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5ESS-2000 Switch
V5 Interface
ES5284
Student Guide

5ESS-2000® V5 Interface

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Introduction

Overview

This course allows students to become familiar with the concepts of the V5 protocol, and the maintenance procedures and commands that are involved with the V5 interface.

Objectives

This course is designed to:

1. Explain the functionality of the V5 interfaces
2. Explain the V5 protocol using call flows
3. Show the messages that are used in the V5 protocol.
4. Enable students to grow a V5 interface
5. Enable students to grow V5 PSTN and ISDN BRA subscribers
6. Enable students to execute the procedures to clear trouble in the V5 interface and V5 PSTN and ISDN user ports.
7. Show V5 maintenance commands and reports.

Documentation

- 5ESS®-2000 Commands and Reports manual (5CR)
- 5ESS®-2000 System Function manual (5SF)
- 5ESS®-2000 Recent Change manual (5RC)
- 5ESS®-2000 Maintenance Procedures manual (5MP)
- 5ESS®-2000 Operational Procedures manual (5OP)
- ETS 300 324-1 and Amendment to ETS 300 324-1
- ETS 300 347-1 and Amendment to ETS 300 347-1

What is a V5 Interface

Definition

The V5 interface connects an Access Network (AN) to the Local Exchange (LE). It is a 2,048 kbit/s interface (one 2,048 kbit/s for the V5.1, up to sixteen 2,048 kbit/s for the V5.2 interface) on which the subscriber signals are multiplexed in one or more communication channels.

The V5 protocol is a message based protocol, i.e. an event such as an on-hook is translated in the sending of a message.

The V5 interface is an "open" interface, meaning that, a variety of vendors may supply the access network part of the network, irrespective of the exchange vendor.

Access Network

An Access Network is a system which is implemented between the exchange and the subscriber, replacing the entire or a part of the local line distribution network. The subscriber lines are therefore no longer directly terminated on the exchange but instead are terminated on the Access Network. An Access Network is completely independent of the 5ESS®-2000 Exchange. The AN may consist of:

- Wireless local loop system
- Passive Optical Network (PON)
- Access Anymedia

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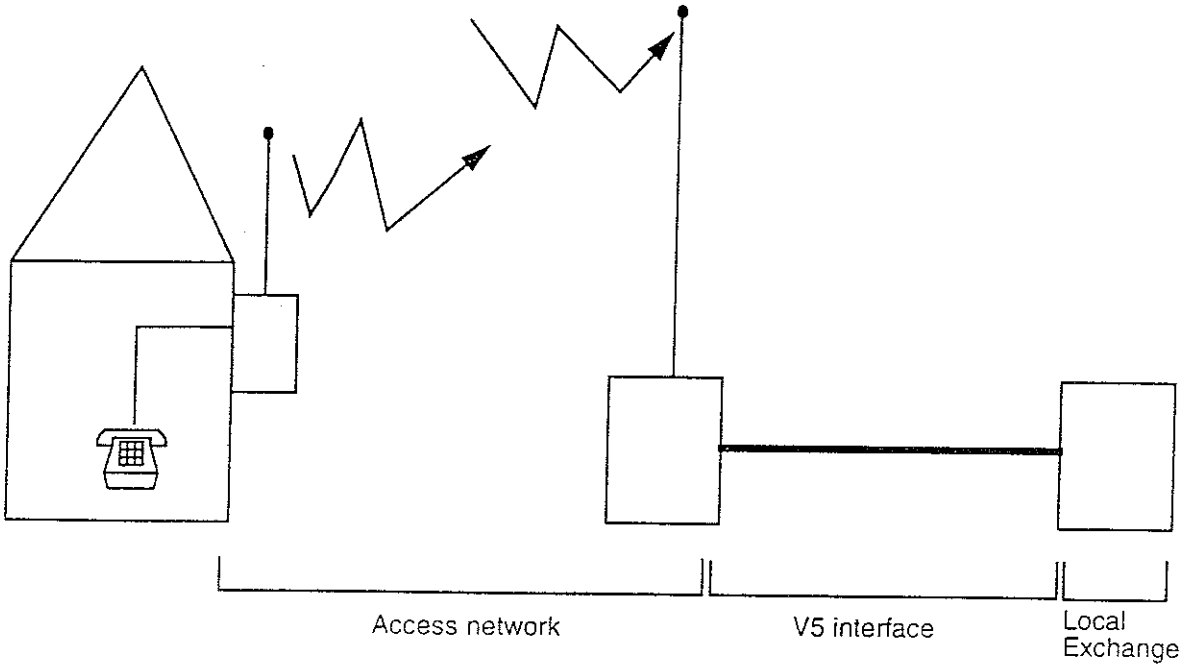
What is a V5 Interface (Continued)

