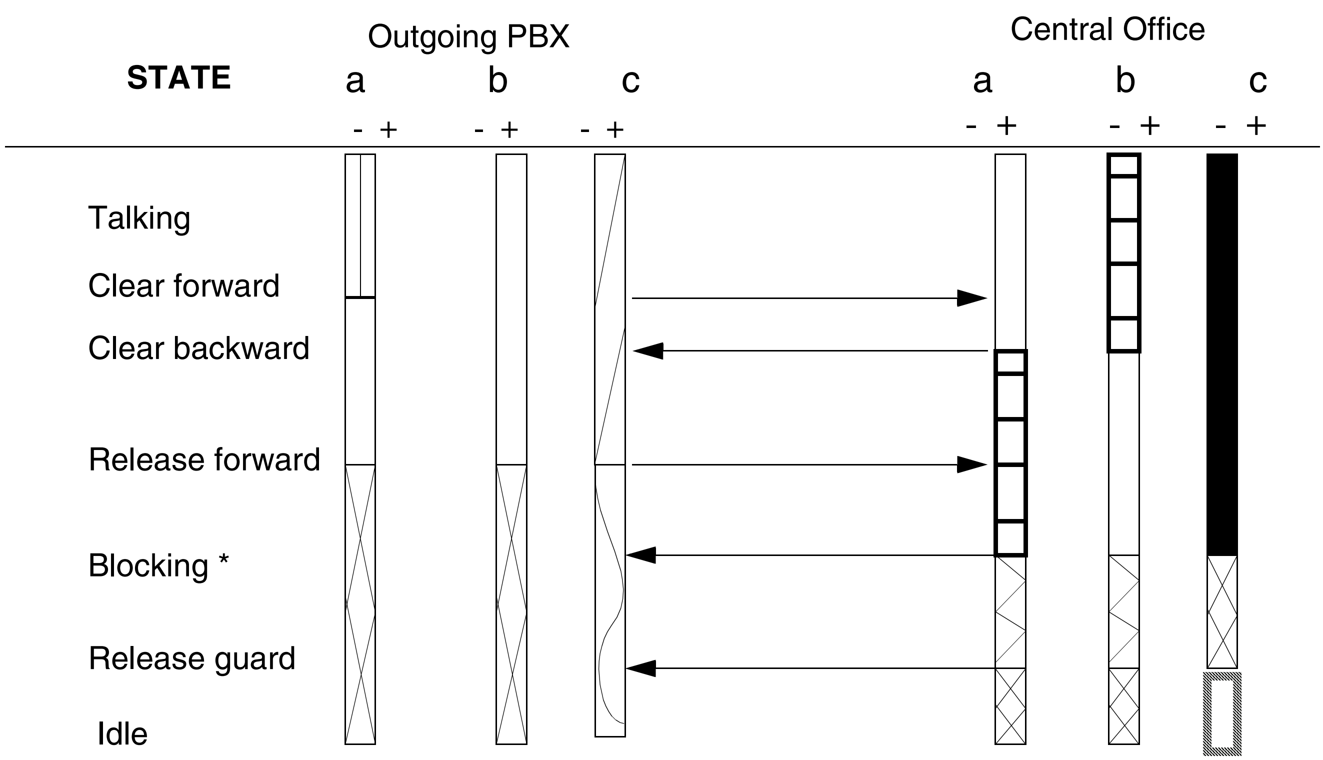
* Optional, because some central offices do not send this signal

Figure 3-100 A Goes On-Hook Before Dialing or Answering or After Answer



* Optional, because some central offices do not send this signal

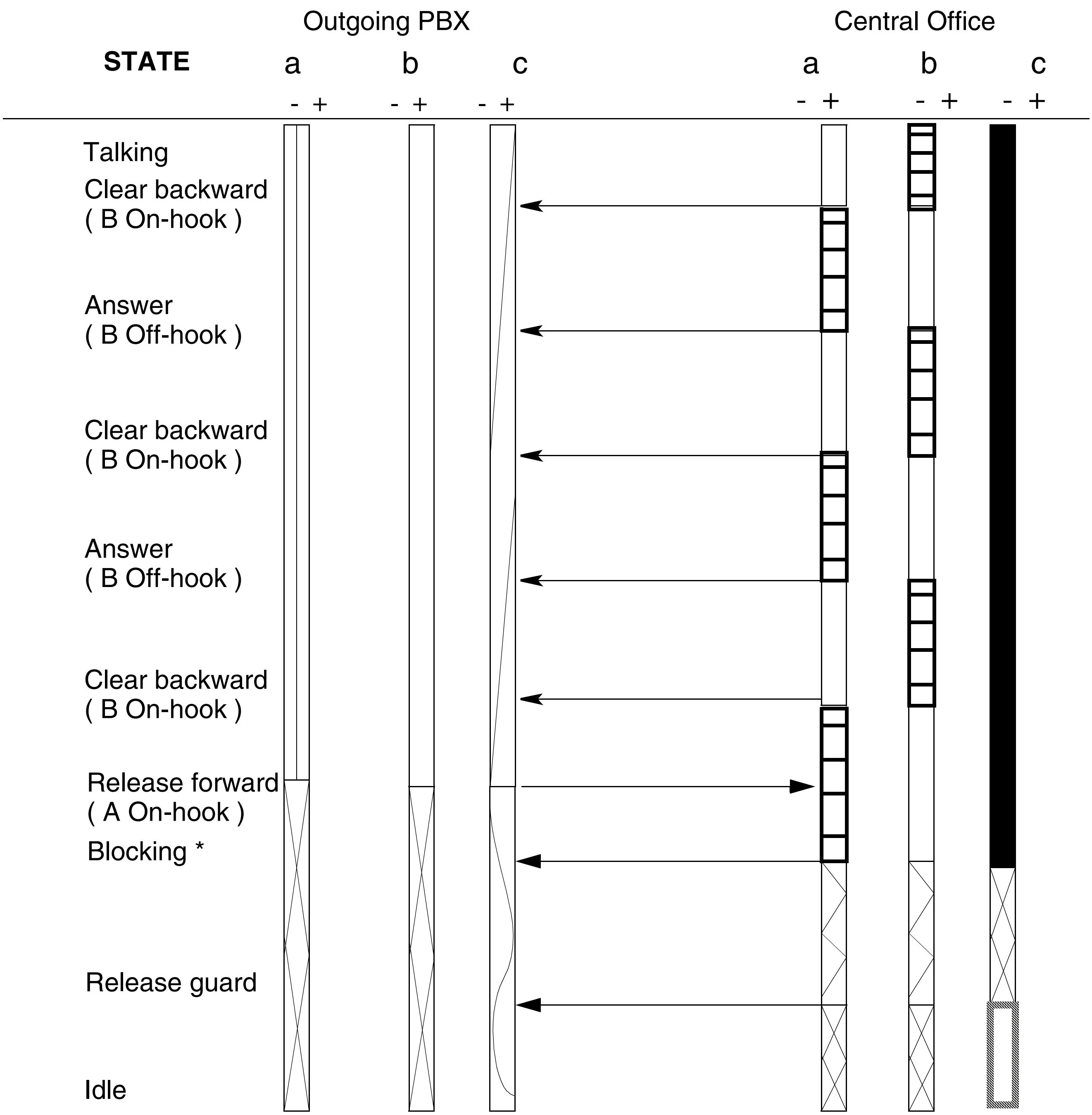
Figure 3-101 A Goes On-Hook During Digit Outpulsing



* Optional, because some central offices do not send this signal

Figure 3-102 A Goes On-hook After Answer (P14 = 1)

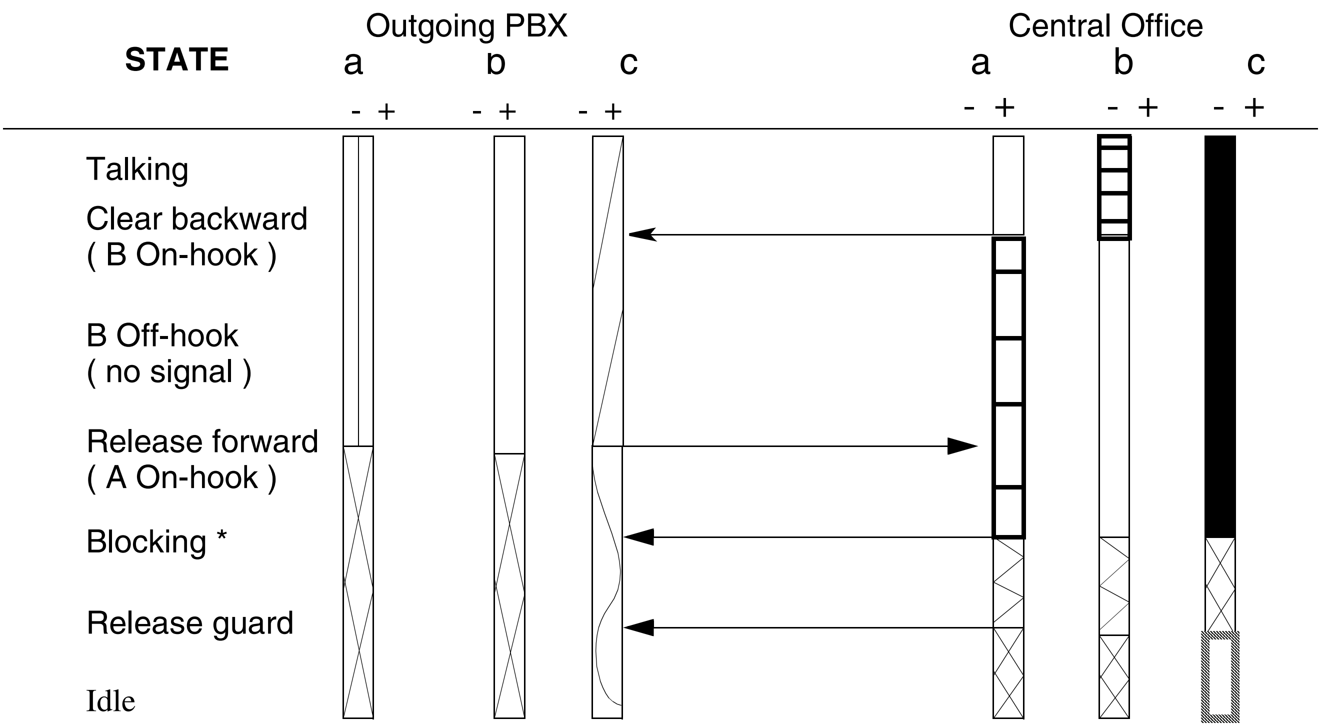
3.45.8 Calling Party Release Control (Unilateral LONIIS)



* Optional, because some central offices do not send this signal

Figure 3-103 B goes On- or Off-hook After Answer

3.45.9 Calling party release control (Unilateral MGTS)



* Optional, because some central offices do not send this signal

Figure 3-104 B goes on-/off-hook after answer (MGTS)

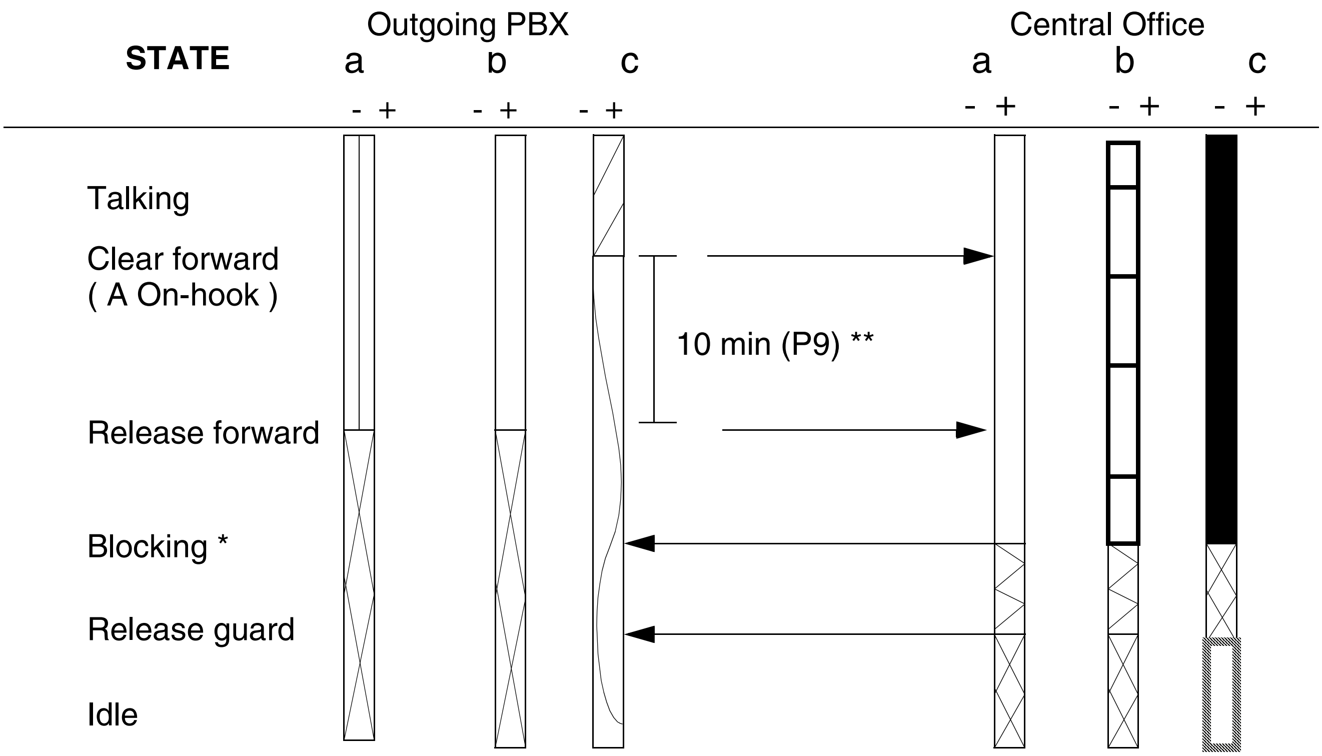


Figure 3-105 A goes On-Hook after Answer, B Remains Off-Hook

* Optional, because some central offices do not send this signal

** P9: Parameter 9 (see PTIME)

3.45.10 Signaling times for INLOC and OTLOC

Fixed and Administrative Timers:

- Incoming Local:

min.length of a qualified seizure	S1 = 20 ms
min. seizure ack. transmission time	300 ms
digit receiving :	
- min/max make time	20 ms/150 ms
- min/max break time	20 ms/150 ms
- interdigit time	>150 ms
min.length of a qualified clear forward (bilateral)	S2 = 70 ms
min.length of a qualified reseizure (bilateral)	20 ms

min.length of a qualified release forward:	20 ms
transmission time of blocking before release guard	150 ms

- Putting out of service and into service:

min. blocking signal transmission time	1200 ms
min.length of a qualified idle	150 ms

- Outgoing local:

seizure ack. simulation time	L1 = 40 ms
digit outpulsing:	
- make/break time	50/50 ms
- interdigit time	700 ms
min. length of a qualified ANI-Request	20 ms
min. length of a qualified ANI-Request to be interpreted	
as an answer	L5 = 2800 ms
min. length of a qualified answer without ANI-Request	L5 = 70 ms
min. length of a qualified answer removal	20 ms
min.length of a qualified answer removal to be intrepeted as ANI-removal (P11 = 1 or 2)	L7 = 1300 ms
answer supervision time	P7 = 10 min
min. length of a qualified clear back	120 ms
min. length of a qualified reanswer signal	20 ms
min. length of a qualified B-busy signal	120 ms
min. length of a qualified release guard	S3 = 20 ms
delay time for forward release transmission	P9 = 10 min
time between clear forward and sending MCID-message to DH	P8 = 2 min
release guard supervision time (after release forward transmission)	L2 = 30s
outgoing guard time	P2 = 1 s

- Seizure for line test:

release forward transmission time	5 min
seizure transmission time	1 s

- Blocking outgoing:

min. length of a qualified blocking from the line	L4 = 1 s
min. length of a qualified idle after blocking	150 ms

- Putting into service:

idle transmission time	150 ms
min. length of a qualified idle for putting into service	150 ms

PTIME Parameter Overview

DEV = A3GUSLOC

Parameter:

P1: dialing type (incoming)
- 0 pulse dialing *(default)*
- 1 DTMF
- 2 MF dialing

P2: blocking time - 1 sec unit (outgoing)
- 1-250 *default: 1* (= *1 sec.)*

P3: direction of seizure
- 1 outgoing *(default)*
- 2 incoming

P4: false signal handling
- 0 no action (outgoing and incoming) (*default*)
- 1 system alarm with line testing (outgoing)
- 2 system alarm without line testing (outgoing and incoming)

P5: outgoing guard time - 1 sec. unit (outgoing)
- 1 - 250 *default: 1 (= 1sec)*

P6: dial tone detection (outgoing)
- 0 no detection *(default)*
- 1 dial tone has to be detected

P7: answer supervision (outgoing)
- 0 no supervision
- 1-250 with supervision (30 sec. unit)
  default: 20 (= 10 *min)*

P8: Malicious Call Identification after clear forward transmission (outgoing)

- 0 no MCID *(default)*
- 1-250 with MCID (30 sec. unit)
  recommended value: 4 (= 2 min)

P9: delay time release forward transmission (outgoing)

- 0 no delay
- 1-250 with delay (30 sec. unit)
  default: 20 (= 10 min)

P10: Clear forward receiving handling (incoming)

- 0 send clear back line signal and release message to the system software *(default)*
- 1 send “A On-hook” message to the system software

P11: ANI-request (outgoing)

- 0 ANI-request handling type 1
  (no ANI-request process in the system software)
- 1 ANI-request handling type 2
  (inform the system software after detection the ANI-request signal in talk state by the trunk loadware)
- 2 ANI-request handling type 3 *(default)*
  (inform the system software after detection the answer removal signal by the trunk loadware)
- 3 No ANI-request

P12: manual busy override (incoming)

- 0 no busy override *(default)*
- 1 busy override

P13: release guard missing handling (outgoing)

- 0 no action
- 1 system alarm with line testing
- 2 system alarm without line testing*(default)*

P14: release-variant (outgoing)

- 0 LONIIS *(default)*
  output signal: release forward

1 MGTS
output signal: clear forward

Shorttimer:

S1: min. length of a qualified seizure (incoming)
10-255 ms
default: 20 ms

S2: reserve

S3: min. length of a qualified release guard (outgoing)
10-255 ms
default: 20 ms

Longtimer:

L1: seizure acknowledge simulation time (outgoing)
4-30000 ms
default: 40 ms

L2: release guard supervision time (outgoing)
1000-30000 ms
default: 30000 ms

L3: min. length of a qualified alarm
1000-30000 ms
default: 10000 ms

L4: reserve

L5: min. length of ANI-request as a qualified answer (outgoing)
1000-30000 ms
default: 2800 ms

L6: speech channel through connection delay time (outgoing + P11 = 0 and incoming)
1000-30000 ms
default: 1000 ms

L7: min. length of a qualified ANI-removal (only for outgoing and P11= 1or 2)
1000-30000 ms
default: 1300 ms

Signaling times

Fixed and administrative timers:

- Incoming traffic:

min. length of a qualified seizure	S1 = 20 ms
min. seizure ack.transmission time	300 ms
min. B-free transmission time	300 ms
min. B-busy transmission time	300 ms
transmission time of B-busy with override	1500 ms
min. answer transmission time	300 ms
min. length of a qualified release forward	20 ms
digit receiving:	
- min/max make timer	20 ms/150 ms
- min/max break timer	20 ms/150 ms
- interdigit time	> 150 ms
min. length of a qualified rering	150 ms
transmission time for blocking after release forward	150 ms
min. length of a qualified release forward after blocking	150 ms
min. length of a signal to be interpreted as false signal	L3 = 5 s
min. length of a qualified release forward after faults	150 ms

- Putting out of service and into service:

min. blocking transmission time	1200 ms
min.length of a qualified idle	150 ms

PTIME-parameter overview

DEV = A3GUSTOL

Parameter:

P1: dialing type (incoming)

- 0 pulse dialing *(default)*
- 1 DTMF
- 2 MF dialing

P2: reserve

P3: direction of seizure

1 outgoing

2 incoming*(default)*

P4: false signal handling

0 no action (outgoing and incoming) (*default*)

1 system alarm with line testing (outgoing)

2 system alarm without line testing (outgoing and incoming)

P5 to P10: reserve

P11: reserve

P12: manual busy override (incoming)

0 no busy override

1 busy override *(default)*

P13: reserve

P14: reserve

Shorttimer:

S1: min. length of a qualified seizure (incoming)

10-255 ms

default: 20 ms

S2: reserve

S3: reserve

Longtimer:

L1: reserve

L2: reserve

L3: min. length of a qualified alarm

1000-30000 ms

default: 10000 ms

L4: reserve

L5: reserve

L6: speech channel through connection delay time (incoming)

1000-30000 ms

default: 100 ms

L7: reserve

3.46 TMANI

This section describes the functions and features of the Trunk Modul Analog Interface (TMANI) board.

3.46.1 Functional Description

The new analog trunk board for HiPath 4000 with 8 analog Ports, TMANI, is a solution to replace the analog trunk board TM2LP and TMC16 in HiPath 4000.

The board TMANI that will be used in HiPath 4000 will be the same use in HiPath 3800, with the same layout and dimensions, only the Part number of the board will be different for HiPath 3800 and HiPath 4000. To make the board useable in HiPath 4000, changes will be made in the LW.

TMANI board will support following line protocols:

- HKZ: same Loop Start protocol supported by TM2LP for the entire world;
- DID Italy: DID protocol (Direct Inward Dial) supported by TM2LP for Italy;
- DID Belgium: DID protocol supported by TM2LP for Belgium;
- Ground for USA: Ground Start protocol supported by TMC16 for USA;
- Loop for USA: Loop Start protocol supported by TMC16 for USA;

Protocol	TM"LP	TMC16	TMANI	TMANI-IM	TMANI-BRA
Loop Start HKZ	X		**X**	**X**	**X**
DID Italy	X		**X**	**X**	**X**
DID Belgium	X		**X**	**X**	**X**
Groun Start USA		X	**X**		
Loop Start USA		X	**X**	**X**	**X**

Table 3-136 TMANI protocols

Beyond the existing features of these protocols, TMANI board will support the following features:

- Clip Detection (Calling Line Identification Presentation);
- Busy Tone Detection;
- Dial Tone Detection* in TMANI board, not in SIU board;
- DTMF Generation* in TMANI board, not in SIU board;

- DTMF Detection* in TMANI board, not in SIU board;

* The TMANI board will not need a SIU board to run

Features	TM2LP + SIU	TMC16 + SIU	TMANI TMANI-IM TMANI-BRA
Clip Detection			**X**
Busy Tone Detection			**X**
Dial Tone Detection	X	X	**X**
DTMF Generation	X	X	**X**
DTMF Detection	X		**X**

Table 3-137 TMANI features

The existing features will be kept, such as:

- Disconnection supervision for Ground/Loop Start trunks;
- Special ring and dial tone cadences for each country;
- Billing tone detectors (only for -X100 variant): 12kHz/16kHz (the 50Hz billing tone is not supported);
- DP dial (IWV).

3.46.2 Systems Supported

- Support up from HiPath 4000 V3.0
- Support with AP 3300, AP 3700, AP 3300 IP and AP 3700 IP
- No special card distribution rules, complies with the standard rules

3.46.3 Hardware Variants

- TMANI: S30810-Q2327-X100, with GEE, with ground start
- TMANI-IM S30810-Q2327-X101, without GEE, without ground start
- TMANI-BRA S30810-Q2327-X182, only for Brasil, without GEE, without ground start

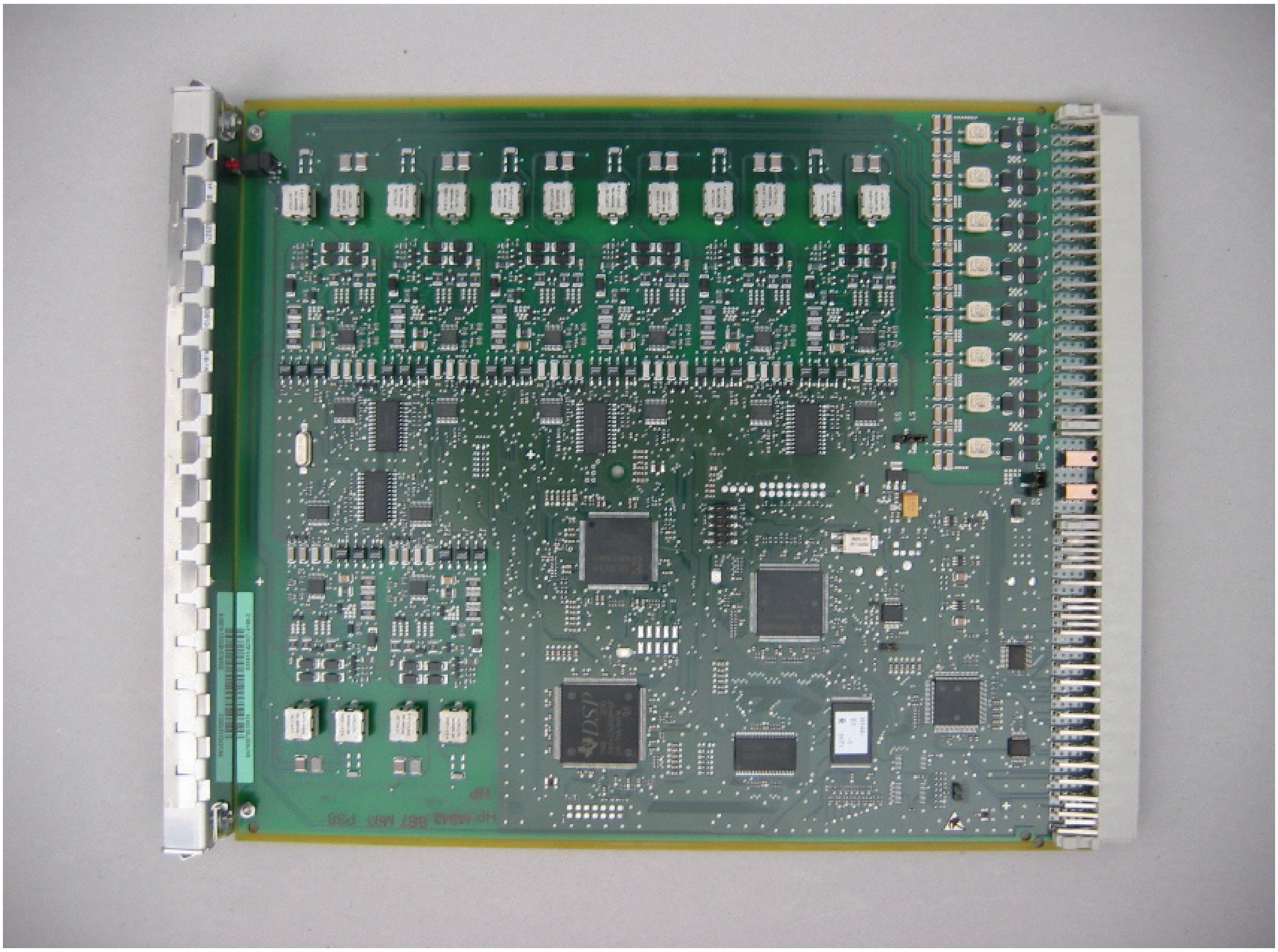


Figure 3-106 TMANI

3.46.4 Pin Assignment

Introduction

The TMANI board connects eight analog trunks to HiPath 4000 using the loop start or ground start protocols.

> **Warning**
> According to U.S. and Canadian installation instructions, analog trunks must be connected over fuse elements in compliance with UL 497A or CSA C22.2 No. 226.

TMANI Front panel

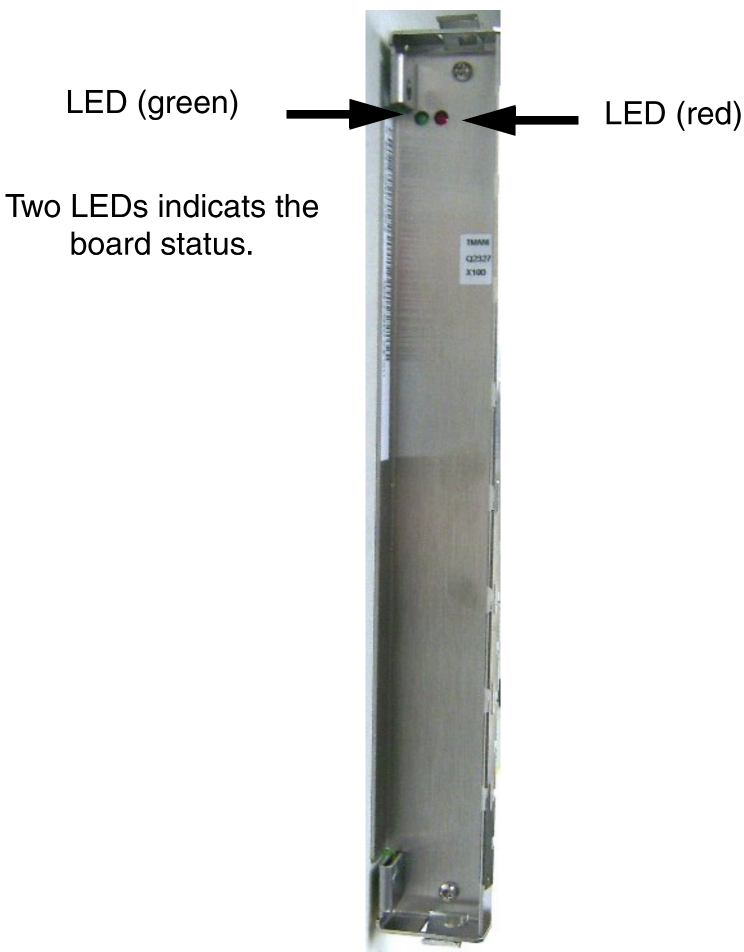


Figure 3-107 TMANI - Front Panel

LED statuses and their meanings

Red LED	Green LED	Status	Action
Off	Off	Board not receiving power or not plugged in correctly. Board is out of order.	Check plug contact on board.
On	Off	Board is receiving power and board test is in progress. Board is defective if status remains unchanged (board test unsuccessful).	Replace the board.
		Loadware loading not successfully completed. Board is faulty.	Replace the board.
		Error detected on board. Board is deactivated (not applicable to errors detected by test loops).	Check whether the board was deactivated. If not, replace board.
Flashing	Off	Loadware is being loaded.	
Off	On	Board test completed successfully. Board is OK (idle state).	
Off	Flashing	At least one subscriber line circuit is activated.	

Table 3-138 TMANI - LED Statuses

Jumper for ground start

The two jumpers marked with GS were placed on the board to satisfy security standards. The jumpers must be closed for countries that support the "Ground-Start" feature (the U.S. and Canada). The jumpers must remain open for other countries that support the "Loop-Start" feature.

Jumper for ground start

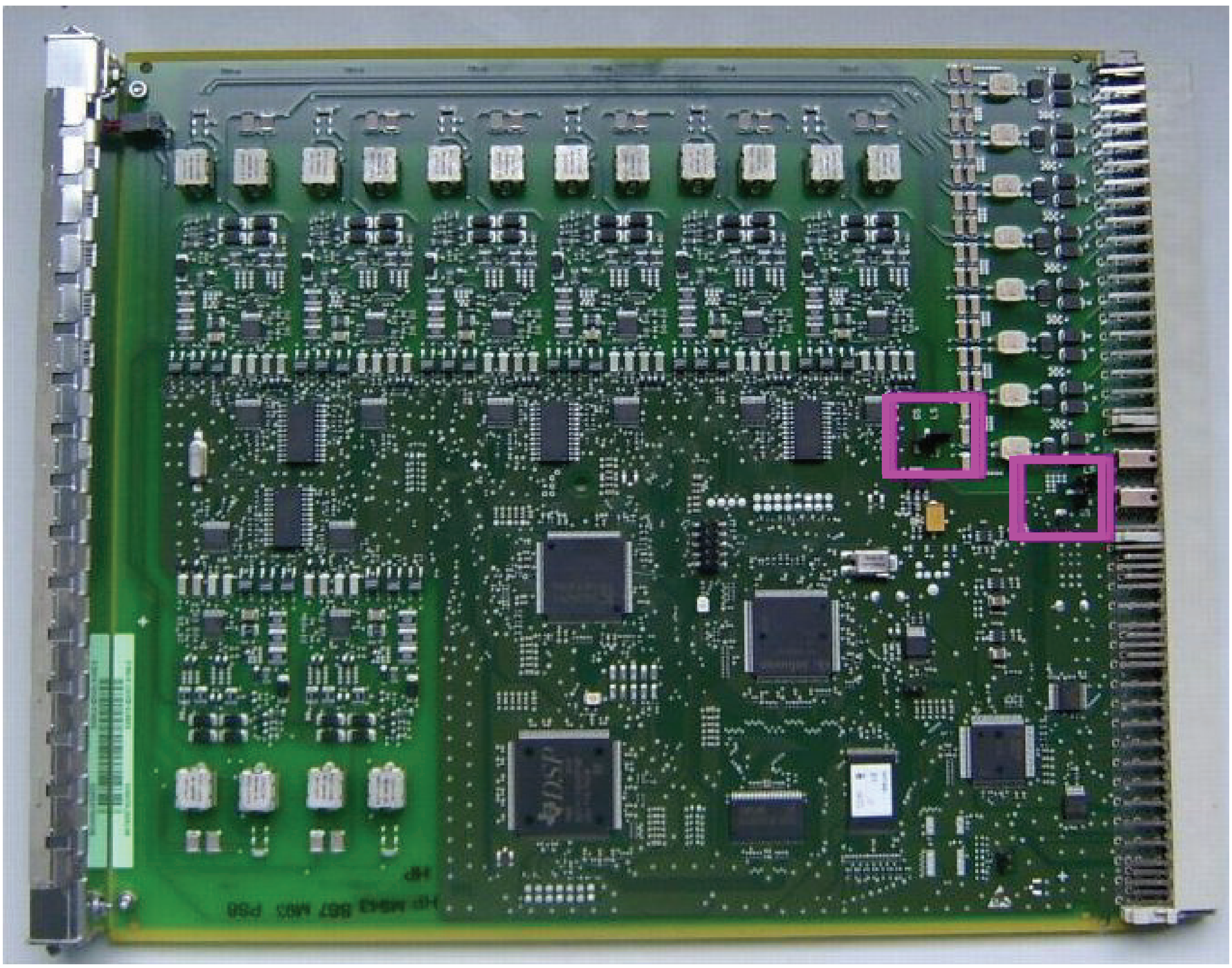


Figure 3-108 TMANI Jumper position

Cable and connector assignment

- For connecting to the SIVAPAC connector on the backplane: Table 3-139
- For connecting to the connector panels using RJ45 jacks: Table 3-140
- For U.S. only: For connecting to the connector panels with CHAMP jack: Table 3-141

Pair	a-wire (Tip)	b-wire (Ring)	SIVAPAC connector	TMANI		MDFU-E	Notes
1	wht/blu		1	1a	Port 1	1a	
		blu/wht	23	1b		1b	
2	wht/ora		3	2a	Port 2	2a	
		ora/wht	4	2b		2b	
3	wht/grn		5	3a	Port 3	3a	
		grn/wht	6	3b		3b	
4	wht/brn		7	4a	Port 4	4a	
		brn/wht	8	4b		4b	
5	wht/grn		9	5a	Port 5	5a	
		grn/wht	10	5b		5b	
6	red/blu		11	6a	Port 6	6a	
		blu/red	12	6b		6b	
7	red/ora		13	7a	Port 7	7a	
		ora/red	14	7b		7b	
8	red/grn		15	8a	Port 8	8a	
		grn/red	16	8b		8b	
9	red/brn		17		Free		
		brn/red	18				
10	red/grn		19		Free		
		grn/red	20				
11	blk/blu		24		Free		
		blu/blk	25				
12	blk/ora		26		Free		
		ora/blk	27				
13	blk/grn		29		Free		
		grn/blk	30				
14	blk/brn		31		Free		
		brn/blk	32				

Table 3-139 TMANI - SIVAPAC Connector Assignment on the Backplane

Pair	a-wire (Tip)	b-wire (Ring)	SIVAPAC connector	TMANI		MDFU-E	Notes
15	blk/grn		34		Free		
		grn/blk	35				
16	yel/blu		37		Free		
		blu/yel	38				

Table 3-139 TMANI - SIVAPAC Connector Assignment on the Backplane

RJ45 jack		TMANI	Notes
No.	Pin		
1	4	1a	
	5	1b	
2	4	2a	
	5	2b	
3	4	3a	
	5	3b	
4	4	4a	
	5	4b	
5	4	5a	
	5	5b	
6	4	6a	
	5	6b	
7	4	7a	
	5	7b	
8	4	8a	
	5	8b	
9	4		Free
	5		
10	4		Free
	5		
11	4		Free
	5		
12	4		Free
	5		
13	4		Free
	5		

Table 3-140 TMANI - Connector Panel Assignment with RJ45 Jacks

RJ45 jack		TMANI	Notes
No.	Pin		
14	4		Free
	5		
15	4		Free
	5		
16	4		Free
	5		
17	4		Free
	5		
18	4		Free
	5		
19	4		Free
	5		
20	4		Free
	5		
21	4		Free
	5		
22	4		Free
	5		
23	4		Free
	5		
24	4		Free
	5		

Table 3-140 TMANI - Connector Panel Assignment with RJ45 Jacks

CHAMP jack	TMANI			Notes
1	1a	1 Ring	Port 1	
26	1b	1 Tip		
2	2a	2 Ring	Port 2	
27	2b	2 Tip		
3	3a	3 Ring	Port 3	
28	3b	3 Tip		
4	4a	4 Ring	Port 4	
29	4b	4 Tip		

Table 3-141 TMANI - Connector Panel Assignment with CHAMP Jack (for U.S. only)

CHAMP jack	TMANI			Notes
5	5a	5 Ring	Port 5	
30	5b	5 Tip		
6	6a	6 Ring	Port 6	
31	6b	6 Tip		
7	7a	7 Ring	Port 7	
32	7b	7 Tip		
8	8a	8 Ring	Port 8	
33	8b	8 Tip		
9			Free	
34				
10			Free	
35				
11			Free	
36				
12			Free	
37				
13			Free	
38				
14			Free	
39				
15			Free	
40				
16			Free	
41				

Table 3-141 TMANI - Connector Panel Assignment with CHAMP Jack (for U.S. only)

3.46.5 Example for configuring the TMANI Board (Germany)

Configuring the TMANI board for other countries please notice the specific ptime values for each country see Section 3.46.6, “PTIMES”.

```
ADD-BCSU:MTYPE=PER,LTG=1,LTU=2,SLOT=79,PARTNO="Q2327-
X100",FCTID=0,LWVAR="0",HWYBDL=A,ALARMNO=0;
```

```
ADD-BUEND:TGRP=40,NAME="HKZ-TMANI
",NO=8,TRACENO=0,ACDTHRH=*,PRIONO=1,TDDRFLAG=ON,GDTRRULE=0,ACDPMGRP=0,CHARC
ON=NEUTRAL;
```

```
ADD-COSSU:NEWCOS=8,INFO="TMANI";
CHANGE-COSSU:TYPE=COS,COS=8,AVCE=TA&TSUID&TNOTCR&TTT;
CHANGE-COSSU:TYPE=COS,COS=8,AFAX=NOCO&NOTIE;
CHANGE-COSSU:TYPE=COS,COS=8,ADTE=NOCO&NOTIE;
CHANGE-COSSU:TYPE=LCOSV,LCOSV=1,COPIN=0;
CHANGE-COSSU:TYPE=LCOSV,LCOSV=1,INFO="LCR ATTENDANT FOR VOICE";
```

```
ADD-
COP:COPNO=40,PAR=DTMF&SFRM&RLSA&BR64&TDED&NO1A&DITW&TIM1&NSDL&IDP2&DTM1;
CHANGE-COP:COPNO=40,COPTYPE=COPADD,DEV=INDEP,INFO="TMANI-DTMF";
```

```
ADD-COT:COTNO=40,PAR=XFER&CHRT&NTON;
CHANGE-COT:COTNO=40,COTTYPE=COTADD,DEV=INDEP,INFO="TMANI-DTMF";
```

```
ADD-LODR:ODR=99,CMD=ECHO,FIELD=2;
ADD-LODR:ODR=99,CMD=END;
ADD-LODR:ODR=99,INFO="NQ A2 OPEN";
```

```
COPY-PTIME:INIBLOCK=119,TBLK=13;
```

```
ADD-TACSU:PEN=1-2-79-
0,COTNO=40,COPNO=40,DPLN=0,ITR=0,COS=8,LCOSV=1,LCOSD=1,TGRP=40,COFIDX=0,CCT
="8102159AB001",DESTNO=0,ALARMNO=2,CARRIER=1,ZONE=EMPTY,LIN=0,CIDDGTS=NONE,
CBMATTR=NONE,SRCGRP=0,CLASSMRK=EC&G711&G729AOPT,TCCID="
",DITIDX=0,TRTBL=GDTR,RULEIDX=0,INS=Y,DEVTYPE=TC,DEV=TMANIMSG,MFCVAR=0,DGTP
R=4808,SUPPRESS=0,DGTCNT=0,TESTNO=1,CIRCIDX=13,CDRINT=1,CCTINFO=0,DIALTYPE=
DTMF-DTMF,DIALVAR=0-0,COEX=0;
```

```
ADD-RICHT:MODE=LRTENEW,LRTE=40,LSVC=VCE,NAME="HKZ-TMANI
",TGRP=40,DNNO=1,REROUT=NO,DTMFTEXT="",ROUTATT=NO,EMCYRTT=NO,INFO="",PDNNO=
0,CHARCON=NEUTRAL,CONFTONE=NO,RERINGRP=NO,NOPRCFWD=NO,NITO=NO,CLNAMEDL=NO,F
WDSWTCH=NO;
```

```
ADD-
LDAT:LROUTE=40,LSVC=VCE,LVAL=1,TGRP=40,ODR=99,LAUTH=1,CARRIER=1,ZONE=EMPTY,
LATTR=NONE,VCCYC=4;
```

```
ADD-WABE:CD=555,DAR=CO,CHECK=N;
```

```
ADD-LDPLN:LCRCONF=LCRPATT,DIPLNUM=0,LDP=555-X,LROUTE=40,LAUTH=1,PINDP=N;
```

3.46.6 PTIMES

Country	Input impedance	Balance Impedance	Attenuation A-D	Attenuation D-A	COEX	P12	P14	P5	P6	P 11	P 13
Algeria	220+820// 115n	220+820// 115n	-7,9	-2,9	5	16	2	76	97	6	0
	220+820// 115n	220+820// 115n	-4,9		5	16	1				
Argentina	600	600	-6	-1	0	0	0	12	65	6	0
Australia	220+820// 115n	220+820// 115n	-6	1	5	16	38	113	65	6	0
Austria	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0
Bahrain	370+620// 310n	300+1000// 220n	-8	2	14	0	14	76	97	6	0
			-5	-1			23				
	370+620// 310n	600	-8	2	13	0	14				
			-5	-1			23				
Belarus	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0
			-7	0			16				
Belgium	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0

Table 3-142 Ptime values for countries

Country	Input impedance	Balance Impedance	Attenuation A-D	Attenuation D-A	COEX	P12	P14	P5	P6	P 11	P 13	
Bangladesh	600	600	-5	-2	0	0	22	76	97	6	0	
			-7	0			16					
			0	-7			34					
Bolivia	220+820//115n	220+820//115n	-5	-2	5	16	22	76	97	6	0	
			-7	0			16					
	900	190+1400//105n	-6	-1	8	0	0					
	900	400+590//50n	-6	-1	7	0	0					
Brazil	900	900	-6	-1	3	16	0	12	65	6	0	
Bulgaria	270+750//150n	270+750//150n	-6	-1	4	16	0	140	97	0	0	
			-4	-3			27					
Cameroon	600	400+700//200n	-6	-1	1	0	0	76	97	6	0	
			-5	-2			22					
			0	-7			34					
Chile	600	400+700//200n	-5	-2	1	0	22	76	97	6	0	
			-6	-1			0					
			0	-7			34					
China	200+680//100n	200+680//100n	-6	-1	12	16	0	12	65	1	0	LL
			0	-3,5			35					SL
Colombia	220+820//115n	220+820//115n	-5	-2	5	16	22	76	97	6	0	
			-7	0			16					

Table 3-142 Ptime values for countries

Country	Input impedance	Balance Impedance	Atten uation A-D	Atten uation D-A	COEX	P12	P14	P5	P6	P 11	P 13
Costa Rica	600	100+820// 68n	-5,8	-1,3	5	0	19	76	97	6	0
	600	400+700// 200n	-5	-2	1	0	22				
			-6	-1			0				
			0	-7			34				
Cote D'Ivoire	600	400+700// 200n	-5	-2	1	0	22	76	97	6	0
			-6	-1			0				
			0	-7			34				
Croatia	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0
			-4	-3			27				
Czech Republic	270+750// 150n	270+750// 150n	-6	-1	4	16	0	76	97	6	0
Denmark	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0
Ecuador	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0
			-7	0			16				
Egypt											
Egypt	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0
			-7	0			16				

Table 3-142 Ptime values for countries

Country	Input impedance	Balance Impedance	Attenuation A-D	Attenuation D-A	COEX	P12	P14	P5	P6	P 11	P 13
El Salvador	600	100+820//68n	-7	0	5	0	16	76	97	6	0
			-5	-2			22				
			0	-7			34				
			-5,8	-1,3			19				
	600	400+700//200n	-5	-2	1	0	22				
			-6	-1			0				
			0	-7			34				
Estonia	270+750//150n	270+750//150n	-6	-1	4	16	0	140	97	0	0
			-4	-3			27				
Europe	270+750//150n	270+750//150n	-6	-1	4	16	0	140	97	0	0
Finland	270+750//150n	270+750//150n	-6	-1	4	16	0	140	97	0	0
France	270+750//150n	270+750//150n	-6	-1	4	16	0	140	97	0	0
Ghana	600	400+700//200n	-6	-1	1	0	0	76	97	6	0
			-5	-2			22				
			0	-7			34				
Greece	270+750//150n	270+750//150n	-6	-1	4	16	0	140	97	0	0
Guatemala											

Table 3-142 Ptime values for countries

Country	Input impedance	Balance Impedance	Attenuation A-D	Attenuation D-A	COEX	P12	P14	P5	P6	P 11	P 13	
Guatemala	600	100+820// 68n	-5,8	-1,3	5	0	19	76	97	6	0	
			-7	0			16					
			-5	-2			22					
			0	-7			34					
Hongkong	600	600	-7	0	0	0	16	12	65	6	0	
Honduras	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0	
			-7	0			16					
Hungary	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	6	0	
Indonesia	600	600	-7	0	0	0	16	12	65	6	0	
India	600	600	-7	-0,5	0	0	37	12	65	6	0	SL
			-9	2			12					LL
Ireland	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	6	0	
Iran	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0	
			-7	0			16					
Israel	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0	
			-7	0			16					
Italy	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0	
Japan	600	600	-4	-3	0	0	27	76	97	6	0	
			-3	-4			30					
			-7	0			16					
			-5	-2			22					

Table 3-142 Ptime values for countries

Country	Input impedance	Balance Impedance	Attenuation A-D	Attenuation D-A	COEX	P12	P14	P5	P6	P11	P13
Jordan	600	400+700// 200n	-6	-1	1	0	0	76	97	6	0
			-5	-2			22				
			0	-7			34				
Kenya	600	400+700// 200n	-5	-2	1	0	22	76	97	6	0
			-6	-1			0				
			0	-7			34				
Kuwait	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0
			-7	0			16				
Latvia	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0
			-4	-3			27				
Libyan Arab Jamahiriya	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0
			-7	0			16				
Liberia	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0
			-7	0			16				
Lithuania	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0
			-4	-3			27				
Luxembourg	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0
			-4	-3			27				
Malaysia	600	400+700// 200n	-7	-0,5	1	0	37	5	65	1	0
Morocco	270+750// 150n	270+750// 150n	-6	-1	4	16	0	76	97	6	0

Table 3-142 Ptime values for countries

Country	Input impedance	Balance Impedance	Atten uation A-D	Atten uation D-A	COEX	P12	P14	P5	P6	P 11	P 13
Macedonia	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0
			-4	-3			27				
Mexico	600	220+820// 115n	-5,8	-1,3	3	0	19	76	97	6	0
Myanmar	600	600	-5	-2	0	0	22	76	97	6	0
			-7	0			16				
			0	-7			34				
Netherlands	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0
			-4	-3			27				
			0	-7			34				
Nigeria	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0
			-7	0			16				
Nicaragua	600	100+820// 68n	-7	0	5	0	16	76	97	6	0
			-5	-2			22				
			0	-7			34				
	600	400+700// 200n	-5	-2	1	0	22				
			-6	-1			0				
			0	-7			34				
Norway	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0
New Zealand	370+620// 310nF	370+620// 310nF	-6	-0,5	6	16	17	76	97	6	0

Table 3-142 Ptime values for countries

Country	Input impedance	Balance Impedance	Attenuation A-D	Attenuation D-A	COEX	P12	P14	P5	P6	P 11	P 13	
Oman	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0	
			-7	0			16					
Pakistan	600	400+700// 200n	-7	-0,5	1	0	37	5	65	6	0	
Panama	600	100+820// 68n	-7	0	5	0	16	76	97	6	0	
			-5	-2			22					
			0	-7			34					
			-5,8	-1,3			19					
	600	400+700// 200n	-5	-2	1	0	22					
			-6	-1			0					
			0	-7			34					
Paraguay	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0	
			-7	0			16					
Philippines	900	900	-7	0	3	16	16	5	65	6	0	LL
			-5	-2			22					SL
Poland	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0	
Portugal	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0	

Table 3-142 Ptime values for countries

Country	Input impedance	Balance Impedance	Attenuation A-D	Attenuation D-A	COEX	P12	P14	P5	P6	P 11	P 13	
Peru	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0	
			-7	0			16					
	900	190+1400// 105n	-6	-1	8	0	0					
	900	400+590// 50n	-6	-1	7	0	0					
Qatar	220+820// 115n	220+820// 115n	-7	0	5	16	16	76	97	6	0	
			-5	-2			22					
Republic of Korea	600	600	-7	0	0	0	16	12	65	11	0	LL
			-4	-3			27					SL
Republic of South Africa	220+820// 115n	220+820// 115n	-6	-1	5	16	0	12	65	8	0	
Romania	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0	
			-4	-3			27					
Russian Federation	150+510// 47nF (600+2,16uF)	150+510// 47nF	-6	-1	2	32	0	76	97	6	0	LL
			-3,5	-3,5			29					SL
Rwanda	600	400+700// 200n	-5	-2	1	0	22	76	97	6	0	
			-6	-1			0					
			0	-7			34					
Saudi Arabia	220+820// 115n	220+820// 115n	-7	0	5	16	16	76	97	6	0	
			-5	-2			22					

Table 3-142 Ptime values for countries

Country	Input impedance	Balance Impedance	Attenuation A-D	Attenuation D-A	COEX	P12	P14	P5	P6	P 11	P 13
Senegal	220+820// 115n	220+820// 115n	-7,9	2,9	5	16	2	76	97	6	0
			-4,9	-5,9			1				
Singapore	600	400+700// 200n	-6	-1	1	0	0	140	97	1	0
Slovenia	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0
			-4	-3			27				
Spain	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0
Slovakia	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0
			-4	-3			27				
			0	-7			34				
Sudan	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0
			-7	0			16				
Switzerland	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0
			-4	-3			27				
Syrian Arab Republic	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0
			-7	0			16				
Thailand	600	600	-6	-1	0	0	0	5	65	6	0
Turkey	600	600	-6	-1	0	0	0	140	97	0	0
Tunisia	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0
			-4	-3			27				
United Arab Emirates	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0
			-7	0			16				

Table 3-142 Ptime values for countries

Country	Input impedance	Balance Impedance	Atten uation A-D	Atten uation D-A	COEX	P12	P14	P5	P6	P 11	P 13
United Republic Tanzania	600	400+700// 200n	-5	-2	1	0	22	76	97	6	0
			-6	-1			0				
			0	-7			34				
Uruguay	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0
			-7	0			16				
United Kingdom	270+750// 150n	270+750// 150n	-6	-1	4	16	0	140	97	0	0
United States of America	600	600	-3	3	0	0	5	76	97	6	0
Venezuela	220+820// 115n	220+820// 115n	-5	-2	5	16	22	76	97	6	0
			-7	0			16				
			-5,8	-1,3			19				

Table 3-142 Ptime values for countries

Country	Input impedance	Balance Impedance	Attenuation A-D	Attenuation D-A	COEX	P12	P14	P5	P6	P 11	P 13
Viet Nam	200+680// 100n	100+820// 68n	-4	-3	2	16	27	12	65	7	0
			-3	-4			30				
			0	-3,5			35				
			0	-7			34				
	200+680// 100n	200+680// 100n	0	-3,5	12	16	35				
	200+680// 100n	600	-3	-4	1	16	30				
	600	100+820// 68n	-4	-3	5	0	27				
	600	200+680// 100n	0	-3,5	4	0	35				
	600	600	-7	0	0	0	16				
			-5	-2			22				
			-4	-3			27				
			-3	-4			30				
			0	-3,5			35				
			0	-7			34				

Table 3-142 Ptime values for countries

<table>
<tr><th>Country</th><th>Input impedance</th><th>Balance Impedance</th><th>Atten uation A-D</th><th>Atten uation D-A</th><th>C O E X</th><th>P12</th><th>P14</th><th>P5</th><th>P6</th><th>P 11</th><th>P 13</th></tr>
<tr><td rowspan="4">Yemen</td><td rowspan="2">370+620// 310n</td><td rowspan="2">300+1000// 220n</td><td>-8</td><td>2</td><td rowspan="2">14</td><td rowspan="2">0</td><td>14</td><td rowspan="4">76</td><td rowspan="4">97</td><td rowspan="4">6</td><td rowspan="4">0</td></tr>
<tr><td>-5</td><td>-1</td><td>23</td></tr>
<tr><td rowspan="2">370+620// 310n</td><td rowspan="2">600</td><td>-8</td><td>2</td><td rowspan="2">13</td><td rowspan="2">0</td><td>14</td></tr>
<tr><td>-5</td><td>-1</td><td>23</td></tr>
<tr><td rowspan="3">Zimbabwe</td><td rowspan="3">600</td><td rowspan="3">400+700// 200n</td><td>-5</td><td>-2</td><td rowspan="3">1</td><td rowspan="3">0</td><td>22</td><td rowspan="3">76</td><td rowspan="3">97</td><td rowspan="3">6</td><td rowspan="3">0</td></tr>
<tr><td>-6</td><td>-1</td><td>0</td></tr>
<tr><td>0</td><td>-7</td><td>34</td></tr>
</table>

Table 3-142 Ptime values for countries

SL = Short Line

LL = Long Line

3.47 TMBD

The trunk module Bundespost Deutschland (TMBD) trunk module has four circuits for every board. It can be used for signalling with main station interfaces (MOSIG) as well as DID with pulse signalling system. In any case, one-way and bothway operations with or without 16 KHz call charge registration is possible.

The operating mode is set using circuit data. The individual circuits on the board can be operated in different modes.

3.47.1 LED Indications

The front panel of the board has four LEDs and four disable keys (see Figure 3-109).

DIP-FIX-Switches

The TMBD board has three DIP-FIX switches for every circuit which allow setting of call data registration and line attenuation levels.

The board has a separate blocking key for each circuit.

When testing with the dial testing device, the board should be set to short-line, since feedback may occur with other settings.

Table 3-143 lists the DIP switches for call detail recording (CDR).

SET	DIP-FIX	Function	Variant	OFF[1)] long line	ON short line
0 1 2 3	SPU 1 SPU 2 SPU 3 SPU 4	Transmit level 16 kHz	A200 X200 X300	+ 22 dB bis - 5 dB	- 5 dB bis - 21 dB
[1)] Delivered state					

Table 3-143 TMBD DIP-FIX Switches for CDR

Table 3-144 lists the DIP switches for line adaptation.

SET	DIP-FIX	Function	Variant	OFF 1) long line	ON short line
0 1 2 3	SUR 1 2) SUR 2 SUR 3 SUR 4	Transmit digital - analog	A200 X200 X300	- 0,5 dBr - 2 dBr - 0 dBr	 - 4 dBr - 2 dBr
0 1 2 3	SUT 1 2) SUT 2 SUT 3 SUT 4	Receive analog - digital	A200 X200 X300	-6,5 dBr - 5,0 dBr - 7,0 dBr	 - 3.0 dBr - 5.0 dBr
1) 2)	Delivered status The DIP-FIX switches SUR and SUT are provided as a pair for each circuit. These have been replaced by fixed resistances for the A200 variant.				

Table 3-144 TMBD, DIP-FIX Switches for Line Adaptation

Figure 3-109 shows a side view of the TMBD board.

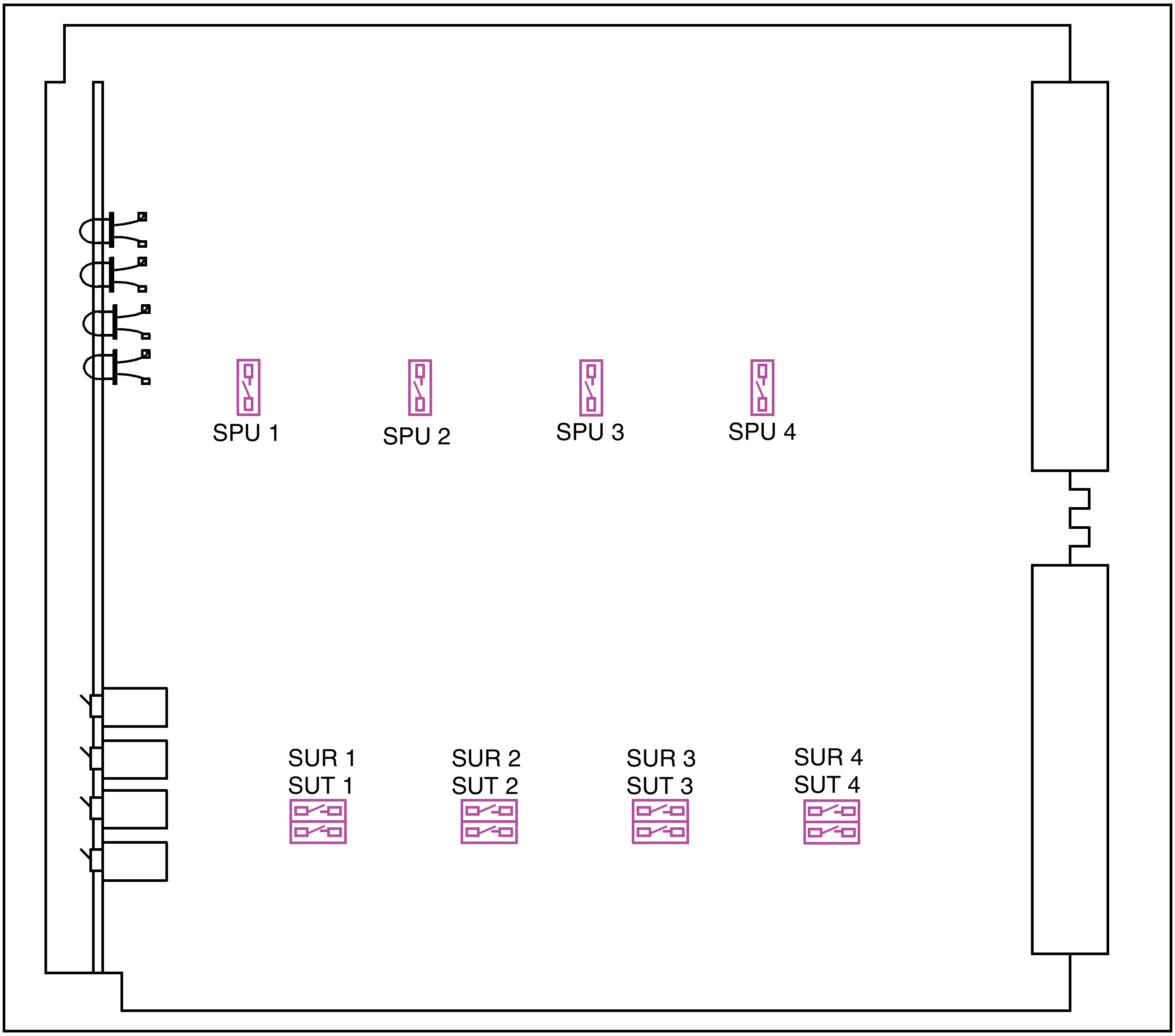


Figure 3-109 TMBD Board

3.48 TMC16

A 16-channel central office trunk module (TMC16) board interfaces between central office trunks and the system by means of the LTUW and L80XF shelf backplane. It has 16 channels for connection to ground-start or loop-start trunks from the central office (CO). The TMC16 supports outbound calls and all incoming calls that are typically routed to the attendant console.

There are two versions of the TMC16 board. One version has SIVAPAC connectors and the other has a SIPAC connector. The SIVAPAC version (Model S30810-Q2475-X) requires SIVAPAC-to-SIPAC adapter or U.S. system migrations. The SIPAC version (Model S30810-Q2485-X) does not require any connector adapter and is available for new sales and system migrations in the U.S.

Figure 3-110 shows a block diagram of a TMC16 board and the SWU.

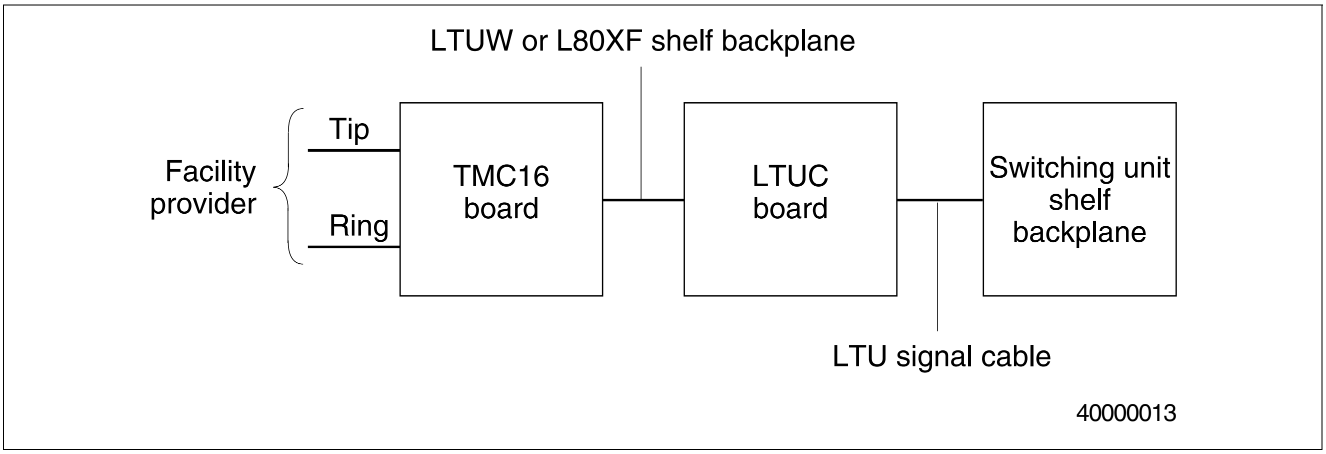


Figure 3-110 TMC16 Block Diagram

3.48.1 LED Indications

The front panel of the TMC16 board (Figure 3-111) contains two LEDs.

Refer to Table 3-145 for LED indications of the TMC16 board

Figure 3-111 TMC16 Board Front Panel

Red LED	Green LED	Indication
On	Off	The board has initial power applied.
Flashing	Off	The board is being loaded with loadware.
On	Off	The board is defective or out-of-service
Off	On	The board is operational and all channels are on the on-hook state.
Off	Flashing	The board is operational and one or more channels are in the off-hook state.

Table 3-145 TMC16 Board LED Indications

3.48.2 Removing the TMC16 Board

Warning
This procedure removes all the channels on this trunk board from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

To remove the TMC16 board:

1. Deactivate all channels on the board as follows:

   a) Type **DEA-DSSU** and press **Enter**.

   b) Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	DC
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

   PEN1 is the PEN of the first channel, and PEN2 is the PEN of the last channel on the board.

2. Deactivate the board as follows:

a) Type **DEA-BSSU** and press **Enter**.

b) Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	DC
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
REFOFF	<blank>

3. Wait for all LEDs to reach a fast flashing state (this indicates that the board is down).
4. Using the board extractor, unseat the board and remove it from the shelf.

3.48.3 Replacing the TMC16 Board

To replace the TMC16 board:

> If you are replacing a TMCOT with a TMC16 or TMC16P board, change the hardware ID and the board type to TMC16 using CHANGE-BCSU.

1. Slide the board into the appropriate slot until it seats firmly into the backplane connector.
2. Activate the board as follows:

a) Type **ACT-BSSU** and press **Enter**.

b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>

3. Activate the channels as follows:

a) Type **ACT-DSSU** and press **Enter**.

b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

PEN1 is the PEN of the first channel, and PEN2 is the PEN of the last channel on the board.

3.48.4 Verifying the TMC16 Board

To verify the operation of the TMC16 board, confirm that all LEDs have stopped flashing.

3.48.5 MDF Assignments

For U.S. installations requiring overcurrent protection devices refer to the *Siemens Secondary Protection Guide*, G281-0070.

Table 3-146 shows the U.S. standard trunk board punch-down sequence. Each channel uses one tip and ring pair. Label the block from channel 00 through 15 or 23, as appropriate.

Pair No.	Wire Color	Channel No.	Pair No.	Wire Color	Channel No.
1	WHT-BLU BLU-WHT	00	14	BLK-BRN BRN-BLK	13
2	WHT-ORG ORG-WHT	01	15	BLK-SLT SLT-BLK	14
3	WHT-GRN GRN-WHT	02	16	YEL-BLU BLU-YEL	15
4	WHT-BRN BRN-WHT	03	17	YEL-ORG ORG-YEL	16
5	WHT-SLT SLT-WHT	04	18	YEL-GRN GRN-YEL	17
6	RED-BLU BLU-RED	05	19	YEL-BRN BRN-YEL	18
7	RED-ORG ORG-RED	06	20	YEL-SLT SLT-YEL	19
8	RED-GRN GRN-RED	07	21	VIO-BLU BLU-VIO	20
9	RED-BRN BRN-RED	08	22	VIO-ORG ORG-VIO	21

Table 3-146 TMC16 Board MDF Punch-Down Sequence (Seite 1 von 2)

Pair No.	Wire Color	Channel No.	Pair No.	Wire Color	Channel No.
10	RED-SLT SLT-RED	09	23	VIO-GRN GRN-VIO	22
11	BLK-BLU BLU-BLK	10	24	VIO-BRN BRN-VIO	23
12	BLK-ORG ORG-BLK	11	25	VIO-SLT SLT-VIO	Not used.
13	BLK-GRN GRN-BLK	12			

Table 3-146 TMC16 Board MDF Punch-Down Sequence (Seite 2 von 2)

3.49 TMCOW

The trunk module central office world (TMCOW) board is a two-wire interface to analog public network exchanges (central office) with loop signaling for

- Outgoing traffic with pulse dialing or DTMF dialing
- Incoming traffic to the attendant console

The board consists of eight circuits. It replaces the TMLRW, TMLRS, TMEDG and TMELS boards.

- Line signaling
  - Impedance in idle state
  - Ring detection (16 2/3 Hz, 20 ... 50 Hz)
  - Seizure / answering by means of loop closure
  - Pulse signaling or DTMF signaling by means of SIU
  - Ground to a-wire or ground to b-wire
  - Exchange polarity reversal detection
  - Call charge pulse detection (50 Hz, 12 kHz, 16 kHz)
- Signaling systems
  - MOSIG
  - Loop-Start
  - Ground-Start

Figure 3-112 shows the side view of the TMCOW board.

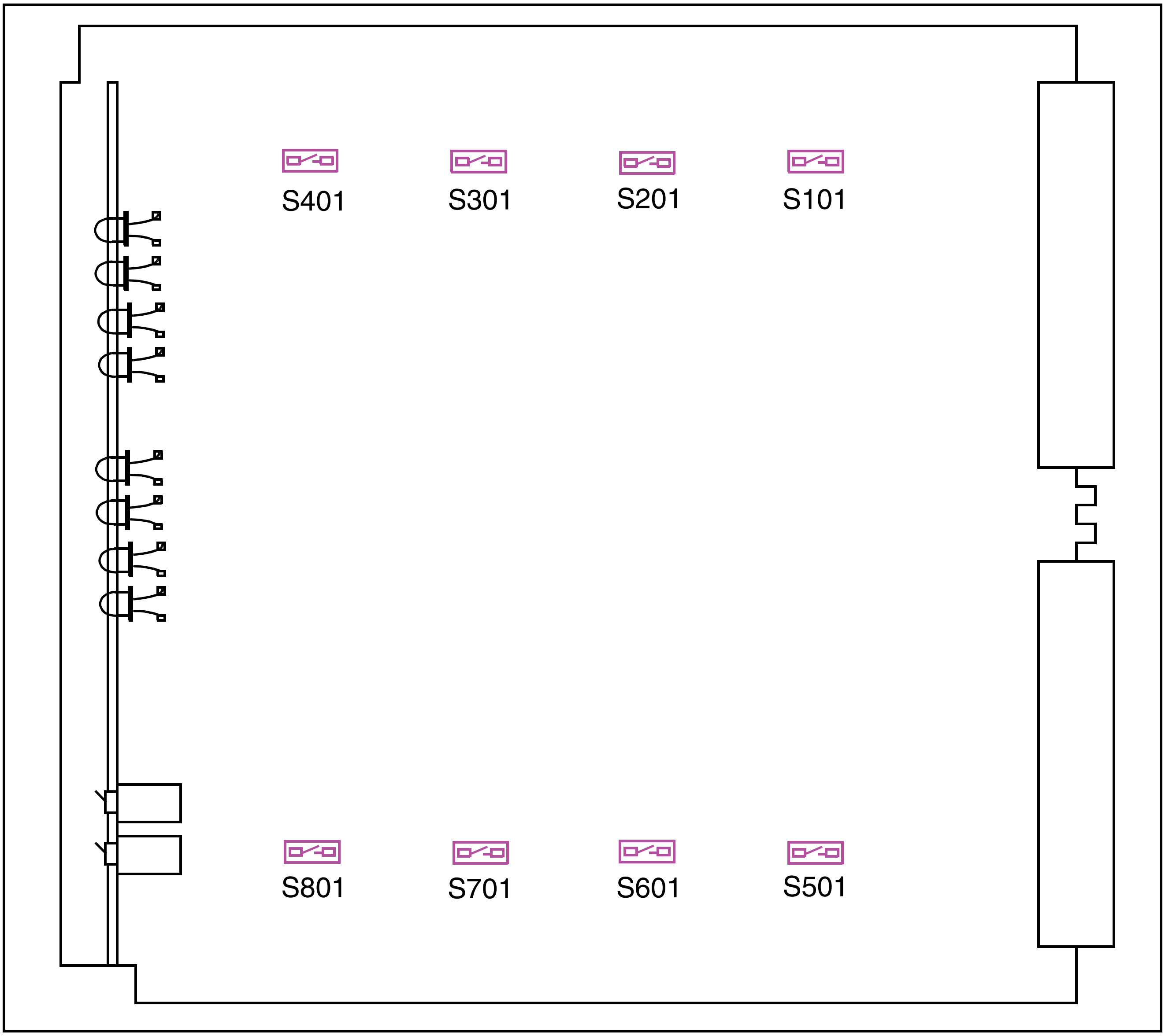


Figure 3-112 TMCOW Board

3.49.1 Module Variants

Table 3-147 lists the variants of the TMCOW board.

Variant Q2288-	Country
X	L

Table 3-147 TMCOW Board Variants

Variant Q2288-	Country
X10	B
X20	B
X30	RSA
X40	PRC (ASEAN)
X50	SF
X110	I
X120	H, IRL
X300	MEX
X310	BRA

Table 3-147 TMCOW Board Variants

3.49.2 LED Indications

The front panel of the board contains eight LEDs and two keys (see Figure 3-112).

The busy status of each circuit is indicated by a separate LED. The first key selects the circuit. The second key locks the circuit

3.49.3 DIP-FIX Switches

The DIP switches allows five different loop resistances to be set on the TMCOW board, depending on the line resistance (RL). The values shown in Table 3-148 are calculated on the basis of 20 mA direct current with a battery voltage of 45 V and 2 x 400 Ohms impedance in the exchange.

Switches			**2 x RL**	**RDC**
1	**2**	**3**		
OFF	OFF	OFF	2 x 530 Ω	380 Ω
ON	OFF	OFF	2 x 430 Ω	590 Ω
OFF	ON	OFF	2 x 385 Ω	680 Ω
OFF	OFF	ON	2 x 280 Ω	890 Ω
ON	OFF	ON	2 x 185 Ω	1080 Ω

Table 3-148 TMCOW Board DIP Switch Settings for Line Adaptation

3.49.4 Call Charge Pulse Detection at 50 Hz

Table 3-149 lists the three different receiver sensitivity values that can be set for 50-Hz call charge pulses.

Switches			**Receiver Sensitivity**
4	**5**	**6**	
ON	OFF	OFF	30 V rms
OFF	ON	OFF	45 V rms
OFF	OFF	ON	66 V rms

Table 3-149 TMCOW board, Receiver Sesitivity Levels

3.49.5 Loop Grounding

To set loop grounding, set the DIP switches as follows:

- Switch 7 ON: a-wire grounded with 27 Ω
- Switch 8 ON: b-wire grounded with 360 Ω

Table 3-150 lists the DIP switch settings for the TMCOW board.

Switches		**Countries**
7	**8**	
OFF	ON	China, United Kingdom
ON	OFF	Rest of world
Never set both switches to ON!		

Table 3-150 TMCOW board, DIP -FIX switches 7 and 8

3.49.6 Loadware Variants

Table 3-151 lists the loadware variants for the TMCOW board.

CTRY	**Input**	**Artificial Line**	**Line Loss**	**Line**
B	150+(830//72nF)	150+(830//72nF)	-4/-3	short
B	150+(830//72nF)	150+(830//72nF)	-6/-1	long
PRC	600 Ω	600 Ω	-3/-4	

Table 3-151 TMCOW Board Loadware Variants

CTRY	Input	Artificial Line	Line Loss	Line
PRC	600 Ω	600 Ω	-4/-3	
PRC	200+(680//100nF)	600 Ω	-3/-4	
PRC	200+(680//100nF)	100+(820//68nF)	-4/-3	
PRC	600 Ω	100+(820//68nF)	-4/-3	
PRC	200+(680//100nF)	100+(820//68nF)	-3/-4	
GB	370+(620//310nF)	300+(1000//220nF)	-8/-2	
I	600 Ω	400+(700//200nF)	-5/-2	
I	600 Ω	400+(700//200nF)	-6/-1	
I	600 Ω	400+(700//200nF)	0/-7	
L	220+(820//115nF)	220+(820//115nF)	-5/-2	short
L	220+(820//115nF)	220+(820//115nF)	-7/0	long
RSA	220+(820//115nF)	220+(820//115nF)	-5/0	

Table 3-151 TMCOW Board Loadware Variants

Table 3-152 lists the line attenuation values for the TMCOW board.

Cable wire gauge (mm)	Line impedance (Ω/km)	Line loss (dB/km)	Line length at	
			2 dB (km)	3 dB (km)
0.6	2 x 62.5	1	2	3
0.4	2 x 135	1.8	1.1	1.7

Table 3-152 TMCOW, Line Attenuation Values

Table 3-153 lists the countries of application for the TMCOW and reference boards.

CTRY	TMCOW					Reference Board			
	HW Variant Q2288-	LW Variant PZGTCOWx	Call charge pulse	Line length	COFI Index	Name	HW Ref. No.	LW Variant PZG..	COFI Index
ARG	X200	I	50 Hz		0	TMLRW	Q2088-X200	TLRW0	6
B	X10	3	16 kHz	long	0	TMLRW	Q2088-X1	TLRW0	1
	X20	3	16 kHz	short	1	TMLRW	Q2088-X1	TLRW0	0
PRC	X40	C	16 kHz			TMGSR, TMELS	Q2075-X101 Q2272-X	TMGS1 TEDG1	0...5 0...5
SF	X50	8	16 kHz			TMLRW	Q2088-X3	TLRW0	4

Table 3-153 TMCOW, Countries of Application and Reference Boards

C T R Y	TMCOW					Reference Board			
	HW Variant Q2288-	**LW Variant PZGTCOWx**	**Call charge pulse**	**Line length**	**COFI Index**	**Name**	**HW Ref. No.**	**LW Variant PZG..**	**COFI Index**
GB	X230	7	50 Hz	long	0	TMEDG	Q2172-X200	0	0 / 1
I	X110	D	12 kHz	l/m/s	0/1/2	TMLRW	Q2088-X101	TLRW2	0/-/1
LUX	X	L	16 kHz	long/short	0/1	TMLRW	Q2088-X	TLRW1	5 / 4
MLD						TMGSR	Q2075-X101	TMGS1	6 / 7
MEX	X300	G	none		0	TMLRW	Q2088-X200	TLRW0	6
RSA	X30	6	16 kHz		0	TMLRW	Q2088-X300	TLRW1	3
l/m/s = long/medium/short									

Table 3-153 TMCOW, Countries of Application and Reference Boards

Table 3-154 lists the TMCOW hardware compatibility to narrowband and broadband switches.

TMCOW HW Version	TRIC (23-80 Hz) PTIME P9=1	Narrowband Switch (13-33Hz) PTIME P9=0	Broadband Switch (13-80Hz) PTIME P9=2
S30810-Q2288-X	bis -Q2288-X-7		ab S30810-Q2288-X-8
S30810-Q2288-X10	bis -Q2288-X10-4		ab S30810-Q2288-X10-5
S30810-Q2288-X20	bis -Q2288-X20-4		ab S30810-Q2288-X20-5
S30810-Q2288-X40	bis -Q2288-X40-5		ab S30810-Q2288-X40-6
S30810-Q2288-X50		bis -Q2288-X50-3	ab S30810-Q2288-X50-4
S30810-Q2288-X60			ab S30810-Q2288-X60-1
S30810-Q2288-X100			ab S30810-Q2288-X100-1
S30810-Q2288-X120		bis -Q2288-X120-2	ab S30810-Q2288-X120-3
S30810-Q2288-X130			ab S30810-Q2288-X130-1

Table 3-154 TMCOW Board Hardware Compatibility

3.50 TMDID

The trunk module direct inward dialing (TMDID) board provides eight channels to an interface to the public switching network. It supports incoming calls only and permits these calls to directly reach the target extension without the assistance of an operator. The calls are routed to the SWU through the LTUW or L80XF shelf backplane and LTU signal cable.

Outbound calls cannot be routed over TMDID trunks.

Figure 3-113 shows an interface diagram of a TMDID board.

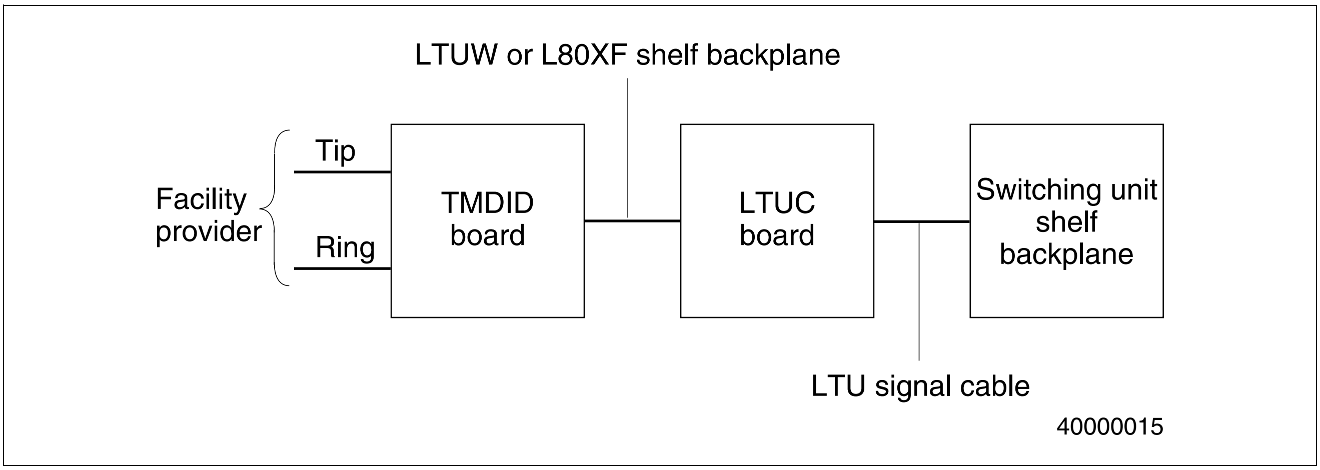


Figure 3-113 TMDID Board Block Diagram

3.50.1 LED Indications

The front panel of the TMDID board (Figure 3-114) contains eight channel and blocking status LEDs. Table 3-155 lists the LED indications for the TMDID board.

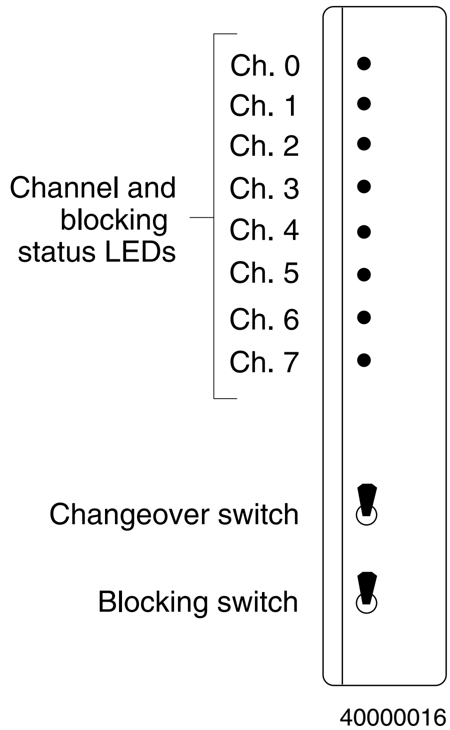


Figure 3-114 TMDID Board Front Panel

LED	State	Indication
All (green)	Off	The channel is idle, ready to use.
	On	The channel is seized by call processing software.
	Slow flash	The channel is deactivated by software.
	Rapid flash	The upper toggle switch is pressed down and the channel is selected for manual activation or deactivation.

Table 3-155 TMDID Board LED Indications

3.50.2 Switches

The TMDID board provides switches for manually selecting and blocking channels. The TMDID board (Figure 3-114) contains the following switches:

- A front panel changeover switch for manually selecting a channel by cycling through the channels until the status LED for the desired channel flashes
- A front panel blocking switch for manually blocking the selected channel

3.50.3 Removing the TMDID Board

Warning
This procedure will remove all the channels on this trunk board from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

Remove the TMDID board as follows:

1. Deactivate all channels on the board as follows:
   a) Type **DEA-DSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	DC
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

2. Deactivate the board as follows:
   a) Type **DEA-BSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	DC
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
REFOFF	<blank>

3. Wait until all LEDs on the board are flashing.
4. Using the board extractor, unseat the board and remove it from the shelf.

3.50.4 Replacing the TMDID Board

Replace the TMDID board as follows:

1. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
2. Activate the board as follows:
   a) Type **`ACT-BSSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
ONTYPE	AUL
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>

3. Activate the channels as follows:
   a) Type **`ACT-DSSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
ONTYPE	AUL
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

> PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

3.50.5 Verifying the TMDID Board

Verify operation of the TMDID board by displaying the status of all channels as follows:

1. Type **`DIS-SDSU`** and press **Enter**.
2. Type the following values, then press **Enter**.

Field	Value
LINK	<blank>
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
CCT	<blank>

3.50.6 MDF Assignments

In the U.S., cable punch-down is standard (refer to Table 3-156). Each channel uses one tip and ring pair. Label the block from 00 through 07.

For U.S. installations requiring overcurrent protection devices refer to the *Siemens Secondary Protection Guide*, G281-0070.

.

Pair No.	Wire Color	Channel No.	Pair No.	Wire Color	Channel No.
1	WHT-BLU BLU-WHT	00	14	BLK-BRN BRN-BLK	13
2	WHT-ORG ORG-WHT	01	15	BLK-SLT SLT-BLK	14
3	WHT-GRN GRN-WHT	02	16	YEL-BLU BLU-YEL	15
4	WHT-BRN BRN-WHT	03	17	YEL-ORG ORG-YEL	16
5	WHT-SLT SLT-WHT	04	18	YEL-GRN GRN-YEL	17
6	RED-BLU BLU-RED	05	19	YEL-BRN BRN-YEL	18
7	RED-ORG ORG-RED	06	20	YEL-SLT SLT-YEL	19
8	RED-GRN GRN-RED	07	21	VIO-BLU BLU-VIO	20
9	RED-BRN BRN-RED	08	22	VIO-ORG ORG-VIO	21
10	RED-SLT SLT-RED	09	23	VIO-GRN GRN-VIO	22
11	BLK-BLU BLU-BLK	10	24	VIO-BRN BRN-VIO	23
12	BLK-ORG ORG-BLK	11	25	VIO-SLT SLT-VIO	Not used.
13	BLK-GRN GRN-BLK	12			

Table 3-156 Standard Punch-Down Sequence

3.51 TMDID2 (for selected countries only)

The TMDID2 board (**T**runk **M**odule **D**irect **I**nward **D**ialing) provides direct inward dialing from the central office (CO) to HiPath 4000 V2.0 or later. It supports incoming calls only and permits these calls to directly reach the target extension without the assistance of an operator.

> Outbound calls cannot be routed over TMDID trunks.

The board has eight trunk circuits that connect to analog trunks. The board supports the protocols Wink Start, Delay Dial, and Immediate Start.

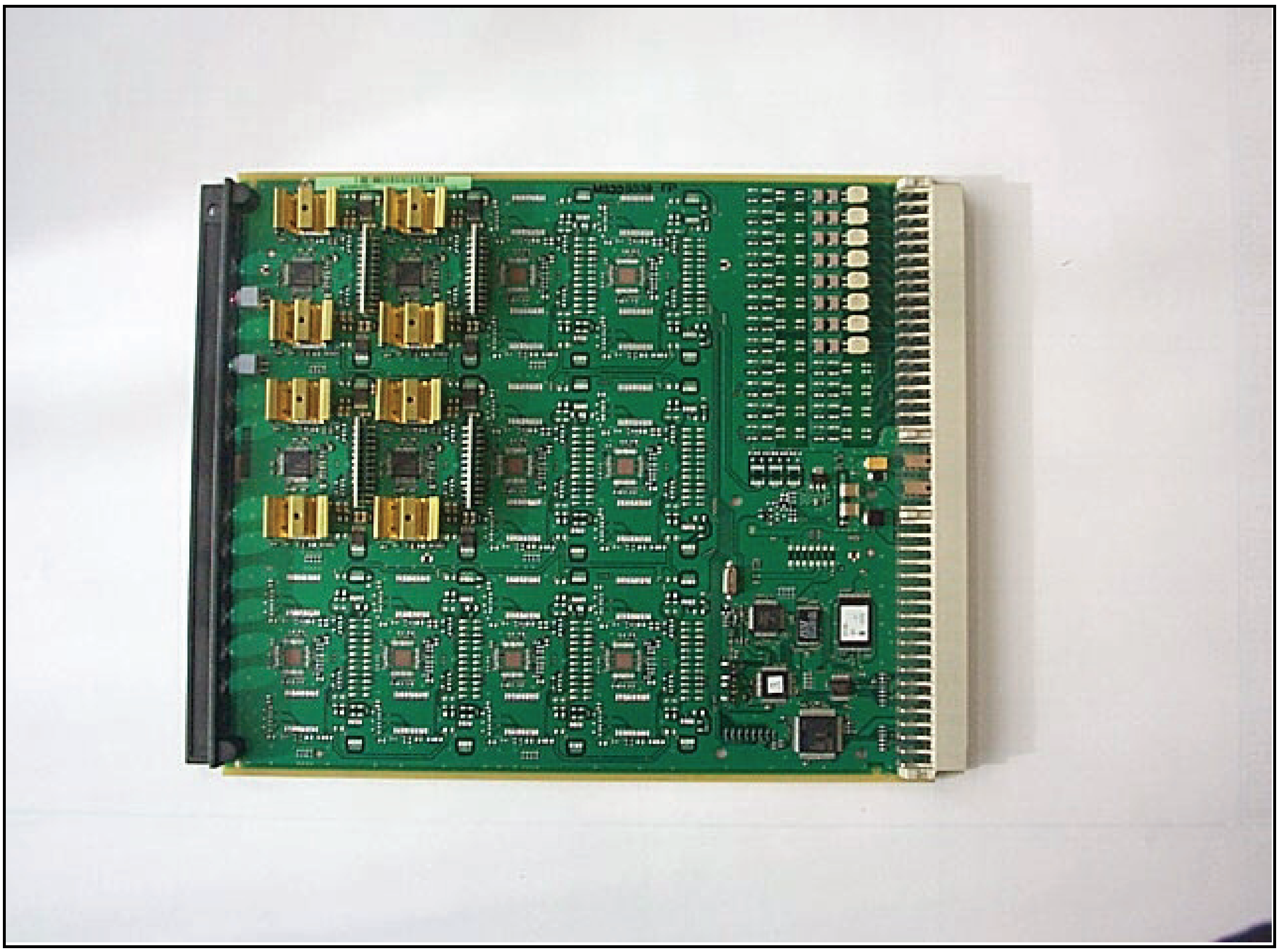


Figure 3-115 TMDID2 Board Type

3.51.1 Front Panel

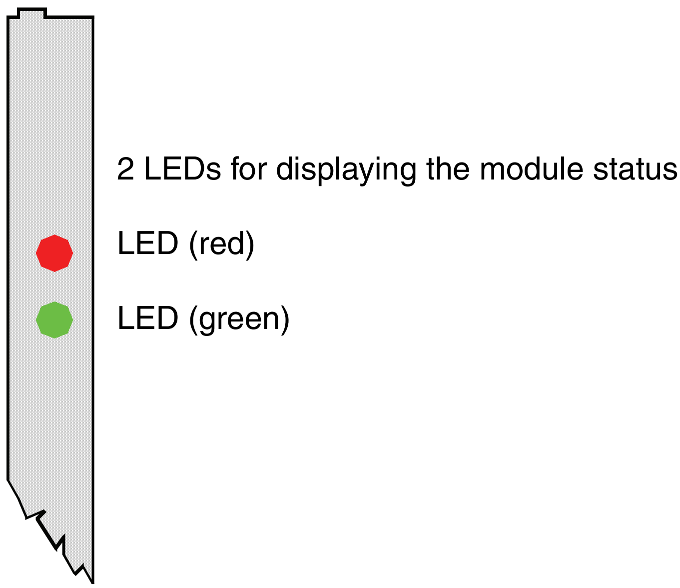


Figure 3-116 TMDID2 - Front Panel

> To ensure sufficient shielding, provide the board with a shielding panel.

3.51.2 LED Statuses and Their Meanings

Red LED	Green LED	Status	Action
Off	Off	Board not receiving power or not plugged in correctly. Board is out of order.	Check plug contact on board.
On	Off	Board is receiving power and board test is in progress. Board is defective if status remains unchanged (board test unsuccessful).	Replace board.
		Loadware loading not successfully completed. Board is faulty.	Replace board.
		Error detected on board. Board is deactivated (not applicable to errors detected by test loops) or board was deactivated using HiPath 4000 Manager E.	Check whether the board was deactivated using HiPath 4000 Manager E. If not, replace board.
Flashing	Off	Loadware is being loaded.	
Off	On	Board test completed successfully. Board is OK (idle state).	
Off	Flashing	At least one subscriber line circuit is activated.	

Table 3-157 LED Statuses and Their Meanings

3.51.3 Cable and Connector Assignment

- For connecting to the SIVAPAC connector on the backplane: Table 3-158
- For connecting to the connector panels using RJ45 jacks: Table 3-159
- For U.S. only: For connecting to the connector panels with a CHAMP jack: Table 3-160

Pair	a-Wire (Tip)	b-Wire (Ring)	SIVAPAC Connector	TMDID2		MDFU-E	Notes
1	wht/blu		1	1a	Port 1	1a	
		blu/wht	23	1b		1b	
2	wht/ora		3	2a	Port 2	2a	
		ora/wht	4	2b		2b	

Pair	a-Wire (Tip)	b-Wire (Ring)	SIVAPAC Connector	TMDID2		MDFU-E	Notes
3	wht/grn		5	3a	Port 3	3a	
		grn/wht	6	3b		3b	
4	wht/brn		7	4a	Port 4	4a	
		brn/wht	8	4b		4b	
5	wht/gry		9	5a	Port 5	5a	
		gry/wht	10	5b		5b	
6	red/blu		11	6a	Port 6	6a	
		blu/red	12	6b		6b	
7	red/ora		13	7a	Port 7	7a	
		ora/red	14	7b		7b	
8	red/grn		15	8a	Port 8	8a	
		grn/red	16	8b		8b	
9	red/brn		17		free		
		brn/red	18				
10	red/gry		19		free		
		gry/red	20				
11	blk/blu		24		free		
		blu/blk	25				
12	blk/ora		26		free		
		ora/blk	27				
13	blk/grn		29		free		
		grn/blk	30				
14	blk/brn		31		free		
		brn/blk	32				
15	blk/gry		34		free		
		gry/blk	35				
16	yel/blu		37		free		
		blu/yel	38				

Table 3-158 TMDID2 (for selected countries only) - SIVAPAC Connector Assignment on the Backplane

RJ45 jack		TMDID2	Notes
No.	Pin		
1	4	1a	
	5	1b	
2	4	2a	
	5	2b	
3	4	3a	
	5	3b	
4	4	4a	
	5	4b	
5	4	5a	
	5	5b	
6	4	6a	
	5	6b	
7	4	7a	
	5	7b	
8	4	8a	
	5	8b	
9	4		free
	5		
10	4		free
	5		
11	4		free
	5		
12	4		free
	5		
13	4		free
	5		
14	4		free
	5		
15	4		free
	5		
16	4		free
	5		
17	4		free
	5		

RJ45 jack		TMDID2	Notes
No.	Pin		
18	4		free
	5		
19	4		free
	5		
20	4		free
	5		
21	4		free
	5		
22	4		free
	5		
23	4		free
	5		
24	4		free
	5		

Table 3-159 TMDID2 (for selected countries only) - Connector Panel Assignment with RJ45 Jacks

CHAMP jack	TMDID2			Notes
1	1a	1 Ring	Port 1	
26	1b	1 Tip		
2	2a	2 Ring	Port 2	
27	2b	2 Tip		
3	3a	3 Ring	Port 3	
28	3b	3 Tip		
4	4a	4 Ring	Port 4	
29	4b	4 Tip		
5	5a	5 Ring	Port 5	
30	5b	5 Tip		
6	6a	6 Ring	Port 6	
31	6b	6 Tip		
7	7a	7 Ring	Port 7	
32	7b	7 Tip		
8	8a	8 Ring	Port 8	
33	8b	8 Tip		

CHAMP jack	TMDID2			Notes
9			free	
34				
10			free	
35				
11			free	
36				
12			free	
37				
13			free	
38				
14			free	
39				
15			free	
40				
16			free	
41				

Table 3-160 TMDID2 (for selected countries only) - Connector Panel Assignment with a CHAMP Jack (for U.S. only)

3.51.4 Removing the TMDID2 Board

Warning
This procedure will remove all the channels on this trunk board from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

Remove the TMDID2 board as follows:

1. Deactivate all channels on the board as follows:
   a) Type **`DEA-DSSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
OFFTYPE	DC
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

> PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

2. Deactivate the board as follows:
   a) Type **DEA-BSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
OFFTYPE	DC
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
REFOFF	<blank>

3. Wait until all LEDs on the board are flashing.
4. Using the board extractor, unseat the board and remove it from the shelf.

3.51.5 Replacing the TMDID2 Board

Replace the TMDID2 board as follows:

1. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
2. Activate the board as follows:
   a) Type **ACT-BSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
ONTYPE	AUL
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>

3. Activate the channels as follows:
   a) Type **ACT-DSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	Value
ONTYPE	AUL
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

3.51.6 Verifying the TMDID2 Board

Verify operation of the TMDID2 board by displaying the status of all channels as follows:

1. Type **DIS-SDSU** and press **Enter**.
2. Type the following values, then press **Enter**.

Field	Value
LINK	<Blank>
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
CCT	<blank>

3.52 TMDNH

The trunk module digital network, HiPath (TMDNH) board (see Figure 3-117) provides 24 channels for digital trunk applications. The TMDNH board has SIPAC shelf connectors. This board supports the following configurations or applications:

- **T1 interface**: When configured as a T1 interface a TMDNH board can support 24-channel associated signaling (CAS), also known as robbed bit signaling, voice, fax or data trunks operating end-to-end with a similarly configured T1 interface.
- **ISDN primary rate interface (PRI)**: When configured as a PRI a TMDNH board can support 23 channels of voice, data or fax between a system and interexchange carriers (for example, AT&T or MCI) or local exchange carriers (for example, Pacific Bell or USWEST). A TMDNH board also supports the National ISDN 2 primary rate interface (NI-2 PRI) protocol.
- **ISDN CorNet-N interface**: When configured as an ISDN CorNet-N interface a TMDNH board can support 23 channels of voice, data or fax between HiPath 4000 systems using CorNet, the Siemens proprietary private networking protocol.
- HiPath 4000 systems provide CorNet-NQ protocol for QSIG private networking connectivity. CorNet-NQ uses a TMDNH board configured as a CorNet-N interface.
- **ISDN CorNet-VN interface**: The TMDNH board can be configured to support CorNet-VN operation.

3.52.1 LED Indications

Figure 3-117 shows the LED indicators on the front panel of the TMDNH board.

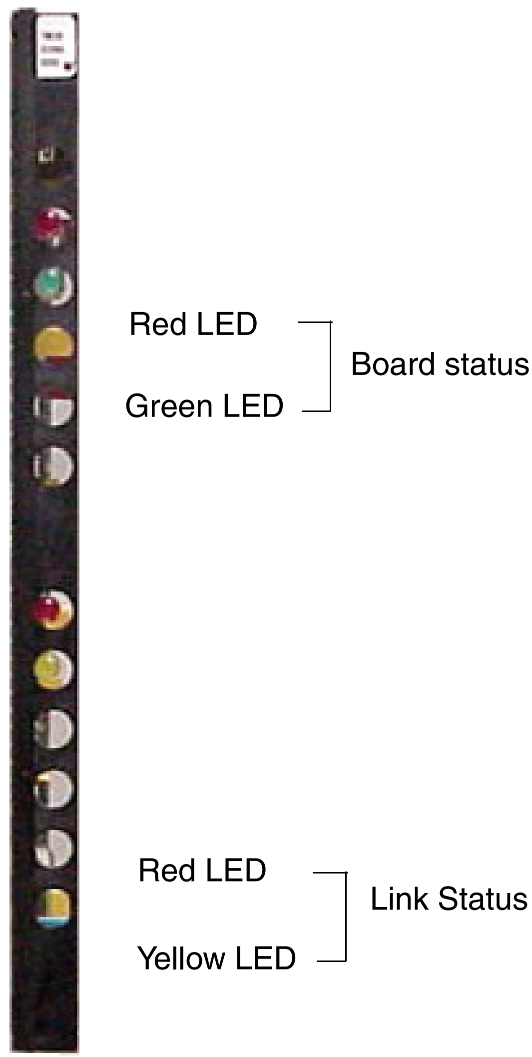


Figure 3-117 TMDNH Board Front Panel

Table 3-161 lists the board status LEDs on the front panel of the TMDNH board.

Red LED State	Green LED State	Board Status Indications
On	Off	The board has initial power applied.
Flashing	Off	The board is being loaded with loadware.
On	Off	The board is defective or out-of-service.
Off	On	The board is operational and all channels are inactive.
Off	Flashing	The board is operational and one or more channels are active.

Table 3-161 TMDNH Board, Board Status LED Indications

Table 3-162 lists the link status LEDs on the front panel of the TMDNH board. These LEDs provide the status of the T1 or ISDN link.

Red LED State	Yellow LED State	Link Status Indications
On	Off	The link is in a red alarm condition.
Off	On	The link is in a yellow alarm condition.
Off	Off	The link is not in an alarm condition.

Table 3-162 TMDNH Board, Link Status LED Indications

3.52.2 Removing the TMDNH Board

Warning
This procedure removes all the channels on this trunk board from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

Remove the TMDNH board as follows:

For ISDN applications, first deactivate the B channels, and then deactivate the D channel.

To remove the TMDNH board:

1. Deactivate all channels as follows:
   a) Type **DEA-DSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	DC
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

> PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

2. Deactivate the board as follows:
   a) Type **DEA-BSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	DC
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
REFOFF	<blank>

   The board is deactivated when the yellow LED is lit and the other LEDs are off.

3. Before removing the board, ensure that the red board status LED is lit, remove the board.

   If the red board status LED does not light within 30 seconds, repeat steps 2a and 2b. If the red board status LED still does not light within 30 seconds, remove the board.

3.52.3 Replacing the TMDNH Board

To replace the TMDNH board:

1. Slide the board into the appropriate slot until it seats firmly into the backplane connector.
2. Activate the board as follows:
   a) Type **ACT-BSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>

For ISDN applications, first activate the D channel, and then activate the B channels.

3. Activate the channels as follows:
   a) Type **ACT-DSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

3.52.4 Verifying the TMDNH Board

To verify the operation of the TMDNH board:

1. Confirm that the LPB LED (red) stops flashing.
2. Confirm that the second LED (red) from the top comes on.

   What is the second LED. If this is labeled, let’s call it out.
3. Confirm that the second LED (red) goes off.
4. Confirm that the top LED (green) lights.
5. Confirm that the red board status LED stops flashing and goes off.
6. Confirm that the green board status LED comes on or is flashing.

3.53 TMEM

The TMEM board contains four bothway E&M tie-line connections. These circuits handle the incoming and outgoing traffic between two PABXs.

If used as a main PABX circuit or satellite PABX circuit with WTK1 signaling (AC carrier frequency signaling system), it is used to handle the incoming and outgoing internal, exchange and consultation traffic between a main system and a satellite PABX.

The external interface to the remote system is provided by the 8-wire line for voice transmission and signaling (EA/EB-wires, MA/MB-wires, for sending and receiving respectively).

Signaling is performed with direct voltage by means of the monitoring lines E and M. Additionally, DTMF signals may be used for dialing and for WTK1 secondary signals.

The wires must be reversed to the remote system as follows:

- EA crossed with MA
- EB crossed with MB
- E crossed with M

Signaling is provided by means of 4-wire lines in VF mode or in multiplex mode, such as PCM systems with signal converters.

> When assigning the slots into which the TMEM is to be plugged, always ensure that the adjacent slot on the right is only equipped with a board which does not require a line to the MDF, for example, a ring generator.

3.53.1 Board Variants

Q2012-X100 FRG/Austria for WTK1 signaling

3.53.2 Carrier Frequency and Ear & Mouth Modes

Signaling is provided with direct voltage by means of the control wires E and M for connection setup, connection cleardown, pulse dialing, and remote blockage. DTMF dialing is also possible.

3.53.3 WTK 1 Mode

Primary signals are transmitted as direct voltage pulses by means of the control wires E and M; secondary signals are transmitted as DTMF tones.

Internal, exchange, and transit connections may be set up directly to the satellite PABX or through the attendant console.

Additional boards required for DTMF signaling: SIU type 2

LW designation on HD: APSP/LTG/LG42/PZGTEMT0

3.53.4 Configuring the TMEM Board on the Main PABX Circuit Using AMOs

- AMO COT
  ANS&NTON&KNOR; possibly: CHRT
- AMO LWPAR
  Circuit type = NWWTK
  Pulse/pause times for DTMF dialing:
  PUTM = 80 ms
  PATM = 80 ms
  Pause between end-of-dial initial pulse and evaluated end of dial:
  EDP = 100 ms
  (this value may have to be increased in the case of connections by means of line transformers, such as high voltage lines)
- AMO TACSU (for X100)
  Device type: DEV = MAINVFSS
  COFIDX = 0 FRG short line
  COFIDX = 1 FRG long line (-2dB)
  COFIDX = 2 Austria

3.53.5 Configuring the TMEM Board on the Satellite PABX Using AMOs

- AMO COT
  ANS&NTON&KNOR&ASAT&CONS; optionally: CHRT
- AMO LWPAR
  as for main PABX
- AMO TACSU
  Device type: DEV = SATVFSS
  COFIDX see main PABX

3.53.6 TMEMW and TMEMUS Board LED Indications

The front panel of the TMEM board has four channel and blocking status LEDs. Table 3-163 provides TMEMW or TMEMUS board LED indications.

LED	State	Indication
All (green)	Off	The channel is idle, ready to use.
	On	The channel is seized by call processing software.
	Slow flash	The channel is deactivated by software.
	Medium flash	The channel is deactivated either manually or by software or the channel is not configured.

Table 3-163 TMEMW or TMEMUS Board LED Indications

3.53.7 Connectors and Switches

The TMEMW or TMEMUS board has:

- Four front panel channel and blocking switches.
- Switch packs for standard M signaling

3.53.8 Removing the TMEM Board

This procedure will remove all the channels on this trunk board from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

To remove the TMEM board:

1. Deactivate all channels as follows:
   a) Type **`DEA-DSSU`**, then press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	DC
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

2. Deactivate the board as follows:
   a) Type **DEA-BSSU** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	DC
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
REFOFF	<blank>

3. Using the board removal and replacement tool, unseat the board and remove it from the shelf.

3.53.9 Replacing the TMEM Board

To replace the TMEM board:

1. Ensure that the straps on the replacement TMEM board are set to the same setting as the defective board.

The TMEMUS board E&M signaling is configured by software and hardware.

2. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
3. Activate the board as follows:
   a) Type **ACT-BSSU** and press **Enter.**
   b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>

4. Activate the channels as follows:

a) Type **`ACT-DSSU`**, then press **Enter**.

b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

> PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

3.53.10 Verifying the TMEM Board

To verify the operation of the TMEM board, display its status as follows:

1. Type **`DIS-SDSU`**, then press **Enter**.

   a) Type the following values, then press **Enter**.

Field	**Value**
STATUS	ALL
LINK	<blank>
TYPE	PEN
LEVEL	PER3
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
CCT	<0 - 15>

2. Verify that all the green LEDs on the board are off.

3.53.11 MDF Punch-Down Assignments, U.S.

Table 3-164 shows the TMEMW and TMEMUS boards punch-down assignments.

Pair No.	Wire Color	Channel No.	Lead Designation
1	WHT-BLU BLU-WHT	00	T1 R1
2	WHT-ORG ORG-WHT	01	T1 R1

Table 3-164 TMEM Board Punch-Down Assignments (Seite 1 von 2)

Pair No.	Wire Color	Channel No.	Lead Designation
3	WHT-GRN GRN-WHT	02	T1 R1
4	WHT-BRN BRN-WHT	03	T1 R1
5	WHT-SLT SLT-WHT	00	T R
6	RED-BLU BLU-RED	01	T R
7	RED-ORG ORG-RED	02	T R
8	RED-GRN GRN-RED	03	T R
9	RED-BRN BRN-RED	00	M E
10	RED-SLT SLT-RED	01	M E
11	BLK-BLU BLU-BLK	02	M E
12	BLK-ORG ORG-BLK	03	M E

Table 3-164 TMEM Board Punch-Down Assignments (Seite 2 von 2)

3.54 TMEMW and TMEMUS

> With the HiPath 4000 V4.0 the TMEMW board (Q2092) will be replaced by the TMEW2 board (Q2292).

This section describes the functions and features of the trunk module for ear and mouth, world (TMEMW) and trunk module for ear and mouth, United States (TMEMUS). It also provides procedures for removing, replacing, and verifying these boards.

3.54.1 Functional Description

The TMEMUS or TMEMW board provides four tie-line connections (4-wire type I E&M signaling) between the HiPath 4000 and other Hicom 300 communication servers (CSs) or private branch exchanges (PBXs).

> The TMEMUS board is used in the United States only.

Figure 3-118 shows an interface block diagram of a TMEMUS or TMEMW board.

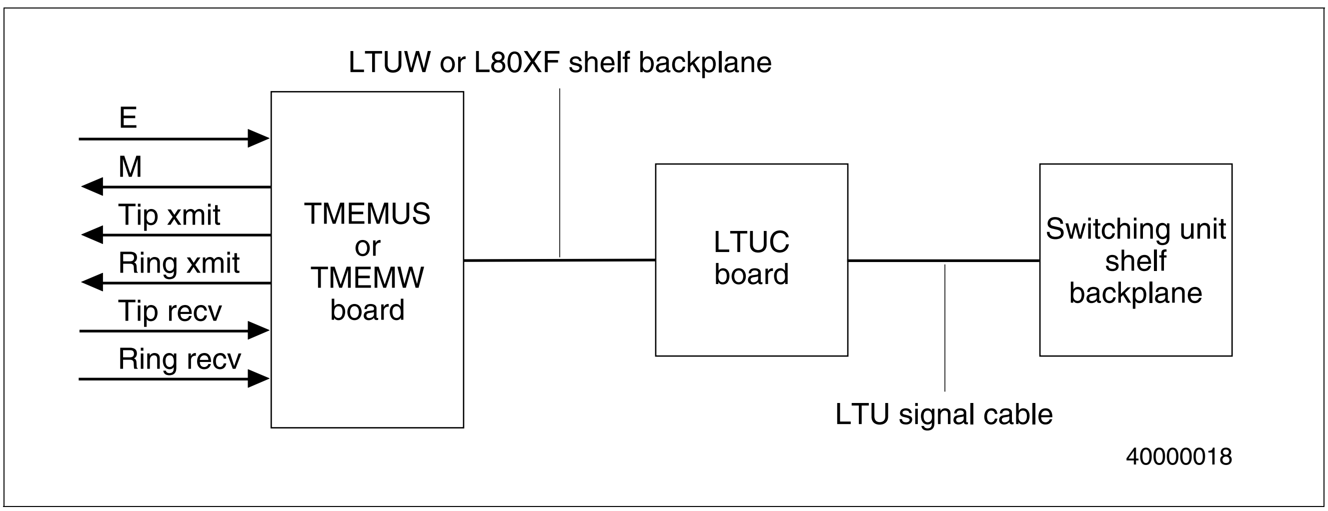


Figure 3-118 TMEMUS Board Block Diagram

3.54.2 LED Indications

The front panel of the TMEMW or TMEMUS board (Figure 3-119) contains 4 channel and blocking status LEDs. Table 3-165 provides TMEMW or TMEMUS board LED indications.

LED	State	Indication
All (green)	Off	The channel is idle, ready to use.
	On	The channel is seized by call processing software.
	Slow flash	The channel is deactivated by software.
	Medium flash	The channel is deactivated either manually or by software or the channel is not configured.