Example

The best way to see what a V5 network consists of is through an example. Below is a figure of a Local Loop Access Network connected to a 5ESS®-2000 Exchange through a V5 interface.



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What is a V5 Interface (Continued)

Characteristics

The main characteristics of the V5 interface are given in this table:

Characteristics	Description
Facility	A V5 interface connection consists of full digital, 2,048 kbit/s facility. (1 for V5.1 or V5.2 release 1, up to 16 for V5.2) Each facility has 32 64-kBps channels.
Exchange	The exchange provides the switching and call processing functionality, including, for example, supplementary services, charging announcements and DTMF decoding.
Access network	The access network is responsible for the maintenance of the access network and the subscriber lines. The access network deals with the physical connection (or termination) of subscriber lines. It is also responsible for the testing of digital lines and the transport of the subscriber speech data and subscriber line signals. NOTE: Examples of PSTN subscriber line signals are the subscriber on-hook, off-hook signals, dial pulse receiving and ringing current.. An example of an ISDN subscriber line signal is the activation of the NT1.
Assignment	For the V5.1 interface, there is a static relation between a bearer channel on the V5.1 interface and a user port. A user port uniquely identifies a subscriber on the AN and exchange sides. The relation is assigned in the ODD (Office Dependent Data base) using RC/V (Recent Change and verify) procedures. For the V5.2 interface, this relation is dynamic.

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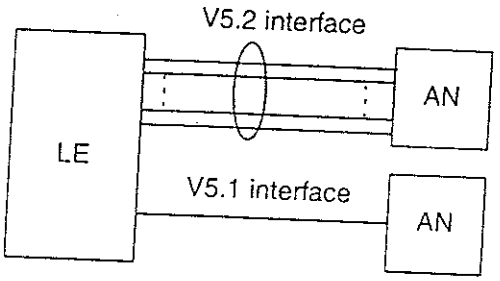
What is a V5 Interface (Continued)

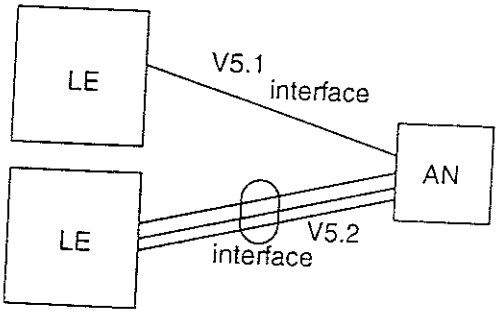
AN to LE connections

AN and LE can be connected to each other in a number of different ways.

An Access Network can be connected to the Local Exchange using one or more V5 interfaces, either V5.1, V5.2 release 1 or V5.2 interface.



The V5 interfaces of an Access Network may be connected to one or more Local Exchanges. The individual V5 interfaces however are connected to one Local Exchanges.



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What is a V5 Interface (Continued)

Advantages

The market is evolving to a network made up of access nodes and service nodes. In such a network, most of the PSTN (Public Switched Telephone Network) lines and ISDN BRAs (Integrated Services Digital Network Basic Rate Access) will terminate on an access network. The V5 interface gives a solution to connect the access network to the 5ESS®-2000 Exchange.