Table 3-165 TMEMW or TMEMUS Board LED Indications

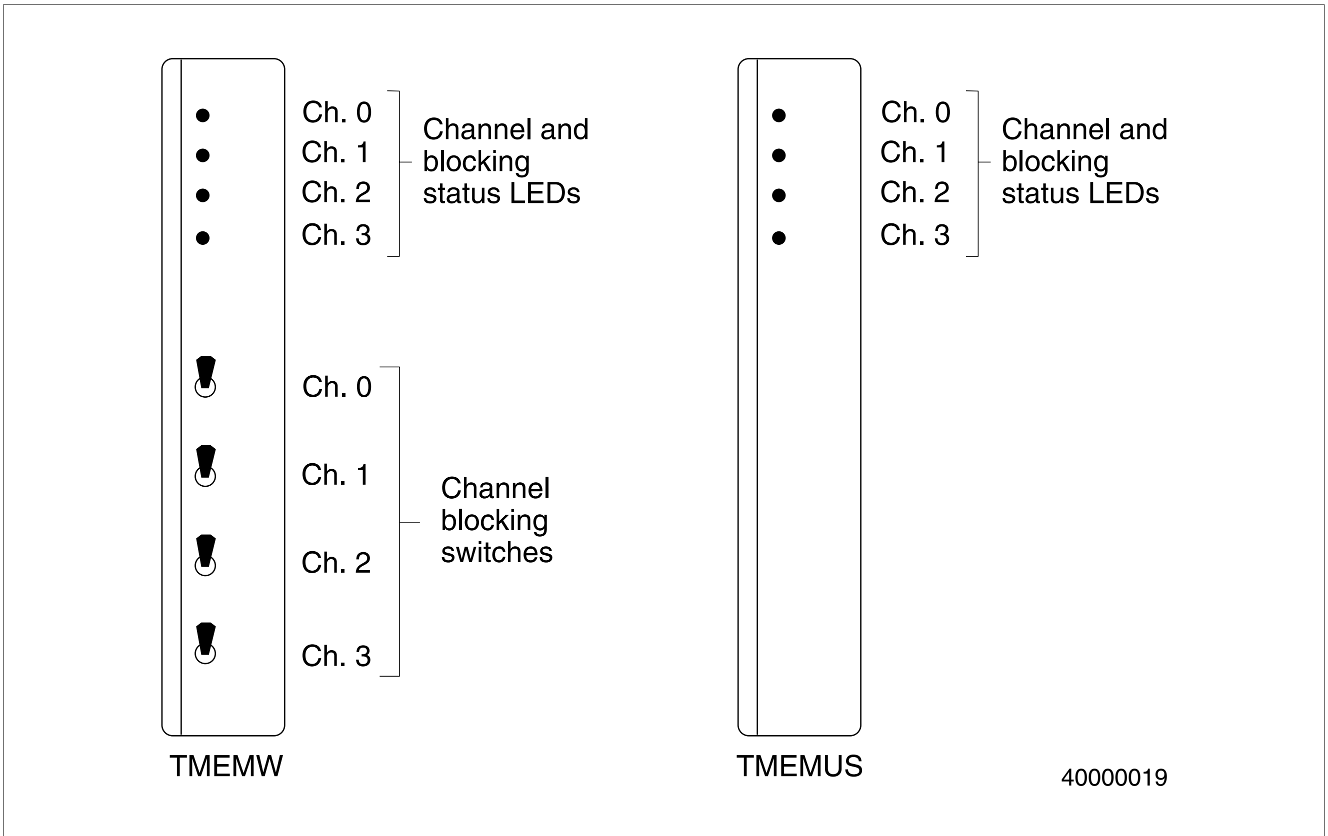


Figure 3-119 TMEMW and TMEMUS Board Front Panel

3.54.3 Connectors and Switches

The TMEMW or TMEMUS board (Figure 3-119) contains:

- Four front panel channel and blocking switches (Figure 3-120 and Figure 3-121)
- Switch packs for standard M signaling

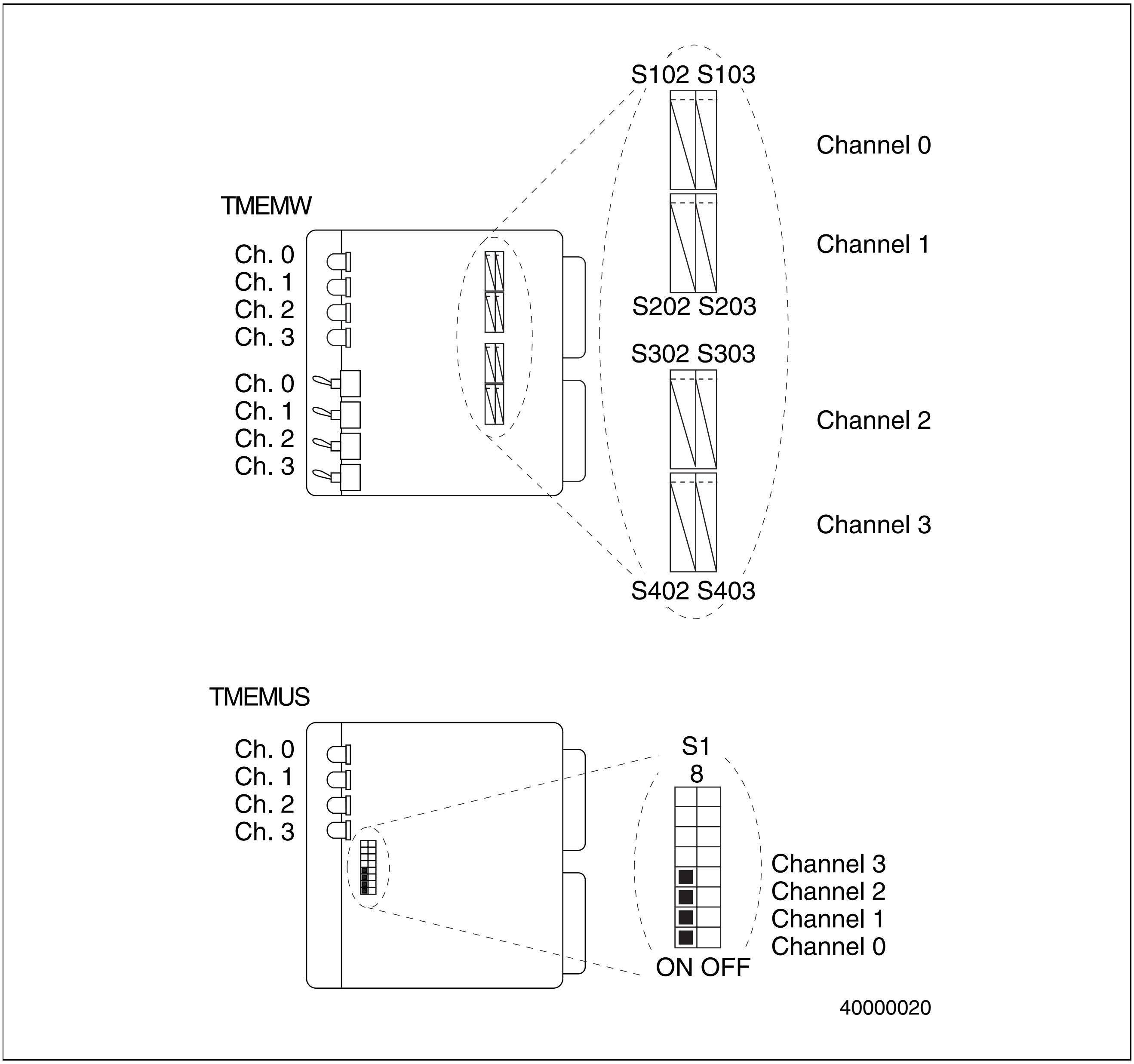


Figure 3-120 TMEMW and TMEMUS Board Jumper Settings for Standard M Signaling (ON)

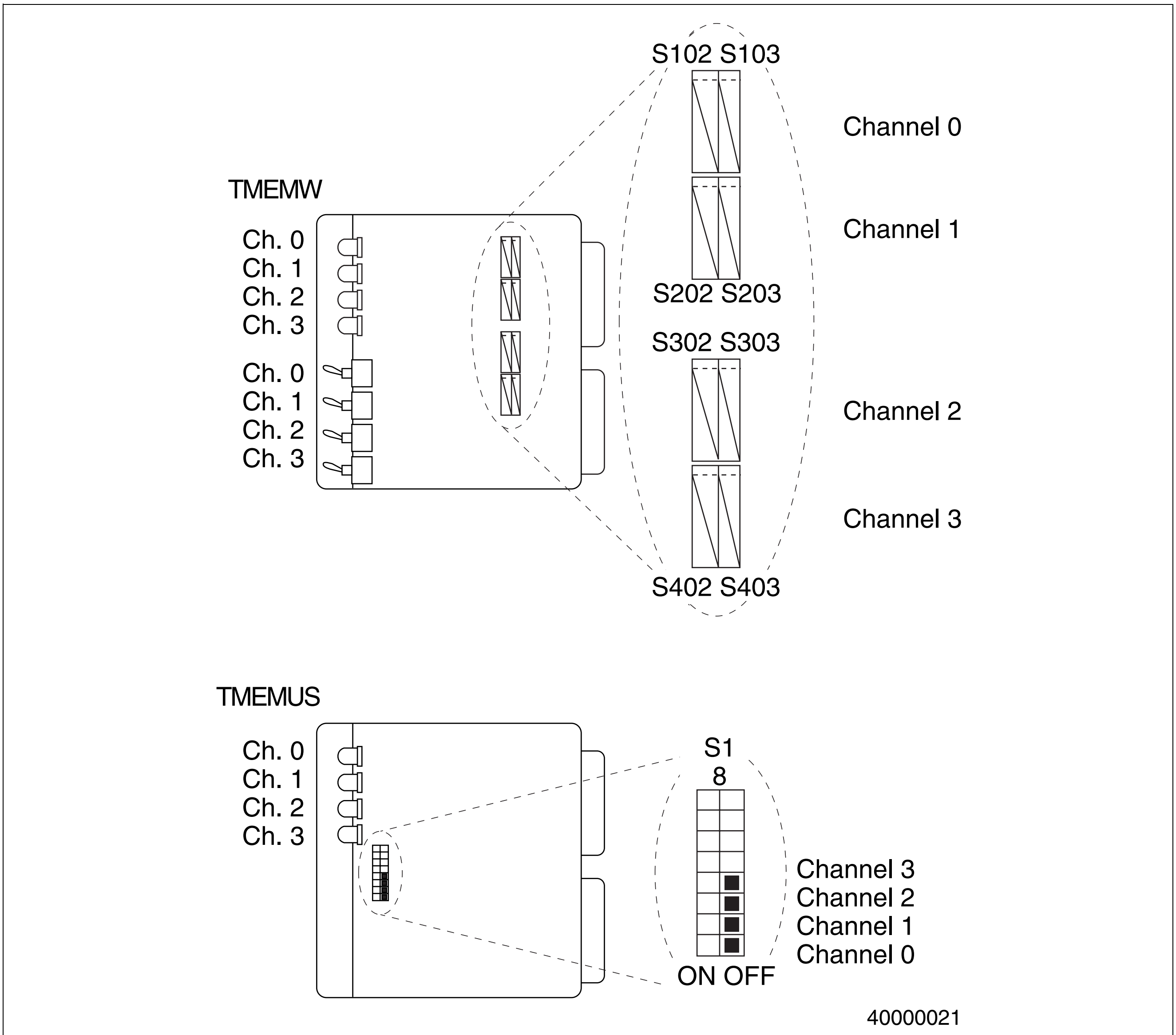


Figure 3-121 TMEMW and TMEMUS Board Jumper Settings for Inverted M Signaling (OFF)

3.54.4 Removing the TMEMW or TMEMUS Board

> **Warning**
> This procedure removes all the channels on this trunk board from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

Remove the TMEMW or TMEMUS board as follows:

1. Deactivate all channels as follows:

   a) Type **`DEA-DSSU`**, then press **Enter**.

   b) Type the following values, then press **Enter**.

Field	Value
OFFTYPE	DC
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

2. Deactivate the board as follows:

   a) Type **`DEA-BSSU`** and press **Enter**.

   b) Type the following values, then press **Enter**.

Field	**Value**
OFFTYPE	DC
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
REFOFF	<blank>

3. Using the board extractor, unseat the board and remove it from the shelf.

3.54.5 Replacing the TMEMW or TMEMUS Board

Replace the TMEMW or TMEMUS board as follows:

1. Ensure that the straps on the replacement TMEMW board are set to the same setting as the defective board.

The TMEMUS board E&M signaling is configured by software and hardware.

2. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
3. Activate the board as follows:
   a) Type **`ACT-BSSU`** and press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	AUL
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>

4. Activate the channels as follows:
   a) Type **`ACT-DSSU`**, then press **Enter**.
   b) Type the following values, then press **Enter**.

Field	**Value**
ONTYPE	**AUL**
TYPE	**PEN**
PEN1	**<PEN1>**
PEN2	**<PEN2>**

> PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

3.54.6 Verifying the TMEMW or TMEMUS Board

Verify the operation of the TMEMW or TMEMUS board by displaying its status as follows:

1. Type **`DIS-SDSU`**, then press **Enter**.
2. Type the following values, then press **Enter**.

Field	**Value**
STATUS	ALL
LINK	<blank>
TYPE	PEN
LEVEL	PER3
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
CCT	<0 - 15>

3. Verify that all the green LEDs on the board are off.

3.54.7 MDF Assignments

Table 3-166 lists the TMEMW and TMEMUS boards U.S. MDF punch-down assignments.

For U.S. installations requiring overcurrent protection devices refer to the Siemens Secondary Protection Guide, G281-0070.

Pair No.	Wire Color	Channel No.	Lead Designation
1	WHT-BLU BLU-WHT	00	T1 R1
2	WHT-ORG ORG-WHT	01	T1 R1
3	WHT-GRN GRN-WHT	02	T1 R1
4	WHT-BRN BRN-WHT	03	T1 R1
5	WHT-SLT SLT-WHT	00	T R
6	RED-BLU BLU-RED	01	T R
7	RED-ORG ORG-RED	02	T R
8	RED-GRN GRN-RED	03	T R
9	RED-BRN BRN-RED	00	M E
10	RED-SLT SLT-RED	01	M E
11	BLK-BLU BLU-BLK	02	M E
12	BLK-ORG ORG-BLK	03	M E

Table 3-166 TMEMW and TMEMUS Boards MDF Assignments

3

3.55 TMEW2

The trunk module for E&M world (TMEW2) board provides four tie-line connections (4-wire type I E&M signaling) between the Hicom 300 and other Hicom 300s or private branch exchanges (PBXs)

E&M leads are used for signalling between PBXs at two different locations. Signalling between TIE trunks is performed by the E (for Ear or for rEceive) and M (for Mouth or transMit) leads.

The M lead transmits a ground, open or -48V signal. The circuitry on the board converts the logic signal (+5V OR 0V) from the microprocessor through the SICOFI latch outputs. Conversely the E-lead which connects to the remote PBX M lead, receives the –48V,open or ground levels and converts them to +5/0 voltage levels. The signalling protocol is system software programmed as Delay Dial, Wink Start (most common choice), Immediate Start, and so on. The on-board loadware microprocessor handles the E & M signalling protocol through the SICOFI.

For standard Type 1 signalling, when E/M is connected to signalling equipment, an offhook M lead is –48V, while onhook is ground. When two TMEW2s are connected back-to-back (M lead to E lead), TYPE 1A signalling should be selected where offhook M lead is ground and onhook is OPEN.

3.55.1 Functions and Features for Target Countries

The TMEW2 has the following analog trunk interface functions:

- TYPE 1, 2, 1A, DC5 E & M signalling and Low level supervision
- Programmable selection of type of Signalling methods
- Programmable transmit and receive gains
- Separate transmit and receive voice pairs - 4 wires
- Optional 2 wires voice path is available for future target countries application

The TMEW2 has the following system features:

- U-law or A-law companding of the voice signal
- Access to PCM highways with flexible time slot channel selection
- HDLC link to communicate with the PBXs switching unit

3.55.2 Description of Interfaces

There are three main functional boundaries to the TMEW2: board

- Analog E & M trunk interface
- Channel and voice-path interface
- Common control interface

3.55.3 LED Indications

The front panel of the TMEW2 board features two LEDs (red and green). Table 3-167 lists the LED indications during the TMEW2 board startup procedure.

Red LED	Green LED	Indication
On	Off	Power supply available
Flashing	Off	Software is being loaded to the board.
On	Off	The board is defective or out-of-service.
Off	On	The board is operational and all channels are assigned.
Off	Flashing	The board is operational and one or more of the channels are assigned.

Table 3-167 TMEMW/TMEMUS Boards, LED Indications

3.55.4 Configuring the Board

AMO BCSU must be modified so that the action CHA-BCSU (change) can be used to reconfigure boards of different types. When replacing a TMEMW board with a TMEW2 board, configure the board as follows:

1. Turn off the lines on the board.
2. Turn off the board.
3. Reconfigure the board.
4. Assign the expanded line data to the lines by means of the index (CIRCIDX).
5. Turn on the lines and the board.

	Transmit Path A->D (Li or PE)			Receive Path D->A (Lo or PA)			
Gain Index	**Normal Loss (dB)**	**Input Relative Level at T1/R1 (dBr)**	**Input Overload Point to Produce D.F.S (dBr)**	**Normal Loss (dB)**	**Output Relative level at T/R (dBr)**	**Output Overload Point Produced by D.F.S. (dBr)**	**Countries**
0 *)	-3.5	-3.5	-0.5	+3.5	-3.5	-0.5	A-law Italy Finland Austria France Greece Sweden
1	0	0	+3	+6	-6	-3	U.S.A.**)—U-law'
2	-1.5	-1.5	+1.5	+1.5	-1.5	+1.5	Australia***)—A-law
3	-2.5	-2.5	+0.5	+4.5	-4.5	-1.5	Germany—A-law
4	+0.5	+0.5	+3.5	+4.5	-4.5	-1.5	U.K.-'A-law'
*) **) ***)	Default gain index used before TMEW2 board is configured to any specific countries Gain index reserved for the USA, but TMEW2 is not sold to the U.S.A. as stated in TMEW2 A30 document Gain index reserved for Australia, but TMEW2 will not be used in Australia						

Table 3-168 TMEW2, Nominal Loss and Overload Point of Half Connections

Weighted Noise (I-ETS 300005)

Table 3-169 lists the weighted noise level of the TMEW2 board.

Connection Type	Noise Level (dBm0p)
Analog-to-Digital	66
Digital-to-Analog	75

Table 3-169 Weighted noise level

Table 3-170 lists the transverse conversion loss (TCL) of the TMEW2 board.

Frequency (Hz)	Min (dB)
300 - 3400	46

Table 3-170 Transverse conversion loss

3.55.5 Connector Pin Assignments

Table 3-171 lists the upper connector pin assignments of the TMEW2 board.

Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name
41	NC	21	+5V	01	T1-1
42	NC	22	GND	02	+12V
43	NC	23	R1-1	03	T1-2
44	NC	24	E(1)/E(2)-3	04	R1-2
45	NC	25	M(1)/SG-3	05	T1-3
46	NC	26	E(1)/E(2)-4	06	R1-3
47	NC	27	M(1)/SG-4	07	T1-4
48	NC	28	GND	08	R1-4
49	NC	29	S3AN(LL)/M(2)-1	09	T-1
50	NC	30	S3AB(LL)/SB(2)-1	10	R-1
51	NC	31	S3AN(LL)/M(2)-2	11	T-2
52	NC	32	S3AB(LL)/SB(2)-2	12	R-2
53	NC	33	GND	13	T-3
54	NC	34	S3AN(LL)/M(2)-3	14	R-3

Table 3-171 Upper connector pin assignment

Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name
55	NC	35	S3AB(LL)/SB(2)-3	15	T-4
56	NC	36	-5V	16	R-4
57	NC	37	S3AN(LL)/M(2)-4	17	E(1)/E(2)-1
58	NC	38	S3AB(LL)/SB(2)-4	18	M(1)/SG-1
59	NC	39	GND	19	E(1)/E(2)-2
60	NC	40	+5V	20	M(1)/SG-2

Table 3-171 Upper connector pin assignment

Table 3-172 lists the middle connector pin assignments of the TMEW2 board.

Pin #	Signal Name
1	GND
2	+5VL

Table 3-172 Middle connector pin assignment

Table 3-173 lists the lower connector pin assignments of the TMEW2 board.

Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name
41	NC	21	+5V	01	RING
42	NC	22	GND	02	+12V
43	NC	23	GND	03	-48V
44	NC	24	DIAL1	04	-60V
45	TOUT*	25	DIAL2	05	+60V
46	FBPE	26	WGSYN	06	U-SLIC
47	TRST*	27	RGSYN	07	RCLK
48	TCK*	28	GND	08	RAC
49	TMS*	29	PRS	09	BA0
50	TDI*	30	BA1	10	RGCL
51	TDO*	31	HO1	11	RGD
52	HO3	32	HO0	12	BA6
53	HO2	33	GND	13	HD0
54	NC	34	BA2	14	BA5

Table 3-173 Lower connector pin assignment

Pin #	Signal Name	Pin #	Signal Name	Pin #	Signal Name
55	NC	35	BA3	15	CKA
56	NC	36	-5V	16	CLS
57	HI3	37	FMB	17	HI1
58	HI2	38	HI0	18	BA4
59	NC	39	GND	19	HDI
60	NC	40	+5V	20	-12V
* used for boundary scan testing					

Table 3-173 Lower connector pin assignment

3.55.6 Removing the TMEW2 Board

This procedure will remove all the channels on this trunk board from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

To remove the TMEW2 board:

1. Deactivate all channels as follows:
   a) Type **DEA-DSSU**, and then press **Enter**.
   b) Type the following values, and then press **Enter**.

```
Field       Value
OFFTYPE     DC
TYPE        PEN
PEN1        <PEN1>
PEN2        <PEN2>
```

PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

2. Deactivate the board as follows:

a) Type **DEA-BSSU** and press **Enter**.

b) Type the following values, and then press **Enter**.

Field	**Value**
OFFTYPE	DC
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
REFOFF	<blank>

3. Using the board removal and replacement tool, unseat the board and remove it from the shelf.

3.55.7 Replacing the TMEW2 Board

To replace the TMEW2 board:

1. Ensure that the straps on the replacement TMEW2 board are set to the same setting as the defective board.

> The TMEMUS board E&M signaling is configured by software and hardware.

2. Slide the board into the appropriate slot until you seat it firmly into the backplane connector.
3. Activate the board as follows:

a) Type `ACT-BSSU` and press **Enter**.

b) Type the following values, and then press **Enter**.

Field	**Value**
ONTYPE	AUL
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>

4. Activate the channels as follows:

a) Type `ACT-DSSU`, and then press **Enter**.

b) Type the following values, and then press **Enter**

Field	Value
ONTYPE	AUL
TYPE	PEN
PEN1	<PEN1>
PEN2	<PEN2>

PEN1 is the PEN of the first channel and PEN2 is the PEN of the last channel on the board.

3.55.8 Verifying the TMEW2 Board

To verify the operation of the TMEW2 board:

1. Display the status by typing **DIS-SDSU**, and then press **Enter**
2. Type the following values, and then press **Enter**.

Field	Value
STATUS	ALL
LINK	<blank>
TYPE	PEN
LEVEL	PER3
LTG	<1 - 32>
LTU	<1 - 8>
SLOT	<1 - 151>
CCT	<0 - 15>

3. Verify that all the green LEDs on the board are off.

3.56 TMLBL

The trunk module for local battery lines (TMLBL) board is used for connecting local battery switchboards (drop indicator panels) and local battery telephones. The board consists of 8 circuits and it can work also as bothway trunk circuits for local battery signalling withou DID or with pseudo-DID.

On tie-trunk circuits (local battery operation), signalling is carried out by means of 25/50-Hz ringing current.

For DTMF dialling to the exchange, a type 2 SIU is required for each line.

At least one ACGEN is required for every line trunk group (LTG). The transmission frequency of the alternating current can be individually set at each associated ACGEN. The TMLBL_ cannot be operated without an ACGEN. One ac generator provides the ringing current for up to 10 TMLBLboards, that is 80 line circuits.

Functional line length: defined by max. ringing transmission distance, 2 x 9 kΩ

3.56.1 LED Indications and Push Buttons

The front panel of the TMLBL board contains eight LEDs and two push buttons. The board has one LED for every line circuit.

To select a line circuit, press the first push button (LED flashes).

To manually block (LED flickers) or unblock the circuit, press the second key.

3.56.2 Loadware Variants

Table 3-174 lists the loadware variants of the TMLBL board.

LW Variant	COFIDX Settings in the TACSU AMO	CTRY	Input	Artificial Line	Line Loss	Line
PZGTBOB0	0	PL	600 Ω	600 Ω	-7/0	long
	1	PL	600 Ω	600 Ω	-5/-2	short
	2	D	220+(820//115nF)	220+(820//115nF)	-7/0	long
	3	D	220+(820//115nF)	220+(820//115nF)	-5/-2	short

Table 3-174 TMLBL Board Loadware Variants (Seite 1 von 2)

LW Variant	COFIDX Settings in the TACSU AMO	CTRY	Input	Artificial Line	Line Loss	Line
	*) 4	PL	600 Ω	600 Ω	0/-7	long
	*) 5	PL	600 Ω	600 Ω	-2/-5	short
	*) 6	PL	220+(820//115nF)	220+(820//115nF)	0/-7	long
	*) 7	PL	220+(820//115nF)	220+(820//115nF)	-2/-5	short
PZGTBOB1	0	GB	370+(620//310nF)	300+(1000//220nF)	-8/2	long
	1	GB	370+(620//310nF)	600 Ω	-5/-1	short
	*) 2	GB	300+(1000//220nF)	370+(620//310nF)	3/-9	-
	3	GB	370+(620//310nF)	370+(620//310nF)	1/-6	long
	*) 4		600 Ω	600 Ω	0/-7	long
	*) 5		600 Ω	600 Ω	-2/-5	short
	*) 6		220+(820//115nF)	220+(820//115nF)	0/-7	long
	*) 7		220+(820//115nF)	220+(820//115nF)	-2/-5	short
*) Connects to a local battery station (otherwise: duplex transmission)						

Table 3-174 TMLBL Board Loadware Variants (Seite 2 von 2)

Table 3-175 lists the line attenuation values of the TMLBL board.

Cable wire gauge (mm)	Line impedance (Ω/km)	Line loss (dB/km)	Line length at	
			2 dB (km)	3 dB (km)
0.6	2 x 62.5	1	2	3
0.4	2 x 135	1.8	1.1	1.7

Table 3-175 TMLBL Board Line Attenuation Values

3.56.3 Functions of the Board

Operation

- Incoming seizure
  AC ringing voltage
  The receiver sensitivity ranges from 10 to 90 Hz.

- Answering
  Speech path switched through
- Release before answering
  Alternating current on the line is interpreted as a release criterion (P1=1!).
  If a release criterion (P1=0) is not configured, or if additional ringing is ignored (P8=1), the answering monitoring time parameter must be set (P7 > 0).
- Outgoing seizure
  AC voltage (25/50 Hz) is applied to the a/b-wires.
- Release from call status (incoming/outgoing connection)
  Alternating current on the line is interpreted as a release criterion (P1=1!).
  If a release criterion (P1=0) is not configured, or if subsequent ringing is ignored (P8=1), the call time supervision parameter must be set (P3 > 0).
  Exception: only if both parties can be guaranteed to go on-hook when the call is terminated.
- Outgoing DTMF dialing
  The DTMF tones are transmitted by the SIU following the outgoing initial seizure ring pulse and a start-of-dial pause.
- Incoming DTMF dialling
  DTMF dialling tones can be received after incoming seizure. To avoid transmitting the DTMF signals during outgoing line seizure, the COP parameters DTN, PDP3, and NTON must be set. Avoid transmitting DTMF signals during ringing (levels must not be too high!).
- Outgoing additional ringing
  If line signalling to the exchange is enabled (PAR=OVRA set in COT), an additional ring can be transmitted by dialling the CALL_TO_CO code.
- Incoming additional ringing before answer
  If P1=0, the additional ringing is interpreted in local battery mode as a connection release with re-seizure (if P8=0), or simply ignored (if P8=1).
  For incoming calls with PREFDGTs or MOSIG-DID with DTMF signalling, additional ringing after the end-of-dial signal either leads to an extension of ringing to the attendant console (attendant intercept) or to override/knocking (if P8=3).
- Incoming additional ringing if busy
  If P1=0, the additional ringing is interpreted in local battery mode as a connection release with re-seizure (if P9=0), or simply ignored (if P9=1.
  For special applications, for example, Trading, an audible tone can be switched with P9=2 or 3; the duration and frequency of the audible tone is set with P10 and P11 respectively.
- Transit connections
  Since the answering criterion is not transmitted back down the transit line, exchange and tie-traffic callers must not be able to reach a local battery line by direct dialling; calls must be extended by the attendant.

To release the line when such calls are terminated, the local battery circuits must either be operated with release criterion signalling or call duration monitoring.

Special Features

Rering signal (only if no release criterion/release acknowledgement; P1,P2=0):

Usage:

- For connecting local battery stations, since only one seizure ring is signalled, which can be overheard. The rering function saves the PABX user having to release the connection and re-seize.

  By default, an incoming rering leads to release and re-seizure, that is, the call is re-entered in the call queue. In this case, set the P8 and P9 to 1 so that the rering is ignored, that is, release and re-seizure is prevented (COP=RLSA), or, for additional ringing which remains unanswered (COT=BRAR), backward release by the system or the board loadware (answering/call duration monitoring: P7/P3 <>0).
- For incoming seizure with DGTPR or in pseudo DID, the rering can initiate a specific call to an attendant number, or specifically initiate camp-on/override, if automatic attendant *intercept* or automatic station camp-on/override are not required (PTIME: P8).
- In Trading systems, the rering function is used in Fig.2-(figure-two-)signalling, in order to initiate an alerting tone at a remote station in calling state.

This feature is implemented according to the feature, *flash signal to exchange line*. To perform this feature, the user dials the CALL_TO_CO code in consultation mode, the attendant presses the line key.

- For assigning digit analysis result, for example, *8:

  ```
  AD-WABE:CD=*8,DAR=CALLTOCO,CHECK=N;
  ```
- For connecting the line for flash signalling to exchange line:

  ```
  CHA-COT:COTNO=<COT.number of TMLBL>,COTTYPE=COTADD,PAR=OVRA;
  ```
- For emergency override or emergency release:
  This feature is mainly used to clear busy connecting lines for priority calls. The feature is mainly used in civil service networks.

Local Battery Operation

This standard operating mode is used for connections to local battery stations, or to remote (duplex) transmitters.

Lines can be operated without or with release signal (P1=1:"ring off") and release acknowledgement (P2=1).

Since local battery connections usually run by means of single lines or very small trunk groups, users frequently encounter an all-trunks-busy (ATB) state. It is recommended to activate the emergency override or emergency release feature.

- Add local battery operation parameters:

```
AD-COT:COTNO=aa,PAR=NTON(&BRAR&CHRT&LWNC&IEVT&OVRA);
AD-COP:COPNO=bb,COPPAR=RLSA&FDGT&LSUP;

COP-PTIME:48,c;
CHA-PTIME:TYPE=REST,INIBLOCK=c,BTYPE=PARA,P3=0,P7=0,P8=1;

AD-TACSU:PEN=?-?-?-?,ANZ=?,COTNO=aa,COPNO=bb,...DEVTYPE=TC,DEV=OB,
DGTPR=?atnd code/stn?,SUPPRESS=0,DGTCNT=0,...CIRCIDX=c,...,DIALTYPE=DP-
DP,
DIALVAR=0-0;
```

Figure-Two-Signalling

This operating mode is used for Trading systems. It is a variant of the local battery operating mode, in which the lines are operated without release signals, and the prefixed digits correspond to a DIGITE terminal, which can be answered by pressing a line key on the Trade boards.

The main function of figure-two-signalling is the possibility of initiating a rering while in talking state. The ringing signal is transmitted to the called party as an audible tone signal (similar to ringback tone. Settings: P9, P10, P11).

Both incoming and outgoing rerings are possible.

Lines in both systems can only be released by the users.

- Add parameters for figure-two-signalling (initial implementation: UK):

```
AD-COT:COTNO=aa,PAR=NTON&OVRA(&BRAR&CHRT&LWNC&IEVT);
AD-COP:COPNO=bb,COPPAR=RLSA&FDGT&LSUP;

COP-PTIME:48,c;
CHA-PTIME:TYPE=REST,INIBLOCK=c,BTYPE=PARA,P3=0,P7=0,P8=1,P9=3,
P10=3,P11=2;

AD-TACSU:PEN=?-?-?-?,CNT=?,COTNO=aa,COPNO=bb,...DEVTYPE=TC,DEV=OB,
DGTPR=?DIGITE-stn?,SUPPRESS=0,DGTCNT=0,...CIRCIDX=c,...,DIALTYPE=DP-DP,
DIALVAR=0-0;
```

Pseudo-DID with DTMF Dialling

Lines operated in local battery mode can also be configured for pseudo-DID with DTMF signals. This is useful if a shortage of *better* tie-lines or transit lines occurs, or if none exist, and allows the remaining local battery lines in a system to be used as tie-lines. All attendant intercept options must be activated.

In connection with a local battery station, users can call other users in the system without having to route by means of an attendant. The local battery station user simply transmits the DTMF signals down the open line after the initial seizure ring, using an *INFO-TIP*.

It is recommended to operate these lines with release signalling, to ensure that connections are correctly cleared down, if used as transit connections to tie lines or exchange lines.

If the lines are only configured as internal lines to PABX users, the release signal can be omitted (P1=0). In this case, it makes sense to configure the rering feature (COT=OVRA) in order to be able to initiate camp-on/override or attendant calls if users do not answer or the lines are busy. The attendant intercept options IBSY and IFR must not be set.

- Add parameters for pseudo-DID with DTMF dialling to/from remote transmitter:

```
AD-COT:COTNO=aa,PAR=NTON&RCL&INDG&IIDL&IVAC&IBSY&INAU
&ITB&IDND&IFR&IDIS&BRAR(&CHRT&LWNC&IEVT&OVRA);
```

  Note: The "ICPTDID" feature must be enabled with the "FEASU" AMO in order for attendant intercept to work!

```
AD-COP:COPNO=bb,COPPAR=DTMF&RLSA&LSUP&DTM1&PDP3;

COP-PTIME:48,c;
CHA-PTIME:TYPE=REST,INIBLOCK=c,BTYPE=PARA,P1=1,P3=0,P7=0,P8=0,P9=0;

AD-TACSU:PEN=?-?-?-?,CNT=?,COTNO=aa,COPNO=bb,...DEVTYPE=TC,DEV=OB,
DGTPR=*,SUPPRESS=0,DGTCNT=0,...CIRCIDX=c,...,DIALTYPE=DP-DP,DIALVAR=0-
0;
```

- Add data for pseudo-DTMF-dialling at local battery stations:

```
AD-COT:COTNO=aa,PAR=NTON&RCL&INDG&IIDL&IVAC&IBSY&INAU
&ITB&IDND&IFR&IDIS&BRAR(&CHRT&LWNC&IEVT&OVRA);

AD-COP:COPNO=bb,COPPAR=RLSA&FDGT&LSUP;

COP-PTIME:48,c;
CHA-PTIME:TYPE=REST,INIBLOCK=c,BTYPE=PARA,P1=1,P3=0,P7=0,P8=0,P9=0;

AD-TACSU:PEN=?-?-?-?,CNT=?,COTNO=aa,COPNO=bb,...DEVTYPE=TC,DEV=OB,
DGTPR=*,SUPPRESS=0,DGTCNT=0,...CIRCIDX=c,...,DIALTYPE=DP-DP,DIALVAR=0-
0;
```

3.56.4 Configuring the TMLBL Board Using AMOs

To configure the TMLBL board use the following AMOs:

- AMO COP/COT

  71/112: outgoing pulse dialling
  72/112: outgoing DTMF dialling

  ```
  ADD-COP:71,RLSA&LSUP&TIE&FDGT;
  ADD-COP:72,DTMF&RLSA&LSUP&TIE&DTM1&PDP3;
  ```

  Other useful COP parameters: DITW, DTN, NTON.

  ADD-COT:112,NTON;

  Other useful COT parameters: OVRA, CHRT.

  Note: For attendant intercept on DID calls, the feature classmark value ICPTDND must be set in the FEASU AMO!

- AMO TACSU

  Device type designation: DEV=OB, DEVTYPE=TC
  AMO TACSU:COTNO=112,COPNO=71,COFIDX=0..1
  CIRCIDX=default assignment to PTIME INIBLOCK: 17

- AMO ZAND

  AMO ZAND:LWTYPE=TEMW,LWVAR=0 (standard)

3.56.5 Adding Board Configuration Data

To add board configuration data to the TMLBL board, use the following AMOs:

> **?** denotes customer-specific data; **lower case** denotes configuration examples.

- AMO BCSU

  ```
  AD-BCSU:TYPE=PER,LTG=<LTG>,LTU=<LTU>,SLOT=<SLOT>,PARTNO=Q2123-X;
  AD-BCSU:TYPE=ACGEN,LTG=<LTG>,LTU=<LTU>,SLOT=<SLOT>,PARTNO=Q2058-X,
  OPMODE=SY50H85V; (for 25 Hz: OPMODE=SY25H85V)
  ```

- AMO ZAND

  ```
  AMO ZAND:LWTYPE=TBOB, LWVAR=0 (default)
  CHA-ZAND:LWTYPE=TBOB,LWVAR=1 (UK)
  ```

- AMO BUEND

```
AD-BUEND:TGRP=xxx,NAME=???,NO=?,RSV=Y;
```

- AMO WABE

```
AD-WABE:CD=yyy,DAR=TIE(/CO),CHECK=N;
```

- AMO RICHT

```
AD-RICHT:TYPE=CD,CD=yyy,SVC=VCE,TGRP1=xx,DNNO=?;
```

- AMO COT

```
AD-COT:COTNO=aa,PAR=NTON&LWNC&IEVT&OVRA;
```

- AMO COP

```
AD-COP:COPNO=bb,PAR=RLSA&FDGT&LSUP;
```

- AMO TACSU

```
AD-TACSU:PEN=<lgt>-<ltu>-<slot>-<cct>,CNT=??,COTNO=aa,COPNO=bb,
.....TGRP=xx,.....DEVTYPE=TC,DEV=OB,...DIALTYPE=DP-DP,DIALVAR=0-0;
```

3.57 TMLR

The trunk module loop reversal inter-PABX (TMLR) board offers two bothway tie line circuits for inter-PABX traffic. The circuits handle incoming and outgoing traffic between two PABXs. If necessary, transfer of exchange calls (transit traffic) is also possible.

The tie line trunk circuit, with feed or loop in idle state, is used in Germany (BRD) and Austria (OES).

The external interface to a remote exchange is a two-wire tie trunk for voice and signaling. Signaling is based on the loop disconnect procedure.

The normal operating range is max. 2 x 1000 Ω. This range may, however, be extended using a negative impedance repeater.

In idle mode, if PABX feeding mode is set, a line monitor can be applied to the line to ascertain the remote exchange's service state.

3.57.1 LED Indications

The front panel of the board contains 4 LEDs and 4 keys.

3.57.2 DIP-FIX Switches

Table 3-176 lists the DIP switch settings for the TMLR board.

Set	**DIP-FIX**		**GermanyA/D -5 dBr D/A -2 dBr**	**Austria A/D -6 dBr D/A -1 dBr**
0	S102	1-2 3-4	ON	OFF
1	S202	1-2 3-4	ON	OFF

Table 3-176 TMLR Board DIP-FIX Switches

3.57.3 Signal Exchange

Signal interchange and electrical characteristics are specified as follows:

- Feeding in the idle state with a line monitor, without battery-ground dialing (a/b wires crossed).

- Feeding in the idle state without a line monitor, without battery-ground dialing (a/b wires uncrossed).
- Loop in the idle state (a/b wires uncrossed).
- Loop signaling according to Telecom Australia Specification Ssf 020.

With the SICOFI version (Q2064-X100) of this board, the transmission parameters are adapted to the specification for the country concerned by means of AMO TACSU, parameter COFIDX.

As for the COFI version (Q2064-X) the nominal values of attenuation can be set according to application (Germany, Austria) by means of DIP-FIX switches for TMLR (Q2064-X).

For transit traffic the relative levels are fixed (DIP FIX switch position is irrelevant).
A/D 0 dBr and D/A -7 dBr.

Table 3-177 lists the SICOFI parameters of the TMLR board.

COFIDX	**CTRY**	**Level (dBr)**		**Remark**
		0 **A/D D/A**	**0** **A/D D/A**	
0	OES	-6 -1	0 -7	
1	BRD	-5 -2	0 -7	Short line
2	BRD	-7 0	0 -7	Long line

Table 3-177 SICOFI parameter

3.58 TMLRB

The trunk module with loop reversal, battery-ground signalling (TMLRB) board is a two-wire interface to analog public network exchanges (central office) for direct inward dialing (loop start signaling criteria).

The board consists of eight circuits. It replaces the TMLSF board.

3.58.1 LED and Key Indications

The busy status of each circuit is indicated by a separate LED.

Key Functions:

The first key selects the circuit. The second key locks the circuit

Line Signaling

The line signaling provides the following:

- Impedance in idle state
- A/b-wire feed
- Loop current detection
- Incoming pulse signal or MFC-R2 / MFC-Socotel through SIU
- Feed voltage reversal
- Timed deactivation of feed voltage
- A/b-wire splitting

Figure 3-122 and Figure 3-123 show the side views of two TMLRB board variants.

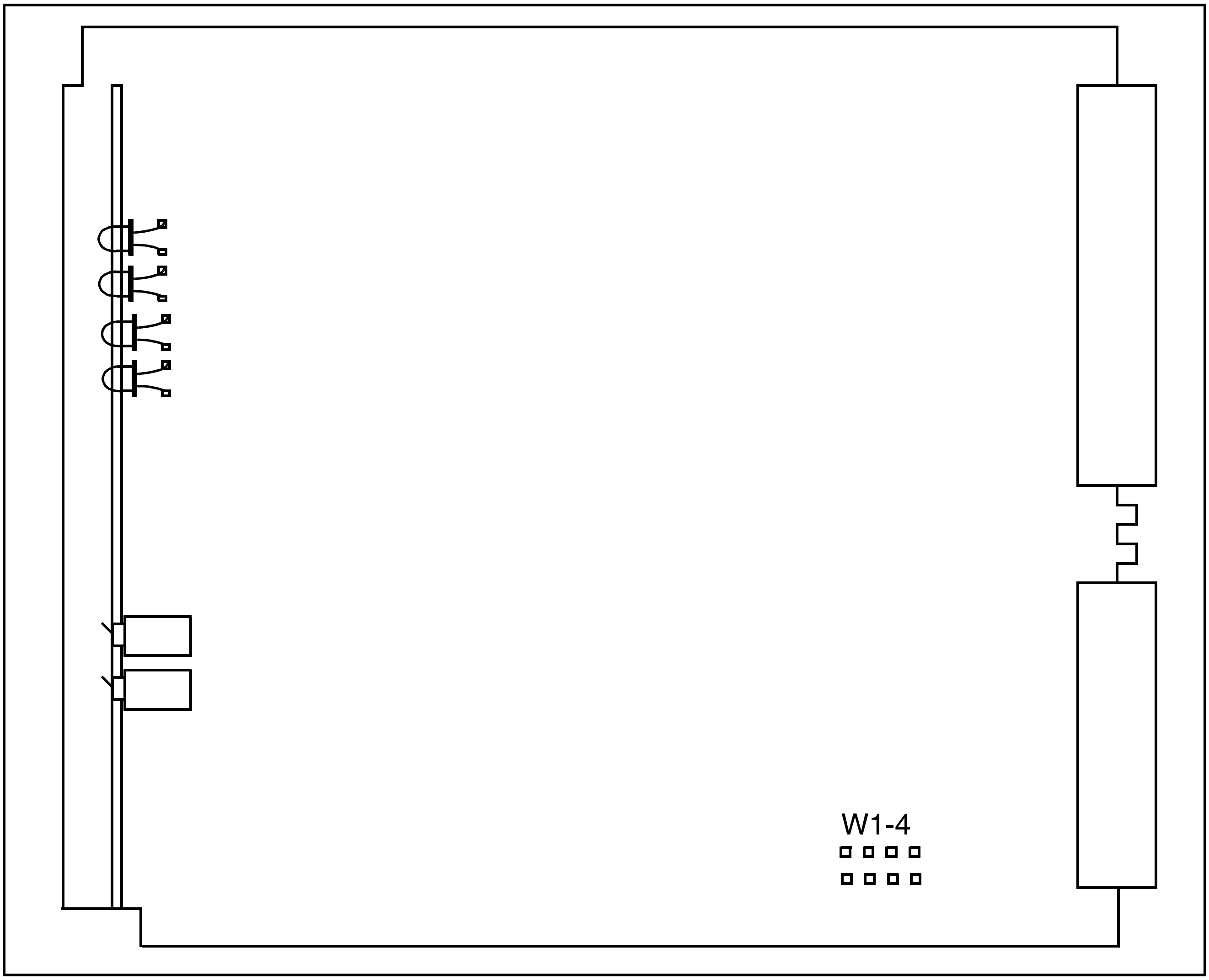


Figure 3-122 TMLRB Board (Q2286-X)

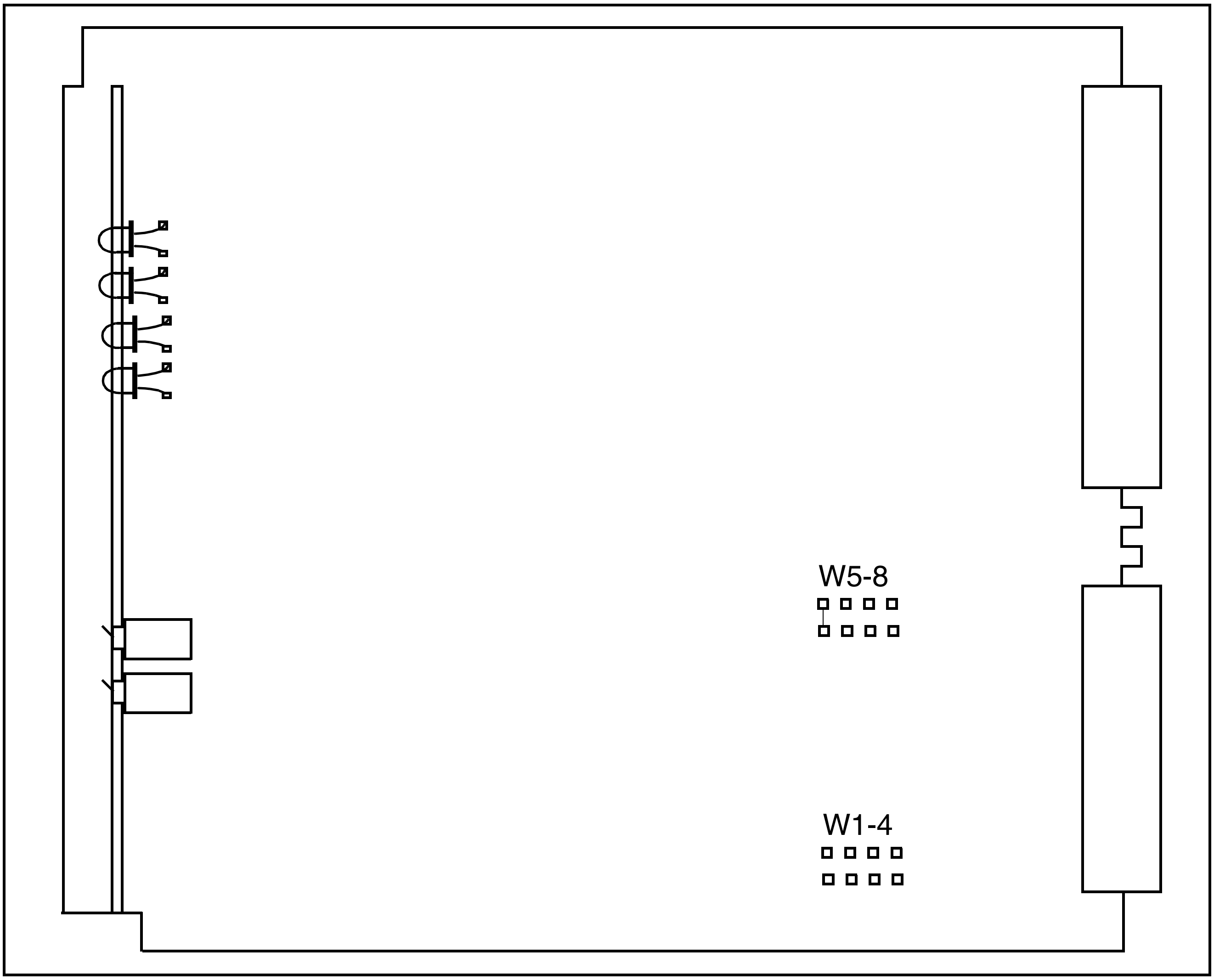


Figure 3-123 TMLRB (Q2186-X100)

3.58.2 Board Variants

Table 3-178 lists the TMLRB board variants.

Variant	Country
Q2186-X	RSA, GB
Q2286-X100	Brazil

Table 3-178 TMLRB Board Variants

3.58.3 Loadware Variants

Q2286-X

Table 3-179 lists the loadware of the TMLRB board Q2286-X variant.

Country	Input	Artificial Line	Line Loss	Line
GB	370+(620//310nF)	300+(1000//220nF)	-5,0/-1,0	< 3 dB
GB	370+(620//310nF)	300+(1000//220nF)	-8,0/+2,0	≥ 3 dB
RSA	220+(820//115nF)	220+(820//115nF)	-5,0/ 0	

Table 3-179 TMLRB Board Loadware Variant Q2286-X

Q2186-X100

Table 3-178 lists the loadware of the TMLRB board Q2286-X variant.

Country	Input	Artificial Line	Line Loss
BRA	900	800//50nF	-6,0/-1,0
	900	1000//100nF	-6,0/-1,0
	600	1000//100nF	-6,0/-1,0

Table 3-180 TMLRB Board Loadware Variant Q2186-X100

Table 3-181 lists the countries of application for the TMLRB board and its reference boards

CTRY	TMLRB				Reference Board			
	HW Var. Q2286-	LW Variant PZGTLRBx	Line length	COFI Index	Name	HW Ref. No.	LW Var PZG..	COFI Index
GB	X	0	long/short	0/1	TMLSF	Q2086-X2	TMLS2	0 / 1
RSA	X	0	long	2	TMLSF	Q2086-X1	TMLS1	2

Table 3-181 TMLRB Board and Reference Boards Countries of Application

3.59 TMOM2

The trunk module outgoing multipurpose (TMOM2) board is a 4-channel analog interface card that provides connectivity between HiPath 4000 and various special equipment.

The TMOM board only works in the outgoing direction.

The TMOM provides connectivity to the following special equipment:

- Code calling/paging system (PSE)
- Dictation equipment (DICT)
- Public address systems (SPKR)
- Recording announcement equipment (RA)
- Entrance telephone (DOOR)
- Night watchman service (NWS)
- Loop transformer for simplified tie line traffic (TIE)

3.59.1 Board Functions

The three main functions of the TMOM board are:

- Analog line interface
- Channel and voice path interface
- Common control interface

Analog line interface

The analog line interface is used for signalling between the PBX and special equipment.

Each equipment requires different analog interfaces; from 2-wire connection up to 6-wire connection. The following sections describe the different interfaces.

Paging systems (PSE)

2-Wire connection–for paging systems provides the following features:

- Monitoring
  - By means of a/b-wires with high-impedance dc-loop in the idle state
  - By means of a/b-wires with low-impedance dc-loop clearback detection (release from the paging system).

- Seizure by closing the dc-loop
- Dialing information by means of a/b-wires.
  - There are 2 types of dialling methods:
  - Rotary dialing and DTMF dialing. The timing depends on the LW and is configurable.
- Seizure acknowledge depending on the loop current in the a/b-wires.
- Clearback detection (release from the paging system) even during dialling phases.
- Backward signaling in accordance with ESPA through crossover of the a/b-wires.
- Entry of the central operating console of the paging system signalled by pulsed crossover of the a/b-wires.
- Forward release by disconnecting the loop

3-Wire connection—for paging system provides the following features:

- Monitoring by means of the c-wire.
- Power supplied to the c-wire provided by the paging system
- Earth potential by means of low impedance on the c-wire before seizure by means of loop on the a/b-wires
- Dialing: there are 2 types of dialling methods:
  Rotary dialing and DTMF dialing. The timings are configurable.
- Seizure acknowledge depending on the loop current in the a/b-wires.
- Backward signalling in accordance with ESPA through crossover of the a/b-wires.
- Clearback detection (release from the paging system by means of the a/b-wires) even during dialing phases.
- Release acknowledgment by means of the c-wire for releases by the system (no time monitoring due to the wide variety of paging system types).
- Entry of the central operating console of the paging system signalled by pulsed crossover of the a/b-wires or by pulses on the c-wire.

4-Wire connection—for paging systems provides the following features:

- Monitoring by means of the c/d-wires.
- Power supplied to the c-wire from TMOM by means of the d-wire and by means of dc-loop in the paging system.
- Rotary dialling and DTMF by means of the a/b-wires.

- Seizure acknowledge depending on the loop current in the a/b-wires.
- Backward signalling in accordance with ESPA through crossover of the a/b-wires or by power interruptions on the c/d-wires.
- Clearback detection (release from the paging system by means of the a/b-wires) even during dialling phases.
- Entry of the central operating console of the paging system signalled by pulsed crossover of the a/b-wires or by pulses on the c/d-wires.

6-Wire connection (similar to E&M)—for paging systems provides the following features:

- Monitoring by means of the c/d-wires.
- Signalling and dial pulsing information by means of the i-wire with respect to ground or DTMF signalling by means of a/b wires.
- Seizure acknowledge depending on the loop current in the c/d-wires.
- Backward signalling in accordance with ESPA by means of the c/d-wires.
- Release acknowledgment by means of the c-wire for release by the system.
- Entry of the central operating console of the paging system signalled by pulses on the c/d-wires.

Dictation equipment (DE)

3-Wire connection

- Option for operating and idle current on the c-wire. The signalling method on the c-wire depends on the dictation equipment used (idle current with interrupt or single pulse).
- Monitoring by means of the c-wire (changing tape cartridges should not produce a line alarm).
- Power is supplied to the c-wire by the dictation equipment.
- Signalling, dialling information by means of the a/b-wires.
- Earth potential by means of low impedance on the c-wire before seizure by means of loop on the a/b-wires.
- Seizure acknowledge:
  - In idle current mode: Depending on the loop current in the a/b-wires.
  - In operating current mode: No dependencies.
- Release acknowledgment by means of the c-wire for releases by the system.

Public address systems (ELA)

4-Wire connection

- Monitoring by means of c/d-wires.
- Power supplied to the c-wire from TMOM by means of the d-wire and by means of dc-loop in the dictation equipment.
- Public address system is activated by means of the p-wire after seizure.

Announcement equipment (ANSE)

6-Wire connection

- Monitoring by means of the c/d-wires.
- Ability to indicate synchronization pulses for beginning of texts or for shutting down the equipment following multiple text repetitions by means of c/d wires.
- Announcement equipment is activated by means of the p-wire after seizure.

Entrance telephone (TE)

4-Wire connection

- Monitoring by means of the c/d-wires.
- Door speaker is activated by means of the j-wire after seizure.
- Door opener function by means of the p-wire.

Night watchman service (NWS)

3-Wire connection

- Monitoring by means of the c-wire.
- Power supplied to the c-wire from the NWS.
- Rotary dialling and DTMF by means of the a/b-wires.
  Earth potential by means of low impedance on the c-wire before seizure by means of loop on the a/b-wires.
- Seizure acknowledge depending on the loop current in the a/b-wires.
- Release acknowledgment by means of the c-wire for releases by the system.

Loop transformer for simplified tie-line traffic (QV)

2-Wire connection

- Rotary dialling and DTMF by means of the a/b-wires.

- Seizure acknowledge depending on the current in the a/b-wires.
- Clearback detection (release by the remote system) even during dialling phases.

Common Control Interface

The TMOM card common control logic consists of the following areas:

- System interface
- Microprocessor and memory
- Card testing capability

System Interface

The Hicom central processor interface function is performed by the Extended Line Card Interface Controller (ELIC). The ELIC connects directly to 2.048 Mbps HDLC highway and recognizes messages with the broadcast address as well as with the individual adress assigned to the slot the TMOM2 is plugged in. The ELIC is also able to identify the slot address that the TMOM board is plugged into and can be addressed separately with this slot address.

Four 2.048 Mbps PCM highways also interface to the ELIC. These four highways contain a total of 128 time slots for each direction which are all available for the TMOM. The time slot-assignments are dynamically changed by the call processing on a per-call basis.

The HiPath backplane contains a reset-signal that will cause a hard-reset to occur on the TMOM. When the TMOM is initially plugged into the HiPath-shelf, the card's power-on-reset circuit will also generate a hard-reset of at least 100 ms.

Electrical Conditions on the External Wires

A/b-Wires

For seizure, the a/b-wires provide a dc-loop with < 400 Ω; during dialling the dc-loop is < 150 Ω.

The loop current must be in the range of 14 to 60 mA.

During monitoring (idle state) the loop current must be in the range of 3.5 to 7 mA.

Possible maximum line length depending on the equipment is between 2x500 to 2x1000 Ω; this depends on the voltage of the partner equipment or system. In case of a 3-wire connection the c-wire determine the line length because of its required low impedance.

The termination of the a/b-wires is Z = 600 Ω real.

3.59.2 Pin Assignments

Table 3-182 lists the pin assignments for the TMOM2 connector to the backplane.

> The 2 ports of the TMOM board and the 4 ports of the TMOM2 board are now compatible. Ports 0 and one of the TMOM board correspond to ports 0 and 2 of the TMOM2 board. Ports 1 and 3 of the TMOM2 board are new.

Signal name	Connector Pin	Signal Description	Direction
+ 5V	1-21, 1-40, 2-21, 2-40	Power supply +5 V_{DC}	Input
- 48V	2-03	Power supply -48V_{DC}	Input
GND	1-22, 1-28, 1-33, 1-39, 2-22, 2-23, 2-28, 2-33, 2-39	Ground return for the +5V and the -48V power supply	Input / Output
HO0 ... HO3	2-32, 2-31, 2-53, 2-52	PCM Highways	Input
HI0 ... HI3	2-38, 2-17, 2-58, 2-57	PCM Highways	Output
HDI	2-19	HDLC Highway	Output
HDO	2-13	HDLC Highways	Input
PRS	2-29	System reset	Input
BA0 ... BA5	2-09, 2-30, 2-34 2-35, 2-18, 2-14	Shelf address identifier	Input
FBPE	2-46	Flash boot programming enable signal	Input
FMB	2-37	Clock synchronizing signal	Input
CKA	2-15	System clock	Input
CLS	2-16	Clock select	Input
TOUT	2-45	Self-test result output	Output
TRST	2-47	Boundary scan: Test reset	Input
TCK	2-48	Boundary scan: Test clock	Input
TMS	2-49	Boundary scan: Test mode select	Input
TDI	2-50	Boundary scan: Test data input	Input
TDO	2-51	Boundary scan: Test data output	Output

Table 3-182 TMOM2 Board, Physical interface to the HiPath 4000 Backplane

3.60 TMSFP

The trunk module single frequency pulse (TMSFP) board has eight trunk circuits for inband voice frequency signaling. The interface is 4-wire, two wires for transmitting and two for receiving voice or signaling.

The speech path is disconnected (split) while signaling tones are being sent or received.

The signaling frequency is 2600 Hz. The 2600 Hz Signal transmitter and receiver are on board for all eight trunks.

Additional signaling by MFC, MFP1 or MFP2 are handled by registers outside this trunk and may be regarded as speech by the hardware of this trunk.

3.60.1 Board Variants

- Q2147-X for China
- Q2147-X100 GUS4 for 2600 Hz (CIS)
- Q2147-X200 GUS5 for 1200/1600 Hz (CIS)
- Q2147-X300 GUS multipurpose (CIS)
- Q2147-X400 GUS (CIS) for HARRIS exchanges

3.60.2 LED and Key Indications

The front panel of the TMSFP board has eight LEDs and two keys.

The eight LEDs show the states of the eight trunks devices as follows:

- Off = idle
- On = busy

The busy status of each circuit is indicated by a separate LED as follows:

- The first key selects the circuit
- The second key locks the circuit

3.60.3 Loadware Variants

- PZGTSFP0 (China - CSN1/Railway)
- PZGTSFP1 (GUS - 2600Hz LONIIS, 2100 Hz OB, 1200/1600Hz ADASE)
- PZGTSFP2 (GUS - 2600Hz LONIIS, 2100 Hz OB, 1600+2100+2600Hz Railway)

- PZGTSFP3 (GUS - 2600Hz LONIIS, 2100Hz OB, 600/750Hz ADASE)

3.60.4 DIP-FIX Switches

For the following variants, the DIP-FIX switches must be left in the delivery status, that is, switches are open:

- Q2147-X
- Q2147-X100
- Q2147-X200

For the TMSFP **Q2147-X300-2** variant, set the DIP-FIX switches as shown in Table 3-183.

> You must set the switches before plugging the board into the shelf.

DIP-FIX Switches				Standard Signalling Variants			
8-7	6-5	4-3	2-1				
Off	On	On	On	GUS4	2600 HZ	LONIIS	
Off	On	On	Off	GUS502	1200/1600 HZ	ADASE	
Off	On	Off	On	GUS501	1200/1600 HZ	ADASE	
Off	On	Off	Off	GUS6	2100 HZ	LB	
Off	Off	On	On	GUS7	600+750 HZ	ADASE	
Off	Off	On	Off	GUS81	1600 HZ	Railway	
Off	Off	Off	On	GUS82	2100 HZ	Railway	
Off	Off	Off	Off	PMTS test only (factory setting)			
On = latched = closed							
Off = unlatched = open							

Table 3-183 TMSFP Board DIP-FIX Settings for Variant Q2147-X300

For the TMSFP **Q2147-X400-1** variant, set the DIP-FIX switches as shown in Table 3-184.

> You must set the switches before plugging the board into the shelf.

DIP-FIX Switches				**Variants for HARRIS exchanges (+ 425 Hz)**
8-7	**6-5**	**4-3**	**2-1**	
Off	On	On	On	GUS41 2600 HZ HARRIS
Off	On	On	Off	GUS512 1200/1600 HZ
Off	On	Off	On	GUS511 1200/1600 HZ
Off	On	Off	Off	GUS61 2100 HZ LB
Off	Off	On	On	GUS71 600+750 HZ
Off	Off	On	Off	GUS811 1600 HZ
Off	Off	Off	On	GUS821 2100 HZ
Off	Off	Off	Off	PMTS test only (factory setting)
On = latched = closed				
Off = unlatched = open				

Table 3-184 TMSFP Board DIP-FIX Settings for Variant Q2147-X400

Transmission Parameters

DTMF transmission levels for GUS5xx (CIS):

GUS501, GUS511: switchable Standard = -4,4 dBm0, optional = -8,8 dBm0
GUS502, GUS512: switchable Standard = -4,4 dBm0, optional = 0 dBm0

Impedance: 600 Ω for active state and for idle state. The same impedance is used for tone signaling.

AMO SICOFI Index	**Relative Levels [dBr]**		**Maximum Line Attenuation [dB]**	**Remarks**
	DA	**AD**		
0	-4,0	-4,0	0	New standard levels
1	-3,5	-3,5	0	Old standard levels

Table 3-185 Transmission Parameters

AMO SICOFI Index	Relative Levels [dBr]		Maximum Line Attenuation [dB]	Remarks
	DA	AD		
2	-3,0	-4,0	0,5	Line attenuation related to the old standard levels
3	-2,5	-4,5	1,0	
4	-2,0	-5,0	1,5	
5	-1,5	-5,5	2,0	
6	-1,0	-6,0	2,5	
7	0	-7,0	3,5	
DA = Digital switch to Analog line AD = Analog line to Digital switch				

Table 3-185 Transmission Parameters

3.61 VCM Voice Compression

The voice compression (VCM) board allows up to four calls for every channel to happen simultaneously. The integrated voice compression is transmitted at 16 Kbps. Compressed voice connections can be switched to various destinations without decompressing and without loss of transmission quality.

In networks with S2M nailed connections, each S2 highway offers up to 30 B-channels, all of which can be used for compressed connections. At a compression factor of 1:4, this offers a theoretical maximum of 120 connections. In practise, up to 112 connections are possible.

Each VCM board (Q2235-X) can be used for compressing and decompressing voice connections on up to 15 channels. This means that eight VCM boards are necessary to obtain the maximum number of compressed connections on one S2 highway.

The VCM board emulates the DIUN2 board on the HiPath side.

This board is assigned a separate trunk group for compressed voice connections. All connections routed through this board are compressed to 16 Kbps.

Since the VCM board emulates the DIUN2 board, an appropriate signalling channel (D-channel) is also set up as the first modulated channel subset in a 64 Kbps timeslot. The signalling information is transmitted with the 16 Kbps HDLC protocol.

On the network side, the compressed connections are routed to a real DIUN2 board or STMD2 board by means of a nailed connection, where they are transparently switched through to the appropriate S2 or S0 highway channel.

- A VCM board has only one D-channel and can only be connected to one DIUN2 board at a time. It is possible for several VCM boards to connect to one DIUN2 at the same time (DIUN2 = > max. 16 VCM15 boards;
- When the compressed trunk group is configured (nailed connection), you will be cautioned to ensure the correct symmetry of the configuration.
  A symmetrical configuration for two system nodes simply means that the configured VCM B-channels in one node must lead to a corresponding number of switchable VCM B-channels in the partner node.

> The correct symmetry is the responsibility of the system administrator!

- Any B-channels of the DIUN2 board can be assigned. The sequence in which they are seized is not important. The VCM B-channels must be assigned to the channels of the DIUN2 board in sequence.

- The VCM B-channels can also be individually enabled and disabled. You must ensure that the subset or *quarter-channel* used for signalling is disabled last (or, conversely, enabled first). The B-channels must always be enabled or disabled symmetrically, that is in the home node AND in the partner node.
- The VCM board does not require loadware parameterization.
- The downloading parameter sets of the DIUN2 are not affected by the voice compression utility.

> The VCM board must not be defined as a reference clock supplier.

- Partial failures of the VCM cannot be signalled to the partner node. Channel-specific dependability blocking of the VCM B-channels would lead to an asymmetrical situation, that is, outgoing voice compression calls from the partner node could lead to blocked B-channels in the home node. For this reason, dependability always reacts to defective VCM channels by putting the entire board out of service. The loss of the signalling channel can be detected by the partner node, which can then react accordingly and block its own appropriate VCM board.
- The possibility of outgoing connections leading to blocked B-channels in a partner node cannot be avoided elegantly. For this reason, you must always deactivate the entire S0 or S2 highway before reconfiguring the channel compression ratio.
- Routing is carried out with the LCR system, exclusively.
- In the LDAT AMO, the LCR route elements concerned must be assigned the attribute >COMPRESSED<.

  A threshold value for the maximum number of compression/decompression cycles must also be assigned.
- The VCM circuit data must also contain the >COMPRESSED< attribute (necessary for incoming seizures)
- The LCOSV (LCR class of service for voice connections) of a station line defines whether or not a compressed connection is permitted (appropriate attribute is defined with the LAUTH parameter of the AMO).
- For call data recording purposes, no special compressed connection attribute is necessary. The current CDR functionality is sufficient for compressed voice connections (e.g.: ZONE / CARRIER).
- Parallel seizure of the S_{2M} / S_0 for non-compressed connections such as data (64 Kbps), analog fax, modem or 64 Kbps voice connections (for higher-grade transmissions) is possible, due to the exclusive assignment of the B-channels for compressed or non-compressed connections.

- DIUN2 / STMD2 / VCM boards for compressed connections must not occupy an LTU quarter or LTU half in which a SIUX/SIUX2 is configured.
- Echo compensation is not necessary with voice compression, since the G.728 method used has extremely short processing periods (1-2 msecs.). In networks which require echo compensation for other reasons, this must take place on the network side of the compressed connections, that is voice compression must not take place between two echo compensation units.
- Route optimization can be deactivated for voice compression connections per system.

3.61.1 Switching Boards and Circuits

The VCM board and circuits are switched with the BSSU and DSSU AMOs.

With partner board and circuits, the BSSU and DSSU AMOs detect soft-blocking (or activation) of the nailed connections of a partner board and carry out a soft block or activation of the appropriate VCM boards or circuits.

In the case of a hard blocking of a partner board or circuit, the appropriate VCM boards or circuits are also blocked by dependability.

3.61.2 Activating and Deactivating Voice Compression

On the system side, a VCM-B15 offers 15 full B-channels (voice only); on the network side, however, up to 4 channels are grouped per nailed connection (voice and data). This reduces the capacity for data transmission.

In some circumstances, it may be necessary to decrease the ratio or compression factor of VCM B-channels to S0/S2 B-channels to increase the data transmission capacity. This ratio can be increased at a later time, as the demand for voice channels increases.

> The nailed connections for voice compression connections must be switched symmetrically in both nodes.

3.61.3 Configuring the VCM Board Using AMOs

To configure the VCM board use the following AMOs:

- **DIMSU** Assign memory for VCM
- **FEASU** Enable VC feature
- **COT** SPCM for VCM circuits / VCMN fir for circuits which are also to carry data, or if external voice compression units are connected.
- **TDCSU** COTNO / COTX / DEV

- **LDAT** LATTR=VOICO / VCCYC=<number> (that is, number of times a call can be compressed)
- VOICO Assign PEN / VCM / B-channels
- ZAND ROLCKVCM=Y deactivates route optimization for voice compression

3.61.4 Configuring the Shelves

Table 3-186 lists the configuration of the VCM boards with a DIUS2 board on first shelf.

.All the B-channels of a DIUN2 are to be used for compressed connections if required.

- Eight VCM boards are required for every DIUN2 circuit (30 B-channels) = 16 VCMs
- DIUN2 / 60 TSLs
- VCM / 19 TSLs 4 Nailed Connection timeslots + 15 B-channel timeslots

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DIUS2				VCM	VCM	VCM		VCM	VCM	VCM		VCM	VCM	VCM	

Table 3-186 Shelf Configuration of VCM Boards with DIUS2 Board On Shelf One

Table 3-187 lists the configuration of the VCM boards on the second shelf.

The board can be installed in any free slot in an LTU half. Remember the maximum number of 128 timeslots for every LTU half.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VCM	VCM	VCM		VCM	VCM	VCM		VCM							

Table 3-187 Shelf Configuration of VCm Boards with DIUS2 Boarb on Shelf Two

Table 3-188 lists the configuration of the VCM boards with a STMD board on shelf one.

All the B-channels of an STMD2 board are to be used for compressed connections, if required

- One VCM required for every STMD2 circuit (2 B-channels)
- STMD2 / 16 TSLs

- VCM (under equipped) / 9 TSLs

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
S T M D	V C M	V C M	V C M	V C M	V C M	V C M	V C M	V C M							

Table 3-188 Shelf Configuration of VCM Boards with STMD Board On Shelf One

Figure 3-124 shows a functional diagram of the VCM board.

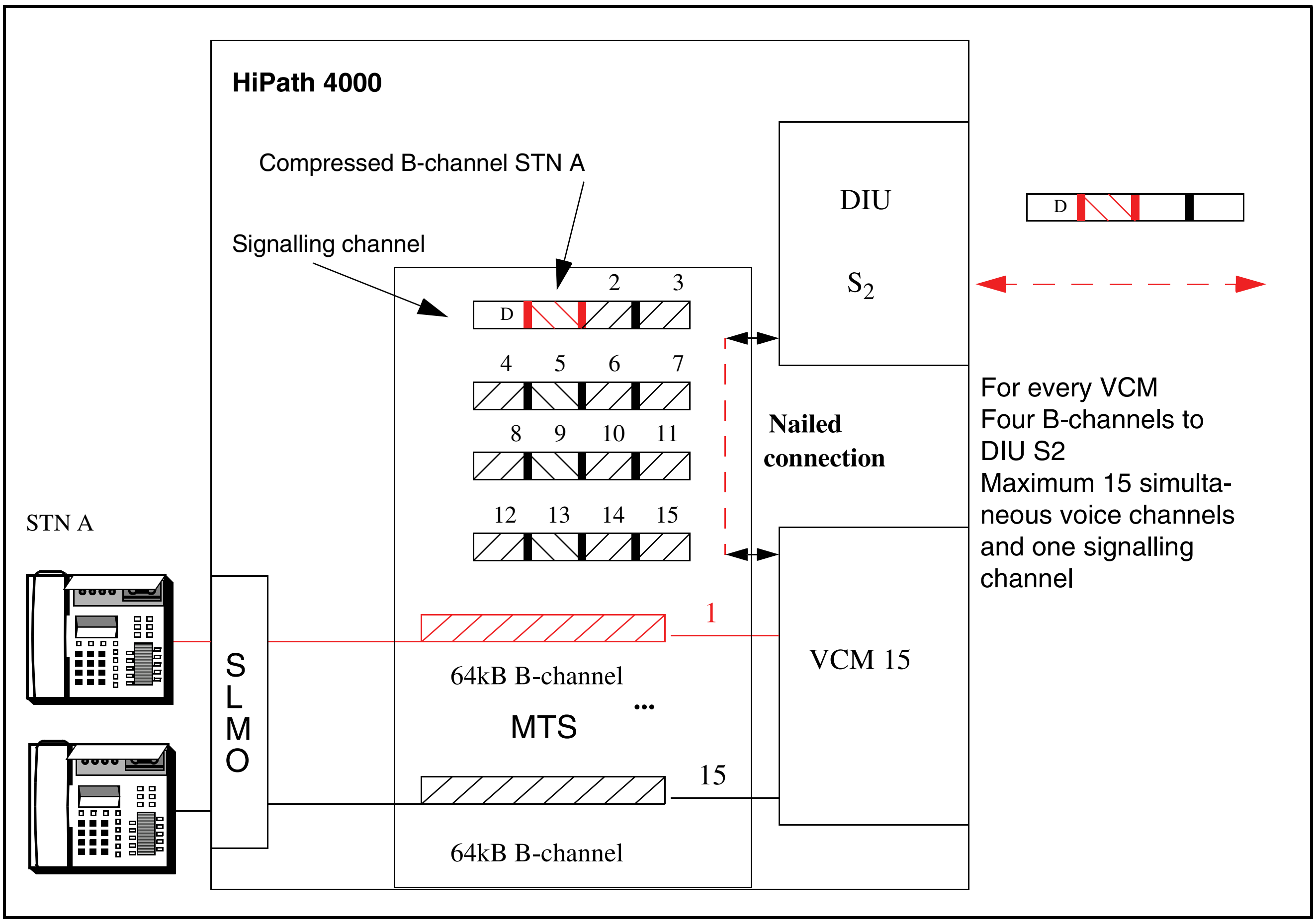


Figure 3-124 VCM Overview

3.61.5 Compression, Outgoing

Outgoing seizures of compressed routes are always handled by the VCM board. This is achieved by configuring the VCM trunk group appropriately. On the HiPath side, the VCM emulates a *normal* DIUN2.

The HiPath system treats such connections as *normal* outgoing connections. One of the 15 available VCM channels is seized for connection setup by call processing. This channel is selected with the aid of the route discrimination and device search components. In the VCM board, the connection is compressed and the appropriate timeslot subsets of the physical B-channel (nailed connection) are selected for D-channel and compressed B-channel signalling to the *correct* DIUN2 board. The DIUN2 board simply switches the timeslots received by the VCM through to the appropriate timeslots of the S2 highway (that is, transparently). The assignment of nailed connection timeslots to S2 timeslots can be configured with AMO commands.

3.61.6 Decompression, Incoming

Incoming compressed connections are transparently switched through to the nailed connection of a VCM by the DIUN2. The VCM board receives the compressed connection, decompresses it and selects an appropriate 64 Kbps timeslot on the Hicom side for transmission to the switching network. The VCM emulates a normal DIUN2 board on the system side, and the connection is accordingly switched through to the station line by the call processing system.

3.61.7 Transit Connections

Compressed -> decompressed

Refer to Section 3.61.6, “Decompression, Incoming”.

Compressed -> compressed

Incoming compressed connections are transparently switched through to the nailed connection of a VCM board. By default, the connection are decompressed for call processing on the system side. In the case of transit connections, that is, from one VCM to another, the call processing system sends an appropriate message to the VCM boards (both boards), whereupon the decompression is deactivated, and the compressed connection transparently switched through the system. As soon as the B-channel is established between the two boards, the entier connection path is monitored using **inband signalling**. This allows the VCM boards to determine whether the transit connection is still open or not.

The inband signalling is carried out at periodic intervals throughout the duration of the compressed connection. If the B-channel status changes during the call due to activated features, for example, through consultation hold with subsequent call transfer, the decompression is deactivated, if the inband signalling system detects that the call has been transferred to a station line circuit.

Inband signalling is only carried out internally between VCM boards in a HiPath 4000 system. The signalling information is transmitted using redundant bits, that is, bits not used for voice signalling. Inband signalling is only used for transit connections, that is, from one VCM to another.

In the transit node, the connection is switched through transparently, that is, in compressed form, using a 64 Kbps timeslot. The timeslot carries only one connection, which means only one of every four channels is used. The other subsets remain unused, or are used for the periodic inband signalling in the B-channel between the two VCM boards.

Figure 3-125 shows an example of a transit connection.

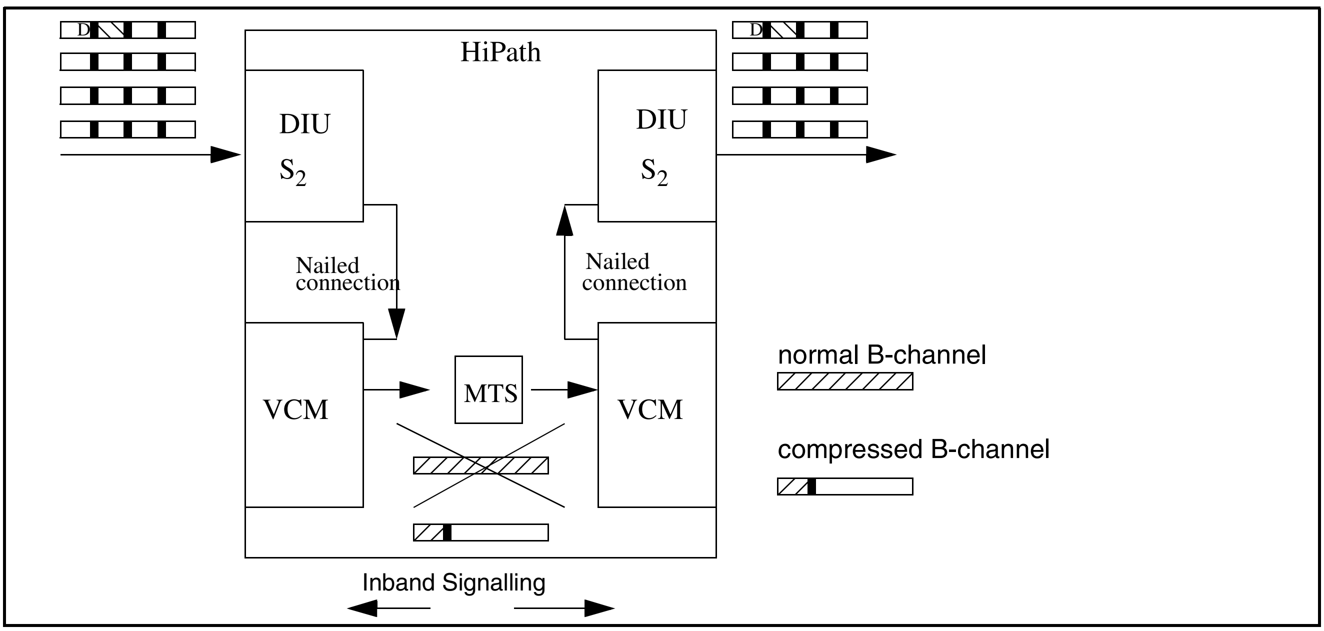


Figure 3-125   Transit Connection Example

3.61.8 Mixed Mode Operation, Voice and Data

Figure 3-126 shows an example of mixed mode operation for voice and data.

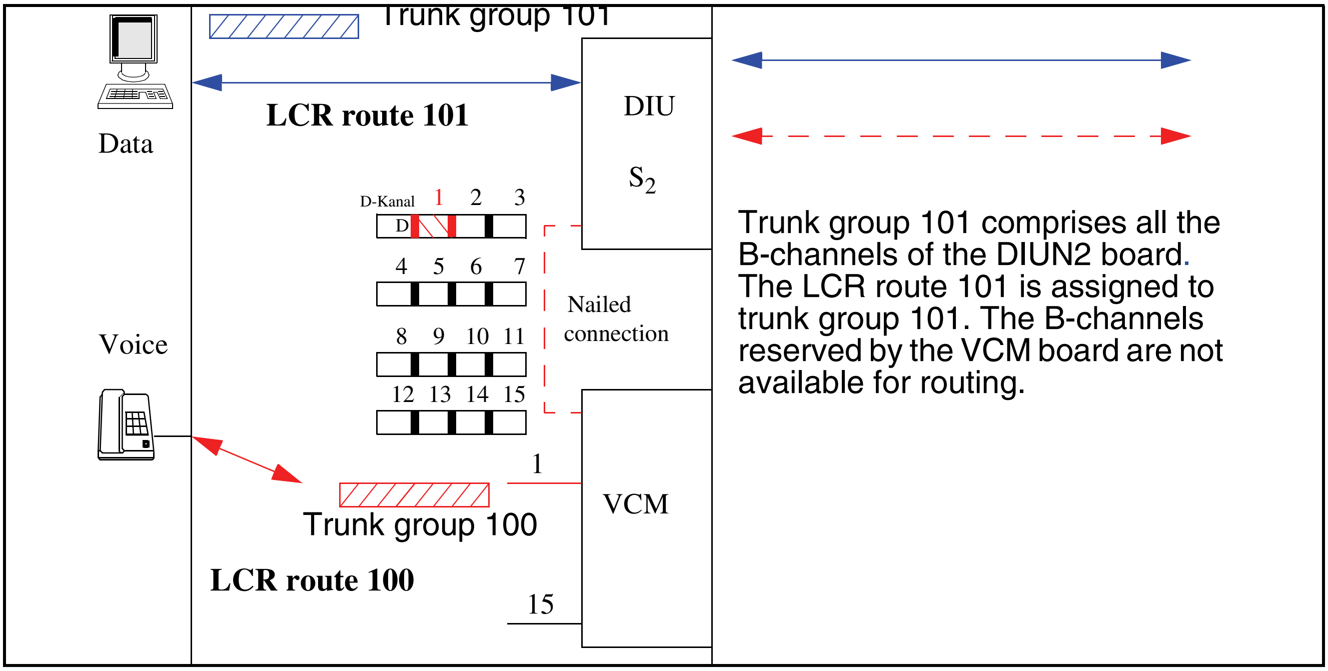


Figure 3-126 Mixed Mode Operation, Voice and Data

DIUN2 B-channel access can be controlled by deactivating and deactivating the individual B-channels of a nailed connection, depending on the traffic volume.

> **Important**
> Do not forget the B-channels of the partner system.

3.61.9 Administering More Data Channels or More Voice Channels

If the demand for data channels increases at certain times of the day, for example, at night, the amount of available B-channels for data transmissions can be increased by deactivating the appropriate voice compression nailed connections. This significantly reduces the number of available voice channels.

If more voice channels are required at a later time, the nailed connections carrying these channels must be explicitly re-activated again.

No voice compression for specified users

Certain station line types, for example, analog fax or modem lines, are not automatically recognized by call processing as data lines, and are therefore not automatically disabled for voice compression.

These lines must be expressly protected from voice compression with the aid of administration and maintenance commands, e.g. using the standard LCR control mechanisms.

4 Power FRUs

4.1 HiPath 4000, AC-Powered, Non-Redundant System (with L80XF Shelf)

The power FRUs on an AC-powered, non-redundant HiPath 4000 system are:

- One AC-to-DC shelf power supply unit (ACPCI) on the CSPCI shelf
- One AC-to-DC shelf power supply unit (LPC80) on the L80XF shelf
- One DC-to-DC shelf power supply unit (PSUP) on the L80XF shelf
- A UACD powerbox can also be used as a battery backup.

> If a Powerbox is used as a battery backup, a DC-to-DC power supply is required.

4.2 HiPath 4000, DC-Powered, Non-Redundant System (with L80XF Shelf)

The power FRUs on a DC-powered, non-redundant HiPath 4000 system are:

- One DC-to-DC shelf power supply unit (DCPCI) on the CSPCI shelf
- One DC-to-DC shelf power supply unit (PSUP) on the L80XF shelf

4.3 HiPath 4000, AC-Powered, Redundant System (with LTUW Shelf)

The power FRUs on an AC-powered redundant HiPath 4000 system are:

- Two AC-to-DC shelf power supply units (PSUC) on the CSPCI shelf
- Two UACD power boxes
- Two DC-to-DC shelf power supply units (PSUP) on the LTUW shelf

> If a Powerbox is used as a battery backup, a DC-to-DC power supply is necessary.

4.4 HiPath 4000, DC-Powered, Redundant System (with LTUW Shelf)

The power FRUs on a DC-powered, redundant HiPath 4000 system are:

- Two DC-to-DC shelf power supply units (PSUP) on the CSPCI shelf

- Two DC-to-DC shelf power supply units (PSUP) on the LTUW shelf

4.5 ACPCI/DCPCI

In HiPath 4000 V2.0 or later, the ACPCI/DCPCI power supply units (see Figure 4-2) are used on the new CSPCI shelf and Survivability Server (see Section 2.7, “Survivability Server”). The two power supply units vary only in input power. The output voltages and the mechanical design are identical.

> The factory setting for the CSPCI shelf’s power supply coding is always set to ACPCI. To use DC power supplies (DCPCI), you must change the coding according to Figure 4-1. The power supply is hot plugable.
>
> Don’t put the power supply in the CSPCI shelf violent.

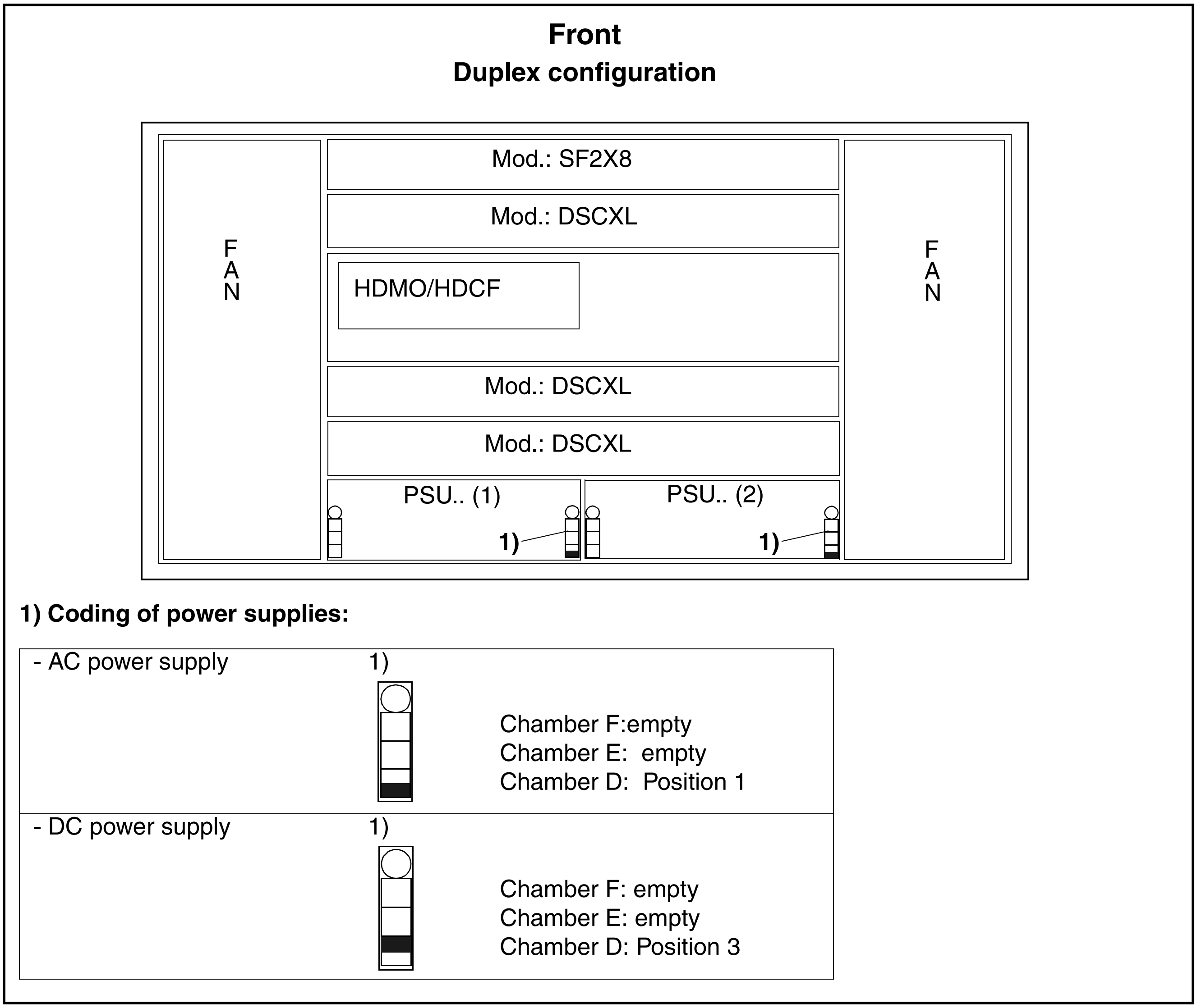


Figure 4-1 Coding for power supply configurations ACPCI/DCPCI

The ACPCI converts AC power to DC. The AC input voltage is 90-264 VAC from the utility outlet that provides power to the system (nominal input voltage 110/230 VAC). The nominal input frequency is 50/60 Hz (tolerance: 47-63 Hz).

The mains input power cable is not directly connected to the power supply unit but is plugged in at the back of the CSPCI shelf (refer to Section 4.5.1, “ACPCI/DCPCI Input Power Connectors”“). The mains input power is fed into the power supply unit by means of the backplane. The AC power supply cable is fed through a slot in the front panel of the MCM board.

For the DCPCI, only 48 VDC (tolerance: 36-72 VDC) is directly connected to the back of the backplane.

The individual output voltages are: +3.3 V (33 A), + 5 V (33 A) and +12 V (5 A).

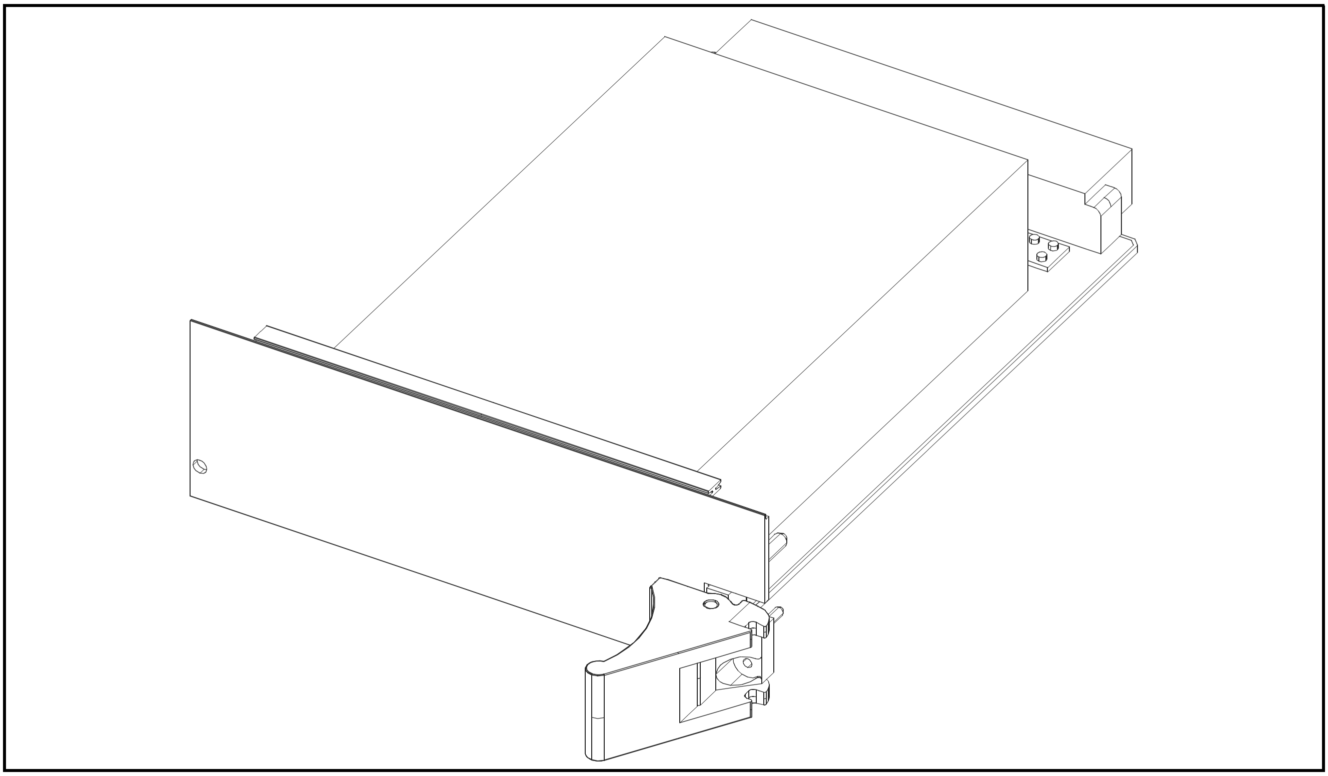


Figure 4-2 ACPCI/DCPCI Power Supply

4.5.1 ACPCI/DCPCI Input Power Connectors

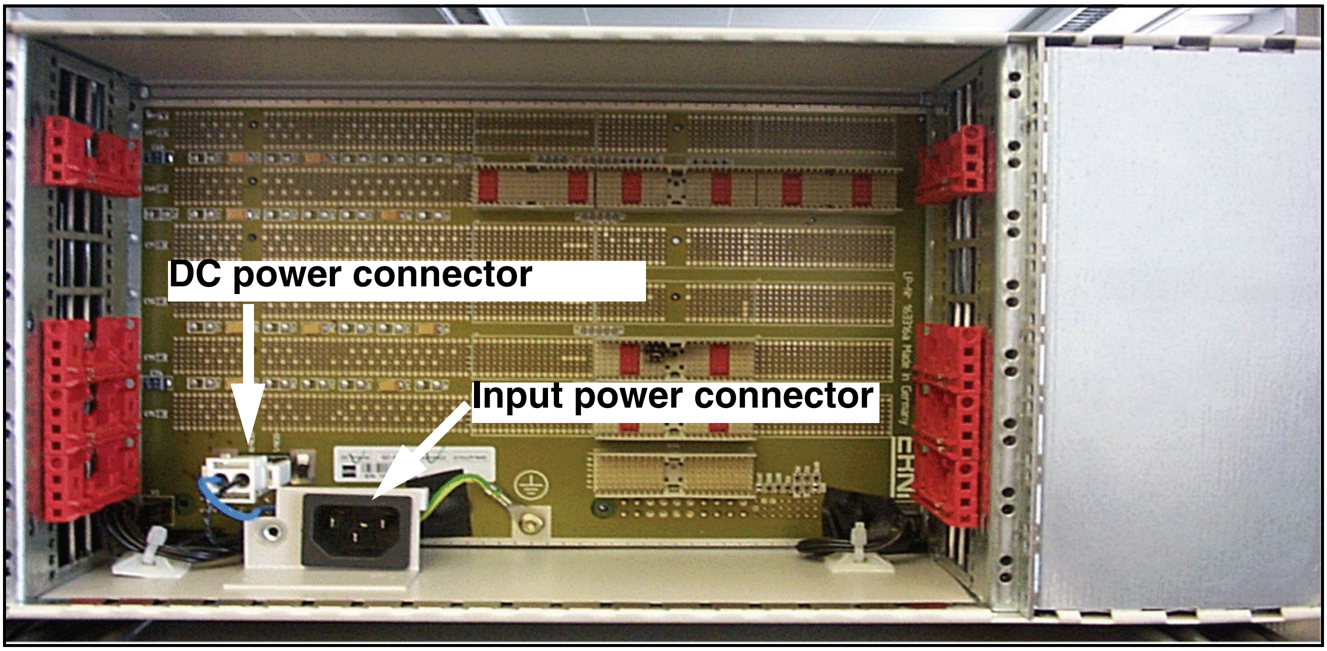


Figure 4-3 ACPCI/DCPCI Power Connectors

4.5.2 Hardware Variants

ACPCI:

Magne Tek (S30122-K7682-M1)

Cherokee (S30122-K7682-C1)

Cable variants: 3-pin for IM: C39195-Z7001-C17 or 3-pin for NA: C39195-Z7001-C19

(IM = International Market, NA = North America)

DCPCI:

Magne Tek (S30122-K7683-M1)

Cherokee (S30122-K7683-C1)

Cable variant: S30805-H5298-X14

4.5.3 LED Indications

The ACPCI/DCPCI has one green LED that is lit when all output voltages are within tolerance. The LED is not lit if any DC output voltage is not within tolerance or if the input voltage is lost.

4.5.4 Removing the ACPCI/DCPCI

To remove the ACPCI, unfasten the two screws on each side of the power supply unit.

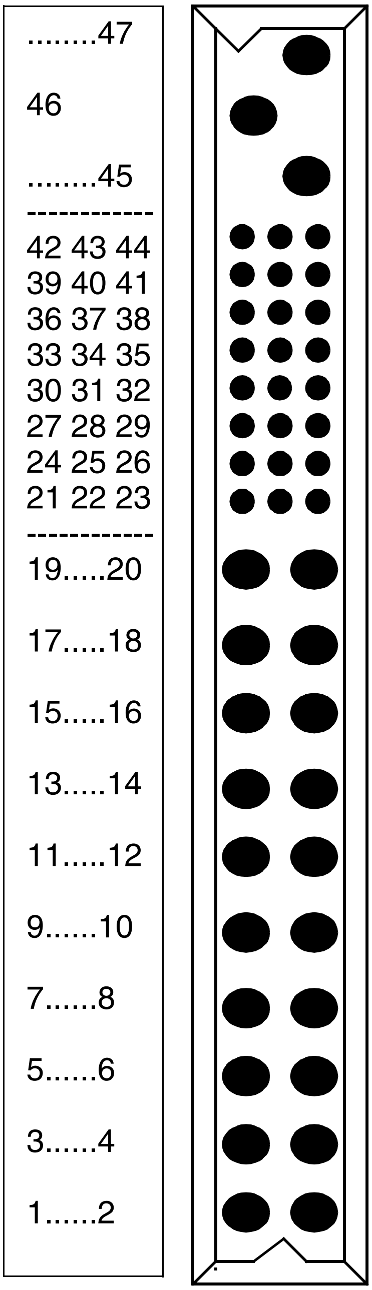
4.5.5 Replacing the ACPCI/DCPCI

To replace the ACPCI, tighten the two screws on each side of the power supply unit.

4.5.6 Verifying the ACPCI/DCPCI

To verify the ACPCI or DCPCI, ensure that the green LED is lit.

4.5.7 Input/Output Assignment



Pin.......Signal Name
1.........V1 Output (5V)
2..........V1 Output (5V)
3.........V1 Output (5V)
4.........V1 Output (5V)
5......V1 and V2 Return
6......V1 and V2 Return
7......V1 and V2 Return
8......V1 and V2 Return
9......V1 and V2 Return
10.....V1 and V2 Return
11.....V1 and V2 Return
12.....V1 and V2 Return
13.....V2 Output (3.3V)
14.....V2 Output (3.3V)
15.....V2 Output (3.3V)
16.....V2 Output (3.3V)
17.....V2 Output (3.3V)
18.....V2 Output (3.3V)
19.....V3 Return
20.....V3 Output (+12V)
21.....V4 Output (-12V)
22.....Signal Return
23.....Reserved
24.....V4 Return
25.....Geograph. Addr Bit 0
26.....Reserved
27.....Enable
28.....Geograph. Addr Bit 1
29.....V1 Adjust
30.....V1 Remote Sense
31..... Data In
32.....V2 Adjust
33.....V2 Remote Sense
34.....Sense Return
35.....V1 Current Share
36.....V3 Remote Sense

Pin.......Signal Name
37.....Data Out
38.....Degrade Signal
39.....Inhibit
40.....Clock
41.....V2 Current share
42.....Fail Signal
43.....Chip Select
44.....V3 Current Share
45.....Chassis Ground (PE)
46.....AC Input - Neutral
.........+DC Input
47.....AC Input Line
........- DC Input

Figure 4-4 ACPCI Input/Output Assignment

4.6 LPC80

The AC-to-DC shelf power supply unit (LPC80) converts AC power to bulk DC, talk voltages. The nominal AC input voltage are 176-253 VAC (LPC80 WR Artesyn 110-230 VAC, Magnetek 110-253 VAC) from the utility outlet that provides power to the cabinet. Its output is bulk –48 VDC that it delivers to the DC-to-DC shelf power supply and talk and ring voltages. The frequency is between 45 Hertz (Hz) and 66 Hz (LPC80 WR Artesyn 50-60 Hz).

The LPC80 occupies slot 16 on the L80XF shelf. It distributes the voltages to the shelf power supplies through backplane connectors.

LPC80 (WR = Wide Range)

4.6.1 LPC80 Power Connection

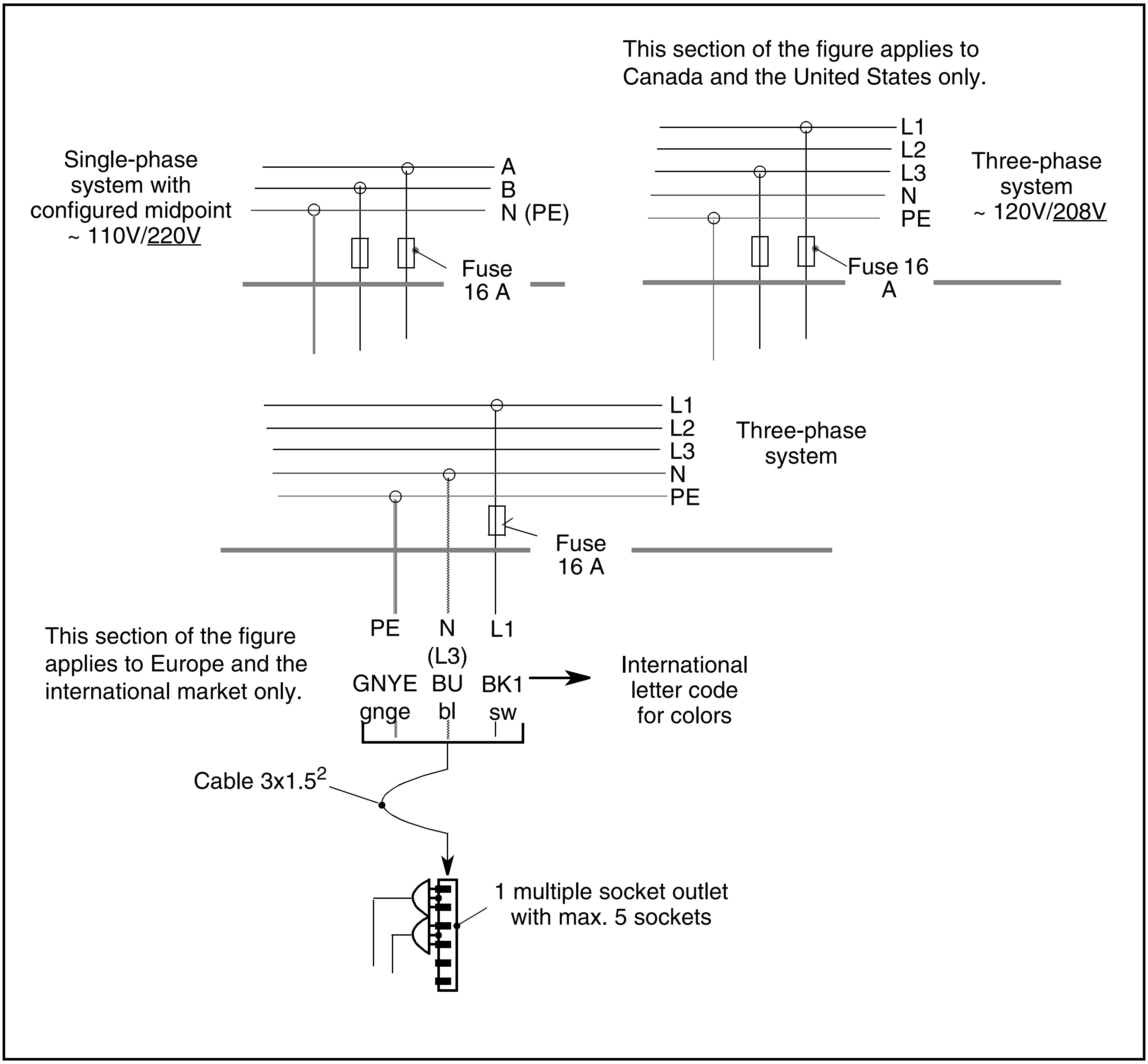


Figure 4-5 LPC80 Power Connection

4.6.2 LPC80 Power Supply Unit, Technical Data

Part Number LPC80: S30122-K7162-X (Artesyn)
Part Number LPC80: S30122-K7163-X (Celestica)
Part Number LPC80: S30122-K7554-X (Magnetek)
Part Number LPC80 WR: S30122-K7554-A (Artesyn)

Weight: approximately 4.3 kg (9.5 lbs.)

Design: Plug-in unit for 2-slot shelf

Dimensions: D = 330mm (13 in.), W = 80mm (3.1 in.), H = 265mm (10.4 in.)

Ambient temperature: +5 °C (41°F) to 55 °C (131°F

Cooling: Free convection

Protection class: Protection class 1, VDE 0805/IEC 435

Standards: in accordance with PN/SBCS specifications on conformance to standards and approval (F31505-G1-X-*-A5)

Input

Altering current range: 176V - 253V

Current: approximately 2.7 A (~230V)

Frequency: 45 - 66Hz

Power P_{input} 535VA (~230V)

Power factor: min. 0.95

Efficiency at 100% load: min. 88%

Power supply connection: modular power cord, 3-pin

Outputs

Output power:

- max. 470W
  - LPC80, standard for CAB80DSC/DSC1 *)

	Nom. voltag e	**Min. voltag e**	**Max. voltag e**	**Limit**	**Rated power**	**Min. power**	**Over current range**
U1 (Bulk)	54,7V	54,3V	55,1V	60V	290W	0 A	7A-7.5A
U2 (Talk)	54,7V	54,3V	55,1V	60V	180W	0,1A	4,5A-5A

  - LPC80, battery charger mode: *)

	Nom. voltage	**Min. voltage**	**Max. voltage**	**Limit**	**Rated power**	**Min. power**	**Over current range**
U3	54,7V	54,3V	55,1V	60V	470W	0A	9A-10A
U3	53,5V	53V	54V	60V	470W	0A	9A-10A

Switching Operating Modes: *)

Between standard/charger mode (on the back of the LPC80)	for -K7162-	Artesyn: neutral switch, clearly identifiable from sticker 1st option: Battery Charger 2nd option: Power Supply Peripheral Shelf: standard mode forCAB80DSC
	for -K7163-	Celestica: jumper W1, clearly identifiable from sticker ON --> connector W1 with J5 --> battery charger mode OFF --> connector W1 with J6 --> standard mode for CAB80DSC
	for K7554-	Supplier: MagneTek/Artesyn 3-pin connector behind a window on the underside of the power supply unit. (2 screws) 1. Connector in "Mode1": as used with peripheral shelves 2. Connector in "Mode2": as used with battery chargers
Between two possible voltages (in charger mode)	for -K7162-	Artesyn: jumper setting, clearly identifiable from sticker 1st option: 54.7 V (factory setting) 2nd option: 53.5 V
	for -K7163-	Celestica: jumper J9, clearly identifiable from sticker 1st option: connection between pin 3 and pin 4 from J9 --> 54.7V (factory setting) 2nd option: connection between pin 1 and pin 2 from J9 --> 53.5V

Table 4-1 Operating Mode Settings of the LPC80 (Seite 1 von 2)

	for K7554-	Supplier: MagneTek/Artesyn Switch on the underside of the power supply unit; (voltages shown on circuit board) - Switch in left position --> 53.5V - Switch in right position --> 54.7V

Table 4-1 Operating Mode Settings of the LPC80 (Seite 2 von 2)

Short circuit current: 1 x I_N to 1.2 x I_N

Output connector: by means of “H15-ERNI” connector on the backplane

Monitor: Summation signal for errors U1 to U2 (undervoltage or overvoltage) with floating relay contact (switch).

Control elements and visual indicators (front)

- Operating switch: I - O
- Operation indicator: green LED
- Modular power cord, 3-pin: power supply unit

LPC80, “ERNI H15” pin assignment (15-pin)

Slot EBP B2 016

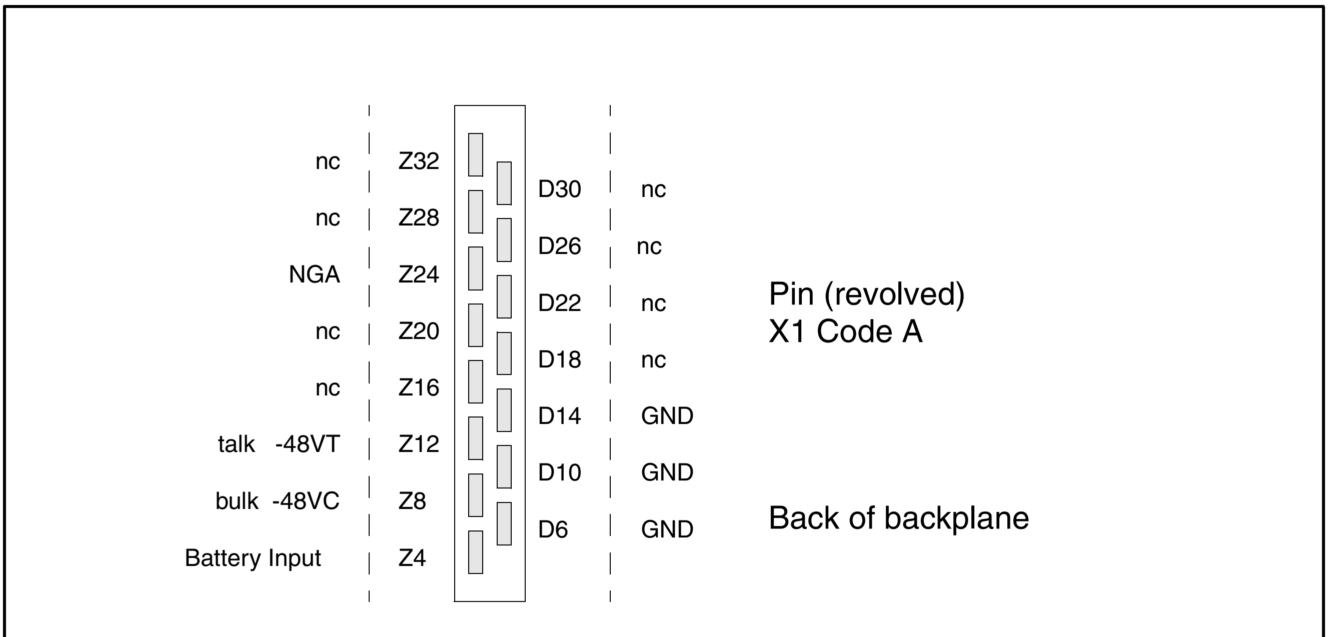


Figure 4-6 “ERNI H15” Pin Assignment

4.6.3 LPC80 LED Indications

The LPC80 has one green LED that is lit when all output voltages are within tolerance (see Figure 4-7). The LED is off if any DC output voltage is not within tolerance or if AC power is lost.

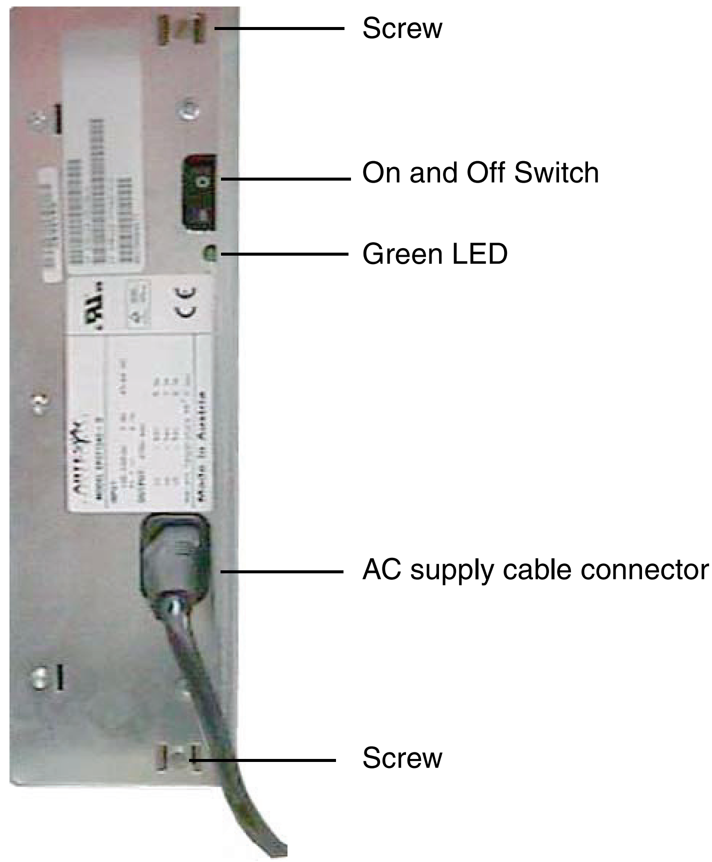


Figure 4-7 LPC80

4.6.4 LPC80 Connectors and Switches

The front of the shelf power supply has a receptacle for AC supply cable and a switch for turning the unit on or off (see Figure 4-7).

4.6.5 Removing the LPC80

> **Danger**
> Use extreme caution when you work on power supply components. Power supply voltages can be lethal. Observe all applicable electrical safety precautions for working with high voltages.
> Do not wear an ESD strap when working on the backup battery.

> **Warning**
> This procedure removes the HiPath 4000 from service when performed on the base cabinet and removes only the expansion cabinet from service when performed on the expansion cabinet.

To remove the LPC80:

1. Turn off the switch on the LPC80.
2. Disconnect the AC supply cable connector from the receptacle.
3. Remove the screws that secure the LPC80 to the shelf.
4. Remove the LPC80 from the shelf.

4.6.6 Replacing the LPC80

To replace the LPC80:

1. Ensure that the AC power supply cable is unplugged.
2. At the front of the shelf, slide the LPC80 into the shelf until you seat it firmly.
3. Secure the shelf power supply with screws to the shelf.
4. At the front of the LPC80, reconnect the AC supply cable connector to the LPC80 receptacle.
5. Plug the AC power supply cable to the wall outlet.
6. Turn on the switch on the LPC80.

4.6.7 Verifying the LPC80

To verify the operation of the LPC80, confirm that the green LED status indicator is lit.

4.7 LUNA 2

The AC-to-DC shelf power supply unit (LUNA 2) converts AC power to DC on the HiPath IP Distributed Architecture (IPDA) system. The nominal AC input voltage is 90-264 VAC from the utility outlet that provides power to the cabinet. The DC output voltages are: -5.0 V, +5.1 V, +12 V, -12 V and –48 V. The frequency is between 47 Hertz (Hz) and 63 Hz.

4.7.1 LED Indications and Switches

The front panel features one green LED and two slide switches:

- Green LED:
  This indicates whether the individual voltages are within tolerance. If the voltage is outside tolerance, the LED goes out. Depending on the operating mode, the LED may illuminate or flash.
- Switch 1: On/off power supply switch
- Switch 2: Operating mode switch
  The power supply unit can be used for supplying power or charging the battery. Set the operating switch to the correct position (see front panel labelling).

  Operating modes:
  - Mode 1: as a power supply unit (LED is lit)
  - Mode 2a: as a battery charger (flashing LED) for maintenance-free dry-cell batteries (charging voltage: 54.7 VDC)
  - Mode 2b: as a battery charger (flashing LED) for wet-cell batteries requiring low charging voltage (53.5 VDC)

The LUNA 2 provides voltages specified in Table 4-2:

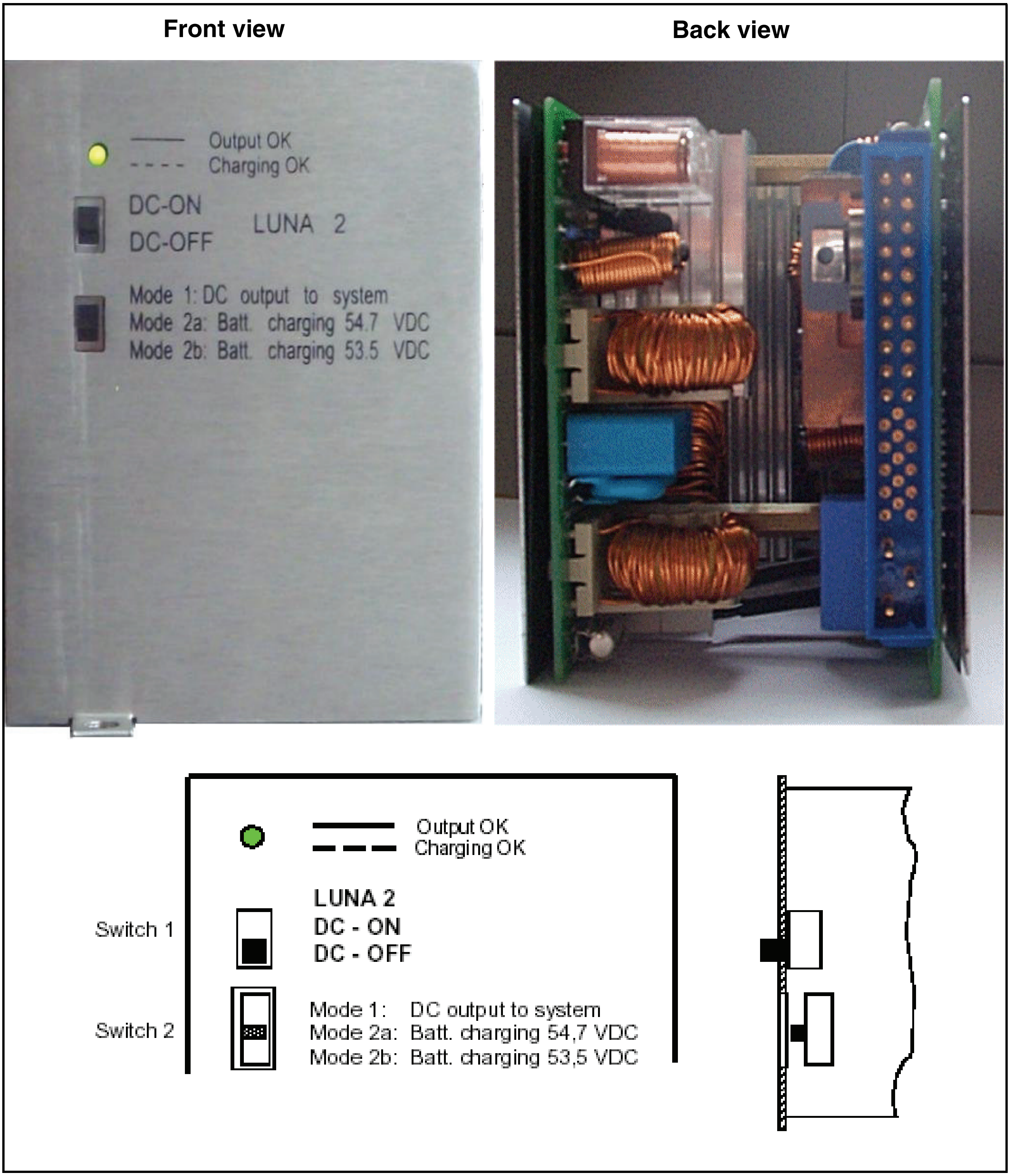


Figure 4-8 LUNA 2 (Front and Back View)

	PIN	PIN	PIN		
DC IN (minus pole)	**2**		**1**	DC IN (minus pole)	**DC output voltage**
U6 (-48 VDC)	**4**		**3**	GND	
GND	**6**		**5**	GND	
nc	**8**		**7**	nc	
U3 (-5 VDC)	**10**		**9**	GND	
U5 (-12 VDC)	**12**		**11**	GND	
U4 (+12 VDC)	**14**		**13**	GND	
GND	**16**		**15**	GND	
U1 (+5.1 VDC)	**18**		**17**	U1 (+5.1 VDC)	
U1 (+5.1 VDC)	**20**		**19**	U2 (+5.1 VL)	
		21			**Logic signals**
	23		**22**	U1 current+sense	
System **I**dentification **SI** 1 (SDA)		**24**			
SI 2 (SLC)	**26**		**25**	U6 current+sense	
Si 3 (reserved)		**27**			
PFL (DC Power Fail)	**29**		**28**	NGA (AC Power Fail)	
		30		Identify PIN_A0	
Identify PIN_A3	**32**		**31**	Identify PIN_A1	
		33			
	35		**34**		

Table 4-2 LUNA 2 PIN Assignment

<table>
<tr><th></th><th>PIN</th><th>PIN</th><th>PIN</th><th></th><th></th></tr>
<tr><td>PE</td><td>36</td><td></td><td></td><td></td><td rowspan="5">Power supply unit</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>37</td><td>Neutral (N)</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Phase (L)</td><td>38</td><td></td><td></td><td></td></tr>
</table>

Table 4-2 LUNA 2 PIN Assignment

4.7.2 Removing the LUNA 2

To remove the LUNA 2, unfasten the two screws on the front panel of the power supply.