The V5 interface is an "open" interface, meaning that, a variety of vendors may supply the access network part of the network, irrespective of the exchange vendor.

The V5 interface is a capability that will be used primarily in the local application.

Types of V5 interfaces

The 5ESS®-2000 Exchange supports three different types of V5 interface:

- V5.1 interface
- V5.2 Release 1 interface
- V5.2 interface

The same 5ESS®-2000 exchange is able to support both the V5.1 single link interface, based on provisioned bearer channel assignment and the V5.2 multi link interface, based on dynamic bearer channel assignment.

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What is a V5 Interface (Continued)

V5.1 Interface

The V5.1 interface is an ETSI defined V5 interface. It is defined in ETSI documents ETS 300 324-1 and Amendment to ETS 300 324-1. The 5ESS®-2000 Exchange implementation of the V5.1 interface complies with the ETSI specifications.

The V5.1 interface provides static provisioning of bearer channels in a single 2,048 kBps link environment.

V5.2 Release 1 interface

The V5.2 Release 1 interface is a Lucent Technologies proprietary interface. V5.2 Release 1 basically is a ETSI V5.1 interface augmented with some ETSI V5.2 functionality. The V5.2 Release 1 adds a concentration protocol to the V5.1 interface.

The V5.2 Release 1 interface provides dynamic provisioning of bearer channels in a single 2,048 kBps link environment.

The V5.2 Release 1 interface is also known under the names V5.1P and V5.1+.

V5.2 Interface

The V5.2 interface is an ETSI defined V5 interface. It is defined in ETSI documents ETS 300 347-1 and Amendment to ETS 300 347-1. The 5ESS®-2000 Exchange implementation of the V5.2 interface complies with the ETSI specifications.

The V5.2 interface adds a number of characteristics to the V5.1 interface. The V5.2 interface offers multiple 2,048 kbit/s links and a protection mechanism is provided to protect those links.
The V5.2 interface is defined on a dynamic multiplexer principle. There is a dynamic relation between a channel on the V5.2 interface and a user port. This is referred to as *dynamic channel assignment*. Bearer channels on a link are dynamically allocated on a call by call basis. This relation is determined after a negotiation between the access network and the exchange.

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What is a V5 Interface (Continued)

Advantages of V5.2 interface over V5.1 interface

The V5.2 interface provides the *Bearer Channel Connection* (BCC) protocol as a means to provide concentration. This means more subscribers can be connected to one access network.

The multilink character of the V5.2 interface has impact on the V5 interface by adding link control and protection protocols.

The link control protocol is used to identify and manage links and the protection protocol is used to enhance reliability by protecting vital signaling and control information that is transferred over the V5.2 interface.

Hardware

No special hardware is required for use of the V5 interface in the 5ESS®-2000 Exchange. The V5 interface uses existing hardware such as Packet Switch Unit (PSU), Protocol Handlers (PH3s), Digital Line and Trunk Units (DLTUs), and Digital Facility Interfaces (DFIs). The V5 interface software is implemented on these existing units.

Subscriber ports

Subscribers are identified at the Local Exchange by user ports. The ISDN and PSTN user ports differ from typical ISDN and PSTN subscriber in that they represent an image of the customer access port in an Access Network and not the actual subscriber itself.

Functional Blocks V5 Interface

Contents

This map gives a detailed description of the interface. It describes:

- The types of information (C-paths) transferred over the interface
- Channel types used to transfer information
- The definition of the protocol used on the interface.

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Functional Blocks V5 Interface (Continued)

Information types

The information transported over the V5 interface between the access network and the exchange can be categorized in the following types