4.7.3 Replacing the LUNA 2

To replace the LUNA 2, tighten the two screws on the front panel of the power supply unit.

4.7.4 Verifying the LUNA 2

To verify the LUNA 2, observe the green LED on the front panel.

- If the LED is lit, the voltages are OK
- If the LED is flashing, the battery is charging properly.

4.8 PSUP

The PSUP DC-to-DC shelf power supply converts bulk –48 VDC into +5/- VDC and +/- 12 VDC and delivers the converted voltage to the boards. The PSUP receives bulk voltage from power distribution wires connected to the backplane of each shelf.

The PSUP resides in CC80F, L80XF, and LTUW shelves.

4.8.1 PSUP LED Indications

The PSUP has a green status LED (see Figure 4-9). It also has a switch for turning the unit on or off. It occupies slot 127 on the L80XF, CC80F, and LTUW shelves. It also occupies slot 16 in a redundant LTUW shelf.

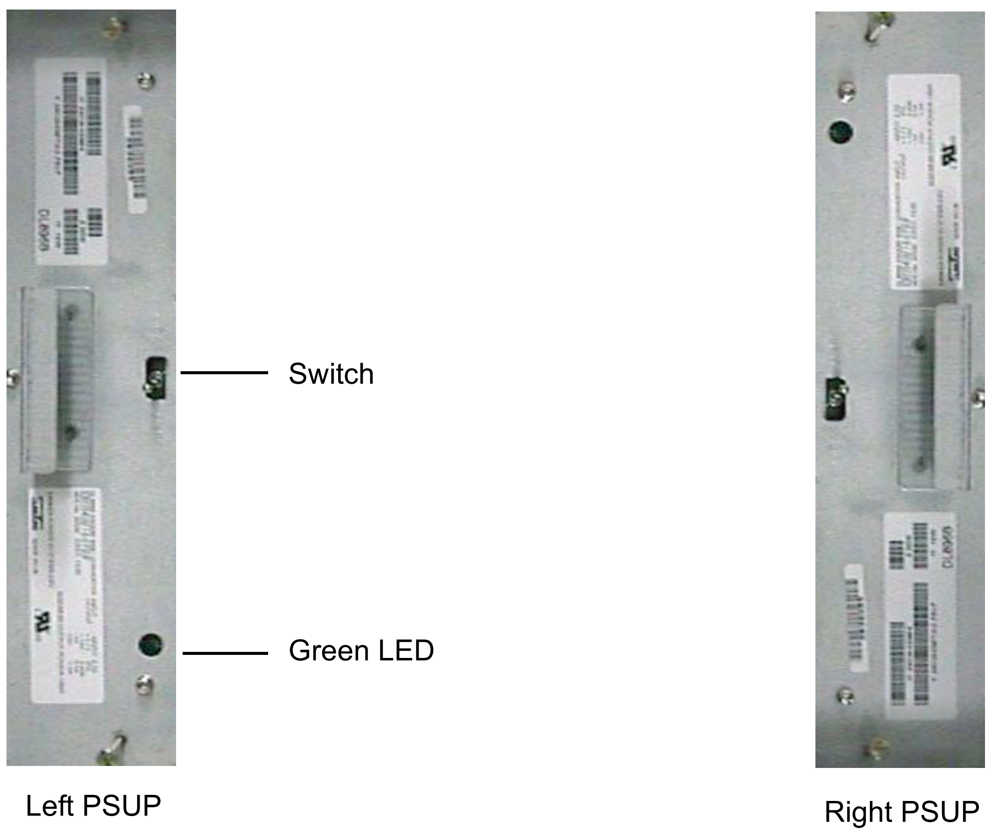


Figure 4-9 PSUP, Front View

Table 4-3 lists the LED indications of the PSUP.

Shelf Type	LED Color	LED Status	Indication
CC80F, L80XF, LTUW	Green	On	All output voltages are within tolerance.
		Off	One or more output voltages are below tolerance or the LTUP or LTUE power is turned off.

Table 4-3 PSUP LED indications

4.8.2 Removing the PSUP

Danger
Use extreme caution when you work on power supply components. Power supply voltages can be lethal. Observe all applicable electrical safety precautions for working with high voltages.

Do not wear an ESD strap when working on the backup battery.

To remove the PSUP:

1. Turn off the PSUP.
2. Loosen the screws that secure the PSUP to the shelf.
3. Remove the PSUP from the shelf.

4.8.3 Replacing the PSUP

To replace the PSUP:

1. Slide the PSUP into the shelf.
2. Tighten the screws to secure the PSUP to the shelf.
3. Turn on the PSUP.

4.8.4 Verifying the PSUP

To verify the operation of the PSUP, ensure that the green status LED is lit.

4.9 UACD

A unit alternating current distribution (UACD) stack consists of:

- One AC input distribution panel (ACDPX)
- One AC output distribution panel (PDPX2)
- Up to 3 line power converters (LPCs)

The UACD is stackable. One UACD supports two stacks (one on top of the other). A two-stack UACD supports a 4-stack HiPath 4000 system with one + one redundancy.

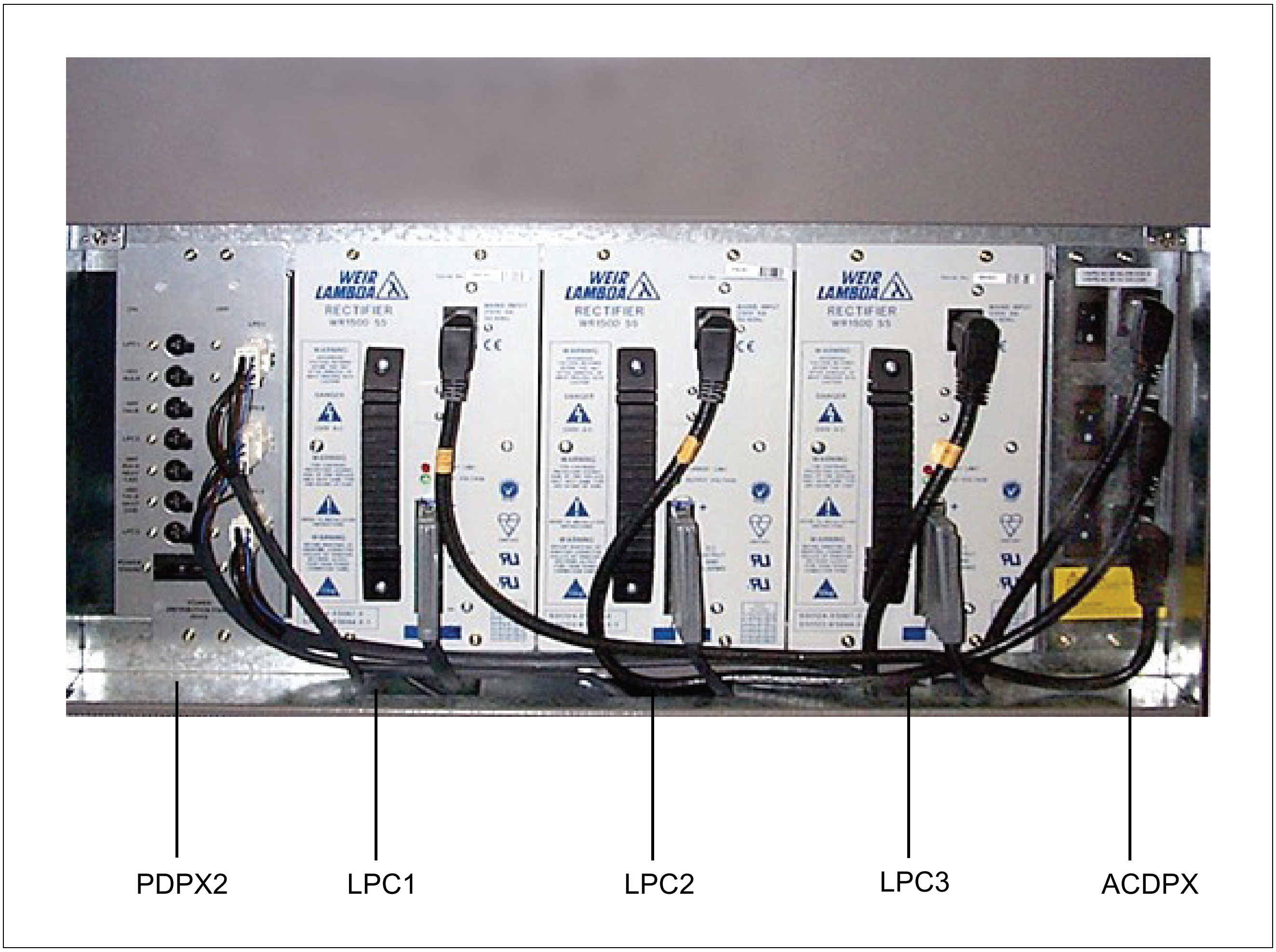


Figure 4-10 UACD Shelf (Front View)

4.9.1 ACDPX

The AC distribution panel (ACDPX) routes AC power to each of the line power converters (LPC). The NORAC kit consists of the ACDPX and a junction box.

4.9.1.1 ACDPX Connectors and Switches

The ACDPX (Figure 4-11) have:

- Receptacles for the AC power module input cables
- Switches to turn on or off the AC power modules individually

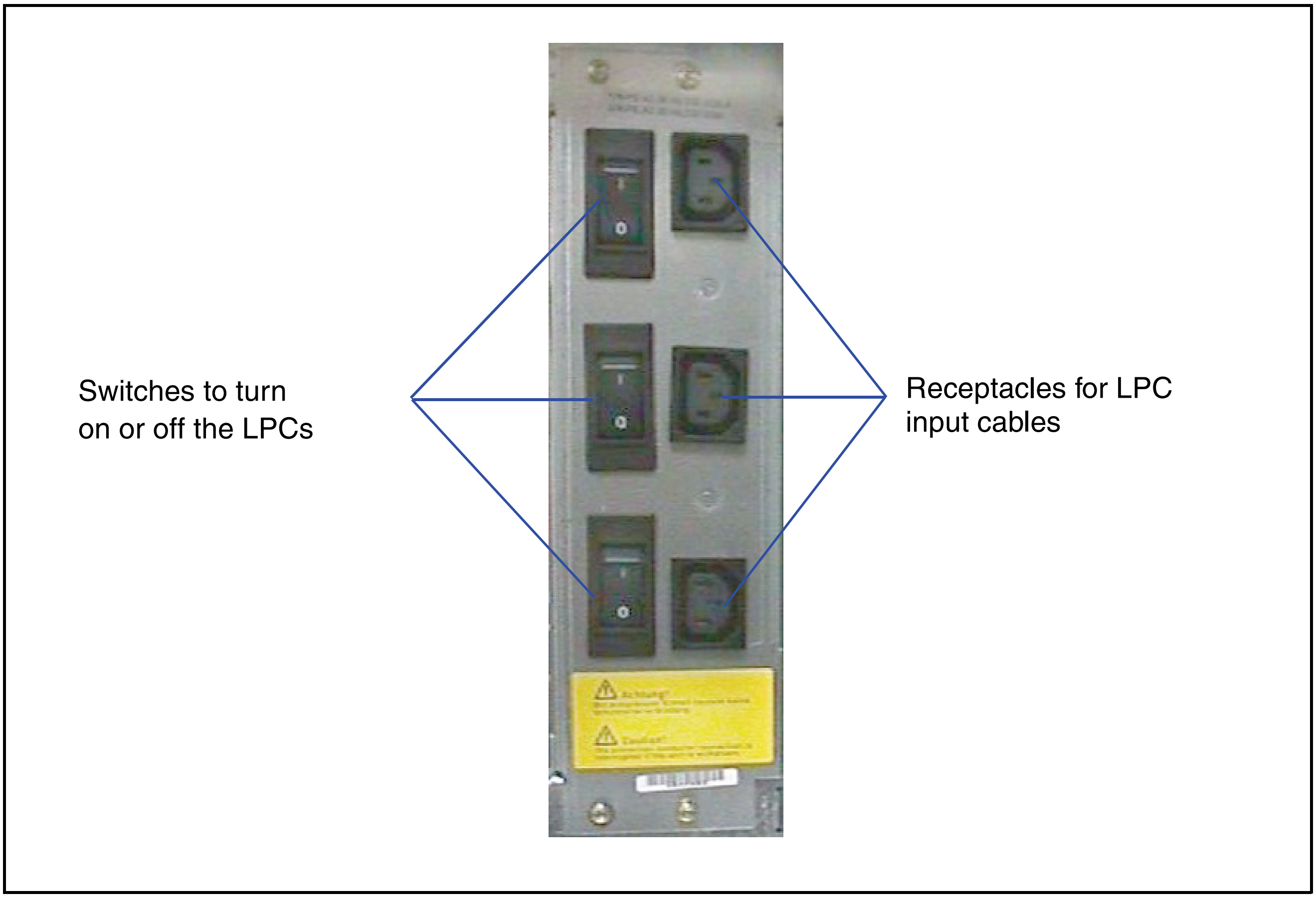


Figure 4-11 ACDPX, Front View

4.9.1.2 Removing the ACDPX

Danger
Use extreme caution when you work on power supply components. Power supply voltages can be lethal. Observe all applicable electrical safety precautions for working with high voltages.
Do not wear an ESD strap when working on the backup battery.

> **Warning**
> This procedure removes the HiPath 4000 from service.

To remove the ACDPX:

1. Turn off the respective HiPath 4000 system stack.
2. Unplug the LPC input cables from the ACDPX.
3. Remove the top and bottom screws that secure the ACDPX to the upper and lower shelf supports (see Figure 4-12).
4. Remove the junction box.
5. Remove the tie wrap that secures the AC supply cable to the ACDPX.
6. Unplug the AC supply cable.
7. Remove the ACDPX.

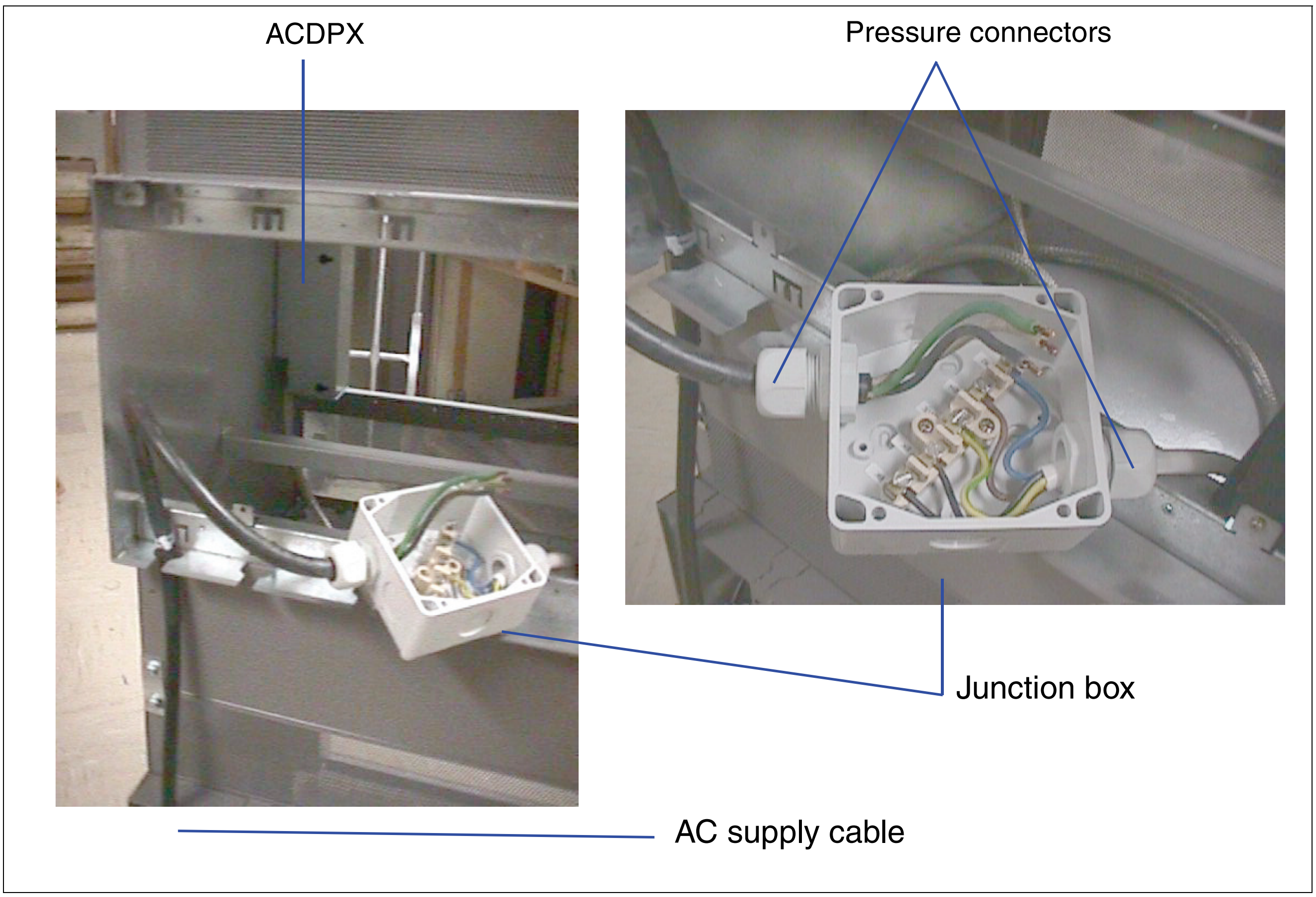


Figure 4-12 Removing the ACDPX from the UACD

4.9.1.3 Replacing the ACDPX

To replace the ACDPX:

1. Secure the AC supply cable to the cabinet frame using tie wrap.
2. Position the junction box inside the UACD cabinet frame using a double stick tape.
3. Secure the ACDPX to the upper and lower shelf supports with screws.
4. Plug the LPC input cables into the ACDPX.
5. Turn on the respective HiPath 4000 system stack.
6. Plug the AC supply cable.

4.9.1.4 Verifying the ACDPX

Verify the operation of the ACDPX by ensuring that the yellow LED (healthy input) on each LPC is lit.

4.9.2 BAM, AC-Powered HiPath 4000 Cabinet 1 or 2

The battery manager (BAM) controls the flow of electricity to the battery during recharging and from the battery during a power outage

4.9.2.1 BAM Connectors

The battery manager contains the following connectors:

- X1 through X9

  X6 and X7 are not used in the U.S.
- Contactor control input
- Battery power input

  The power share and battery input are not used in the U.S.

4.9.2.2 Removing the BAM

> **Danger**
> Use extreme caution when you work on power supply components. Power supply voltages can be lethal. Observe all applicable electrical safety precautions for working with high voltages.
> Do not wear an ESD strap when working on the backup battery.

> **Warning**
> This procedure removes the HiPath 4000 from service when performed on cabinet 1 and removes cabinet 2 from service when performed on cabinet 2.

To remove the BAM:

1. Turn off cabinet 1 or cabinet 2, as applicable.
2. At the back of the UACD shelf, label and disconnect all the cables from the BAM.
3. Remove the screws that secure the BAM to the cabinet frame.
4. Slide the BAM partially out of the shelf until the BAM circuit board is accessible from the right (open) side of the battery manager.
5. First label and then remove the cables connected to the BAM circuit board.
6. Remove the BAM from the cabinet.

4.9.2.3 Replacing the BAM

Replace the BAM as follows:

1. Connect the black wire (Figure 4-13) to the BATTERY POWER INPUT connector at the back of the PDPX2.
2. Slide and secure the BAM into the UACD with screws.
3. Reconnect the cables to the applicable BAM circuit board receptacles.
4. Turn on cabinet 1 or cabinet 2, as applicable.

Figure 4-13 PDPX2, Back View

4.9.2.4 Verifying the BAM

> **Caution**
> Do not perform this procedure if the condition of the backup battery is suspected to be low or if the procedure is being performed during customer operating hours. In either case, the verification procedure must be performed quickly. A fully charged backup battery provides power for up to 2 minutes.

To verify operation of the BAM, ensure that the HiPath 4000 returns to normal operation.

4.9.3 EBCCB

> The EBCCB is not used in the U.S.

The external battery connection with circuit breaker (EBCCB) provides an external connection to the power box. The external battery is connected to the battery manager through a 70-Amp circuit breaker (see Figure 4-14). If more than 6 LTU frames are installed in the entire system when battery management is used, then the power box is configured with two PDPXs and two EBCCBs.

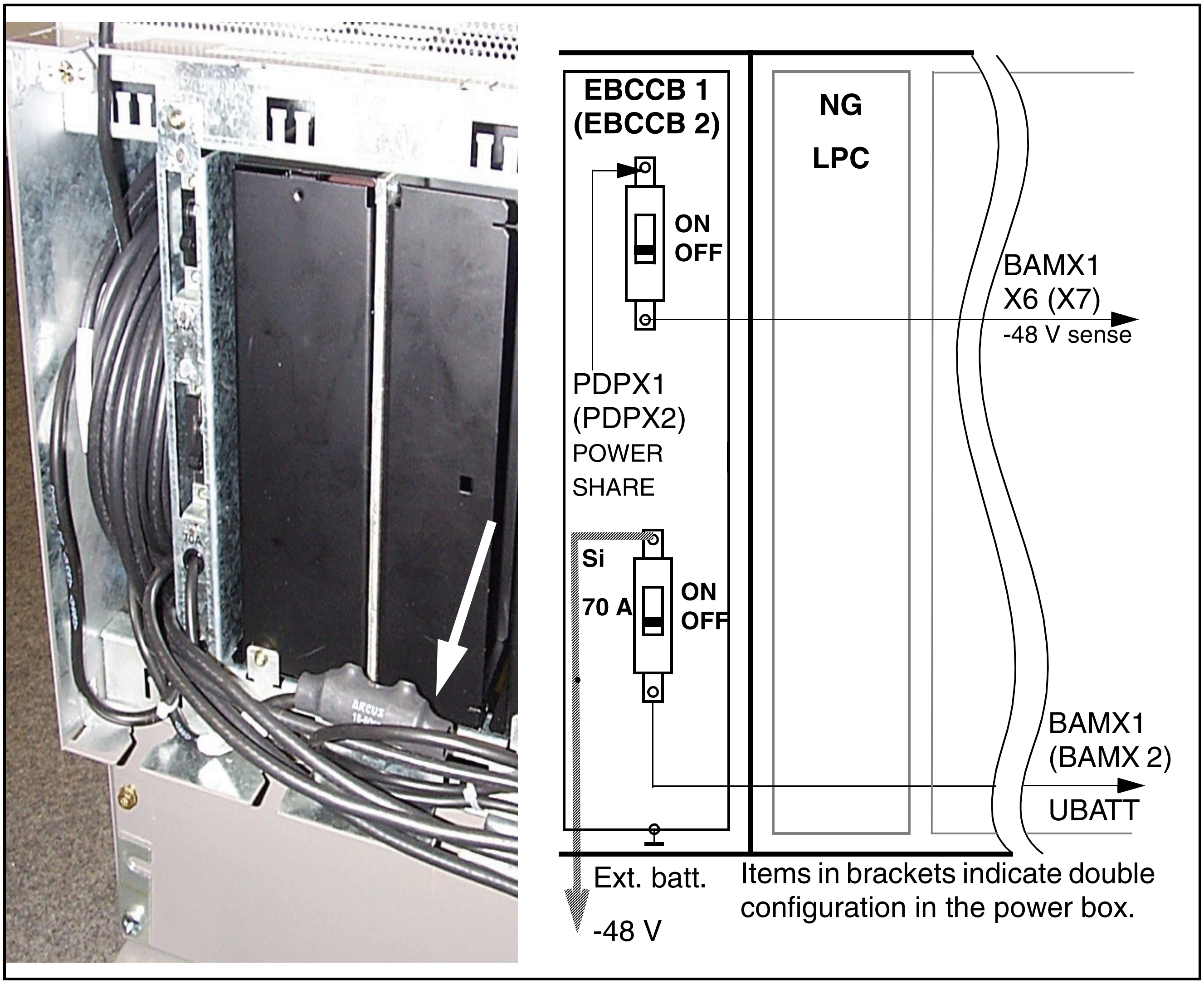


Figure 4-14 EBCCB, Back View

4.9.4 LPC

The line power converter (LPC) converts 208 VAC or 240 VAC input power to –48 VDC power (see Figure 4-15). Each module receives its input power from a power cord connected to the front of the ACDPX and LPC. The -48 VDC power of the LPC is routed to the PDPX2 through a cable on the front of the LPC.

4.9.4.1 LPC LED Indications

The front of the LPC has two status LEDs (see Figure 4-15).

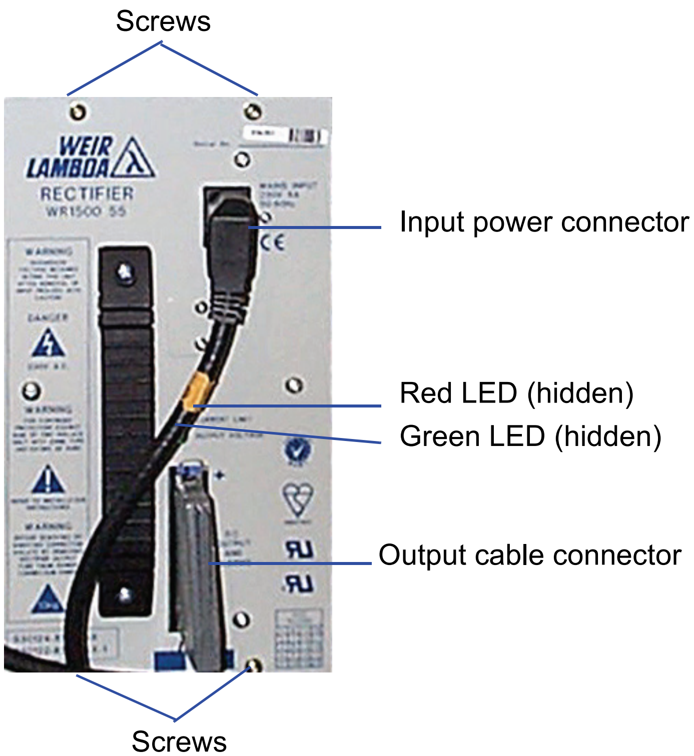


Figure 4-15 LPC, Front View

Table 4-4 lists the LED indications.

Name	Color	State	Indication
Overvoltage and Current Limit	Red	On	Overvoltage; overcurrent
		Off	Voltage OK; current OK
Output Healthy	Green	On	Input and output voltage are OK
		Off	Input and output malfunction

Table 4-4 LPC LED Indications

4.9.4.2 LPC Connectors

The LPCs have an input power receptacle and output power receptacle on the front panel. The module receives input power through a power cord from the ACDPX. The LPC routes output voltages and signals to a terminal block along the left side of the PDPX2 and to a connector along the right side of the PDPX2.

4.9.4.3 Removing the LPC

> **Danger**
> Use extreme caution when you work on power supply components. Power supply voltages can be lethal. Observe all applicable electrical safety precautions for working with high voltages.
> Do not wear an ESD strap when working on the backup battery.

Remove the LPC as follows:

> The LPCs provide sufficient power to support the cabinet while a single LPC is removed and replaced.

1. At the ACDPX, turn off the switch for the LPC being replaced.
2. At the PDPX2, turn off the circuit breaker for the LPC being replaced.
3. At the front of the LPC unplug the AC input plug from the AC input receptacle.
4. At the front of the LPC, loosen the two clips securing the output cable connector to the receptacle.
5. Unplug the output cable connector.
6. Remove the screws that secure the LPC to the shelf.
7. At the back of the power shelf, remove the screws that secure the LPC to the UACD shelf.
8. Remove the LPC from the shelf.

4.9.4.4 Replacing the LPC

To replace the LPC:

1. Slide the replacement LPC into the shelf.
2. At the back of the shelf, use screws to secure the LPC.
3. At the front of the shelf, use screws to secure the LPC.

4. At the front of the LPC, connect the output cable connector to the output receptacle.
5. Fasten the two clips onto the output cable connector.
6. At the front of the LPC, plug the AC input plug into the AC input receptacle.
7. At the ACDPX, turn on the circuit breaker for the LPC.
8. At the PDPX2, turn on the circuit breaker for the LPC.

4.9.4.5 Verifying the LPC

To verify the operation of the LPC:

1. Ensure that the green LED (healthy output) is lit.
2. Ensure that the red LEDs (overcurrent and overvoltage) are off.

4.9.5 PDPX2

The power distribution panel (PDPX2) electrically splits the –48 VDC into –48 VDC talk voltage and –48 VDC bulk voltage (talk voltage is used by LTUW shelves and bulk voltage is used by DC-to-DC shelf modules). The PDPX2 bulk and talk circuit breakers control the flow of electricity to the cabinet circuit breakers. The stack 1 PDPX2 distributes the bulk and talk voltages to the cabinet circuit breakers in cabinets 1 and 2. The stack 2 PDPX2 distributes the bulk and talk voltages to the cabinet circuit breaker panel in cabinets 3 and 4.

4.9.5.1 PDPX2 Circuit Breakers and Connectors

The PDPX2 (Figure 4-16) contains:

- LPC1, LPC2, and LPC3, output circuit breakers for each AC power module
- LPC1, LPC2, and LPC3, ALARMS AND DC OUTPUT cable connectors for each AC power module
- –48 V BULK, circuit breaker, stack 1 and 3
- –48 V TALK, circuit breaker, stack 1 and 3
- –48 V BULK NEXT CAB, circuit breaker for stack 2 or 4
- –48 V TALK NEXT CAB, circuit breaker for stack 2 or 4
- POWER SHARE, circuit breaker for current share between two power shelves (when applicable)

  This is not used in the U.S.

4.9.5.2 Removing the PDPX

> **Danger**
> Use extreme caution when you work on power supply components. Power supply voltages can be lethal. Observe all applicable electrical safety precautions for working with high voltages.
> Do not wear an ESD strap when working on the backup battery.

> This procedure removes the HiPath 4000 from service when performed on cabinet 1 and removes cabinet 2 from service when performed on cabinet 2.

Remove the PDPX2 (see Figure 4-16 and Figure 4-17) as follows:

1. Turn off HiPath 4000 stack 1 or 2, as applicable.
2. At the back of the PDPX2, remove the battery manager (refer to Section 4.9.2.2, “Removing the BAM”).
3. At the back of the PDPX2, label and remove the cables.
4. At the front of the PDPX2, label and remove the cable connectors from the receptacles on the right side of the AC power module circuit breakers.
5. Remove the two screws that secure the PDPX2 to the upper and lower front shelf supports.
6. Remove the PDPX2 from the shelf.

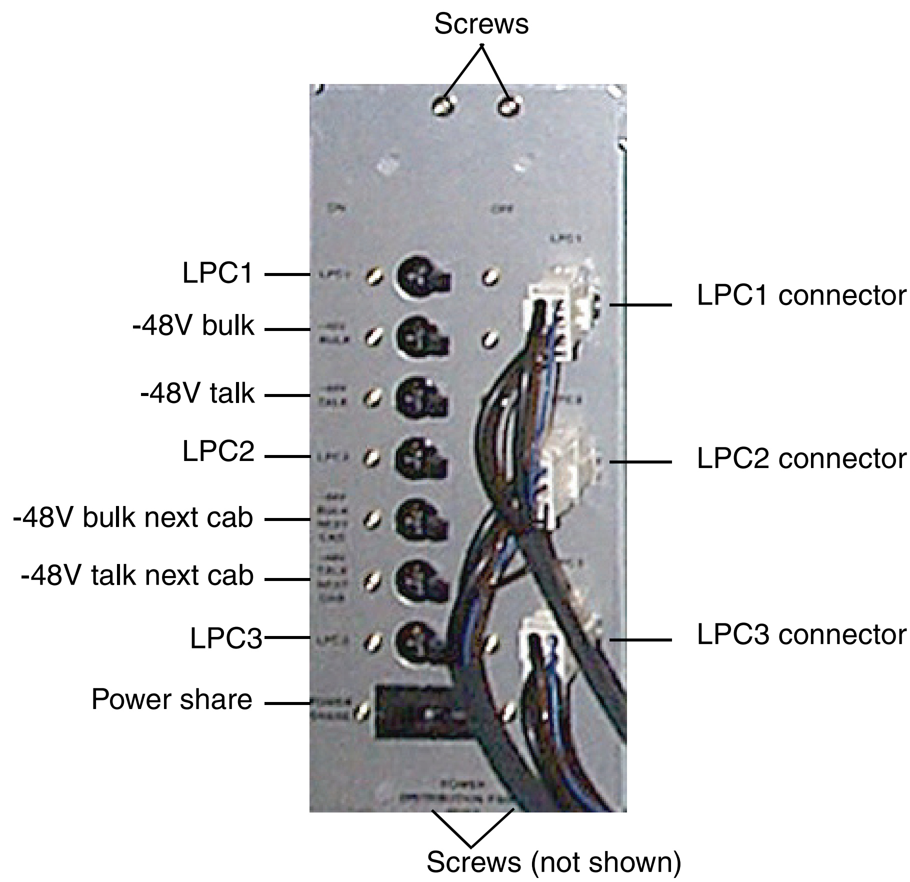


Figure 4-16 PDPX2 (Front View)

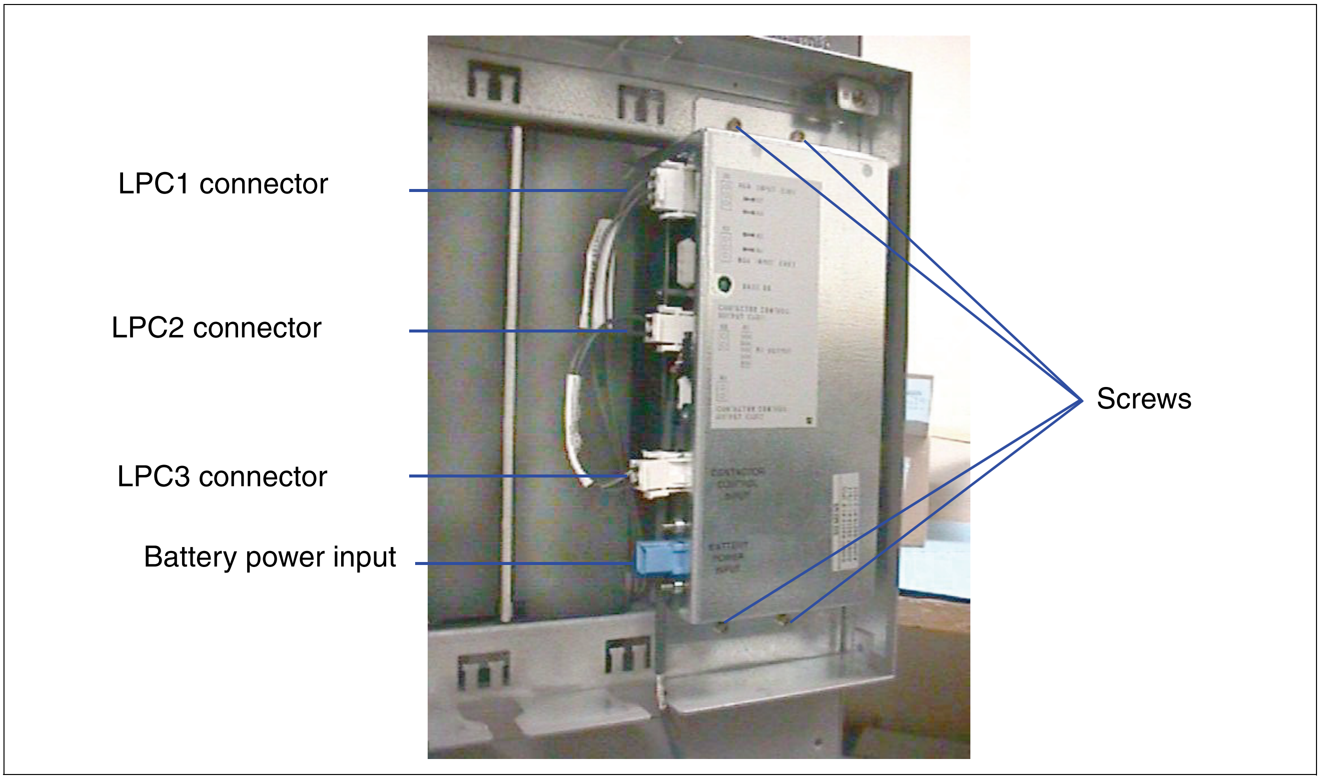


Figure 4-17 PDPX2, Back View

4.9.5.3 Replacing the PDPX2

To replace the PDPX2:

1. At the front of the UACD, use the screws to secure the PDPX2 to the upper and lower front shelf supports.
2. At the front of the PDPX2, plug the connectors into the receptacles on the right side of the AC power module circuit breakers.
3. At the back of the PDPX2, replace the cables.
4. At the back of the UACD, replace the battery manager (refer to Section 4.9.2.3, “Replacing the BAM”).
5. Turn on HiPath 4000 stack 1 or 2, as applicable.

4.9.5.4 Verifying the PDPX2

To verify the operation of the PDPX2:

> The condition of the AC power module circuit breakers cannot be verified.

1. Verify the bulk circuit breakers by ensuring that the DC OK LED on the DC-to-DC shelf modules in each cabinet are lit.
2. Verify the talk circuit breakers by ensuring that the LED on the ring generator board in each cabinet is lit.

4.10 UACD (PSR930/PSR930E)

The UACD Powerbox (PSR930/PSR930E) is a new AC/DC Powerbox for 19” Cabinets. It is usable from version HiPath 4000 V2.0 on.

For a detailed technical description please refer to the service information **INF-06-000663**:

https://www.g-dms.com/livelink/livelink.exe?func=ll&objId=3617209&objAction=view&nextURL=%2Flivelink%2Flivelink%2Eexe%3Ffunc%3Dsrch%2ESearchCache%26cacheId%3D58504281

Information for installation of an HiPath 4000 System please refer to the relevant Installation Instruction.

4.11 UDCD

A unit direct current distribution (UDCD) stack consists of (see Figure 4-18):

- One DC input circuit breaker panel (ICBP)
- One DC output distribution panel (ODP)
- Up to 3 Zytron power modules (ZYTs)

The UDCD is stackable. One UDCD supports one 4-stack HiPath 4500. A two-stack UDCD supports two 4-stack HiPath 4000 system with one + one redundancy.

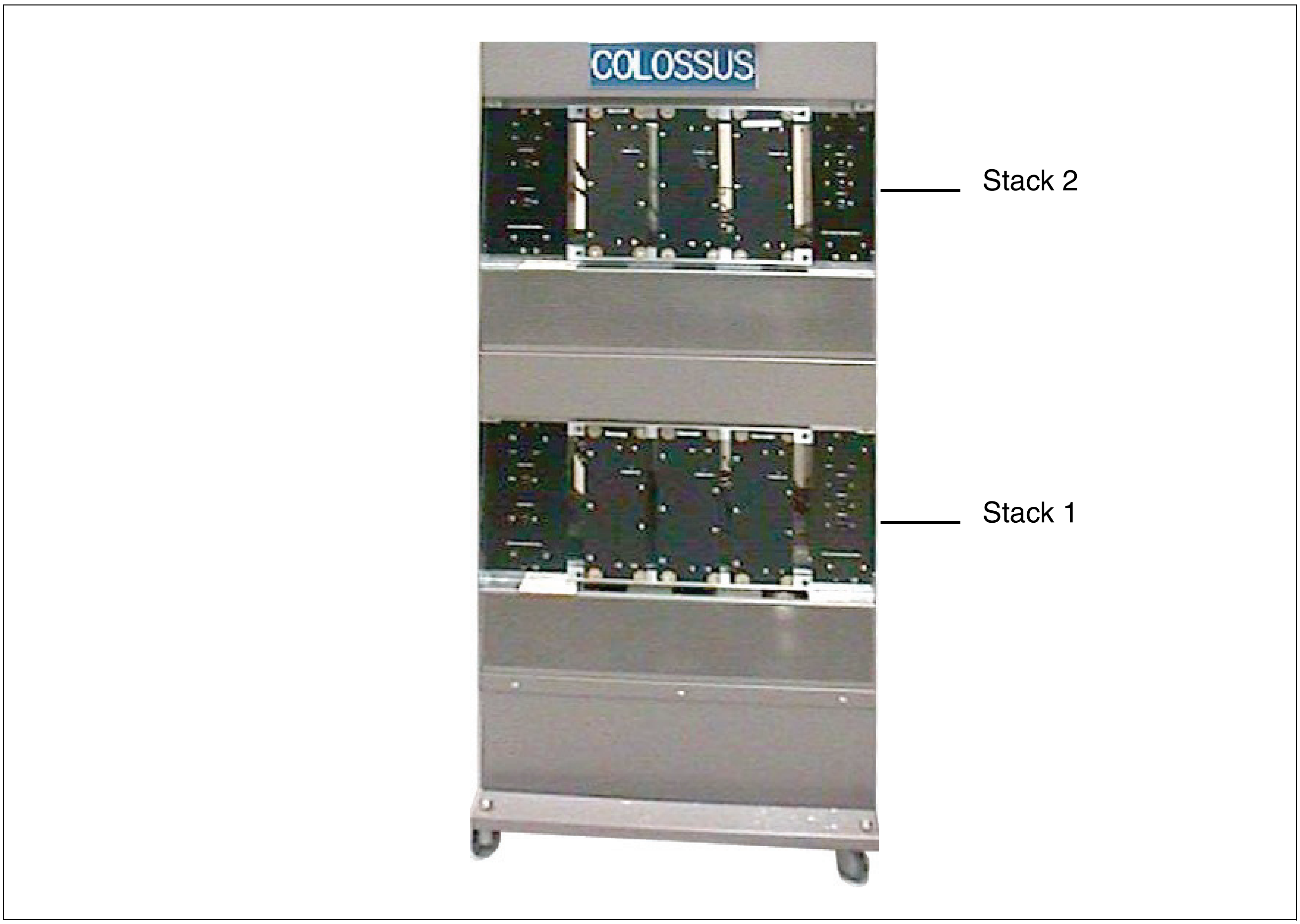


Figure 4-18 LPC, front view

4.11.1 ICBP

The input circuit breaker panel (ICBP) is the main power distribution point for HiPath 4500 DC systems. The ICBP supplies –48 V power to the Zytron modules (ZYTs).

4.11.1.1 ICBP Connectors and Switches

The front of the ICBP has the following switches (see Figure 4-19):

- -48 V bulk, to the cabinet 1 or cabinet 2 bulk circuit breaker
- -48 V bulk next cabinet, to the cabinet 2 or cabinet 3 bulk circuit breaker
- ZYT1, ZYT2, ZYT3, power on and off for the ZYTs

The back of the ICBP has the following connectors:

- Three Anderson quick connectors to the three Zytrons for input power
- ZYT1, ZYT2, ZYT3, ZYT input cables

Figure 4-19 ICBP, HiPath 4500, Front View

4.11.1.2 Removing the ICBP

> **Danger**
> Use extreme caution when you work on power supply components. Power supply voltages can be lethal. Observe all applicable electrical safety precautions for working with high voltages.
> Do not wear an ESD strap when working on the backup battery.

> **Warning**
> This procedure removes the HiPath 4000 from service when performed on cabinet 1 and removes cabinet 2 from service when performed on cabinet 2.

To remove the ICBP:

1. Remove the power from the base unit assembly (BAU)

1. Turn off the respective HiPath 4000 cabinet stack.

> **Danger**
> Before proceeding, perform the following steps.

   a) Establish a ground reference point near the HiPath 4000 cabinet.

   b) Use the power and grounding tester with the remote ground probe and a previously tested 120 VAC receptacle to perform the ECOS ground path impedance test (5A2). Refer to the power and grounding kit instruction booklet.

   c) Use the analog multimeter to check for less than 1 VAC and 1 VDC between the AC power terminals and the ground reference point and chassis of the UDCD.

3. Note the polarity of each of the ICBP cable conductors connected to the junction box (see Figure 4-12). Mark the conductors if necessary.

4. Remove the nuts that secure the ICBP cable conductors to the circuit breaker terminals.

5. Remove the ICBP power cable.

6. At the back of the ICBP, label and disconnect all cables.

7. At the front of the ICBP, remove the screws that secure the ICBP to the upper and lower shelf supports.

8. Slide the ICBP out of the front of the shelf.

4.11.1.3 Replacing the ICBP

To replace the ICBP:

1. Slide the ICBP into the front of the shelf.

2. At the back of the ICBP, reconnect all cables.

3.

> **Caution**
> Be extremely careful when tightening the nuts onto the circuit breaker terminals. Excessive torque or side pressure can crack the circuit breaker housing.

   While observing the polarity of the ICBP cable conductors, use two nuts fasten to them to their respective circuit breaker terminals.

4. Position the strain relief bracket over the ICBP cable and use two screws to secure it.

5.

> **Danger**
> You must perform the following steps before you power on the HiPath 4000. Lethal electrical current can be present on the HiPath 4000 cabinet frame if the cabinet is not properly grounded.

Verify as follows that the HiPath 4000 cabinet frame is safe to touch when powered on:

a) Establish a ground reference point near the HiPath 4000 cabinet.

Use the power and grounding tester with the remote ground probe and a previously tested 120 VAC receptacle to perform the ECOS ground path impedance test (5A2). Refer to the power and grounding kit instruction booklet.

The following are recommended ground reference points:

- Effectively grounded metal conduit or metal receptacle outlet
- Effectively grounded structural building steel or metal water pipe

> **Danger**
> Do not touch the HiPath cabinet frame at this time. Lethal electrical current can be present on the HiPath 4000 cabinet frame if the cabinet is not properly grounded.

b) Instruct the electrical contractor to turn on the circuit breaker or install the fuse at the DC system switchboard for the DC branch circuit serving the HiPath 4000, and to remove the tags.

c) Use the analog multimeter to test for less than 1 VAC and 1 VDC between the ground reference point and the UDCD chassis.

d) Use the power and grounding tester with the remote ground probe and a previously tested 120 VAC receptacle to perform the ECOS ground path impedance test (5A2) on the HiPath 4000 cabinet frame. Refer to the power and grounding kit instruction booklet.

6. Turn on the respective HiPath 4000 cabinet stack.

4.11.1.4 Verifying the ICBP

To verify that the ICBP is functioning properly:

1. Turn on the main power at the back of the base unit.
2. Ensure that the bulk and talk input LEDs on the ODP for the applicable cabinet stack are green.

4.11.2 ODP

The output distribution panel (ODP) electrically combines the output of the DC modules and routes it through two circuit breakers that distribute the -48 V talk to the cabinet circuit breakers.

The ODP (Figure 4-20) is on the left side of the UDCD.

4.11.2.1 ODP Connectors, Jumpers, and Switches

The front of the panel contains two circuit breakers that distribute the -48 V bulk and talk to the circuit breakers in cabinets stack 1 and 2 or 3 and 4.

At the back of the ODP are circuits for power signalling. There are three RJ11 4-pin connectors for failure report cables from each of the DC power modules (up to 3), and four FASTON lugs for reporting power supply alarm status to the ADP.

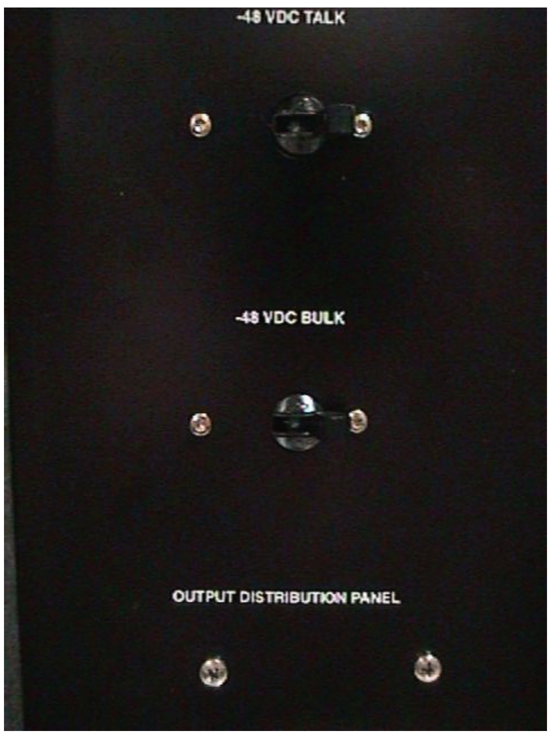


Figure 4-20 ODP, Front View

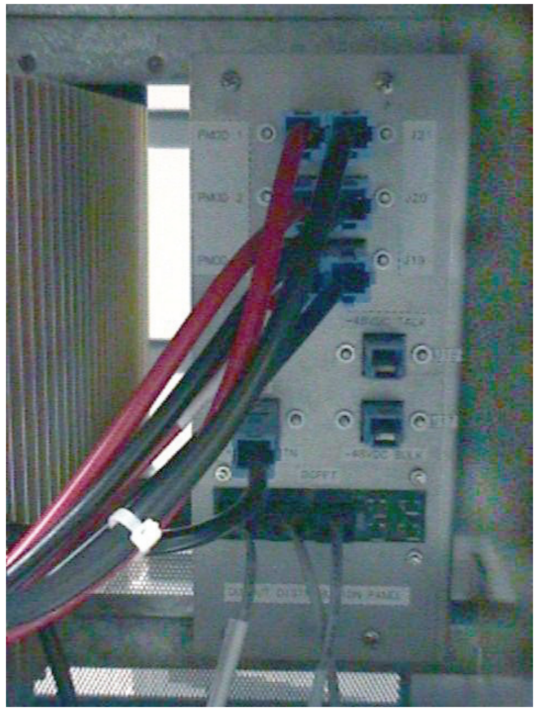


Figure 4-21 ODP, Back View

4.11.2.2 Removing the ODP

> **Danger**
> Use extreme caution when you work on power supply components. Power supply voltages can be lethal. Observe all applicable electrical safety precautions for working with high voltages.
> Do not wear an ESD strap when working on the backup battery.

> **Warning**
> This procedure removes the HiPath 4000 from service when performed on cabinet 1 and removes cabinet 2 from service when performed on cabinet 2.

To remove the ODP:

1. Turn off the respective HiPath 4000 cabinet stack.
2. At the back of the ODP panel, label and disconnect all cables.
3. Remove power on the ICBP.

4. At the front of the ODP panel, remove the four screws that secure the ODP panel to the lower and upper shelf supports.
5. Slide the ODP panel out of the front of the shelf.

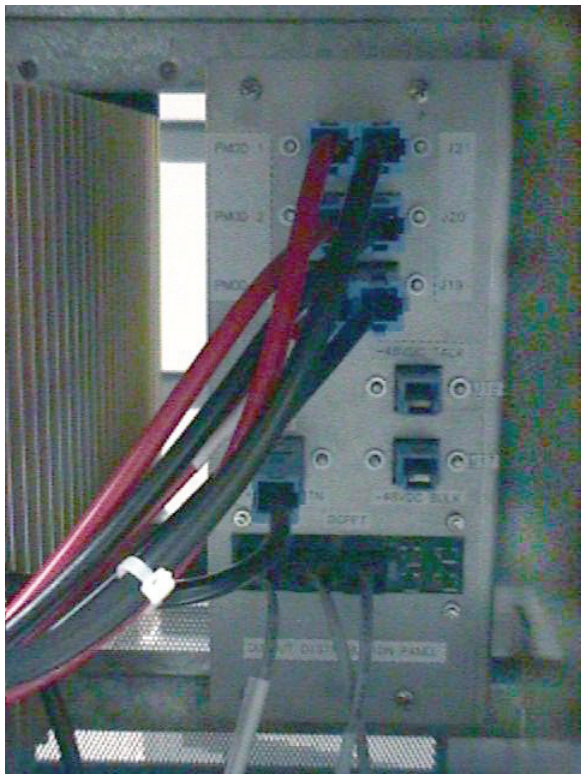


Figure 4-22 ODP, Back View

4.11.2.3 Replacing the ODP

To replace the ODP:

1. Slide the ODP into the front of the shelf.
2. Use screws to secure the ODP panel to the upper and lower shelf supports.
3. Ensure that all the circuit breakers on the ODP are turned off.
4. At the back of the ODP:
   a) Reconnect the FASTON connectors.
   b) Reconnect the failure sense wires.
   c) Reconnect the three DC power module (Zytron) cables.

d) Reconnect the cabinet stack1 and 2 talk cables, as applicable.

e) Reconnect the power fail cable.

5. Turn on the ICBP.
6. Turn on cabinet stack 1 or cabinet 2, as applicable.

4.11.2.4 Verifying the ODP

To verify the operation of the ODP:

1. Turn on the main power at the back of the base unit.
2. Ensure that the bulk and talk input LEDs on the ODP to the cabinet stacks are green.

4.11.3 ZYT

The ZYTs regulate and condition the –48 V line power received from the ICBP. The output power of the ZYTs is routed to the ODP panel. Connections for current sharing among the ZYTs, and for failure reporting, are provided at the back of the ZYTs.

4.11.3.1 ZYT LED Indications

The ZYT has a single Power OK LED on the front panel. It is lit when the power module is on.

4.11.3.2 ZYT Connectors

The back of the ZYT (Figure 4-23) has five receptacles:

- The output -48 VDC receptacle is for the 2-conductor connector of the output power cable. The – conductor connects to the ODP panel and the + conductor connects to the talk return isolation block.
- The CTRL1 and CTRL2 receptacles are for the 6-pin RJ11 current share wire connectors. The current share wires transfer current sharing signals between modules.
- The SUPV receptacle is for the 4-pin RJ11 failure sense wire connector to the ODP panel.
- The Input -48 VDC receptacle is for the 2-conductor connector of the input power cable from the ICBP.

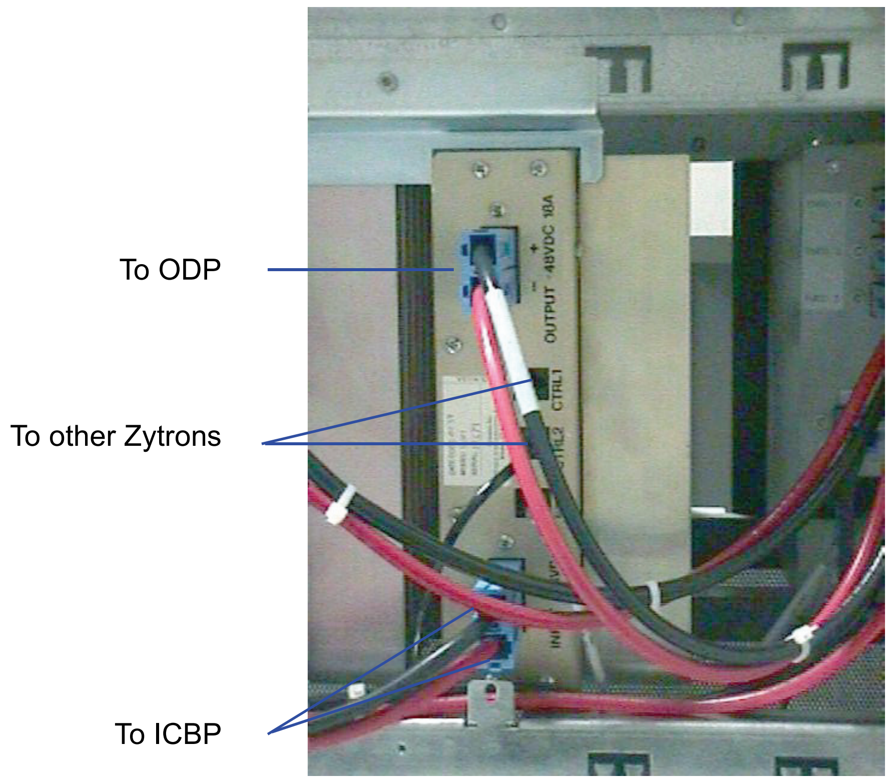


Figure 4-23 ZYT (Back View)

4.11.3.3 Removing the ZYT

> **Danger**
> Use extreme caution when you work on power supply components. Power supply voltages can be lethal. Observe all applicable electrical safety precautions for working with high voltages.
> Do not wear an ESD strap when working on the backup battery.

To remove the ZYT:

1. At the ICBP, turn off the circuit breaker for the ZYT.
2. At the back of the shelf, do the following steps:
   a) Remove the failure sense wire from the ODP and ZYT.
   b) Remove the current share wire from the ZYT and the adjacent ZYT.
3. At the back of the ZYT, disconnect the input power cable connector.

4. At the back of the ZYT, disconnect the output power cable connector.

> **Danger**
> After performing this step, -48 VDC is present in the output power cable connector. Ensure that no metal objects come in contact with the conductors inside the connector.

5. At the front of the ZYT, remove the screws that secure it to the upper and lower shelf supports.
6. Remove the screws to the brace panel of the Zytrons.
7. Slide the ZYT out of the front of the shelf.

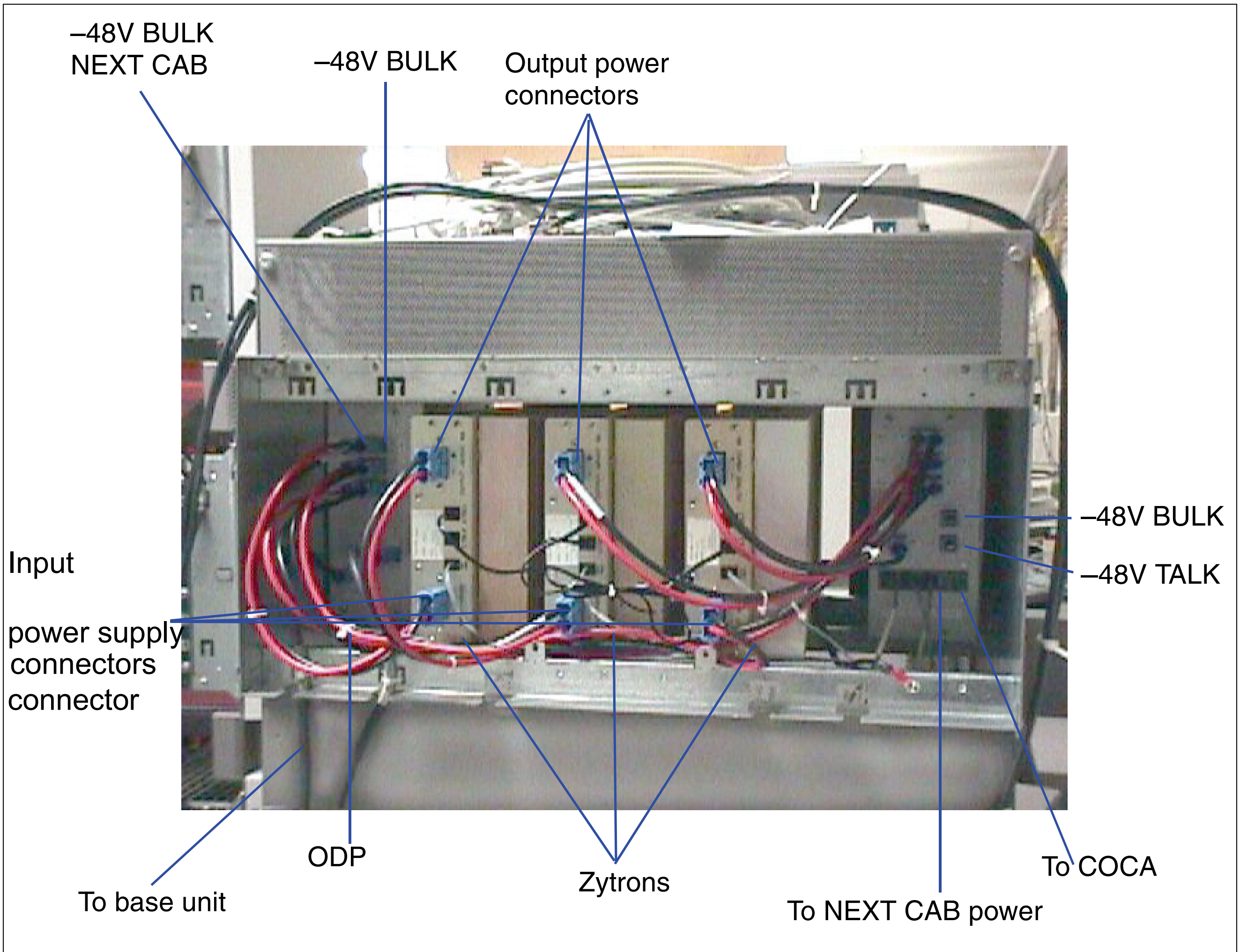


Figure 4-24 DD (Back View)

4.11.3.4 Replacing the ZYT

Replace the ZYT as follows:

1. Slide the ZYT into the front of the shelf.
2. Use screws to secure the module to the upper and lower shelf supports.

> **Danger**
> While performing this step, -48 VDC is present in the output power cable connector. Ensure that no metal objects come in contact with the conductors inside the connector.

3. At the back of the module, reconnect the output power cable connector to the upper receptacle on the module.
4. At the back of the shelf, connect the replacement failure sense wire to the applicable receptacles on the ODP and ZYT.
5. At the back of the shelf, connect the replacement current share wire to the applicable receptacles on the ZYT and the adjacent ZYT.
6. At the ICBP, ensure that the ZYT circuit breaker is turned off.
7. At the back of the ZYT, reconnect the input power cable to the lower receptacle.
8. At the ICBP, turn on the ZYT circuit breaker.

4.11.3.5 Verifying the ZYT

Verify the ZYT as follows:

1. Ensure that the LED on the front of the ZYT is lit.
2. At the back of the ZYT, insert the volt-Ohm-millimeter (VIM) probes into the upper connector. See Figure 4-24 for assistance in determining the connections.
3. Ensure that the VIM indicates that approximately –48 VDC is present.

5 Devices

5.1 Attendant Console (AC-Win IP)

AC-Win IP is the first enhanced attendant console type connected to HiPath 4000 via IP. Detailed informations see in the Service Manual for the Attendant Console AC-Win IP.

5.2 Fan Tray

The fan tray (see Figure 5-1) is a plug-in unit for 19-inch houses and consists of two 12-Vdc fans. It is suitable for on-site installation and replacement. An air current (from left to right) of 30 cf/m per fan is sufficient. Thermal simulation is subsequently performed to check performance. Each fan generates a square wave, open collector signal that is proportional to the fan speed. The absence of this signal indicates a fan problem in the system.The fan tray is hot swapable.

Figure 5-1 shows the fan model that is used, model 4412F/2 GL (PAPST).

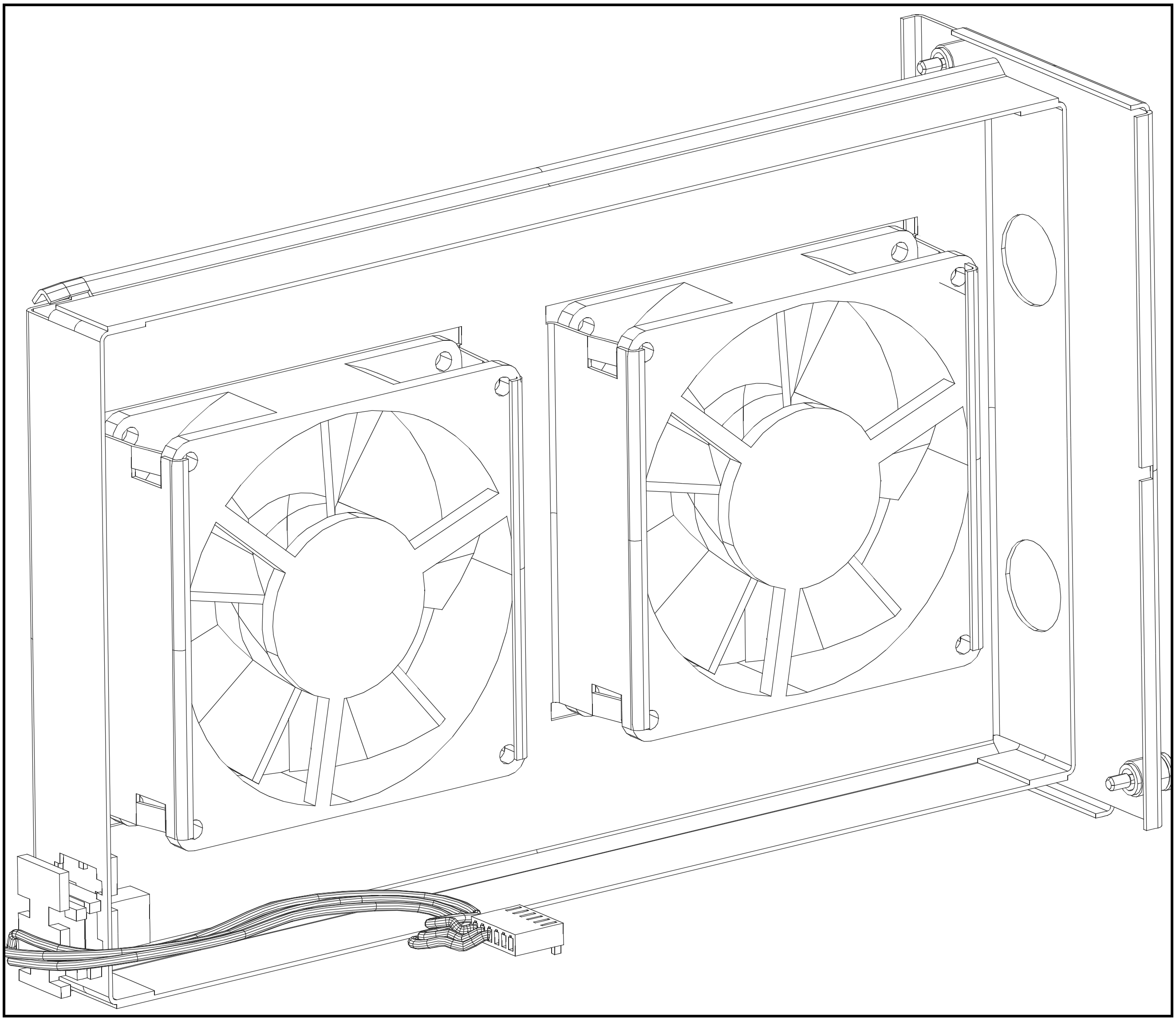


Figure 5-1 Fan Tay

The fan trays are positioned on the left and right in the CSPCI shelf. Each fan features three conductors (12 V, ground (GND), speed signal). The fan trays are connected to the backplane by a connection cable.

Figure 5-2 indicates the position of fan trays in the CSPCI shelf.

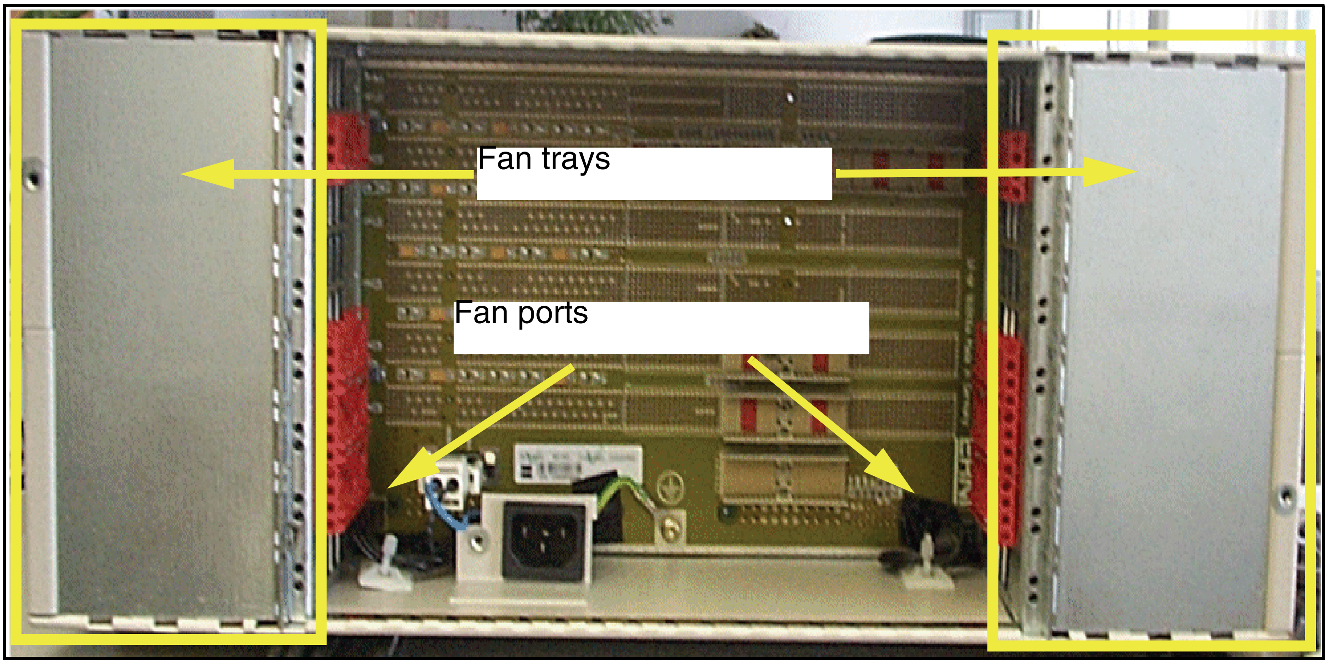


Figure 5-2 Fan tray position

Figure 5-3 shows the numbering of fans.

Figure 5-3 Numbering of fans

5.3 Hard Disk Drive

The hard disk drive functions as the mass storage device for system, application, and database software.

The hard disk drive and MO-disk drives are mounted on an SD3HX drive holder that is installed in a single slot on the shelf (slot 22 for HiPath 4300 and slot 19 for Model HiPath 4500).Hard Disk drive Connectors.
The hard disk drive have one SCSI and one power connector. A SCSI ribbon cable connects the hard disk drive to the disk drive holder's electronic board (see Figure 5-10). Mount the hard disk on the disk drive holder and install the drive holder into one of the following:

- HiPath 4300 - CC80F
- HiPath 4500 - CCDAX shelf

5.3.1 9 GB 3.5-Inch IBM (DNES-309170)

Figure 5-4 shows connector and jumper locations of the 9G Byte 3.5-inch IBM hard disk.

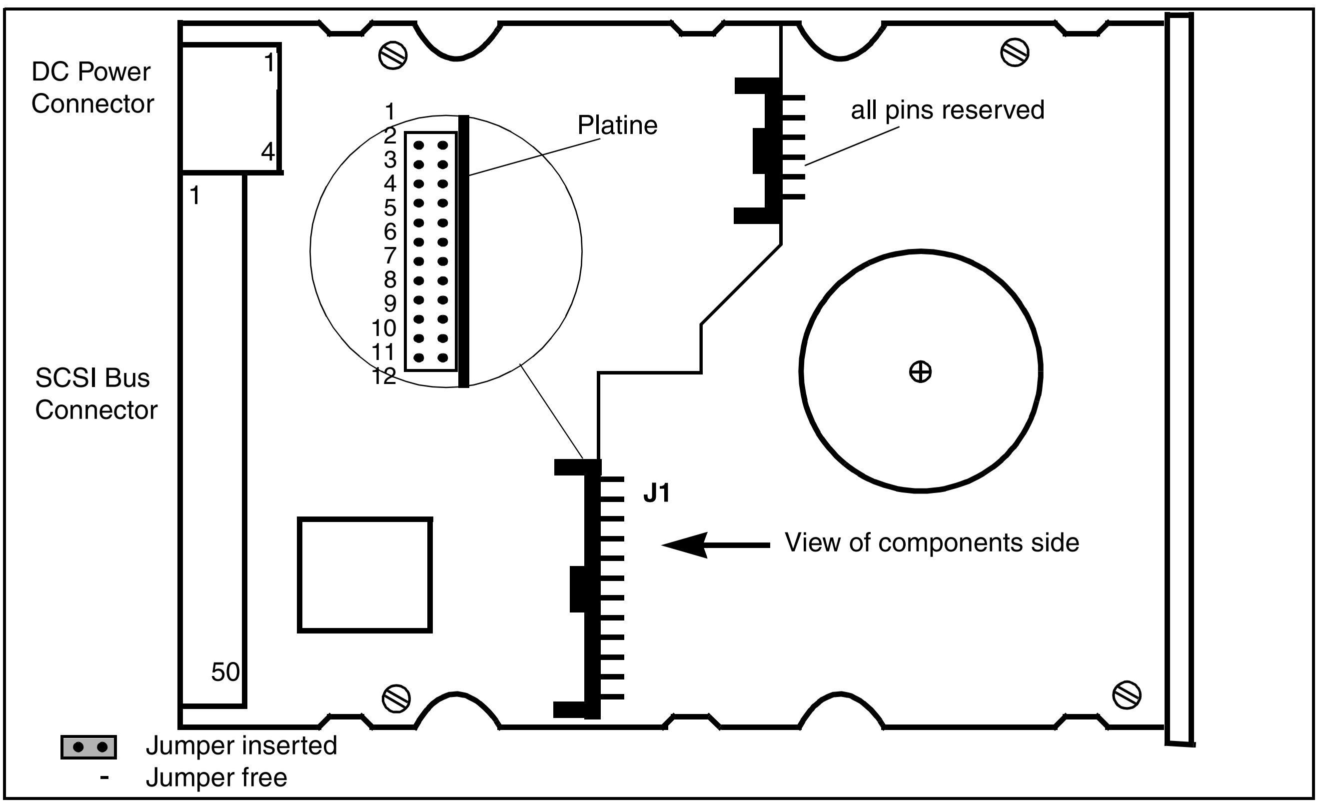


Figure 5-4 9G Byte 3.5-Inch IBM (DNES-309170)

Table 5-1 lists the jumper descriptions of the 9 GB 3.5-inch IBM hard disk drive.

Jumper Number		**Description**
Jumper **J1**:		
1		not used
2, 3, 4	HD-No.	SCSI-ID (s. Table)
5	-	Motor auto spin enabled
6	see. Table "Installation Variants"	Terminators ON/OFF
7	-	Unit ATN disabled
8	-	TISYNC NEGOTIATION
9	-	Auto Start Delay disabled
10	-	Delay Start 6/12
11	-	Parity disabled
12	LED OU	remote LED

Table 5-1 Hard Disk-Drive Jumper Descriptions

Table 5-2 lists the SCSI IDs of the 9 GB 3.5-inch IBM hard disk drive.

HD-No.	**SCSI-ID**	**Jumper J1: 4**	**Jumper J1: 3**	**Jumper J1: 2**
1	0	-	-	-
2	1	X	-	-
3	2	-	X	-
4	3	X	X	-
5	4	-	-	X
6	5	X	-	X
7	6	-	X	X

Table 5-2 Hard Disk-Drive SCSI ID

Table 5-3 lists the installation variants of Jumper J1: 6.

Compact	**Cabinet Configuration**	**DBox2**
The jumper **must** be removed.	The Jumper must **only** be inserted, if the HD is connected at the end of the SCSI bus.	The jumper **must** be inserted

Table 5-3 Installation Variants

5.3.2 18 GB 3.5-Inch SEAGATE (ST318416N)

Figure 5-5 shows the connector and jumper locations of the 18 GB 3.5-inch SEAGATE hard disk.

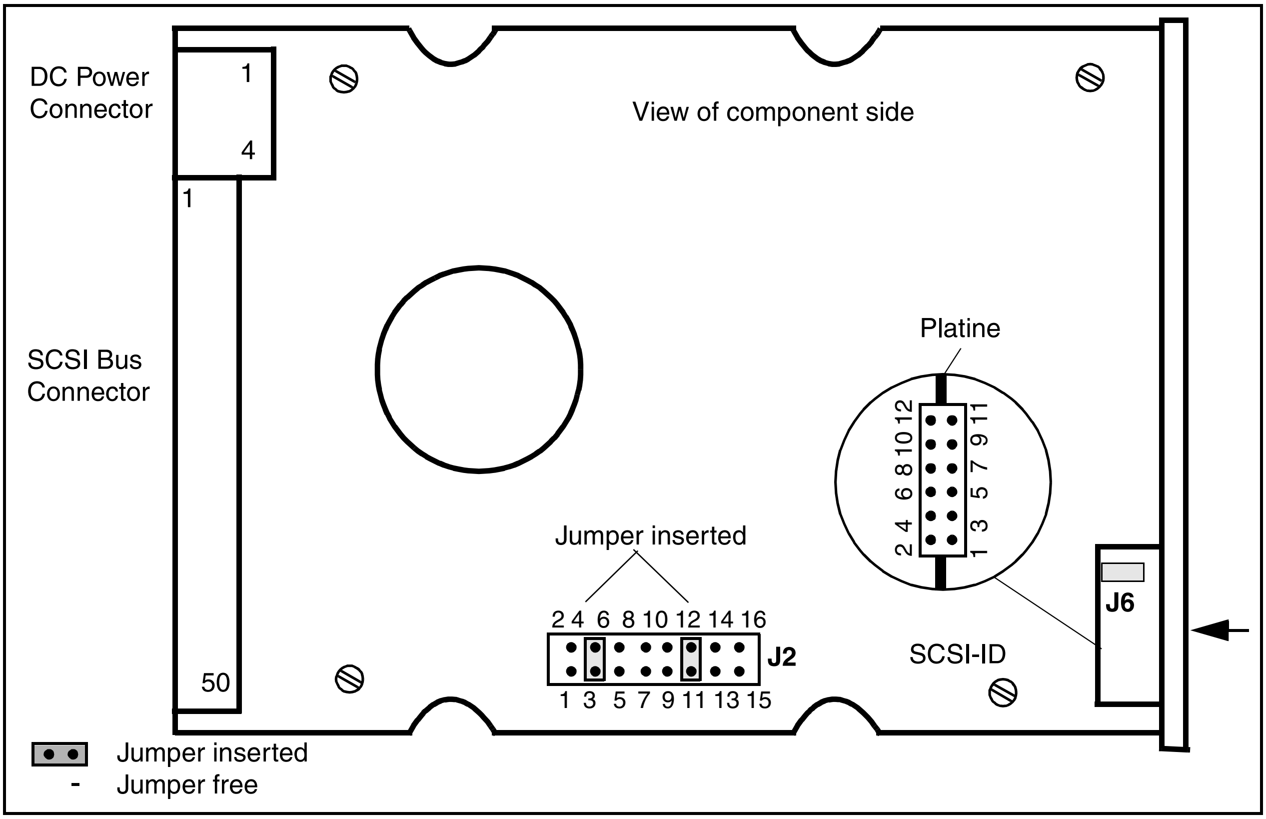


Figure 5-5 18 GByte 3,5” SEAGATE (ST318416N)

Table 5-4 Lists the jumper description of the 18 GB 3.5-inch SEAGATE hard disk drive.

Jumper		Description
J2: 1-2 **J2**: 3-4 **J2**: 5-6 **J2**: 7-8 **J2**: 9-10 **J2**: 11-12 **J2**: 13-14 **J2**: 15-16	- X - - - X - see. Table "Installation Variants"	Terminator Power to SCSI-Bus Terminator Power from drive Reserve Parity Check (- = ON) Write protect (- = OFF) Motor Start (X = after START UNIT) Motor Start Delay (- = OFF) Terminators ON/OFF
J6: 1-6 **J6**: 7-12	A0, A1, A2	HD-No, SCSI-ID not used

Table 5-4 Hard Disk Drive Jumper Descriptions

Table 5-5 lists the SCSI IDs of the 18 GB 3.5-inch SEAGATE hard disk drive.

HD-No.	SCSI-ID	Jumper J6: 1-2 A0	Jumper J6: 3-4 A1	Jumper J6: 5-6 A2
1	0	-	-	-
2	1	X	-	-
3	2	-	X	-
4	3	X	X	-
5	4	-	-	X
6	5	X	-	X
7	6	-	X	X

Table 5-5 Hard Disk Drive SCSI IDs

Table 5-6 lists the installation variants of Jumper J2: 15-16.

Compact	Cabinet Configuration
The Jumper **must** be free.	The Jumper must **only** be inserted, if the HD-Drive is the connected at the end of the SCSI bus.

Table 5-6 Installation Variant for Jumper J2:15-16.

5.3.3 18 GB 3.5-Inch SEAGATE (ST318417N)

Figure 5-6 shows the connector and jumper locations for the 18 GB 3.5-inch SEAGATE hard disk.

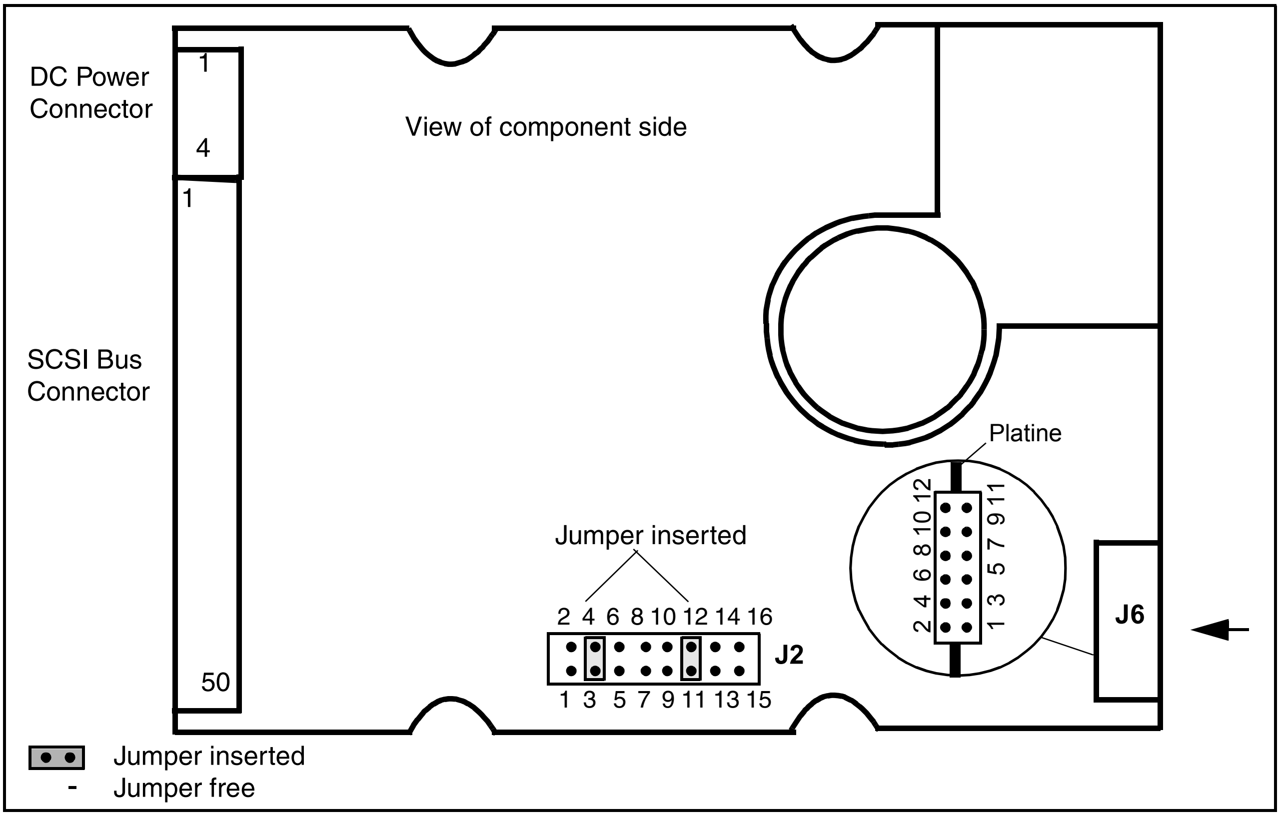


Figure 5-6 18 GByte 3.5-Inch SEAGATE (ST318417N)

Table 5-7 lists the jumper descriptions of the 18 GB 3.5-inch SEAGATE hard disk.

Jumper		Description
J2: 1-2 **J2**: 3-4 **J2**: 5-6 **J2**: 7-8 **J2**: 9-10 **J2**: 11-12 **J2**: 13-14 **J2:** 15-16	- X - - - X - see. Table "Installation Variants"	Terminator Power to SCSI-Bus Terminator Power from drive Reserve Parity Check (- = ON) Write protect (- = OFF) Motor Start (X = after START UNIT) Motor Start Delay (- = OFF) Terminators ON/OFF
J6: 1-6 **J6**: 7-12	A0, A1, A2	HD-No, SCSI-Address not used

Table 5-7 Hard Disk Drive Modes

Table 5-8 lists the SCSI IDs of the 18 GB 3.5-inch SEAGATE hard disk.

HD-No.	**SCSI-ID**	**Jumper J6: 1-2 A0**	**Jumper J6: 3-4 A1**	**Jumper J6: 5-6 A2**
1	0	-	-	-
2	1	X	-	-
3	2	-	X	-
4	3	X	X	-
5	4	-	-	X
6	5	X	-	X
7	6	-	X	X

Table 5-8 Hard Disk Drive SCSI IDs

Table 5-9 lists the installation variant for Jumper J2: 15-16.

Compact	**Cabinet Configuration**
The Jumper **must** be free.	The Jumper must **only** be inserted, if the HD-Drive is the connected at the end of the SCSI bus.

Table 5-9 Installation Variants for Jumper J2: 15-16

5.3.4 3.5" Fujitsu hard disk, 36.7 GB (MAP3367NP)

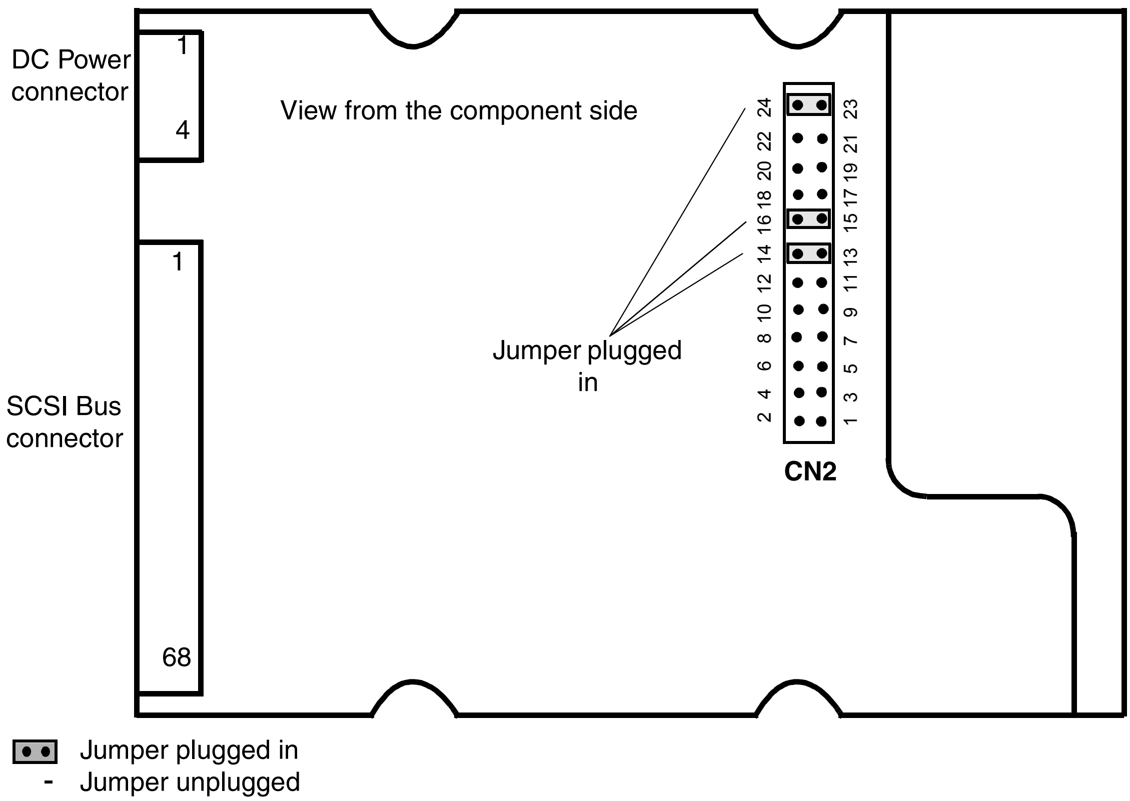


Figure 5-7 3.5" Fujitsu hard disk, 36.7 GB (MAP3367NP)

> The wideband adapter is included with the Fujitsu HD drive!

Functions of the individual jumpers:

Jumper		**Description**
CN2: 1-2	-	SCSI ID=0-6
CN2: 3-4	-	SCSI ID=0-6
CN2: 5-6	-	SCSI ID=0-6
CN2: 7-8	-	DB 8 to 15 (not connected)
CN2: 9-10	-	Write protection (- = OFF)
CN2: 11-12		Motor start (X = to START UNIT)
CN2: 13-14	x	Force Narrow (Width of 8-bit bus)
CN2: 15-16	x	Single-ended Mode
CN2: 17-18	-	Reserve
CN2: 19-20	-	IDD Res. Signal
CN2: 21-22	-	LED Signal
CN2: 23-24	x	Terminating Power Supply (Power to SCSI bus)

Table 5-10 Jumper functions for 36.7 GB Fujitsu

SCSI IDs:

HD no.	**SCSI address**	**Jumper J6 A0**	**Jumper J6 A1**	**Jumper J6 A2**
1	0	-	-	-
2	1	X	-	-
3	2	-	X	-
4	3	X	X	-
5	4	-	-	X
6	5	X	-	X
7	6	-	X	X

Table 5-11 SCSI IDs for 36.7 GB Fujitsu

5.3.5 3.5" SEAGATE hard disk, 36.7 GB (ST336607LW)

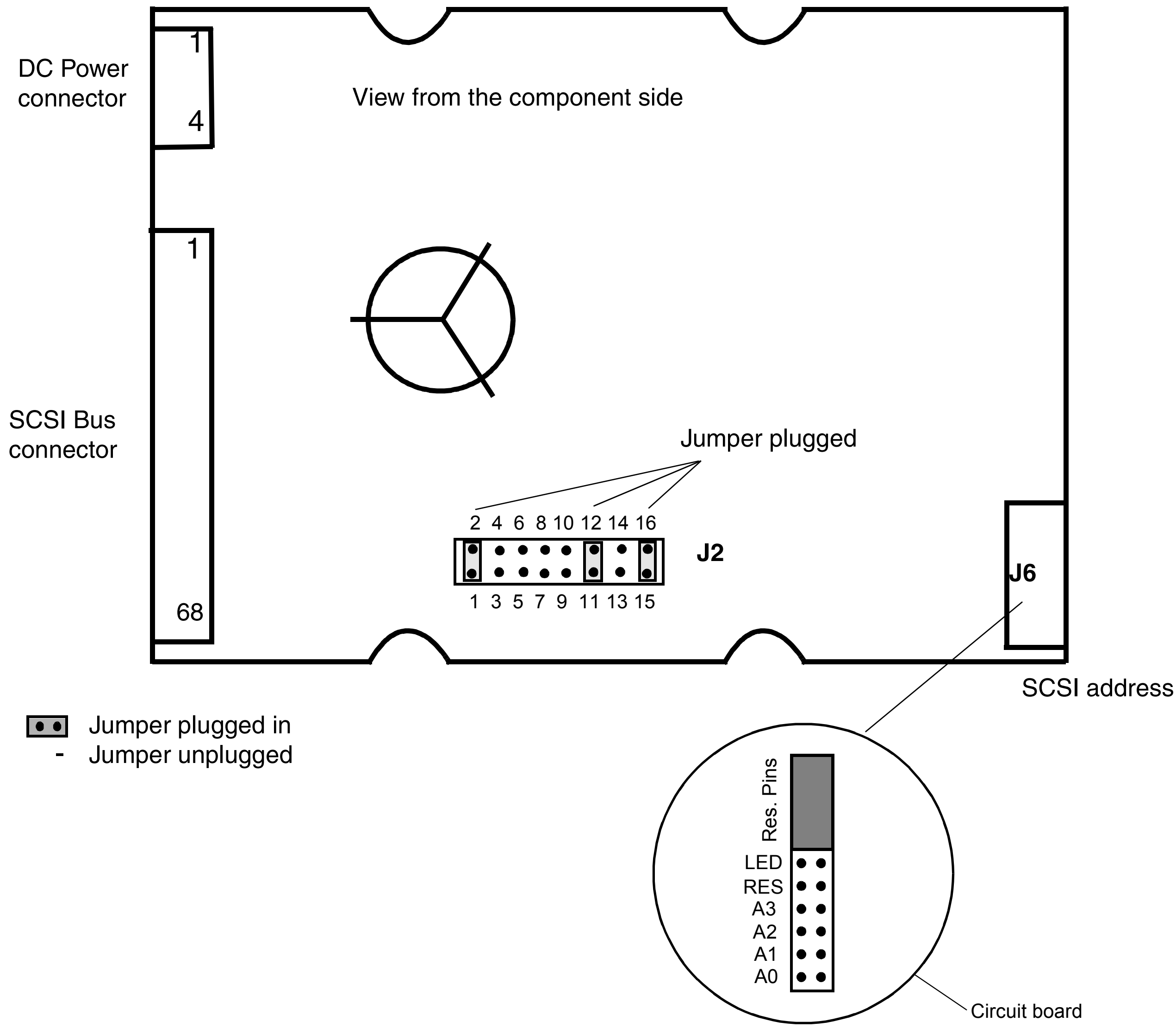


Figure 5-8 3.5" SEAGATE hard disk, 36.7 GB (ST336607LW)

> The special adapter S30122-X8022-X3 (wideband to narrow) is needed for the SEAGATE HD drives.

Functions of the individual jumpers:

Jumper		**Description**
J2: 1-2 **J2**: 3-4 **J2**: 5-6 **J2**: 7-8 **J2**: 9-10 **J2**: 11-12 **J2**: 13-14 **J2:** 15-16	x - - - - X - x	Connection plug voltage to the drive Reserve Reserve Parity check (- = ON) Write protection (- = OFF) Motor start (X = to START UNIT) Motor start delay (- = OFF) Connection plug ON/OFF
J6 **J6**	A0, A1, A2 A3	HD no., SCSI address not used

Table 5-12 Jumper functions for 36.7 GB SEAGATE

SCSI IDs:

HD no.	**SCSI address**	**Jumper J6 A0**	**Jumper J6 A1**	**Jumper J6 A2**
1	0	-	-	-
2	1	X	-	-
3	2	-	X	-
4	3	X	X	-
5	4	-	-	X
6	5	X	-	X
7	6	-	X	X

Table 5-13 SCSI IDs for 36.7 GB SEAGATE

5.3.6 3.5" Fujitsu hard disk, 73.4 GB (MAT3073NP)

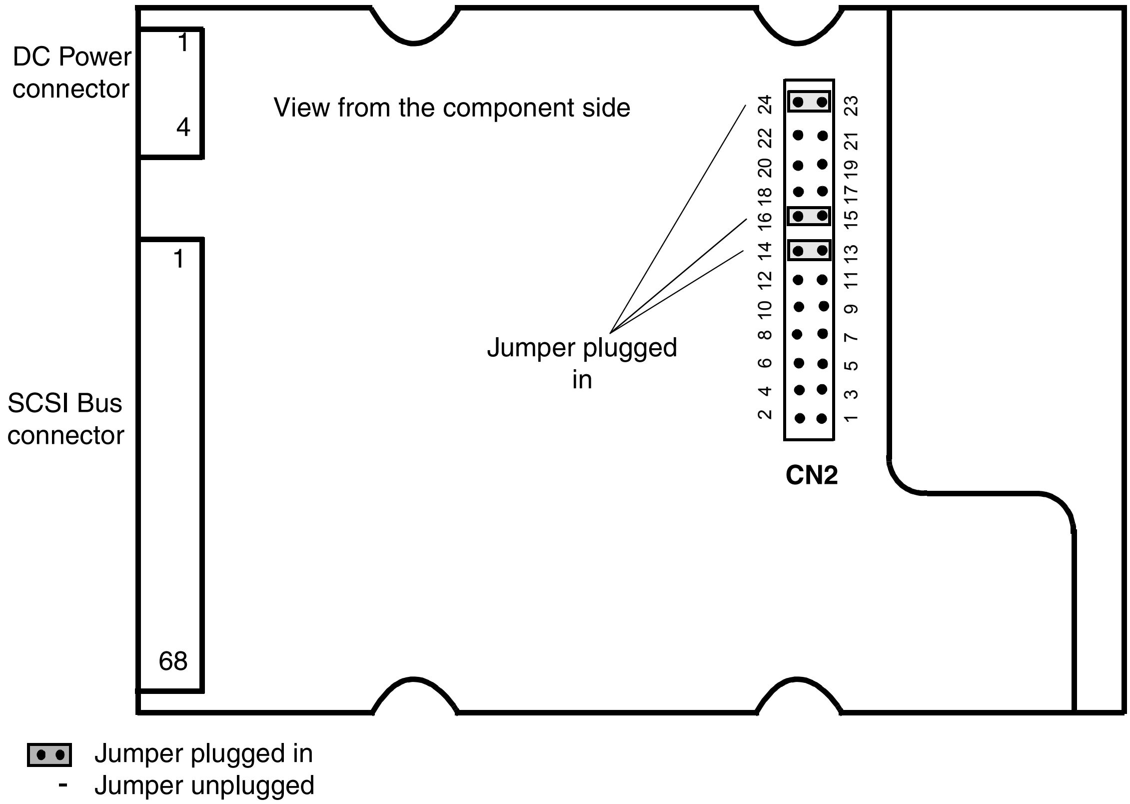


Figure 5-9 3.5" Fujitsu hard disk, 73.4 GB (MAT3073NP)

> The wideband adapter (50/68) is delivered with the Fujitsu HD drive!

Functions of the individual jumpers:

Jumper		Description
CN2: 1-2	-	SCSI ID=0-6
CN2: 3-4	-	SCSI ID=0-6
CN2: 5-6	-	SCSI ID=0-6
CN2: 7-8	-	DB 8 to 15 (not connected)
CN2: 9-10	-	Write protection (- = OFF)
CN2: 11-12		Motor start (X = to START UNIT)
CN2: 13-14	x	Force Narrow (Width of 8-bit bus)
CN2: 15-16	x	Single-ended Mode
CN2: 17-18	-	not connected
CN2: 19-20	-	IDD Res. Signal
CN2: 21-22	-	LED Signal
CN2: 23-24	x	Terminating Power Supply (Power to SCSI bus)

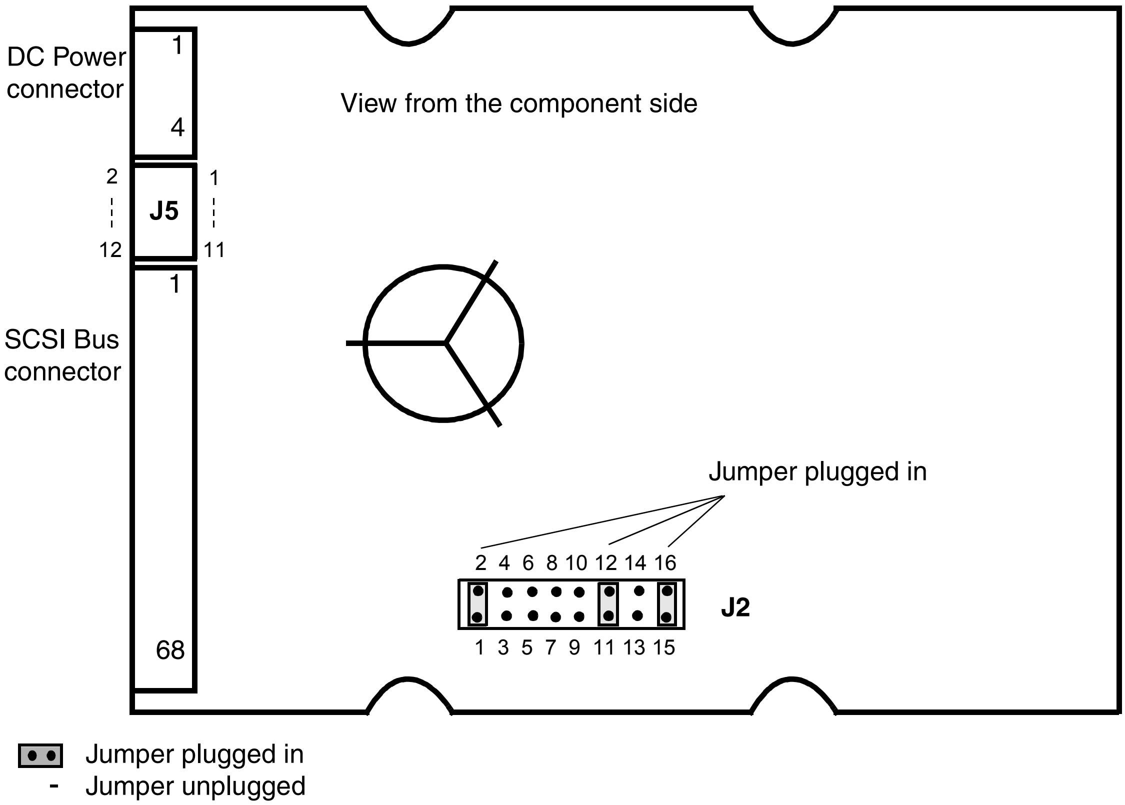
Table 5-14 Jumper functions for 73.4 GB Fujitsu

SCSI IDs:

HD no.	SCSI address	Jumper J6 A0	Jumper J6 A1	Jumper J6 A2
1	0	-	-	-
2	1	X	-	-
3	2	-	X	-
4	3	X	X	-
5	4	-	-	X
6	5	X	-	X
7	6	-	X	X

Table 5-15 SCSI IDs for 73.4 GB Fujitsu

5.3.7 3.5" SEAGATE hard disk, 73.5 GB (ST373207LW)



Functions of the individual jumpers:

Jumper		Description
J2: 1-2	x	Connection plug voltage to the drive
J2: 3-4	-	Reserve
J2: 5-6	-	Reserve
J2: 7-8	-	Parity check (- = ON)
J2: 9-10	-	Write protection (- = OFF)
J2: 11-12	X	Motor start (X = to START UNIT)
J2: 13-14	-	Motor start delay (- = OFF)
J2: 15-16	x	Connection plug ON/OFF

Table 5-16 Jumper functions für 36.7 GB SEAGATE

Jumper		Description
J5: 1-2		SCSI address 0-6
J5: 3-4		SCSI address 0-6
J5: 5-6		SCSI address 0-6
J5: 7-8		A3 not used
J5: 9-10		Reserve
J5: 11-12		Reserve

Table 5-16 Jumper functions für 36.7 GB SEAGATE

SCSI IDs:

HD no.	SCSI address	Jumper J5: 1-2 A0	Jumper J5: 3-4 A1	Jumper J5: 5-6 A2
1	0	-	-	-
2	1	X	-	-
3	2	-	X	-
4	3	X	X	-
5	4	-	-	X
6	5	X	-	X
7	6	-	X	X

Table 5-17 SCSI IDs for 36.7 GB SEAGATE

5.3.8 Removing the Hard Disk Drive

Warning
This procedure removes the hard disk drive from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

Warning
If CC80F or the CCDAX shelf is switched on, the hard disk holder may only be removed when the hard disk and the MOD drive (if present) have been deactivated.

Proceed as follows to remove the hard disk drive (Figure 5-10):

1. Log on to the HiPath 4000.
2. Check whether Unixware is activated in the A1. If it is, UnixWare must be deactivated.
3. Now deactivate all devices on the drive holder.

   Hard disk: **`DEACT-DSSM:A1,1;`**

   MOD drive (if present): **`DEACT-DSSM:A1,6;`**
4. Loosen the two screws that secure the disk drive holder to the shelf.
5. Slide the drive out of the shelf.

   If applicable, remove the half-height hard disk drive from the drive holder as follows:

   a) Disconnect the SCSI connector from the hard disk drive.

   b) Disconnect the power connector from the hard disk drive.

   c) Remove the four screws that secure the hard disk to the holder.

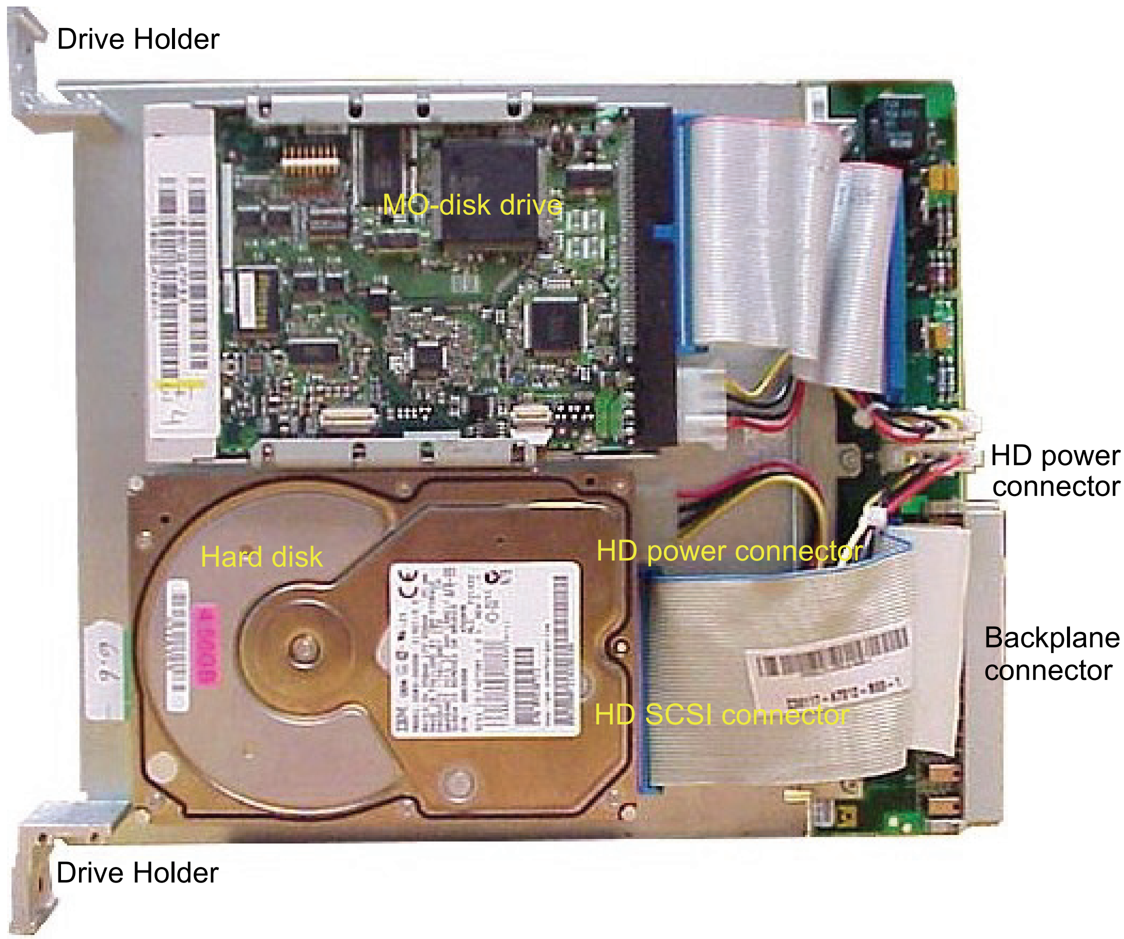


Figure 5-10 Drive Holder Showing MO-Disk and Hard Disk Drives

5.3.9 Replacing the Hard Disk Drive

To replace the hard disk drive:

1. Mount the hard disk drive on the drive holder as follows:
   a) Secure the hard disk drive to the holder with four screws.

   > The hard disk drive is mounted at the bottom of the holder.

   b) Reconnect the SCSI connector to the hard disk drive.

c) Reconnect the power connector to the hard disk drive.Align the drive with the guide rails.

d) Slide the drive holder into the shelf until it is seated into the backplane connector (see Figure 5-11)

2. Tighten the two screws that secure the SD3HX to the front of the shelf.
3. Activate the hard disk drive, using the RMX port by typing **`ACT-DSSM:A1,1;`**.
4. Activate Unixware.
5. Activate the MO-disk drive by typing **`ACT-DSSM:A1,6;.`**

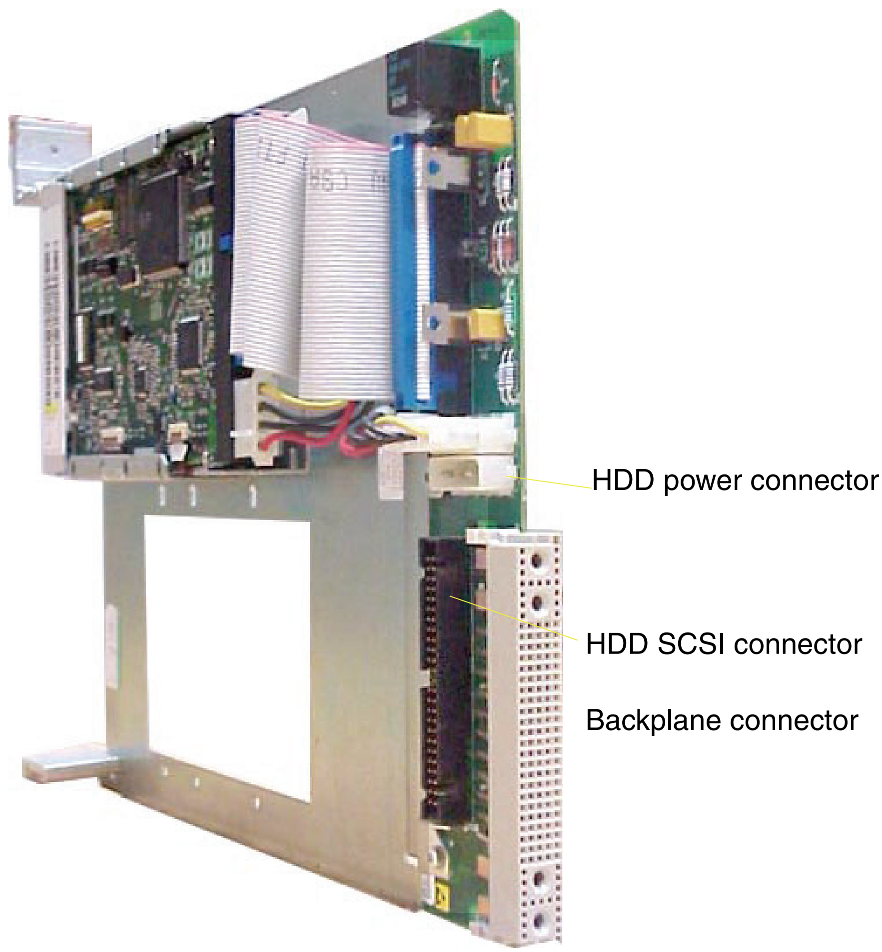


Figure 5-11 Drive Holder Showing MO-Disk Drive, Hard Disk, and Backplane Connectors

5.3.10 Verifying the Hard Disk Drive

Verify the operation of the hard disk drive as follows:

1. Check that the status of the hard disk drive is ready:

   `DIS-DSSM:A1,C,1;`

2. Should the drive not be operational, there are 2 possible causes:

   Blocked by AMO: Activate with ACTIVATE-DSSM

   Disabled for security reasons: Activate with CHANGE-DSSM.

5.4 HDMO

The HDMO board consists of an magneto optical (MO) drive and a hard disk. This board may be plugged in and unplugged at any time during live operation. To prevent any loss of data, the electrical connection to the drives should be interrupted before this board is removed.

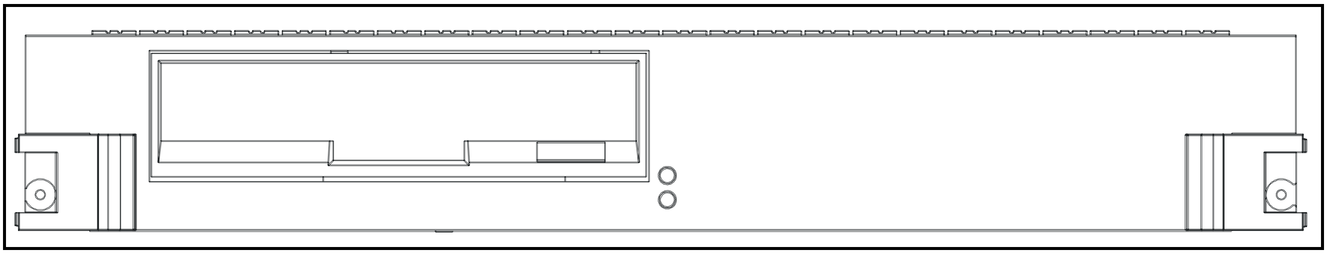


Figure 5-12 HDMO board

5.4.1 Hardware Part Number

S30810-K2310-X-*

- 1.3 GB MO drive: Fujitsu MCM 3130 AP (S30122-X7635-X)
- 40 GB HD drive: Seagate ST340014A (S30122-X7685-X)

5.4.2 LEDs

The front side of the board features two green LEDs (IDE1 = HD/IDE2 = MO) that indicate the status of the individual drives.