Information Types	Function
Bearer	Bearer information is the voice or data information transferred via the speech path between two parties.
Signaling	The PSTN signaling information consists of subscriber line signaling. The ISDN signaling information consists of the LAPD frames which are transferred between the exchange and the subscribers.
Port control	Port control information is the information transferred between the access network and the local exchange to control an individual user port (e.g. (un-)blocking). A user port uniquely identifies a subscriber on the exchange and AN side.
Common control	Common control information is the information, that is transferred when a call is made, between the access network and the local exchange to ensure the proper functioning of the entire V5 interface.
Bearer Channel Connection	Bearer Channel Connection (BCC) protocol information is the information transferred between the access network and the local exchange used to dynamically assign a particular bearer channel on the V5.2 interface to a user port. (not used for V5.1)
Link Control	Link Control information is information related to links, exchanged between the AN and LE. This includes link identification and link blocking information (V5.2 only).
Protection Protocol	Protection Protocol information is the information transferred between the AN and the LE, that is needed to protect communication paths. The communication paths can be switched from one link to another when a link failure occurs. (V5.2 only).

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Functional Blocks V5 Interface (Continued)

Channels

The V5 information types are transported via the V5 interface over a 2,048 kbit/s link. The V5 interface consists of 32 channels, each carrying 64 kbit/s. The three channel types are:

Channels	Function
Bearer channels	Bearer channels are used to transport the bearer information. A V5 bearer channel is a 64 Kbps timeslot.
Communication channels	A V5 communication channel is a 64 Kbps timeslot. Communication channels are used to transport the following information types between the access network and the exchange: — User signaling information (PSTN and ISDN LAPD frames) — Port control information — Common control information — BCC protocol information (not for V5.1) — Protection protocol information (V5.2 only) — Link Control protocol information (V5.2 only) On the first link on a V5.2 interface, 1, 2 or 3 logical communication channels can be assigned per link. Per default, port control, common control and BCC information is provisioned on C1 of the primary link. Protection protocol information is sent on a primary and secondary link. User signaling information can be provisioned on any communication channel.
Synchronization channel	The synchronization channel is used for the control of the 2,048 kbit/s link (for example maintenance and timing).

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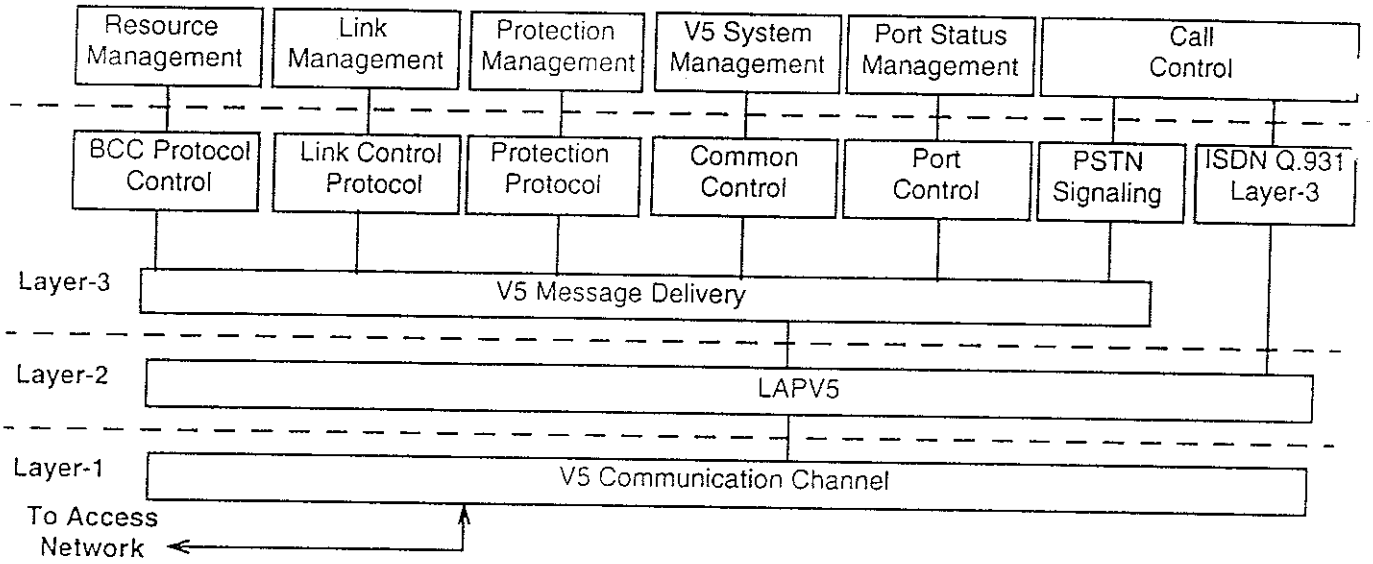
Functional Blocks V5 Interface (Continued)