5.4.3 Block Diagram

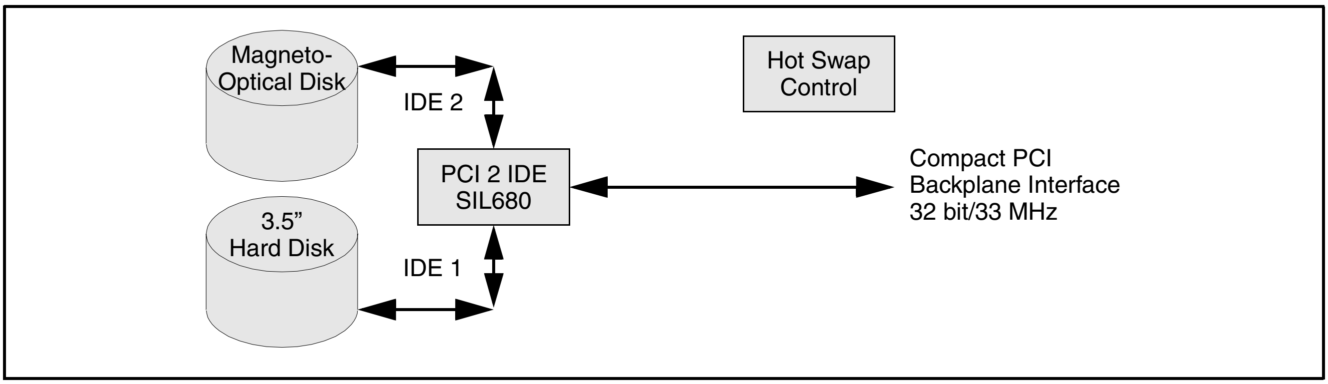


Figure 5-13 HDMO Block Diagram

5.4.4 Power Supply

The power supply values at the individual components on the HDMO board are as follows:

HW components	3.3 V		5 V		12 V	
	Type	**Max.**	**Type**	**Max.**	**Type**	**Max.**
SIL680	0.25A	0.35A	-	-		
HD drive (Seagate ST340014A)	-	-	0.70A	0.93A	0.71A	2.20A
MO drive (MCM3130AP)	-	-	2.03A	2.11A		
Power supply	**0.25A**	**0.35A**	**2.73A**	**3.04A**	**0.71A**	**2.20A**

Table 5-18 Power Supply Values

5.5 HDCF

The HDCF board consists of an hard disk (HD) and a compact flash card (CF).

The board can be plugged and extracted at any time when the system is running. To prevent the loss of data it is necessary to disable any access to the drives before the board is extracted.

Also the CF/Microdrive Medium can be plugged and extracted at any time when the system is running, provided that no access is active.

> Before removing this module or the module in slot 1 the AMO DEACT-DSSM:A1,1,,YES; has to be executed.

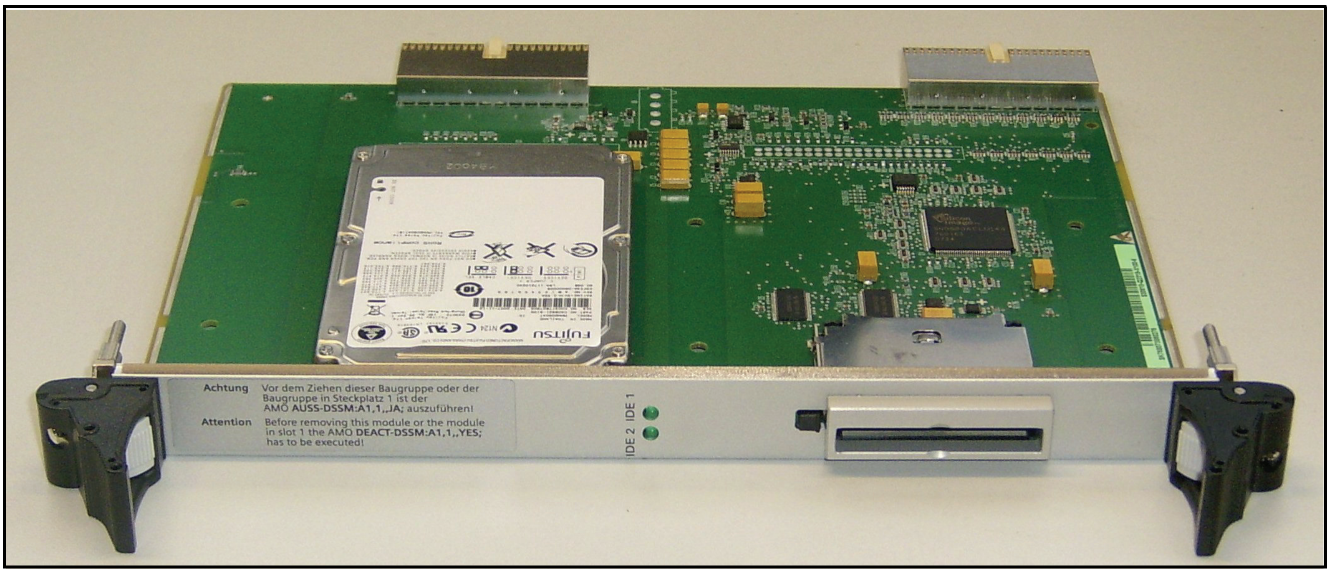


Figure 5-14 HDCF board (front view)

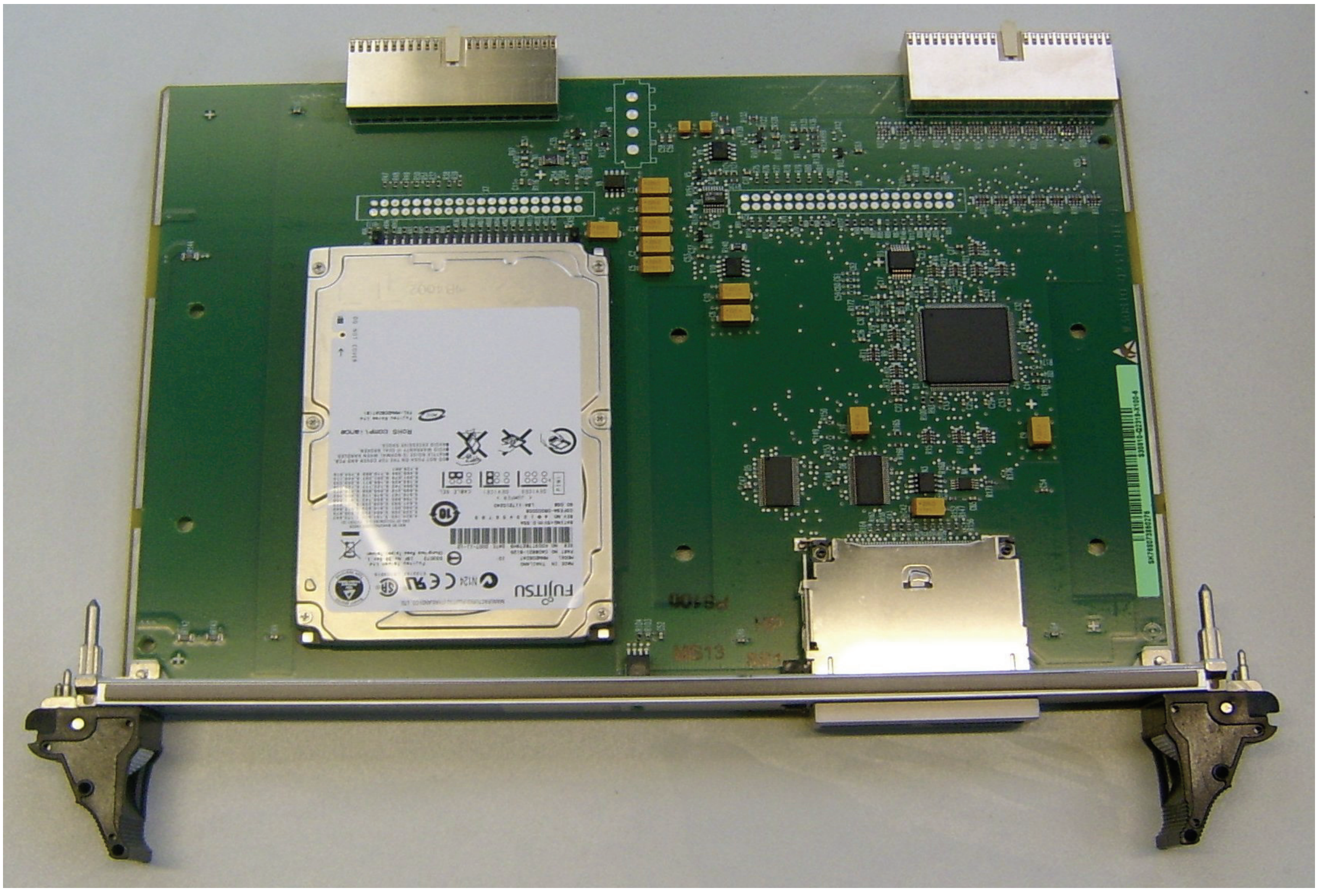


Figure 5-15 HDCF board

5.5.1 Hardware Part Number

S30810-K2319-X300

- 60 GB HD drive: Fujitsu (S30122-X8014-X11)
- 2 GB CF: SimpleTech (S30122-X8014-X13)

5.5.2 LEDs

The front side of the board features two green LEDs that indicate the status of the individual drives:

IDE 1: HD (= upper LED), which is located at left side of the board.

IDE 2: CF (= lower LED), which is located at right side of the board.

5.5.3 HDCF Block Diagram

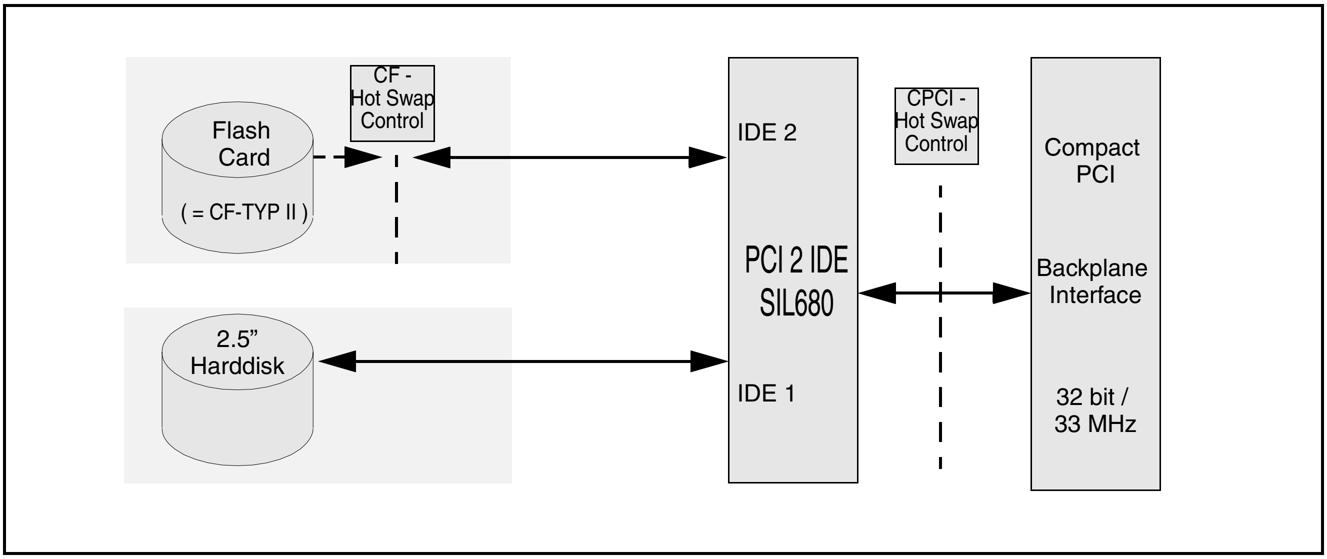


Figure 5-16 HDCF Block Diagram

5.5.4 Power Supply

The power supply values at the individual components on the HDCF board are as follows:

HW components	3.3 V		5 V	
	Type	**Max.**	**Type**	**Max.**
SIL680	0.25A	0.35A	-	-
60 GB HD drive (Fujitsu)	-	-	0.70A	0.93A
2 GB CF (SimpleTech)	-	-	0,075A	0,075A
Power supply	**0.25A**	**0.35A**	**0,775A**	**1,005A**

Table 5-19 Power Supply Values

5.5.5 Administration

After exchanging the HD/MO board with the HD/CF board the CF-Card has to be configured:

– login to UW7/Assistant with user engr

– execute the Unix command /opt/adpcfg/cf_activation

If a "pure" AMO configuration is needed (instead of using the HBR application) the following steps are necessary for a CF-Card setup:

1. Remove the previous device setup from the database:

   ```
   DEACT-DSSM:A1,6;
   DEL-DASM:A1,6;
   DEL-DCSM:A1,6;
   ```

2. Define a new device type for the CF-Card:

   ```
   ADD-DTSM:A1,HD,18932,512,"CF1G3";
   ```

   > The only difference from the 1.3 GB MOD setup is the sector size (which are really phsycally different).
   > Only 1.3 GB is configured for compatibility reasons, but the whole device capacity can be used with proper DTSM definition if needed.

3. Configure the new device:

   ```
   ADD-DLSM:A1,6,E,":PDS:";
   ADD-DLSM:A1,6,F,":DBDA:"&":DBD:"&":TMD:"&":PAS:"&":AMD:"&":DMP:";
   ADD-DLSM:A1,6,G,":CGD:";
   ADD-DLSM:A1,6,H,":DMS:"&":DSY:";
   ADD-DLSM:A1,6,I,":MOD-SCR:";
   ```

Restrictions:

- Since there is no medium locking mechanism in CF-Cards additional care has to be taken that the device is deactivated both on the RMX (DEACT-DSSM) and Unix (umount if necessary) sides before it is removed.
- Due to the standard Unix device handling mechanism it is necessary to have a card inserted during the Unix boot phase, otherwise no device resources will be allocated for the CF-Card.
- After bootup the device can already be changed.
- It is not permitted to start device operations under Unix if no card is inserted, because it results in a hanging I/O operation. (But it does not relate to operations started in dipas_batch, since these run on the RMX side.)
- Any CF-Card greater than 2GByte will be treated as an 2GByte CF in HBR.
- In RMX backups HBR will use only 1,3Gbyte of the CF-Card.

5.6 MO Disk Drive

The MO disk drive is a storage device that writes data using a magnetic field and light (a laser beam) to write to a disk that resembles a CD-ROM disk (see Figure 5-17). The MO disk can be used to backup hard disk data.

The MO disk drive supports the ADS, ADP, and SWU and has a capacity of 1.3 GB. The 3 1/2-inch MO disk drive is installed on a holder (SD3H or SD3HZX) in slot 22 of the HiPath 4300 and slot 19 of the HiPath 4500.

Figure 5-17 MO Disk

5.6.1 LED and Switch Indications

The front panel of the MO disk drive (Figure 5-18) has two LEDs.

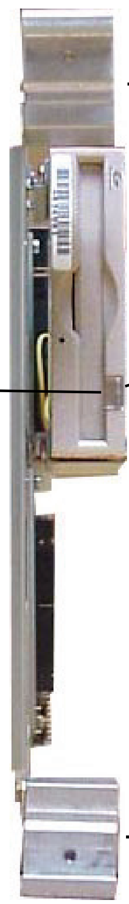


Figure 5-18 MO Disk Drive, Front View

Table 5-20 lists the LED information for the MO disk drive assembly.

LED	State	Indication
Green	On	MO disk drive is loading.
Amber	On	MO disk drive is searching for a file or it is reserved.

Table 5-20 MO Disk Drive LED Indications

The back panel of the MO disk has 4 DIP switches for modes and 1 rotary switch for SCSI ID.

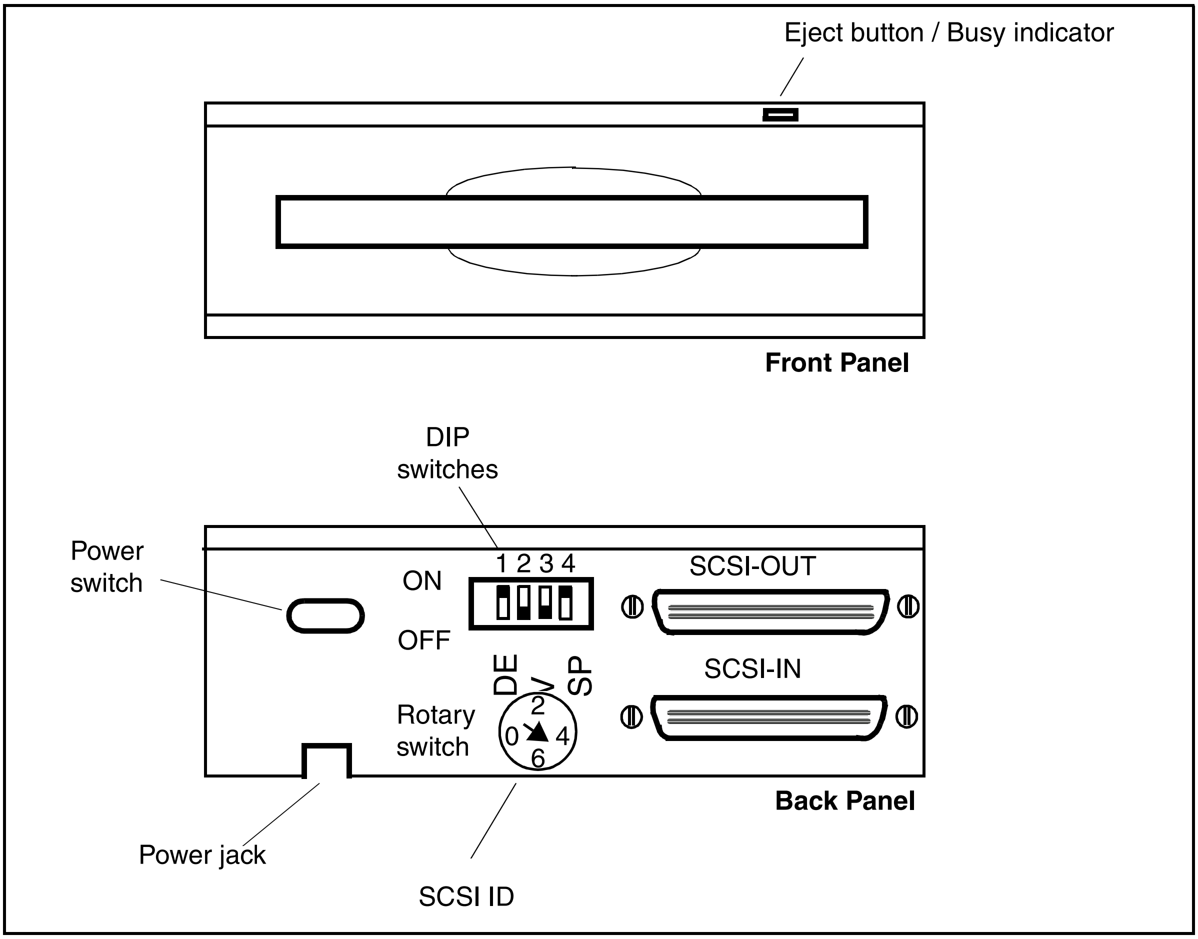


Figure 5-19 External 3.5-Inch Fujitsu (DynaMO 1300 SF)

Table 5-21 lists the DIP switch descriptions of the MO disk.

DIP Switch	Position	Description
1 **2** **3** **4**	ON OFF OFF see explanation below	Device Mode, **DEV (HD)** Auto Spindel-Stop-Mode, **SPM** Write Cache Mode, **WRC** Internal Terminator ON/OFF, **TM**
• The SCSI-Bus Parity-Check has to be switched OFF factory installed. • DIP Switch **4**, **T**ermination **M**ode • The switch must **only** be in ON position, if the MO drive is connected at the end of the SCSI bus.		

Table 5-21 MO Disk DIP Switches on the external MO disk drive

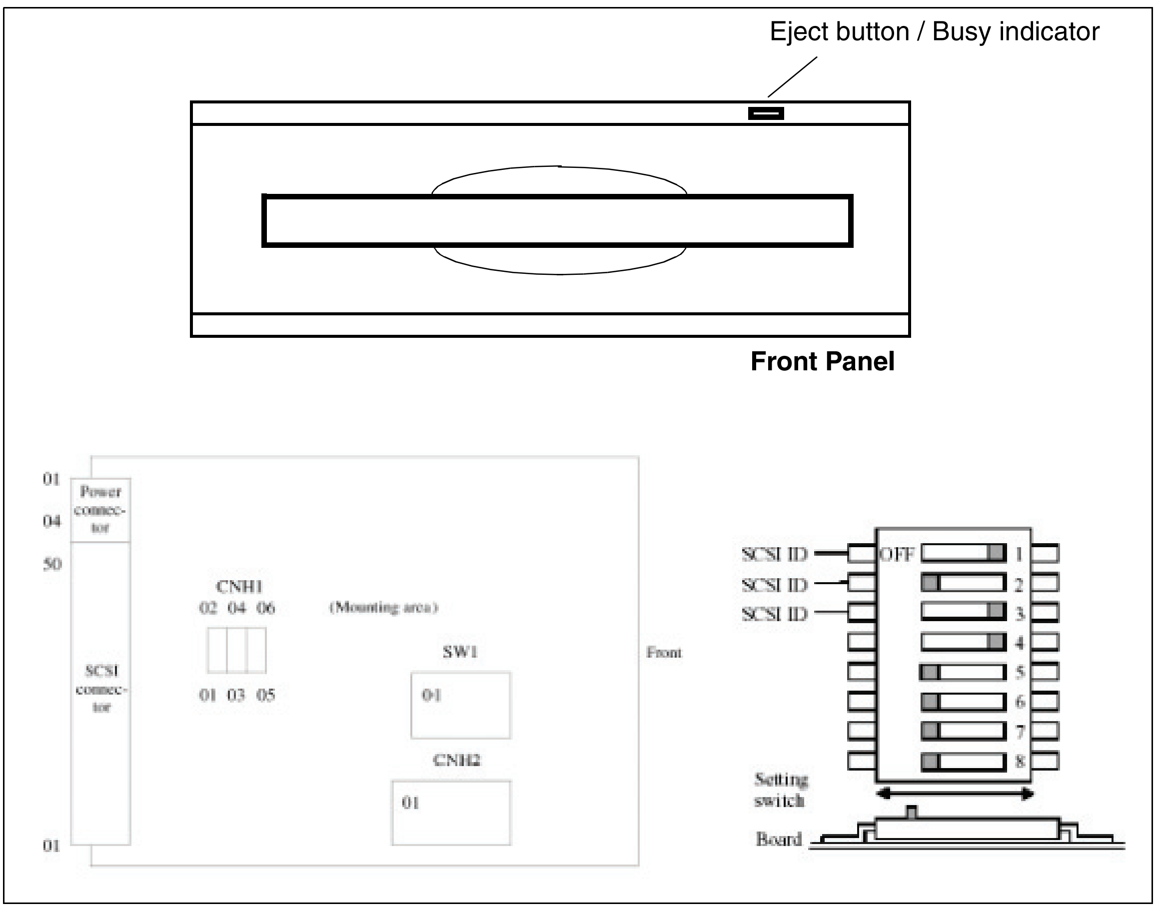


Figure 5-20 Internal 3.5-Inch MO disk drive

	Switch Number	Signal	Position
SW1	01	SCSI-ID (5)	ON
	02	Hicom/HiPath “6”	OFF
	03		ON
	04	SCSI data bus parity check	ON
	05	Write Cache Mode, **WRC**	OFF
	06	Device Type Mode	OFF
	07	Auto Spindel-Stop-Mode, **SPM**	OFF
	08	Factory test mode	OFF
CNH1	5-6	Bus termination (no termination)	OPEN

Tabelle 5-22 MO Disk DIP Switches on the internal MO disk drive

5.6.2 Connectors

The MO disk drive provides SCSI and power connectors for connection of cables to the backplane (see Figure 5-21).

The MO disk drive SCSI and power connectors plug into the:

- CC80F - backplane in a HiPath 4300
- CCDAX - backplane in a HiPath 4500

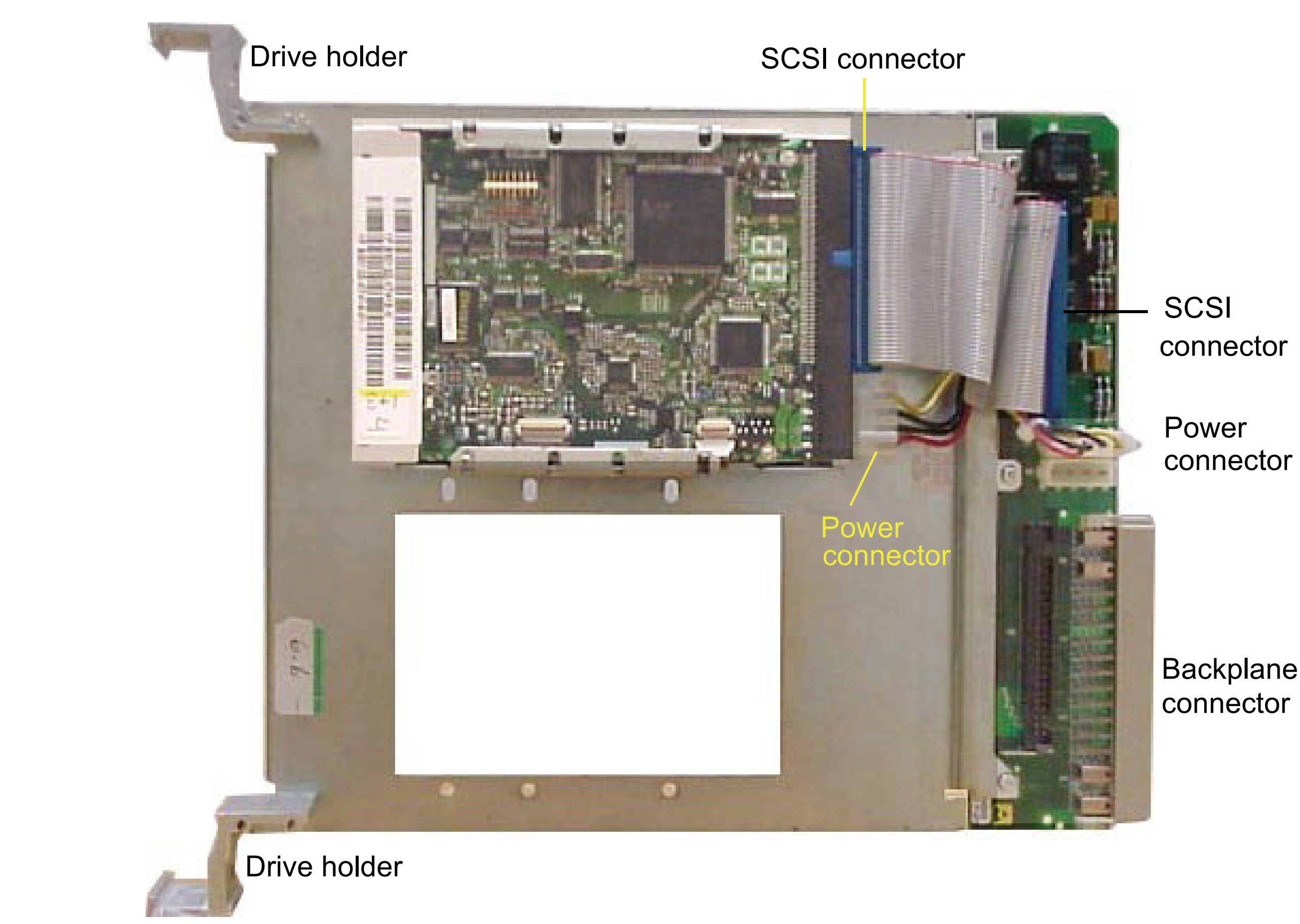


Figure 5-21 MO Disk Drive Connectors

5.6.3 Removing the MO Disk Drive

This procedure removes the MO disk drive and the hard disk drive from service.

Attention: Static Sensitive Devices
Observe all precautions for electrostatic discharge.

> **Warning**
> If CC80F or the CCDAX shelf is switched on, the hard disk holder may only be removed when the hard disk and the MOD drive (if present) have been deactivated.

Remove the MOD drive as follows:

1. Log on to the HiPath 4000 and call up the dialog box Direct AMO.
2. Deactivate the MOD drive:

   `DEACT-DSSM:A1,6;`

3. If the MOD drive is mounted together with a hard disk drive on the same drive holder, this must also be deactivated:
   a) Check whether the Unixware is installed: If so, this must be deactivated first.
   b) Now switch off the hard disk: **`DEACT-DSSM:A1,1;`**
4. Loosen the screws on the holder that secure the drive holder to the shelf.
5. Remove the drive holder from the shelf.
6. Remove the MO disk drive from the drive holder as follows

:

> Observe the position of the MO disk drive on the drive holder.

   a) Disconnect the SCSI connector from the MO disk drive.
   b) Disconnect the power connector from the MO disk drive.
   c) Remove the four screws that secure the MO disk drive to the holder.
   d) Remove the four screws that secure the MO disk drive to the bracket of the holder.

5.6.4 Replacing the MO Disk Drive

> **Warning**
> If CC80F or the CCDAX shelf is switched on, the hard disk holder may only be removed when the hard disk and the MOD drive have been deactivated.

Replace the MO disk drive as follows:

1. Install the MO disk drive on the drive holder as follows:
   a) Secure the MO disk drive to the bracket with four screws.
   b) Secure the MO disk drive to the holder with four screws.

> Ensure that the MO disk drive is installed in the original position on the drive holder.

   c) Reconnect the SCSI connector to the MO disk drive.
   d) Reconnect the power connector to the MO disk drive.
2. Slide the drive into the shelf until it is seated into the backplane connector.
3. Tighten the screws on the holder to secure the drive holder to the shelf.
4. If the MO disk drive is mounted with a hard disk drive on the same drive holder:
   a) Activate the hard disk as follows: **`ACT-DSSM:A1,1;`**
   b) Activate Unixware.
5. Replace the security MOD and activate the MOD drive as follows:

   `ACT-DSSM:A1,6;`

5.6.5 Checking the MOD drive

To check whether the MOD drive is working correctly, you must check its status. This is done with the command **`AB-DDSM:A1,C,6`**.

5.6.6 Cleaning the MO Disk Drive

> Ensure to clean the MO disk drive with a cleaning disk every six months.

6 Adapter

6.1 AMOM

The adapter module optical multifunction (AMOM) adapter is an opto-electronic converter that enables optical fiber cable to be connected to the ports of the DIUNx board for links to a private E1 network (see Figure 6-1). The AMOM board has one port and consists of a sender and a receiver with ST connectors. The AMOM is connected to the DIUNx board through a SUB-D connector at the front plate of the board.

The following AMOM versions have been developed for the various optical interfaces:

- X100 for 850nm multi-mode
- X200 for 1300nm multi-mode
- X300 for 1300nm single mode

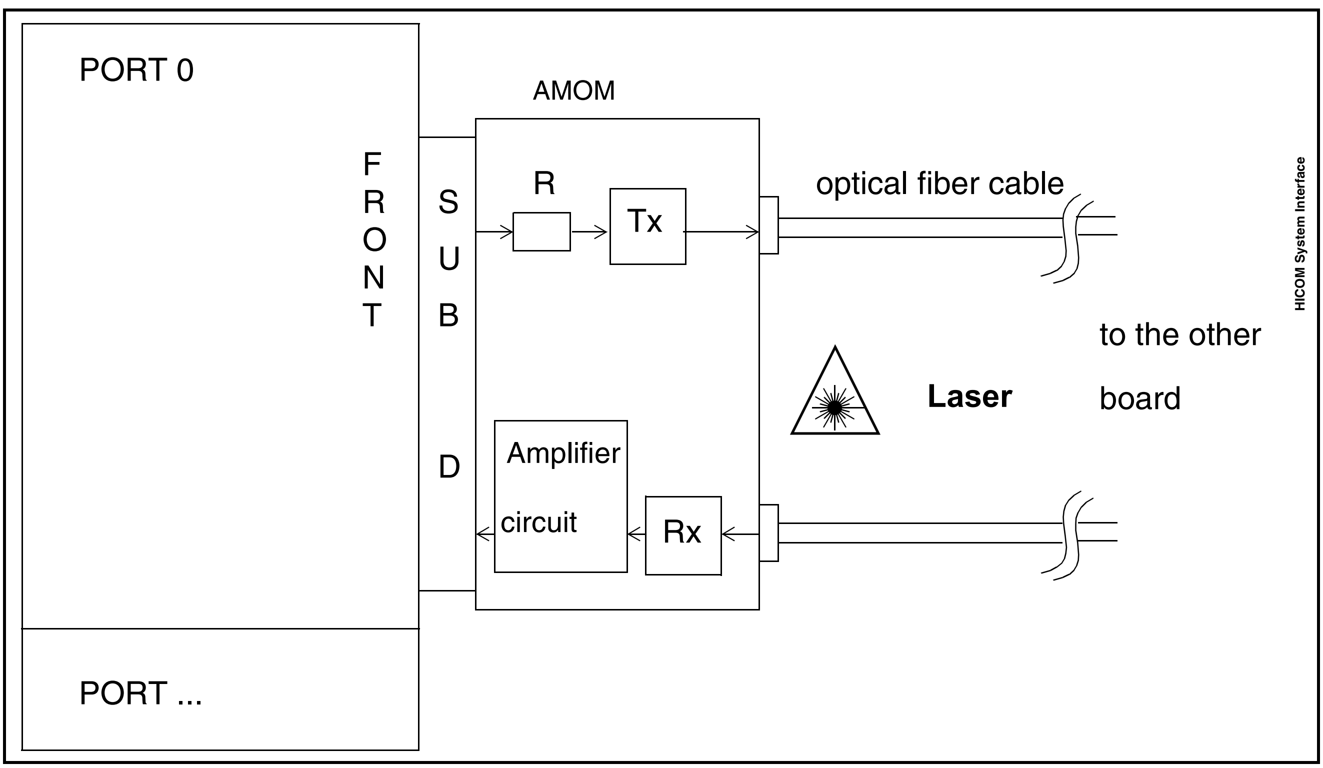


Figure 6-1 DIUN Board

> The AMOM adapter (part number: S30807-K5480-X100 / -X200 / -X300) is not compatible with the APCFL (S30807-K5422-X) and APCFM (S30807-K5446-) adapters.

6.1.1 Technical Description

Table 6-1 provides some technical data about the AMOM versions.

AMOM version	Wave length	Optical Fiber Cable	Cable Length (km)	Attenuation on Cable (dB/km)	Maximum Attenuation (dB) *)
x 100	850/820 nm multi-mode	50µm 62.5µm	2.5 3	3 3.5	11.5 14.5
x 200	1300nm multi-mode	50µm and 62.5µm	6	1	10
x300	1300nm single mode	9µm/125	8	0.5	8
*) The maximum optical attenuation for an AMOM to AMOM link, after taking a reserve amount of 4dB attenuation due to aging and splicing into account.					

Table 6-1 Technical Data

6.1.2 Pin Assignments

Table 6-2 lists the pin assignments for the SUD connectors.

Signal Name	PIN	Signal Description	Direction
LWLI0_FRONT	11	Data input at the fiber interface (front)	Outgoing
LWLO0_FRONT	4	Data output at the fiber interface (front)	Incoming
+5V	10; 14	+5V power supply	
GND	5; 12;	Ground return for the +5V power supply	
SCAN_IN0	7; 6	Adapter test	Outgoing
* The case is directly connected with the front section of the board.			

Table 6-2 Pin assignment

Power Supply and Dissipation

Table 6-3 lists the power supply and dissipation states of the AMOM.

Power Supply State	I_{5V} [mA]
Sender (maximum)	100

Table 6-3 Power Supply and Dissipation

Receiver	70
Total capacity	170
Dissipation State	**P_{5V} [mW]**
Sender circuit	67.5
Receiver circuit	262,5
Total dissipation	330

Table 6-3 Power Supply and Dissipation

6.2 APPCU

The Adaption Plug Universal with Protection Circuit (APPCU), art no: S30807-K5415-X is used on 2-Mb routes for connecting both 75-Ohm and 120-Ohm lines to the HiPath system. Depending on the board (DIUxx, CDG), two lines, which can also be run with different impedances if required, are routed through the adapter.

> xx refers to either DIUC, DIUR, or DIUS2.

The transmission rate is 2,048 MHz. Operating voltage is not required. The adapter plug is considered part of the transmission route from a fault management point of view and is monitored by the board. All signal and alarm wires are provided with surge protection. In addition, the a/b wires are routed through a universal adapter plug with protection circuit VHF filter.

The APPCU is plugged into the slots of the DIUC, DIUR, DIUS2 and CDG boards in the LTU shelf from the back instead of a normal cable connector.

The APPCU adapter plug replaces the APPC2, APPCK and APPCKG adapter plugs in new applications.

The existing cables are designed to allow continued use of the APPC2 adapter, so extensions can be made without exchanging the old adapter.

6.2.1 Applications

- DIUC, DIUR and DIUS2
  - Alarm wires are not used.
  - All DIP-FIX switches are open. The required grounding of the cable occurs in the cable connector.
- CDG
  - The APPCU adapter is already equipped for a CDG with two DPNSS lines, so alarm wires are provided for on line 1 as well.
  - The required grounding of the cable occurs by setting the DIP-FIX switch.

If high availability is required, a second circuit with a greater range should be implemented using another board.

When testing the adapter plug or tracking signals, it should be noted that the pin assignment of the plug as opposed to the LTU shelf is rotated on the vertical axis.

More precise details on calculating ranges can be found in the *CCS Cable Systems Manual* (A30951-V6000-X-*-20), Volumes 2, 3 and 4, Cabling with symmetric lines, coaxial cables and optical fiber (LZW Fürth).

For connection examples and cabling, refer to Table 6-4.

DIP-FIX Switch	**Position**	**Effect**	**Connection**
S1/1-2	ON	Tx port of the DPNSS connection grounded	Line 1
S1/3-4	ON	Rx port of the DPNSS connection grounded	Line 1
S1/5-6	ON	Alarm wires grounded (if required)	Line 1
S2/1-2	ON	Tx port of the CorNet connection grounded	Line 2
S2/3-4	ON	Rx port of the CorNet connection grounded	Line 2
S2/5-6	ON	Alarm wires grounded (if required)	Line 2
In the OFF setting, the respective port is not grounded = factory setting			

Table 6-4 Connection Examples and Cabeling

Figure 6-2 shows the APPCU arrangement on the HiPath system.

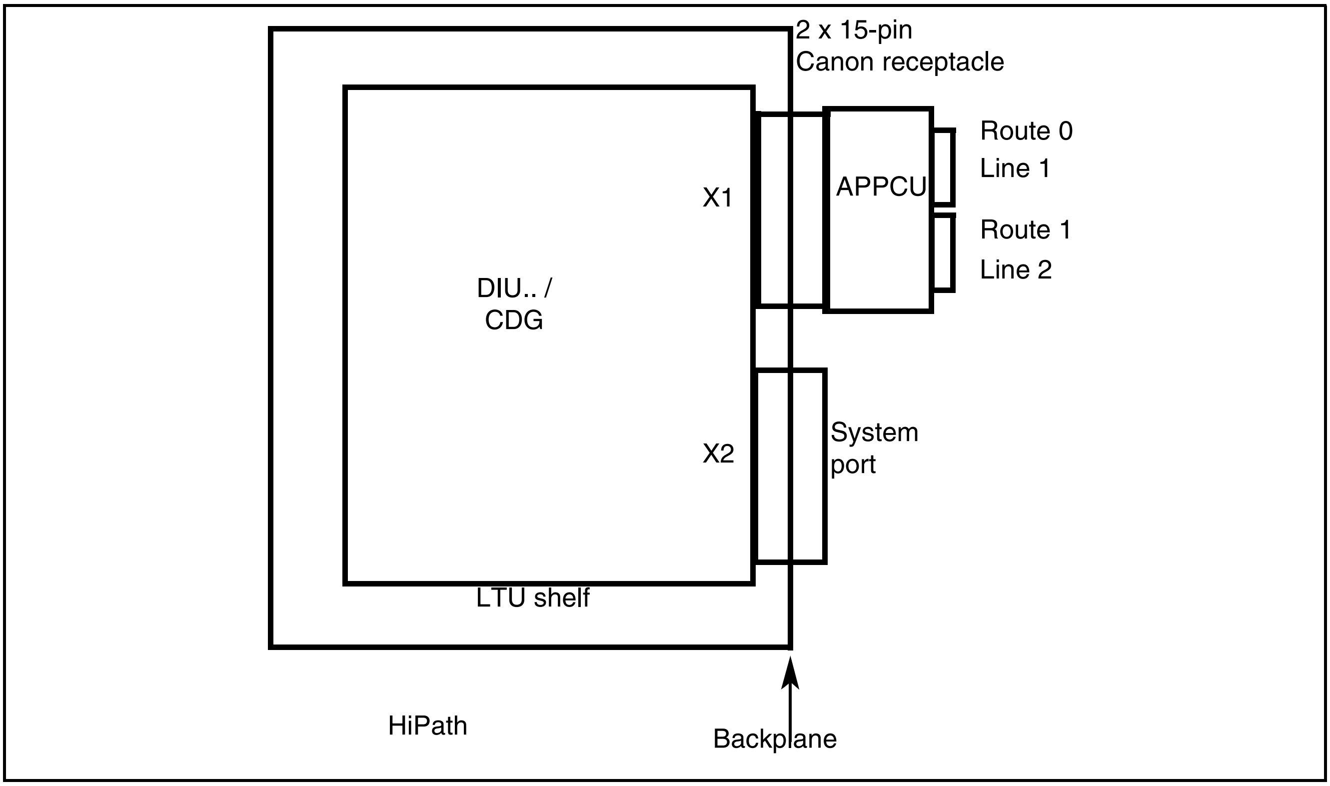


Figure 6-2 APPCU Arrangement on HiPath System

Figure 6-3 shows the pin assignments on a Canon receptacle.

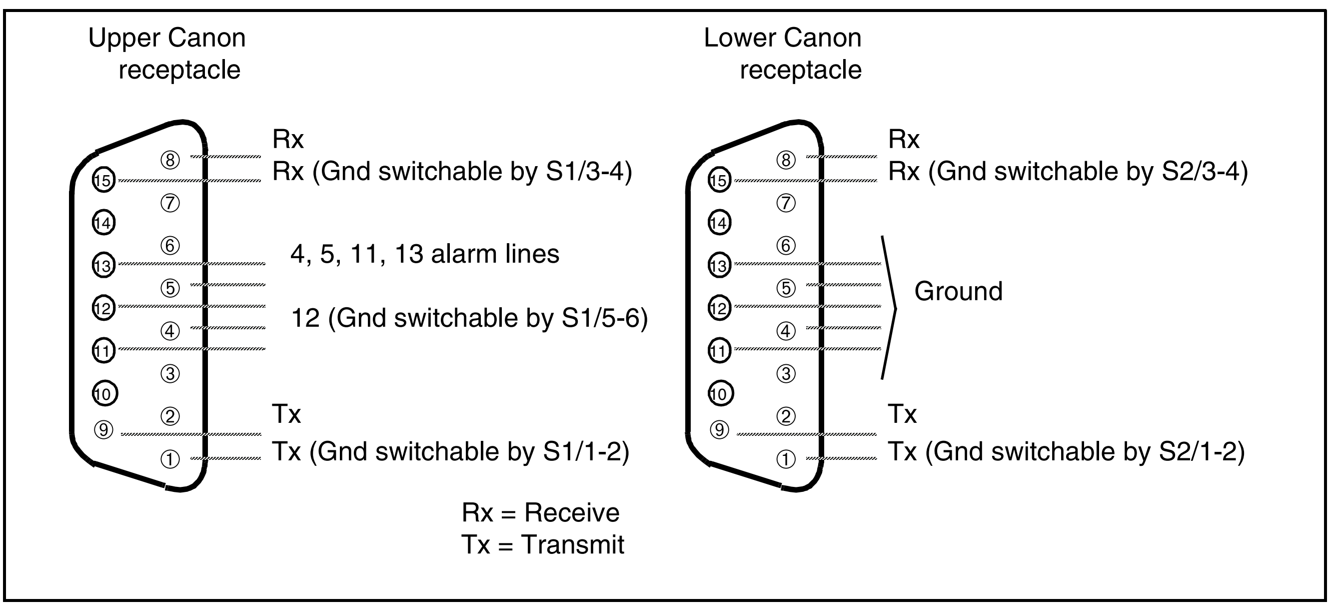


Figure 6-3 Pin Assignments on Canon Receptacle

Figure 6-4 shows a connection example of line one with 120 Ohms.

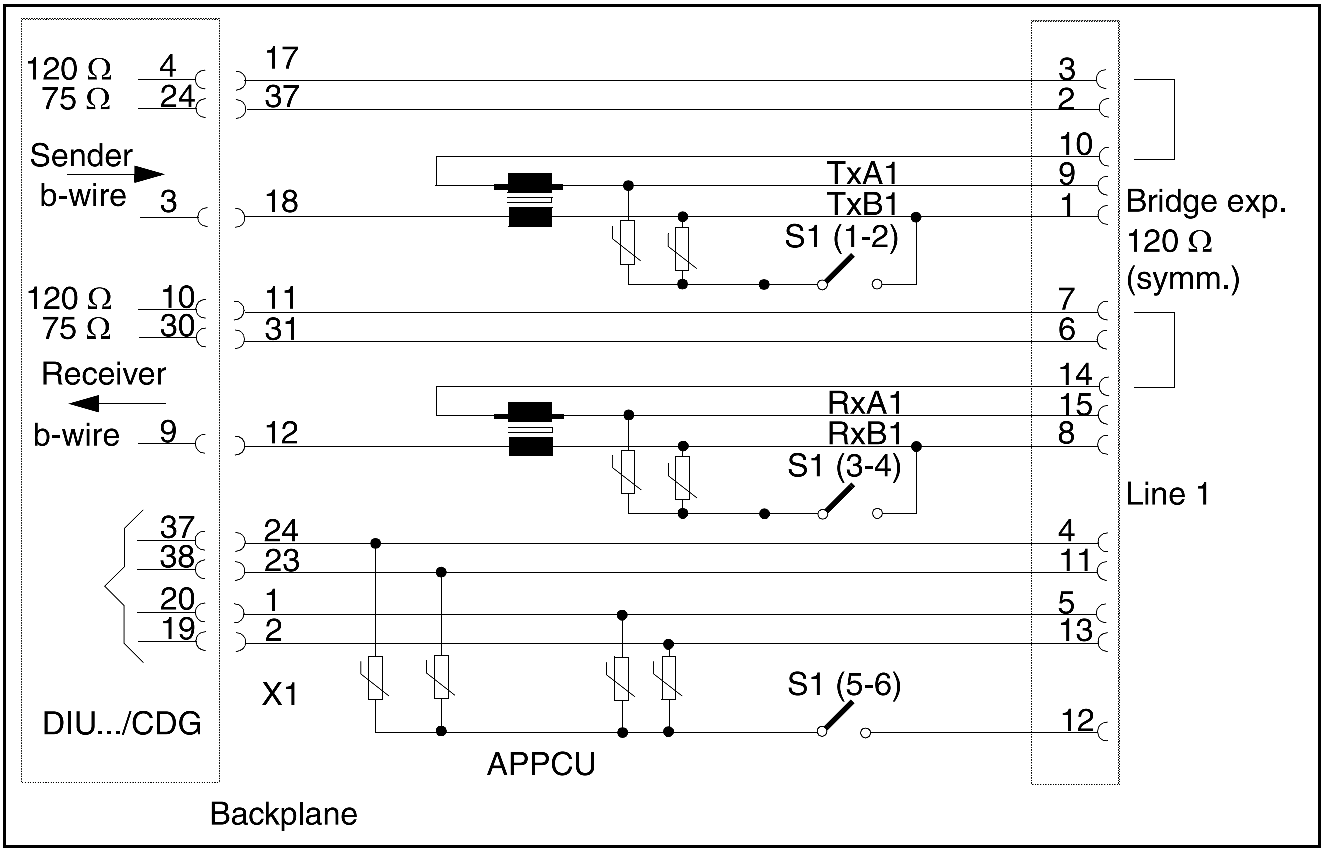


Figure 6-4 Connection Example—Line 1 with 120 Ohms

Figure 6-5 shows a diagram of a 120-Ohm cable.

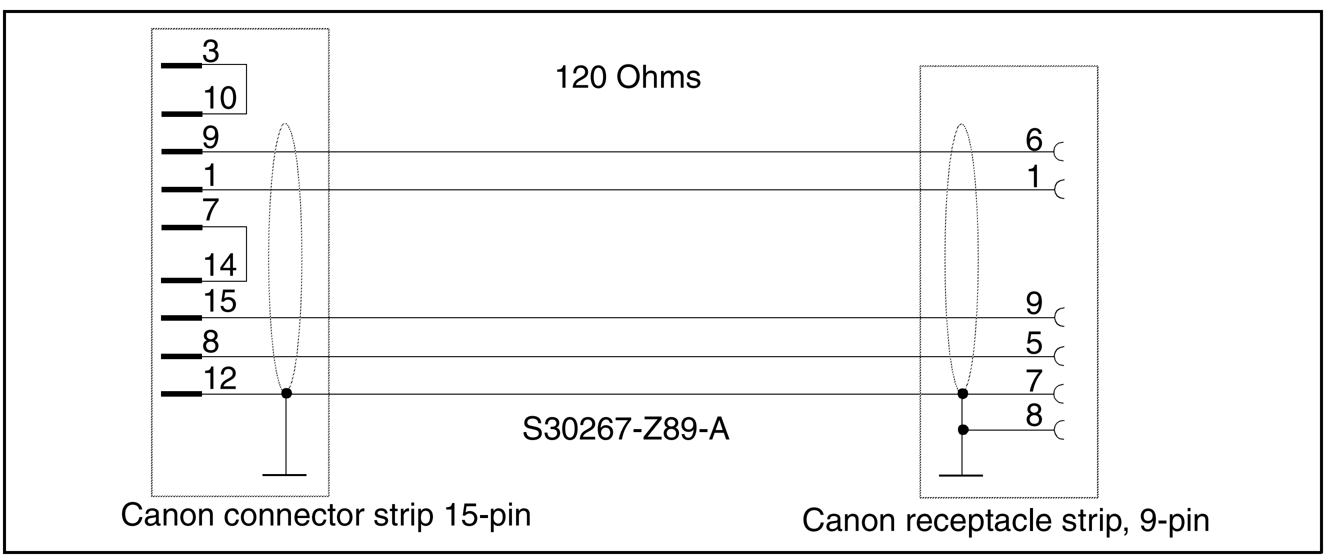


Figure 6-5 120-Ohm Cable

Figure 6-6 shows another connection example of line 2 with 75 Ohms.

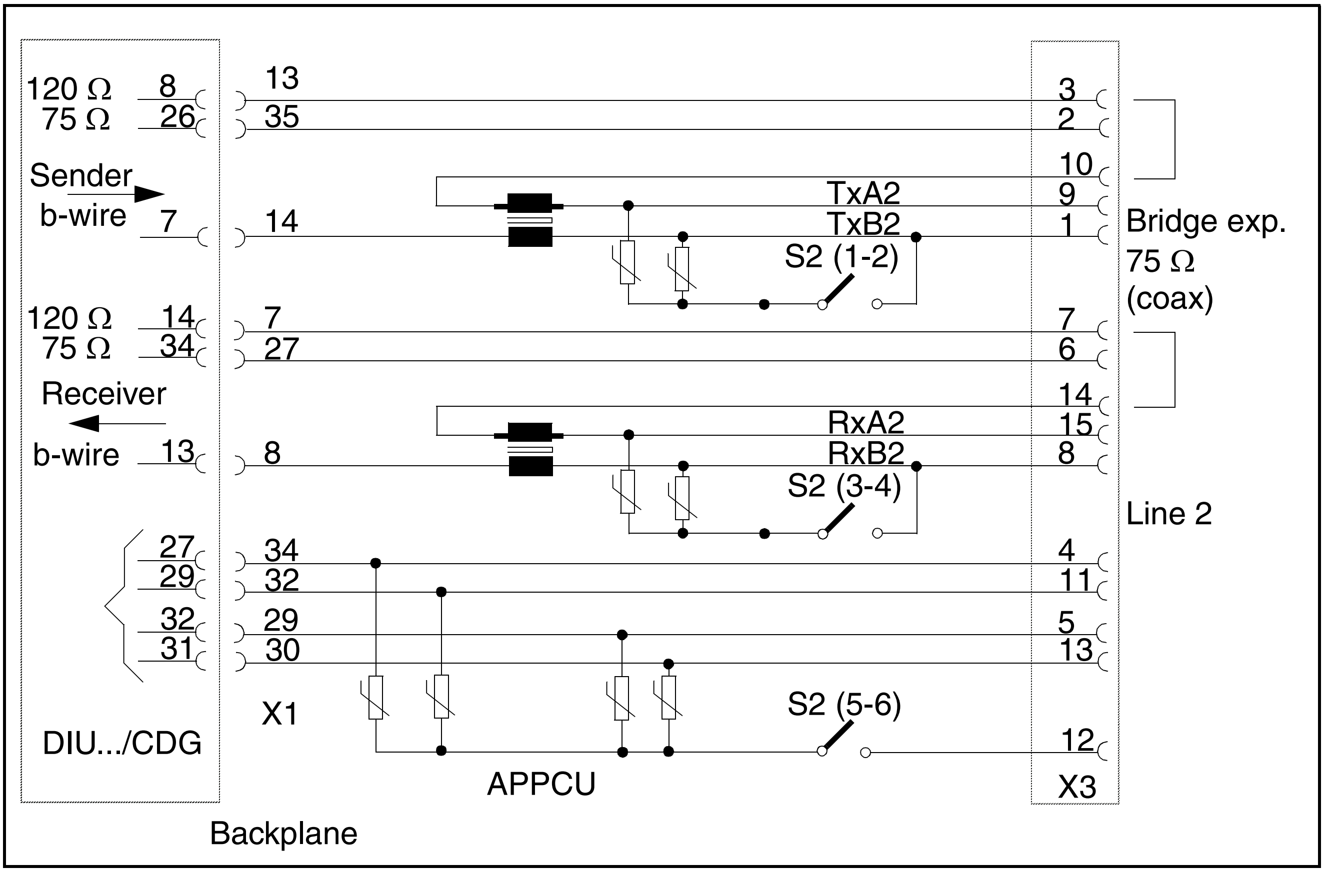


Figure 6-6 Connection Example—Line 2 with 75 Ohms

.. in DIU.. refers to either DIUC, DIUR, or DIUS2.

Figure 6-7 shows a diagram of a 75-Ohm cable.

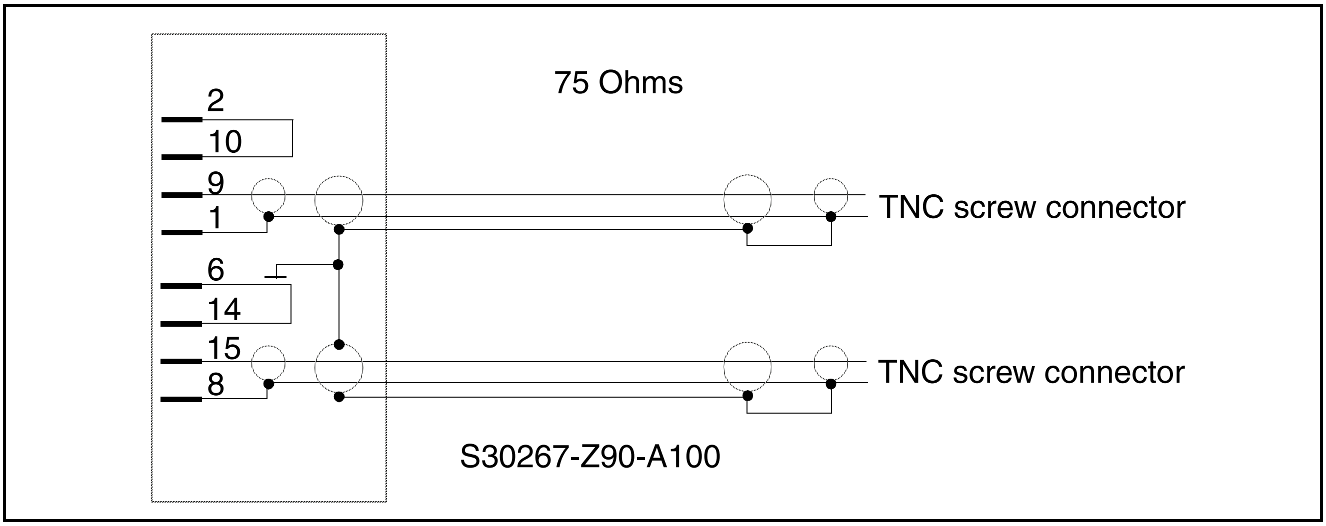


Figure 6-7 75-Ohm Cable

Figure 6-8 shows cabling between CDG to DIUS2.

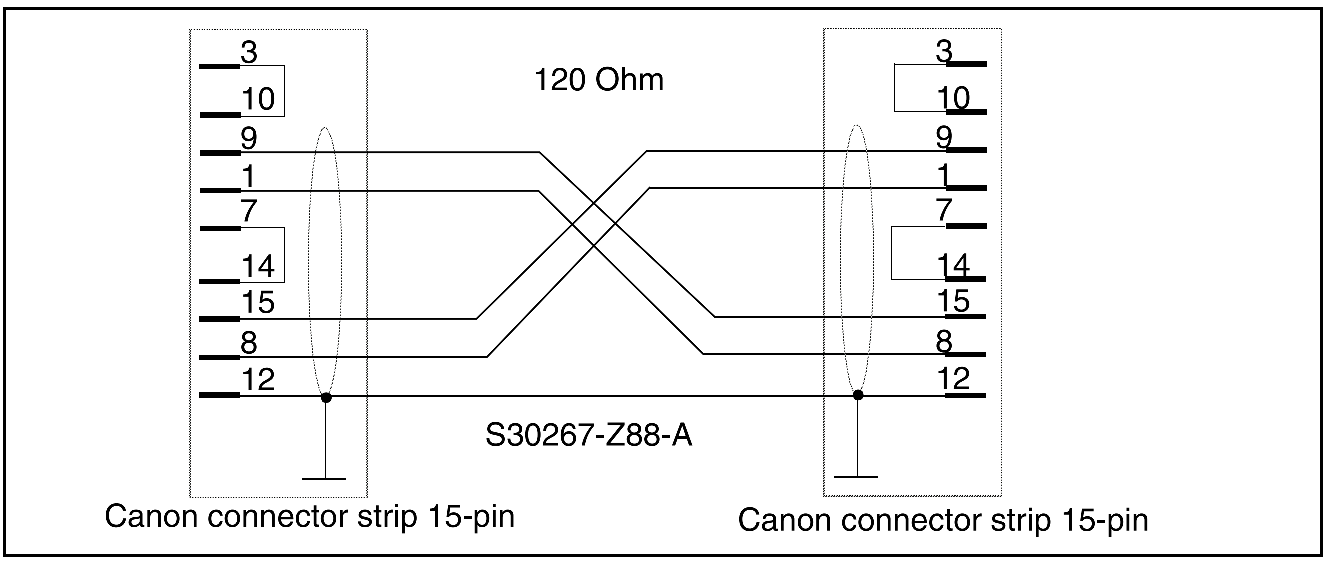


Figure 6-8 CDG - DIUS2 Cabling

Figure 6-9 shows a cabling diagram between CDG to the British Post.

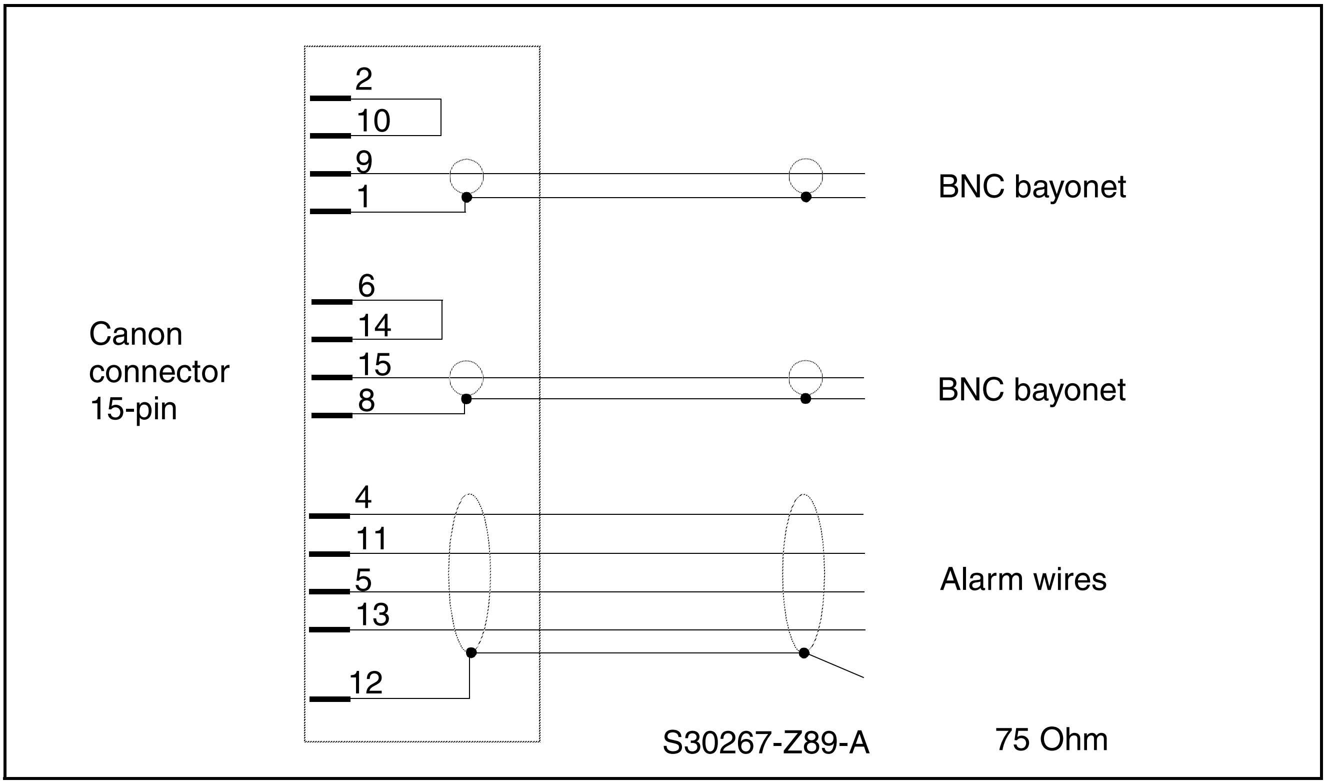


Figure 6-9 CDG - British Post Cabling

Figure 6-10 shows a diagram of CDG cabling.

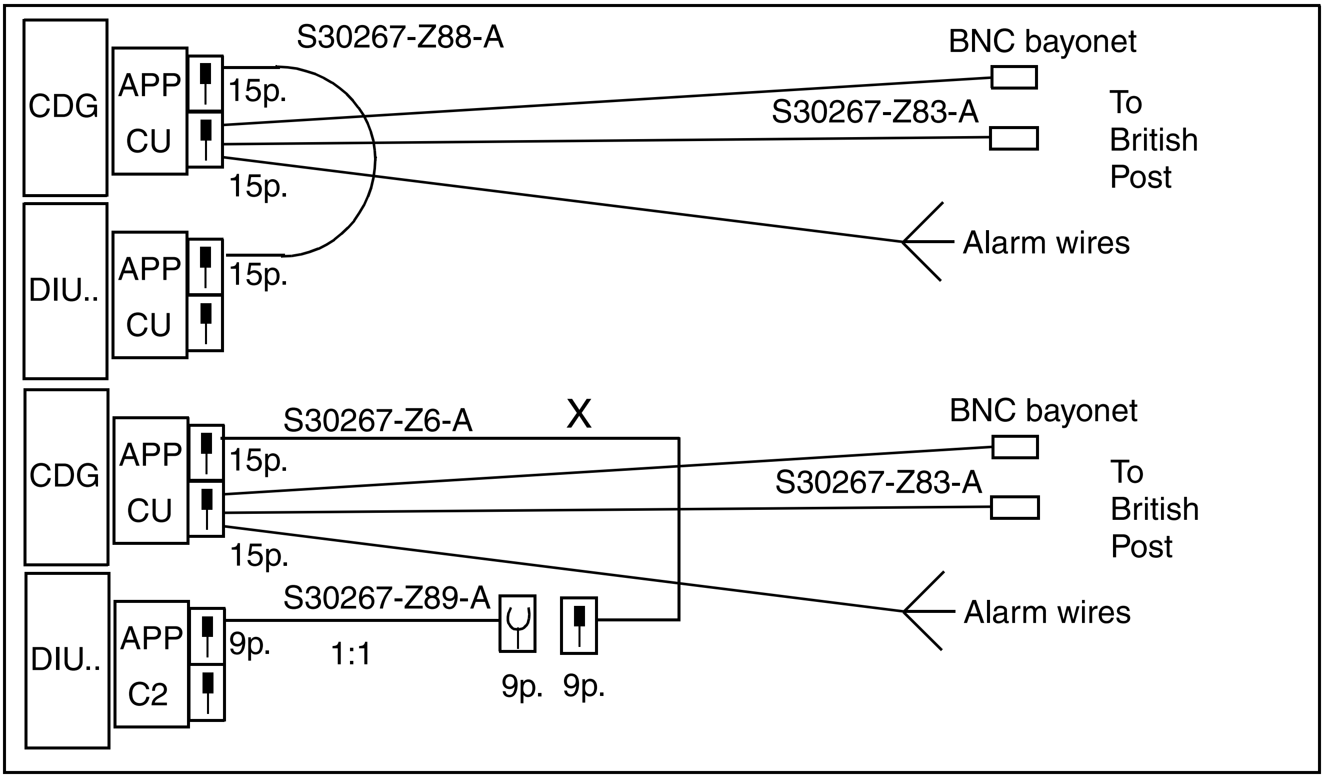


Figure 6-10 CDG Cabling

Figure 6-11 shows a DIUxx 75-Ohm cabling diagram.

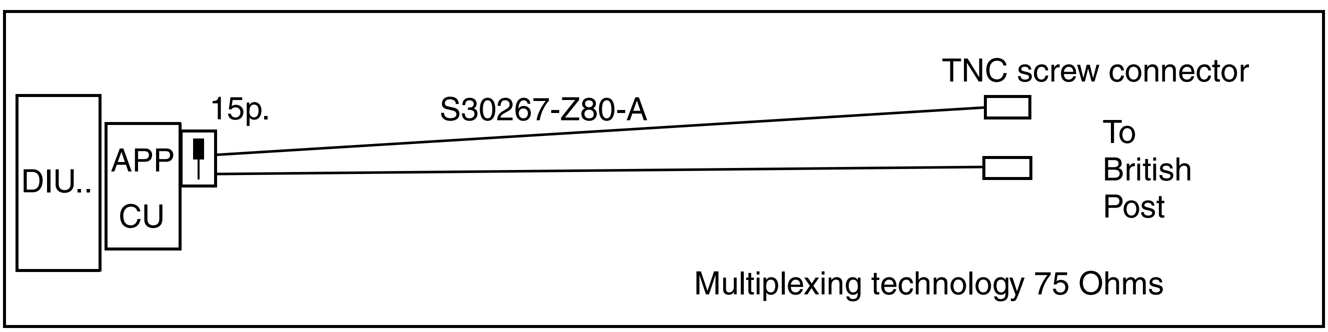


Figure 6-11 DIUxx 75-Ohm Cabling

Figure 6-12 shows a DIUxx 120-Ohm cabling diagram.

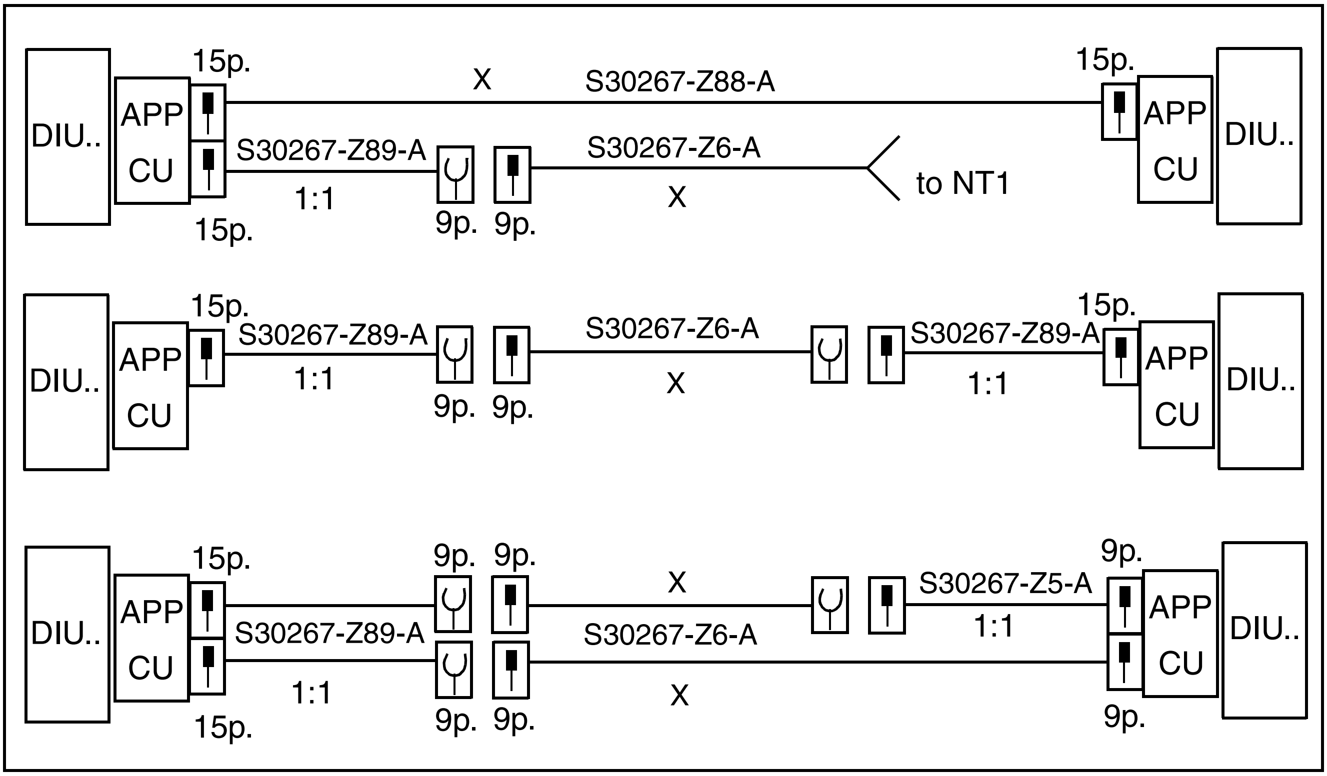


Figure 6-12 DIUxx 120-Ohm Cabling

6.3 APPC1, APPC2 and APPC3

A number of adapter plugs are available for connecting electrical and optical transmission routes over medium and long ranges. These adapters are plugged into the boards at the back instead of the normal cable connector.

- APPC1 (S30807-K5373-X)

  Adapter plug with surge-protection circuit for X.21 interfaces. The APPC1 contains two 15-pin connectors with 5x2 signal wires each.

- APPC2 (S30807-K5374-X)

  Adapter plug for connecting two circuits over copper lines (120-Ohm impedance) up to a range of 240 m each, depending on the cable type (refer to Section 6.3.1, “Cable types”).

- APPC3 (S30807-K5409-X)

  Adapter plug for connecting two circuits over copper lines (120-Ohm impedance), of which one (line 1) features enhanced reception dynamics and is thus intended for ranges up to 1 km (.62 miles), depending on the cable type (refer to Section 6.3.1, “Cable types”).

Figure 6-13 shows a diagram of APPC2 and APPC3 adapters.

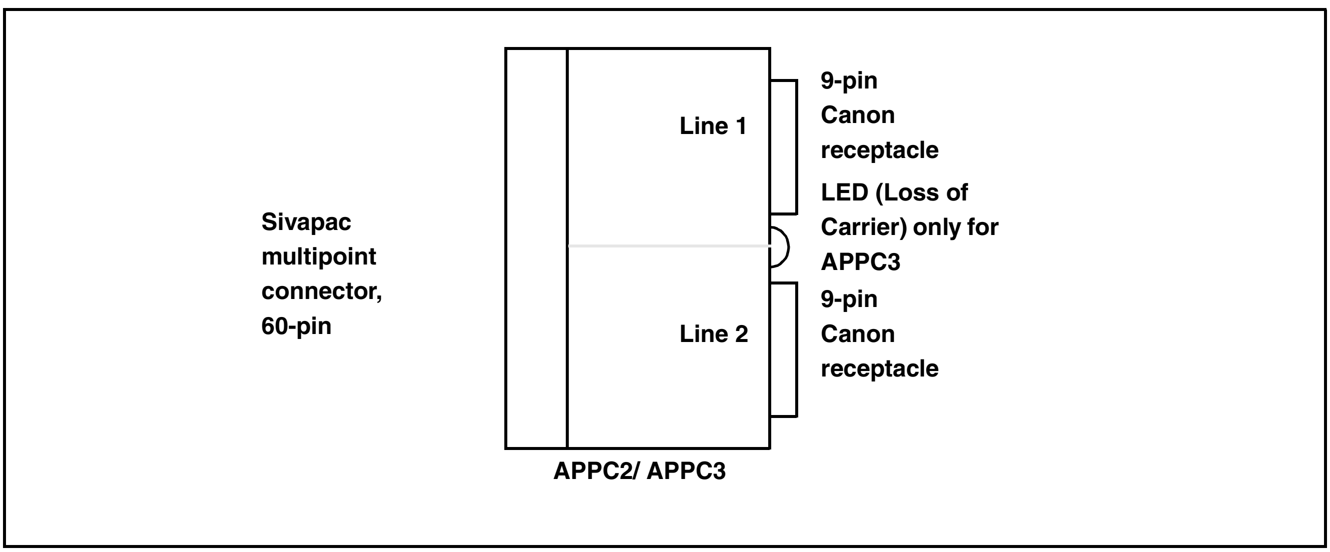


Figure 6-13 APPC2 and APPC3 Adapters

6.3.1 Cable types

- APPC2
  - Cross-connect cable (S30267-Z6-A) with male connectors on both sides for directly linked systems.

– Extension cable 1:1 (S30267-Z5-A) with male and female connectors to extend the connection between the systems.

– Connection cable (S30267-Z7-A) with male connector on one end and one open end for screw-on or soldered connection for linking a network terminator (NT) and the system.

– For longer distances, a shielded multi-conductor cable or insulation cable should be used. As with the connection cable, the cable is equipped with male connectors for termination.

- APPC3

  Same cable types as described for APPC2.

  The maximum transmission distance on line 1 (enhanced reception dynamics) depends on the cable types used, their attenuation for every kilometer (at 1 MHz) and the crosstalk attenuation (from other wires combined with the cable).

  Two examples of cable types are described as follows:

  - TF multi-conductor cable (S-09YSY 2x2x0.6/1.35 PIMF F) up to a maximum of 1.4 km
  - PE cable (grounded) with 17 dB/km up to a maximum of 2.12 km

    The shortest possible transmission distance on line 1 is limited by the need to provide for a minimum attenuation of 6 dB (override).

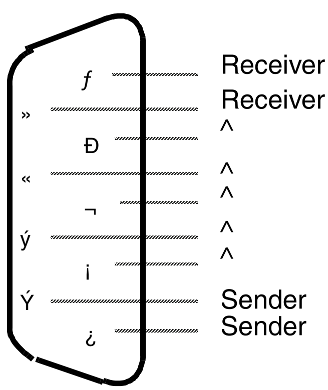


Figure 6-14 Pin Assignments of the Canon Receptacle

6.3.2 Checking the APPC2 and APPC3 Adapter Plugs

Lines 1 and 2 can be switched together (back to back connection over one connector) for testing purposes. With the appropriate configuration of the DIUS2-BG (e.g. line 1 = master and line 2 = slave), the adapter plug can be fully operated and tested.

If the input level on line 1 is too low (as of about 42 dB below the nominal level), this is signaled for the APPC3 adapter plug by a red LED (LOC=Loss of Carrier).

6.4 APCFL and APCFM

The adaption plug copper and fiber long distance (APCFL) and adaption plug copper fiber monomode (APCFM) adapters are used for networking HiPath systems with S2 circuits (PCM30) over long distances, where one of the two circuits (line 1 and line 2) is optionally routed through a shared optical point-to-point connection. If only one circuit (line 1) is routed through the optical link, then the second circuit (line 2) of the DIUS2-BG can be additionally used electrically.

6.4.1 Interfaces to the Systems

The interface to the system through the back panel connector of the DIUS2-BG consists of two logical parts:

- Part 1
  Transmission of the B signals of the BG through a special interface to control the optical fiber equipment. The data and clock speeds for sending and receiving equipment are transmitted separately with the option of transmitting the reference clock (implicitly).
- Part 2
  Conventional interface to transmit signals over copper lines.

Optical Connection (Line 1 and 2)

The APCF adapter has an optical transmitter (Tx) and an optical receiver (Rx), each of which has a receptacle for optical fiber cable (50 μm or 62.5 μm gradient fiber) with ST connectors. The transmitted data is multiplexed and always includes the data of both circuits (line 1 + line 2), but is only used optionally for the second circuit (line 2).

The APCFM can transmit both line 1 and line 2 simultaneously (timed multiplex).

The interface is not standardized. The transmission clock is regained only once. The optical route must be configured with the AMO LWPA.

Electrical connection (Line 2 Only)

Apart from the optical connection, there is also an optional electrical connection available for a second S2 circuit (line 2). Copper lines with an impedance of 120 Ohms can be connected through an additional 9-pin Canon receptacle (see Figure 6-15 for pin assignments).

An optical transmission route must generally be constructed with fiber of the same diameter along the entire path. The use of fibers with different diameters will result in unnecessarily high attenuation at transition points (spliced connections). Refer also to Section 6.4.2, “Cable Types”, A30951-V6000-X-*-20).
Plug-in connections for intermediate distributors, for example, between the sender and receiver should be avoided.

Extreme care must be taken to ensure dirt does not penetrates the optical connectors, since this has an adverse effect on the transmission quality.

- APCFL (S30807-K5422-X)
  Adapter plug for copper and glass fiber cable. Range for electrical circuits: up to 240 m (787 ft.); for optical circuits: up to about 6 km (20 ft.), depending on cable type (refer to Section 6.4.2, “Cable Types”).
- APCFM (S30807-K5446-X)
  Adapter plug for copper and glass fiber cable. Range for electrical circuits: up to 240 m (787 ft.); for optical circuits: up to about 8 km (26 ft.), depending on cable type (refer to Section 6.4.2, “Cable Types”). The adapter plug is equipped with a surge-protection circuit.

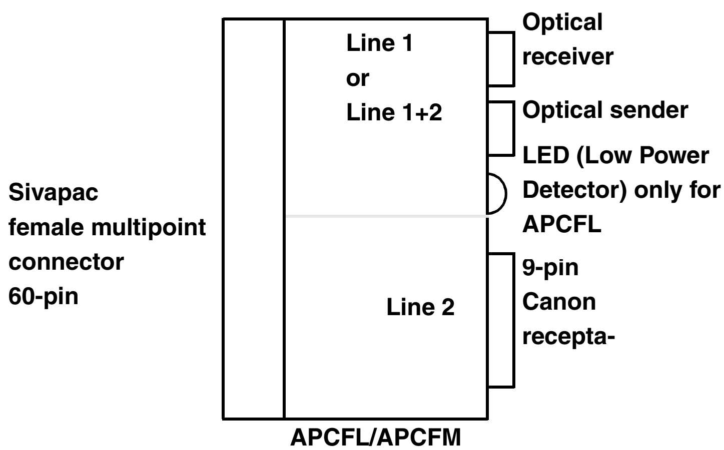


Figure 6-15 Adapter Plug APCFL and APCFM

6.4.2 Cable Types

- APCFL

For electrical connection (only line 2): cable types as for APPC2.
For optical connections, fiber with a bandwidth of ≥ 160 MHz based on 1 km (3 ft) is recommended. The maximum range depends on the fiber types used (refer to Table 6-5:

Table 6-5 lists the types of optical cables and its ranges.

Cable type	**Attenuation Coefficient**	**Attenuation**	**Range for**	
			APCFL	**APCFM**
G50/125	820 nm	2.5dB/km	6 km	
G62,5/125 3.2B160	820 nm	3.2dB/km	5.3 km	
G62,5/125 0.9F500	820 nm	3.2dB/km	5.3 km	
E9/125 0.36F3,5	1300 nm	0.5dB/km		8 km
E9/125 0.45F5	1300 nm	0.5dB/km		8 km

Table 6-5 Optical Cable Types and Ranges

The shortest possible optical transmission path is equal to 5 m (16 ft.), excluding an override of the receiver from leakage waves).

6.4.3 DIP-FIX switches

Table 6-6 lists the DIP-FIX switches for APCL and APCFM.

	Switch APCFL/APCFM			
System	7-8	5-6	3-4	1-2
HiPath 4000 *	OFF	OFF	OFF	OFF
EMS 601	ON	ON	OFF	ON
KN switch	OFF	OFF	ON	OFF
* Factory setting				

Table 6-6 DIP-FIX Switches for APCFL and APCFM

6.4.4 Testing and Maintaining the APCFL and APCFM

If an high bit error rate (see L1 errors and L1-sporadic errors at the operating terminal) occurs or the red LED (LPD = Low Power Detection) lights up on the APCFL adapter plug, the light intensity at the receiving site must be checked to determine if it lies within the specified range (refer to Table 6-7). Otherwise, the transmission path and the power of the sender must be tested. In contrast to APPC2 and APPC3, an optical back-to-back connection with only one adapter can be switched locally for testing purposes, but can only be operated without level 2 (such as L2 errors), since each line receives only its own data back, and no crossover for level 2 is possible. Full operational status can only be achieved with the connection of 2 adapters.

6.4.5 Characteristic Values for Optical Connections

Table 6-7 lists the characteristic values for the APCFL optical adapter.

Gross bit rate			**= 12,288 MBd**
a.	Sender		
	Output level		
	for 50 μm fiber, NA 0.2	peak min.	= -13 dBm
		peak max.	= -10 dBm
	for 62.5 μm fiber, NA 0.29	peak min.	= -11 dBm
		peak max.	= -8 dBm
b.	Receiver		
	Receiving sensitivity		
	(for BER <10^{-10})	peak min.	= -32 dBm
	Receiving dynamics	min.	= 24 dB
	Low Power Detection (rote LED)	peak	= -33 dBm ± 1 dB

Table 6-7 Characteristics of the APCFL optical adapter

Table 6-8 lists the Characteristic values for the APCFM Optical Adapter.

Gross bit rate			**= 12,288 MBd**
a.	Sender		
	Output level		
	for 9 μm fiber, NA 0.12	peak min.	= -24 dBm
		peak max.	= -15 dBm
b.	Receiver		
	Receiving sensitivity		
	(for BER <10^{-10})	peak min.	= -34 dBm

Table 6-8 Characteristics of the APCFM optical adapter

	Receiving dynamics	min.	= 24 dB
	Low Power Detection (red LED)	peak	= -33 dBm ± 3 dB

Table 6-8 Characteristics of the APCFM optical adapter

6.5 Custom Callout Adapter (CCA II)

This section describes the function of the custom callout adapter (CCA II). It also provices provides procedures for installing and configuring the CCA II.

6.5.1 Functional Description

The CCA II is an autodial, autospeed modem that supports HiPath 4000 service and remote access features. The CCA II transmits the state of itself and the HiPath 4000 to a predetermined service center. It also can transmit without HiPath 4000 intervention, loss of power, loss of communication with the HiPath 4000, loss of cable to the HiPath 4000 or external alarm activation. It also provides the service port for the maintenance terminal.

The CCA II has a data communication equipment (DCE) V.32 port for communication with the HiPath 4000. A similar port is used to allow service personnel to communicate through the CCA II as if calling in from an external location. This feature is used for service without the need to disconnect the CCA II from the HiPath 4000.

Figure 6-16 shows a typical CCA II configuration.

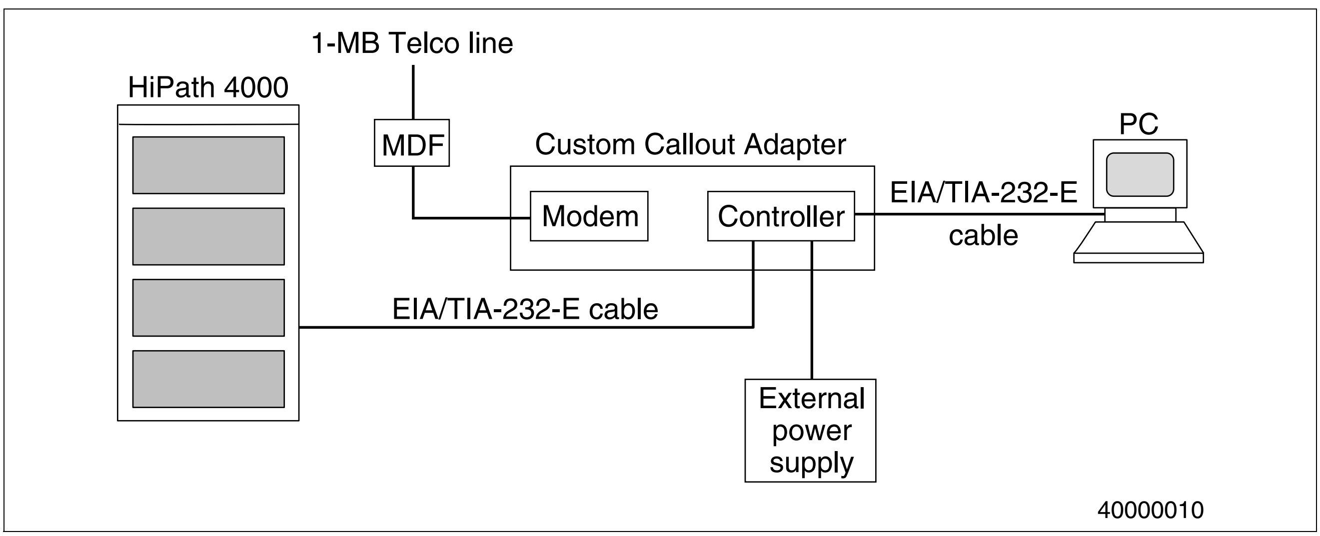


Figure 6-16 Typical Custom Callout Adapter II Configuration

6.5.2 Tools Required

The following tools are required to service the CCA II:

- Torx—No. 20 screwdriver
- Modular jack

- An analog line or 1-MB telephone company (telco) line

6.5.3 CCA II Connectors

Table 6-9 lists the CCA II connectors and their use.

Connector	Use
DC 24 V	Input for external 24 V dc power
SYSTEM	RS-232 port for the HiPath 4000
ALM1	External alarm input
GND	Ground
GND	Ground
ALM2	External alarm input
TERMINAL	Service port for the Customer Engineer
LINE/TELCO	Four-pin jack for analog phone line
PHONE	Not used

Table 6-9 Custom Callout Adapter II Connectors

6.5.4 CCA II LED Indications

Table 6-10 lists the CCA II LED indications.

LED	Color	State	Indication
PWR	Green	On	AC or battery power is being supplied to the CCA II.
		Off	AC or battery power is not being supplied to the CCA II.
OH	Green	On	The CCA II is off-hook using the modem line.
		Off	The CCA II is not off-hook using the modem line.
BAT	Red	On	The backup battery is faulty or has discharged.
		Off	The backup battery is good.
FAULT	Red	Flash	The CCA II has detected an error.
		On	Test mode.
		Off	No fault exists.

Table 6-10 CCA II LED Indications (Seite 1 von 3)

LED	Color	State	Indication
DCD	Green	On	Data carrier detect. The modem in the CCA is receiving a suitable carrier signal and is connected to a remote modem through an analog telephone line. DCD will be on when there is a connection to a remote modem and off when it is not connected to a remote modem.
		Off	The modem in the CCA is not receiving a suitable carrier signal and is not connected to a remote modem through an analog telephone line.
AA	Green	On	The CCA II automatically will answer incoming telephone calls.
		Off	The CCA II auto answer is disabled.
CTS	Green	On	Clear to send. The modem in the CCA II is ready to transmit data to the HiPath 4000. CTS is always on when the CCA II is in a functional state.
		Off	The modem in the CCA II is not ready to send data to the HiPath 4000.
RTS	Green	On	Request to send. The HiPath 4000 is ready to send data to the modem in the CCA II. RTS will be on when the HiPath 4000 port is active and the correct cable is connected.
		Off	The HiPath 4000 is not ready to send data to the CCA.
DSR	Green	On	Data set ready. The modem in the CCA II is in a ready state. DSR always will be on when the CCA II is in a functional state.
		Off	The modem in the CCA II is not in a ready state.
DTR	Green	On	Data terminal ready. The HiPath 4000 is connected to the CCA and the data link is active. DTR always will be on when the HiPath 4000 port is active and the correct cable is connected.
		Off	The data link is not active or the cable is not connected between the HiPath 4000 and the CCA II.
RxD	Green	Flash/On	The HiPath 4000 is receiving data from the CCA II.
		Off	The HiPath 4000 is not receiving data from the CCA II.
TxD	Green	Flash/On	The HiPath 4000 is transmitting data to the CCA II.

Table 6-10 CCA II LED Indications (Seite 2 von 3)

LED	Color	State	Indication
		Off	The HiPath 4000 is not transmitting data to the CCA II.

Table 6-10 CCA II LED Indications (Seite 3 von 3)

6.5.5 CCA II Cable Connection Table and Pin Assignments

Table 6-11 lists the CCA II custom cable port connections for the HiPath 4000 models.

System Type	P-1 Port Location V.24/2 Backplane	CCA II Custom Cable Model Number
HiPath 4300	Port X30, CC80F	96941
HiPath 4500	Port X10, CCDAX	96941

Table 6-11 CCA II Cable Port Connection

Table 6-12 lists the CCA II pin assignments for the HiPath 4000 models.

Custom Callout Adapter II Custom Cable (P2)	HiPath 4000 Port (P1)
2	3
3	2
4	5
5	4
6	20
7	7
20	6
8	23
11	FG*
* FG is frame ground. The CBX end of the cable is tied to the cable head. When connected to a HiPath 4000 port there will be a ground on the cable head. This ground is connected through the cable on pin 11 to the CCA II. The CCA II monitors this for ground and if it goes open it will report a cable loss alarm.	

Table 6-12 CCA II Custom Cable Pin Assignments

6.5.6 Installing the CCA II Power Supply

> Mount the CCA II power 24 V d power supply within 2m (6 ft) of a 120 V ac isolated ground (IG) convenience outlet.
> Ensure you use part number S30122-K5636-X.

Install the CCA II power supply as follows:

1. Using two wall mount screws, install the plastic wall mount bracket and straps, onto the wall (see Figure 1).
2. Install and secure the CCA II power supply in the straps.
3. Connect the ac power cord into the CCA II power supply.
4. Connect the power cord into a 120 V ac IG outlet.

6.5.7 Installing the CCA II

Install the CCA II as follows:

1. Unpack and place the CCA II on a sturdy table or mount it to the wall.

   > Use no. 6 or 8 one-in. pan-head wood screws. Other walls may require wall anchors.

2. Using the slide switch on the side of the CCA II box, turn on the battery.

6.5.8 Connecting the CCA II

Connect the CCA II as follows:

1. Plug in the 24 V dc power cable from the CCA II power supply to the DC 24 V connector on the CCA II.
2. Connect the CCA II custom cable as follows for:

   HiPath 4300

   a) Connect the other end to the CCA II custom cable to the SYSTEM connector on the CCA II.

   b) At the CC80F backplane, connect the other end of tthe CCA II custom cable to the connector labeled V24/2 on the backplane of the processor shelf (see Figure 6-17).

HiPath 4500

a) Conect one end of the CCA II custom cable to the CCA II SYSTEM connector,.

b) At the CCDAX backplane, connect the other end of tthe CCA II custom cable to the connector labeled V24/2 on the backplane of the processor shelf (see Figure 6-18).

3. Plug the line/telco cord to the LINE/TELCO connector on the CCA II, and connect the other end of the line/telco cord to the modular connecting block containing the 1 MB or loop start analog line.

> Ensure the customer has installed a dedicated 1 MB or loop start analog telephone line and has provided a modular connection for the modem.

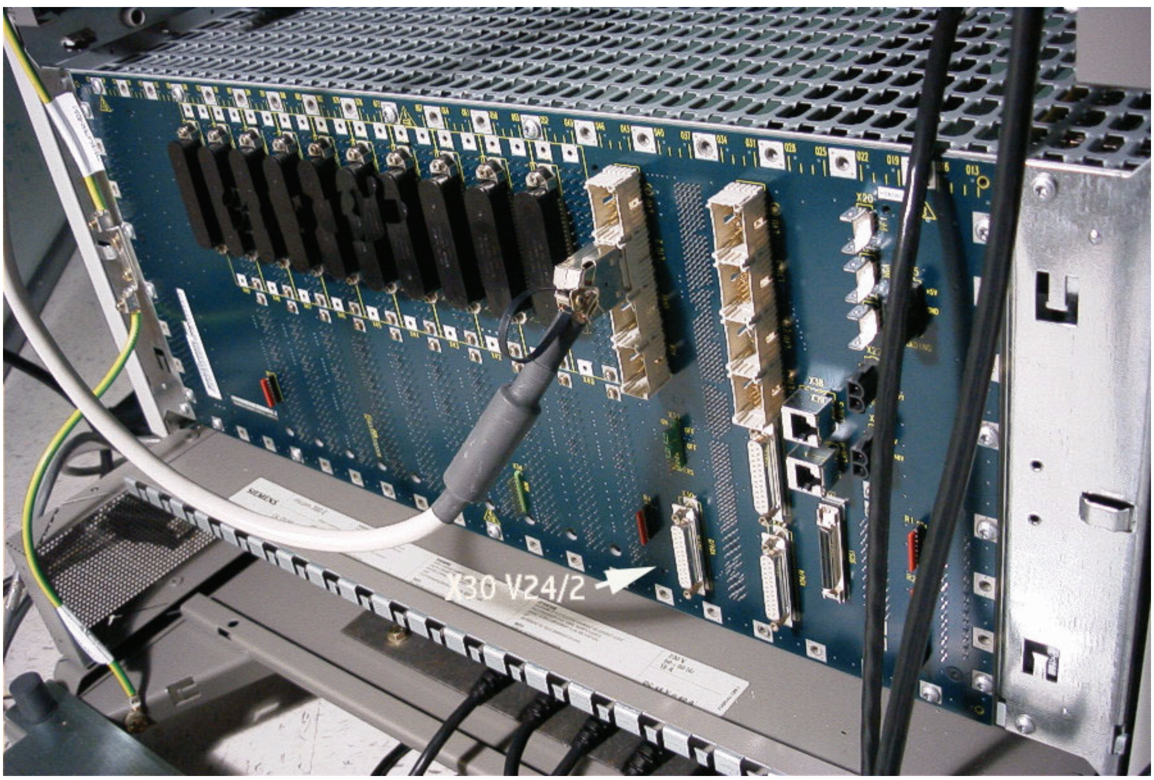


Figure 6-17 Service Port, HiPath 4300

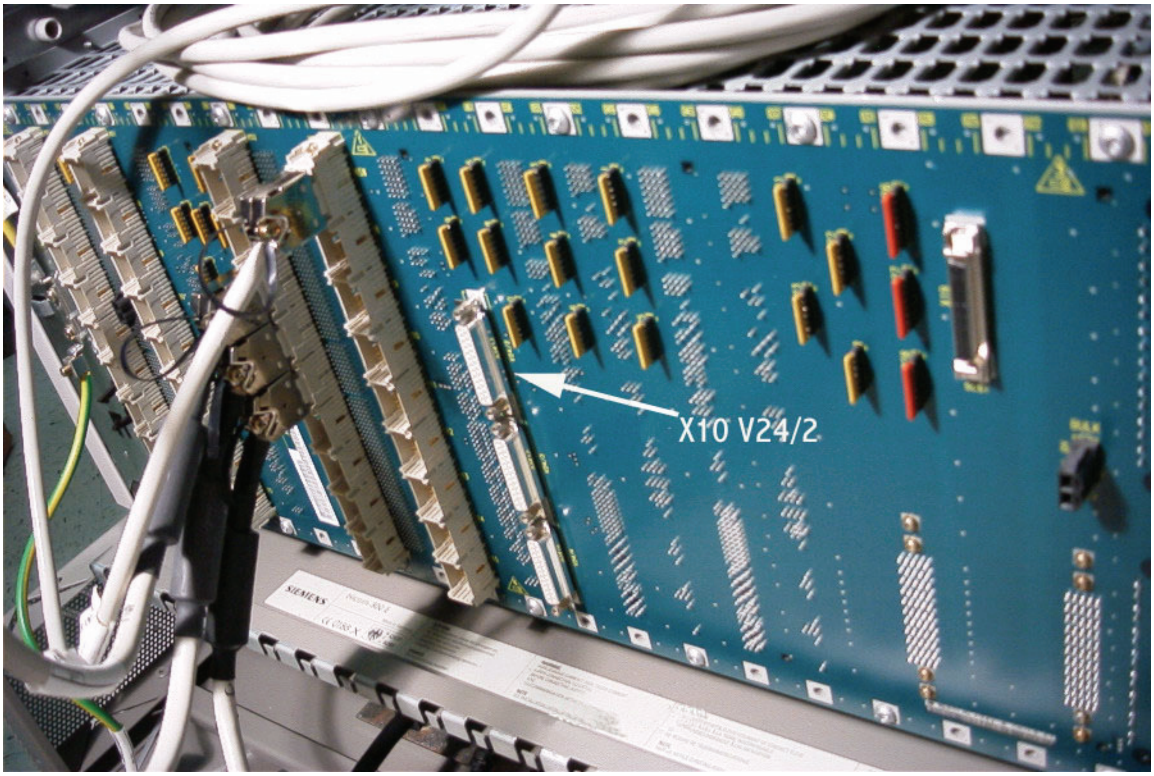


Figure 6-18 Service Port, HiPath 4500

6.6 UCON U-Converter

The U-Converter (UCON) enhances the working range of Optiset telephones from 1km (.62 miles) up to 8km (5 miles).

The UCON is available in two different product versions:

- Single port stand alone device (**UCON-S**)
- Multi port stand alone version (**UCON-M**)

There are two main functional interfaces to the UCON:

- U_{PN} - Interface
- U_{2B1Q} - Interface

The local power supply supplies electricity to the UCON boards. The telephones connected to the U-Converter´s U_{PN} ports are also supplied with electricity by the UCON local power supply.

The UCON-S is a 1-port interface card which provides connectivity between the a U_{2B1Q} port of a SLMQ-2 (HiPath 4000) and Optiset -line telephone with U_{PN}-Interface.

The UCON-M is a 4-port interface card providing connectivity between 4 x U_{2B1Q} port of a SLMQ-2 (HiPath 4000) and 4 x Optiset-line telephones with U_{PN}-Interface.

6.6.1 Adapter Variants

- UCON-S: S30807-Q5468-X-1
  Uses a country specific power supply
- UCON-M: S30807-Q5467-X-1
  The UCON-M module uses a power supply which is common for all countries

6.6.2 U_{2B1Q} - Interface

The U_{2B1Q} interface is a 2-wire interface. It is connected to the UCON through a line cord with a 6-pin jack (mini western jack RJ12). The PBX side of the transmission line (SLMQ) is the master frame clock and bit clock.

Table 6-13 lists the UCON board pin designation.

Pin Number	UCON-S/UCON-M Designation
1	---

Table 6-13 Pin Designation of the U_{2B1Q} Plug on UCON-S/UCON-M Board (Seite 1 von 2)

Pin Number	UCON-S/UCON-M Designation
2	---
3	U_{2B1Q}
4	U_{2B1Q}
5	---
6	---

Table 6-13 Pin Designation of the U_{2B1Q} Plug on UCON-S/UCON-M Board (Seite 2 von 2)

The interface transmits two user channels (B channels with 64 Kbps each) and signaling channel (D channel with 16 kbps) with a total capacity of 144 Kpbs. A quarternary AMI code is used, therefore, the transmission rate is 80 K baud.

Switching Characteristics

Voltage higher than 9V has to be supplied on the U_{2B1Q} line, otherwise the internal dc/dc converter does not work, even if the external power supply is active. An exchange of the 2 wires of a port (pin 3 and pin 4) has no influence on the UCON operation (see Table „Pin Designation of the U_{2B1Q} Plug on UCON-S/UCON-M Board).

Electrical conditions

The range of the U_{2B1Q} interface includes the transmission path between output of the peripheral board (backplane plug) and the input of the UCON. The range is limited by the value range of the type of cable used.

The transmission range is 8000 meter (5 miles), when using for example, PE cable type A-2YF(L)2Y 4*2*0.6 or AWG22.

6.6.3 U_{PN} - Interface

The U_{PN} interface allows the connection of Optiset-line telephones to the UCON through one 6-pin mini Western jack (RJ12).

Pin Number	Designation
1	---
2	---
3	U_{PN}
4	U_{PN}

Table 6-14 Pin Designations of the U_{PN} Plug on the UCON-S/UCON-M Board

Pin Number	Designation
5	---
6	---

Table 6-14 Pin Designations of the U_{PN} Plug on the UCON-S/UCON-M Board

Switching Characteristics

The supplied voltage on the U_{PN} line is switched off when the local UCON power supply fails and also when the supplied voltage on the U_{2B1Q} line is lower than 9V.

An exchange of the 2 wires of a port (pin 3 and pin 4) has no influence on the UCON operation(see Table „Pin Designations of the U_{PN} Plug on the UCON-S/UCON-M Board).

Table 6-15 lists the electrical conditions of the U_{PN} and U_{2B1Q} lines.

Output Voltage	
Minimal value	42 V
Maximum value	58 V
Current	
Average value	30 mA
Maximum value	85 mA

Source Impedance	
Nominal value	30 Ω
Minimal value	15 Ω
Maximal value	40 Ω
Power	**output**
Average value	1224 mW
Maximum value	2210 mW

Table 6-15 Electrical Conditions of the Lines and Line Systems

Operational characteristics (UCON limits)

Table 6-16 lists the UCON operating limits.

Interface Input or Output	Value
Input on U_{2B1Q}	min. 9 - 20V[1], max. 10mA max. 58V, max. 10 mA
Output on U_{PN} (using local power supply)	min. 48V, max. 58V max. 85mA

Table 6-16 UCON Limitations

1 the exact value will be defined in the Component Specification of the UCON

The function block U_{2B1Q} interface contains the IEC-Q (PEB 2091).

The function block U_{PN} interface contains the SmartLink-P (PSB 2197).

6.6.4 Power Supply

Due to the different amount of power consumption in the single port device (UCON-S) and the multi-port device (UCON-M), two kinds of power supplies are required. The goal is to use existing power supplies, which have different types of jacks. UCON-S and UCON-M shall use the same power supply plug with the pins listed in the following table:

Table 6-17 lists the pin number and designations of the UCONs for the power supply jacks.

Pin Number	Designation
1	0V
2	48...58V
3	0V
4	48...58V
5	48...58V
6	0V
7	OV
8	48...58B

Table 6-17 Pin meaning of the Power Supply Jack for the UCON-S and UCON-M

UCON-S pins 1, 3, 6 and 7 are connected together.

UCON-M pins 2, 4, 5 and 8 are connected together.

6.6.4.1 UCON-S Power supply

The power supply provided on the secondary side 48V at 180mA is protected against short-circuit and has a 2m cord.

Six different types of power supplies are available for different countries considering the country specific supply system frequencies, supply system voltages and plug types.

Table 6-18 lists the power supply recommendations for specific countries.

Vendor Part Name	Siemens Part Number	Short Name	Country Application
A7-1176-1504	S30122-K5061-X-	PSP-1	FRG, Austria, Switzerland, Belgium, France, Finland, Italy, Netherlands, Spain, Argentinia, Portugal, Luxembourg

Table 6-18 Country Specific Power Supplies (Seite 1 von 2)

Vendor Part Name	Siemens Part Number	Short Name	Country Application
A7-1176-4601	S30122-K5062-X-*	PSP-2	UK
A7-2176-6501	S30122-K5063-X-*	PSP-3	China
A7-1176-5501	S30122-K5064-X-*	PSP-4	South-Africa
A7-2176-3301	S30122-K5065-X-*	PSP-5	USA, Canada
A7-2176-6601	S30122-K5066-X-*	PSP-6	Australia

Table 6-18 Country Specific Power Supplies (Seite 2 von 2)

Table 6-19 lists the pin designations for the external power supply plug.

Pin Number	Designation
1	---
2	0V
3	48...58V
4	48...58V
5	0V
6	---

Table 6-19 Pin Designations for the External Power Supply Plug

The connection of the power supply is potential-free.

Caution
Do not plug the secondary power supply plug into a U_{2B1Q} or a U_{PN} jack otherwise a short-circuit can occur inside the external power supply.

As a result this internal short-circuit switches off the secondary voltage. This switch off condition lasts even if the short-circuit is removed. To fix this problem, switch on the power supply by taking the mains connection plug out of the mains connection and make the power supply voltage-free for about 5 seconds.

UCON-S Power supply control

The supply control declares an output current >85 mA as a short circuit and generates a chip reset for IEC-Q and SmartLink-P. In this case the U_{PN} output voltage is switched off after 10 to 250ms. After 9-11sec. the U_{PN}-Interface is switched on again and remains switched on if the current is lower than 85mA, otherwise it is switched off again after 10 to 250 ms (the exact time-values for switching on and off will be defined in the Component Specification of the UCON). The supply control generates also a chip reset for IEC-Q and SmartLink-P and switches off the U_{PN} output voltage, if the U_{2B1Q} feeding voltage is lower then 9 V.

6.6.4.2 UCON-M Power supply

The external power supply used by the UCON-S is not sufficient for the 4-port UCON-M device. The UCON-M power supply has to provide power on the secondary side 48V at 375mA (18W). It must be protected against short-circuit. It shall have a 2m (6 feet) cord with a 8-conductor Miniwestern plug RJ45.

The power supply has a power jack and operates with 110V/60Hz and 230V/50Hz input voltage as well. A switch is not available to select between these voltages.

Pin Number	Designation
1	0V
2	48...58V
3	---
4	---
5	---
6	---
7	0V
8	48...58V

Table 6-20 Pin Designation of the External Power Supply Plug

6.7 Adapter 1/2

6.7.1 Installing the Adapter 1

An Adapter 1 is a SIVAPAC-to-SIPAC board adapter. Use the Adapter 1 to adapt boards with SIVAPAC connectors to shelves with SIPAC connectors.

> Once installed, never remove the board adapters.
> The board Adapter 1 (SIVAPAC to SIPAC adapter) comes in three pieces: one power-up module and two adapter modules (see Figure 6-19).

To install the board adapter:

1. Face the backplane connector of the board towards you.
2. On the adapter module, slightly pull the catch hooks apart.
3. Position the adapter module over the backplane connector of the board. Ensure that the outer edge of each adapter module corresponds with each outer edge of the board.
4. Ensure that the outermost row of pins of each adapter module is aligned with the outermost row of the board connector, then insert the module into the connector.
5. Snap on the catch hooks.
6. Install the other module onto the board connector.

   > If the clearance between the board connector and the hot plug connector on the board is not sufficient for the module catch hook, loosen the two hot plug connector screws on the back of the board and adjust location to allow the catch hook to fit between the hot plug and the board connector.

7. Insert the power-up module into the hot plug connector of the board.

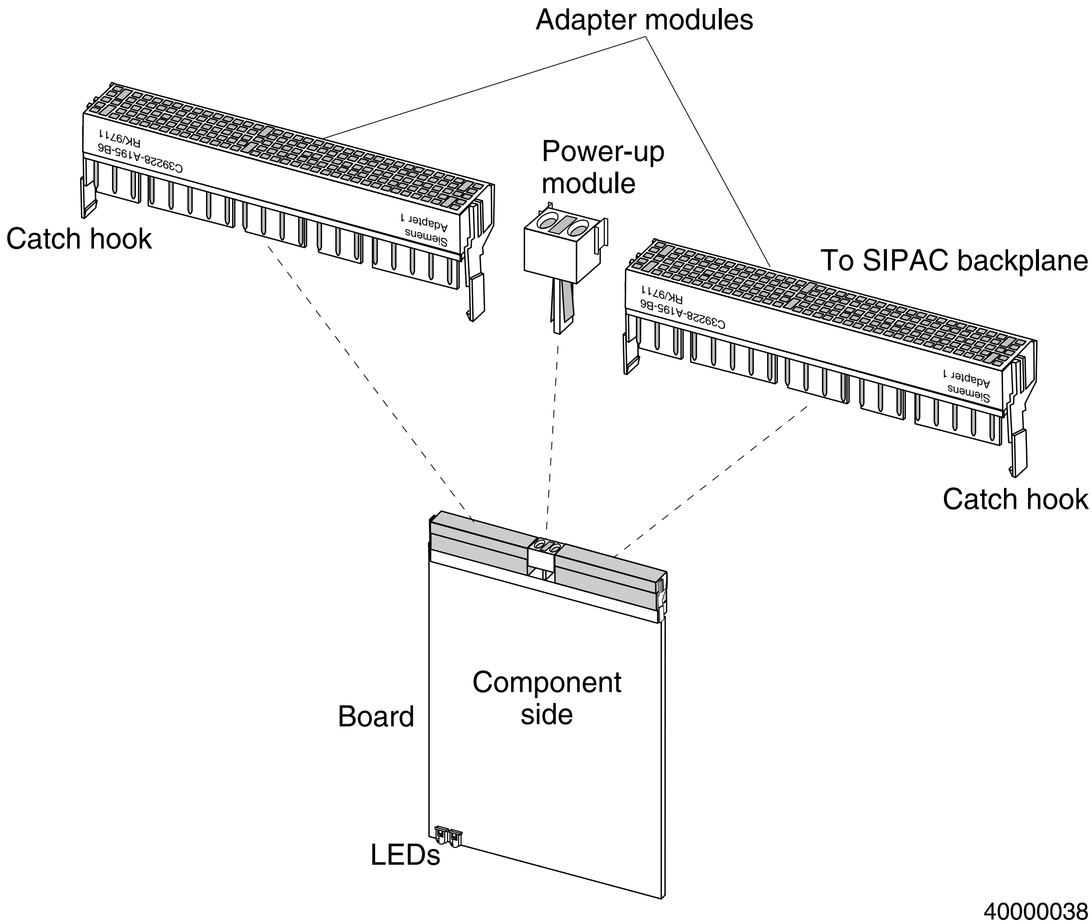


Figure 6-19 SIVAPAC to SIPAC Board Adapter 1

6.7.2 Installing the Adapter 2

An adapter 2 is a SIPAC to SIVAPAC board adapter. Use an Adapter 2 to adapt boards with SIPAC connectors to shelves with SIVAPAC connectors.

> Once installed, never remove the board adapters.
> The board Adapter 2 comes in three pieces: one power-up module and two adapter modules (see Figure 6-20).

Perform the following procedures to install the board adapter.

1. Face the backplane connector of the board towards.
2. Insert the power-up module into the middle section of the backplane connector as shown in Figure 6-20.

3. On the adapter module, slightly pull the catch hooks apart.
4. Position the adapter module over the backplane connector of the board. Ensure that each adapter module's outer edge corresponds with each outer edge of the board as shown in Figure 6-20.
5. Ensure that each adapter module's outermost row of pins is aligned with the outermost row of the board connector, then insert the module into the connector.
6. Snap on the catch hooks.
7. If the catch hooks do not correctly lock, the adapter module is incorrectly positioned. Reverse the position of the module and repeat the step.
8. Perform steps 3 through 7 for the other adapter module.

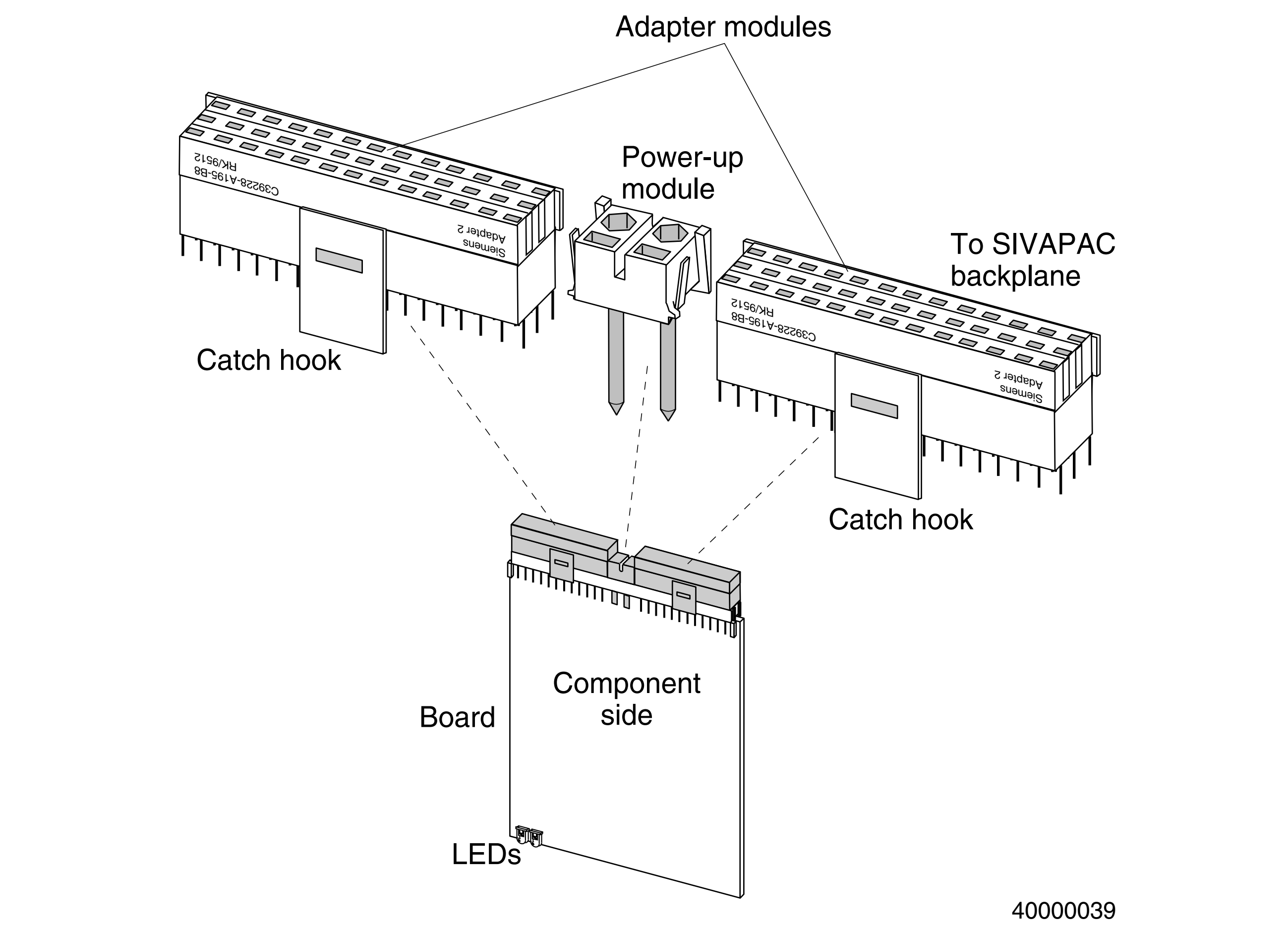


Figure 6-20 SIPAC to SIVAPAK Board Adapter 2

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