Protocol

The protocol on the V5 interface uses a 3-layer stack for the handling of the communication channels. The relation between the different entities of the protocol layers is represented in the figure below. This figure give the implementation on the 5ESS®-2000 exchange.



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Functional Blocks V5 Interface (Continued)

Layer-1

The layer-1 functionality extracts frames from the layer-1 bit stream. The layer-1 functionality also passes the frames of the communication channels to the layer-2 functionality.

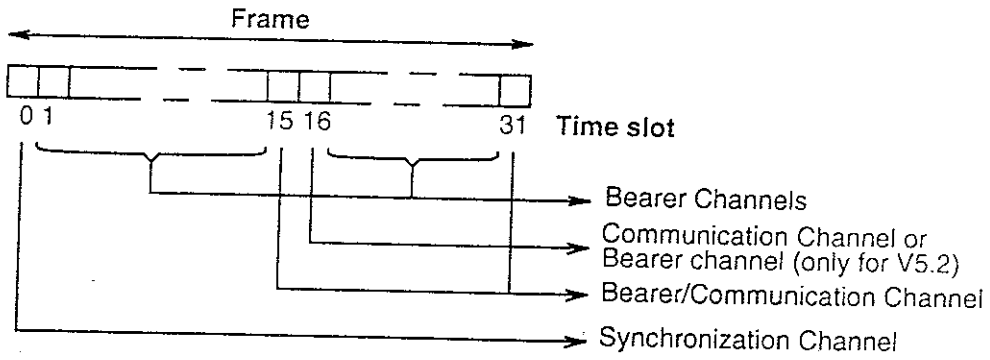
The V5 interface uses the layer-1 functionality (the electrical and physical characteristics) of a 2,048 kbit/s interface conforming to the ITU-T recommendations G.703 and G.704.

The bit stream carries 8000 frames per second; each frame consists of 32 time-slots of 8 bits each. The time-slots with the same position within a frame together form a 64 kbit/s logical channel. The usage of the timeslots is shown in this table:

Time Slot	Usage
0	Synchronization and maintenance
16	Communication channel or bearer channel (only for V5.2)
15 + 31	Communication channel. When timeslots are not used as communication channel, they are available as bearer channels.
Other	Bearer channels.

Time slots

The time slot allocation in a frame are shown this figure. For the mapping of C-channels to timeslots refer to the chapter on defining the V5 interface.



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Functional Blocks V5 Interface (Continued)

Layer-2

The layer-2 functionality of the V5 interface is performed by the LAPV5 protocol. The LAPV5 protocol is responsible for:

- Identifying a received V5 layer-2 frame as:
  - A PSTN signaling message frame, containing the PSTN subscriber signaling information
  - An ISDN signaling message frame, containing the ISDN subscriber signaling information
  - A control message frame, containing the port control and common control information
  - A BCC protocol frame, containing the BCC protocol information (not for the V5.1 interface)
  - A Protection protocol frame, containing protection protocol information. (V5.2 only)
  - A Link Control protocol frame, containing link control protocol information. (V5.2 only)
- Establishing and maintaining a V5 (common control, port control, BCC protocol control and protection protocol control) data link connection to its peer entity in the access network.
- Establishing and maintaining a PSTN data link connection to its peer entity in the access network.
- Passing the content of an incoming V5 layer-2 frame to the layer-3 functionality, and an outgoing frame to the layer-1 functionality.

Establishing and maintaining an ISDN data link connection to its peer entity in the access network. These functions are the responsibility of the LAPD protocol and is performed using the ITU-T Q.921 LAPD procedures.

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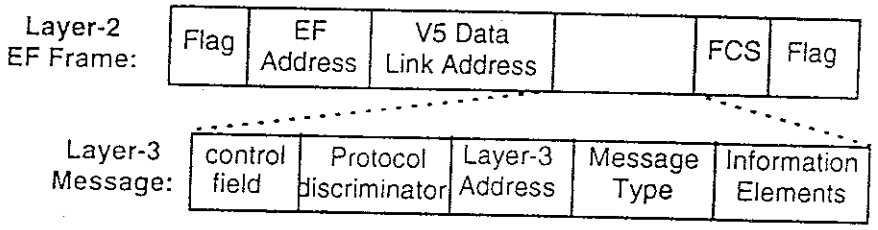
Functional Blocks V5 Interface (Continued)

Envelope function frames

The information in the communication channels is transported at layer-2 level in Envelope Function (EF) frames. The layout of an EF frame is shown in the following figure.



The *Layer-3 Address*, *Message Type*, and the *Information Elements* are used in layer-3.

For ISDN signaling the contents of the layer-3 message is the control and information part of the Q.921 LAPD frame. Also for ISDN the V5 Data Link Address is not used.

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Functional Blocks V5 Interface (Continued)

Address field values

The *EF Address* is used to identify a received EF frame as a control frame or a signaling frame. The table shows the *EF Address* and *V5 Data Link Address* fields.

For...	The EF address is...	The V5 data link address is...
PSTN signaling	8176	8176
ISDN signaling	0 through 8175. It uniquely identifies an ISDN user port within the V5 interface.	The values of the ISDN Q.921 address fields, the Terminal Endpoint Identifier (TEI) and the Service Access Point Identifier (SAPI).
Control Information	8177	8177
BCC protocol information	8178	8178
Protection protocol information	8179	8179
Link Control protocol information	8180	8180

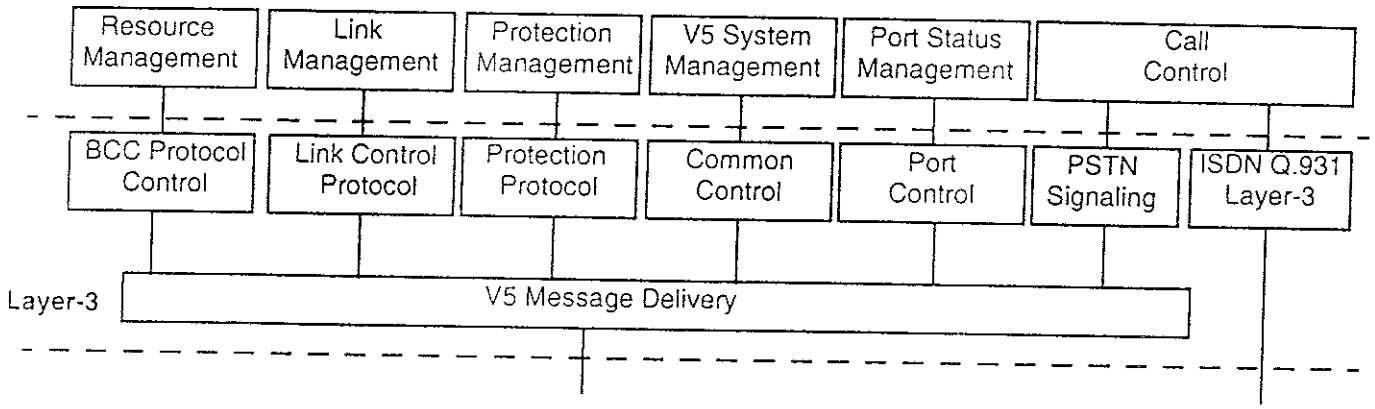
Functionality of Layer-3 and Above

Layer-3

The layer-3 protocol consists of protocol entities. These entities are shown in the figure below.

The entities and the functions they support are further explained.

For provisioning aspects, such as defining users, mapping of C-paths to logical and physical C-channels and timeslots refer to the chapter about defining the interface.



Message delivery

The V5 Message Delivery passes the incoming V5 PSTN signaling and control messages, to the associated layer-3 entities PSTN Signaling, Port Control, Common Control, BCC Protocol Control, Link Control or Protection protocol. It also passes the outgoing V5 PSTN signaling and control messages to the layer-2 functionality.

The V5 Message Delivery verifies the sanity of the incoming messages, and distributes them to the appropriate layer-3 entity. The layer-3 entity is determined using the *Layer-3 Address* field of the incoming message. The *Layer-3 Address* field uniquely identifies the user port (for PSTN Signaling and Port Control messages) or identifies the destination of the message (Common Control, BCC Protocol Control, Link Control or Protection protocol).

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Functionality of Layer-3 and Above (Continued)

V5 System Management

The V5 System Management controls and synchronizes operation of the V5 interface. It sends and receives commands to be taken on various events on the V5 interface, such as initialization, re-start and fault recovery.

The V5 System Management communicates with its peer-layer entity in the access network via the Common Control protocol using layer-3 messages.

Common Control

The Common Control protocol interprets incoming messages and notifies the V5 System Management to take the appropriate actions. It also translates notifications from the V5 System Management into outgoing messages.

Port Status Management

The Port Status Management is responsible for the status changes of user ports. It sends and receives commands to the access network which are used to control the user ports (for example blocking and unblocking of user ports).

The Port Status Management communicates with its peer-layer entity in the access network via the Port Control protocol using layer-3 messages.

Port Control

The Port Control interprets incoming messages and notifies the Port Status Management to take the appropriate actions. It also translates notifications from the Port Status Management into outgoing messages.

The user ports are identified using the *Layer-3 Address* field of the layer-3 messages.

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Functionality of Layer-3 and Above (Continued)

Call Control	The Call Control is the exchange call handling functionality. This functionality includes, for example, handling of a seizure, digit reception and analysis, and supplementary services. The Call Control handles the requests coming from the PSTN and ISDN Signaling.
PSTN Signaling	The PSTN Signaling communicates with its peer-layer entity in the access network using layer-3 messages in order to transfer information about the analog line state over the V5 interface. It is concerned with the setup and the release of a speech path between the access network and the exchange. The PSTN Signaling interprets the incoming messages (for example the detection of an on-hook or off-hook) and requests the Call Control to take the appropriate actions. It also translates notifications from the Call Control into outgoing messages.
ISDN Q.931	The ISDN Q.931 Layer-3 communicates with its peer-layer entity in the access network using ISDN Q.931 messages, to transfer information about supplementary services and it handles setup and release of a speech path between the access network and the exchange. The ISDN Q.931 Layer-3 interprets the incoming messages and requests the Call Control to take the appropriate actions. It also translates notifications from the Call Control into outgoing messages.
Resource Management	The Resource Management is responsible for the dynamic assignment (not for V5.1) of a particular bearer channel to a user port when a call is set up. It communicates with its peer-layer entity in the access network via the BCC Protocol Control using layer-3 messages.
BCC Protocol Control	The BCC Protocol Control interprets incoming messages and notifies the Resource Management to take the appropriate actions. It also translates notifications from the Resource Management into outgoing messages.

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Functionality of Layer-3 and Above (Continued)

Protection management

The protection management handles the protection protocol information and manages switch-overs.

Protection protocol

The protection protocol is the protocol that is used in the V5.2 interface to ensure links are protected against failure. It does not protect individual bearer channels but protects critical communication paths such as BCC, control protocol, link control protocol and ISDN d-channels that carry information about large number of subscribers.

The following two methods are employed to protect communication channels:

- Duplication of the protection protocol datalinks
- Switch-over procedures

Protection groups

Protection group 1 is made up of the 2 timeslots 16 of the two 2 Mbit/s links that carry the protection protocol , BCC, control protocol, link control protocol and possibly PSTN signaling information. These links are called the Primary and Secondary link. The C-paths carrying this information on the Primary and Secondary link are not subject to switch-overs.

Please note that for a V5.2 interface which has only one link defined (in Recent Change and Verify), it is defined as a Regular link and not as a Primary link. Having one link also means there is no protection provided.

However reliability is ensured by duplication of the protection protocol datalinks. This means that protection protocol messages are sent over the timeslots 16 of both the Primary and the Secondary link. This ensures that in case of for example a link failure, protection protocol information is still sent, thus allowing switch-overs of the other protocols.

A sequence number mechanism is provided to discard every second message.

Protection group 2 consists of all other timeslots assigned to control functions. PSTN signaling information can be configured on protection group 1 or 2.

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Functionality of Layer-3 and Above (Continued)

Switch-over

Switch-overs may occur when 2 Mbit/s links are lost, e.g. due to physical disconnection or when persistent datalink failures occur. Or because a link is taken out of service manually.

In a switch-over, datalinks are reestablished by switching to standby links.

The LE commands switch-over procedures, but the AN can also request switch-over. In case of glare (both AN and LE requesting switch-overs) the LE has priority. The LE can reject a switch-over request when no resources are available. A switch-over request contains an Information Element with a proposal for a particular new physical C-channel. The actual switch-over command contains the actual physical C-channel to which is being switched.

Switch-overs can occur automatically, initiated by either AN or LE. They can also be initiated manually.

Switching between active and standby C-channels can only occur within the same protocol group.

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Functionality of Layer-3 and Above (Continued)

Link Management

The V5 Link Management is responsible for handling procedures regarding links. These include monitoring the operational state of links and communicating this with the Access Network.

Link Control Protocol

The V5 Link control protocol is used in the V5.2 interface to manipulate links, consists of two parts:

- Link identification
- Link blocking and unblocking

Link identification

Link identification procedures are required to identify individual links in the multilink V5.2 environment. These procedures check to ensure proper provisioning (no mismatch between ends of the links).

The procedure for link identification can be requested by both AN and LE, however a request by the LE has priority over a request by the AN.

Link blocking/ unblocking

There are two methods of blocking links.

- Deferred blocking
- Non-deferred blocking

With deferred blocking links are blocked only when they are not in use. No new calls are allowed on the link, but the link will only be removed from service when all calls are released.

In a non-deferred blocking the LE will switch-over logical C-channels to standby C-channels, terminate all calls on the link and then remove the link from service.

Please note that blocking implies the occurrence of switch-overs and thus the availability of the protection protocol.

Layer-3 Message Handling

V5 interface messages

Each of the layer-3 entities PSTN Signaling, BCC Protocol Control, Common Control, Port Control, Link Control and Protection Protocol has its own set of layer-3 messages to communicate with its peer-layer entity of the access network. The types of the messages are identified using the layer-3 field *Message Type*. A layer-3 message can also contain additional information in the *Information Element* part, such as an on-hook and an off-hook signal.

Example of V5 message

The table below shows how a V5 protocol message is build up. Every message is build up from different Information Elements. For the exact coding refer to the V5 ETSI specifications.

In general a V5 protocol message consists of:

- Protocol Discriminator
- Address
- Message Type
- Other Information Element(s)

The table below shows the content of one of the protection protocol messages, the SWITCH-OVER COM message, which is used to switch-over logical C-channels to physical C-channels.

Information element	Direction	Type	Length
Protocol Discriminator	LE to AN	M	1
Logical C-channel identification	LE to AN	M	2
Message Type	LE to AN	M	1
Sequence Number	LE to AN	M	3
Physical C-channel identification	LE to AN	M	4

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Layer-3 Message Handling (Continued)

PSTN signaling

This table gives the set of layer-3 messages and their descriptions, used by the PSTN Signaling.

Message	Direction	Description
ESTABLISH	Bothway	Request to establish a speech path
ESTABLISH ACK	Bothway	To acknowledge the receipt of an ESTABLISH message
SIGNAL	Bothway	A change in electrical condition, for example an on-hook signal
SIGNAL ACK	Bothway	To acknowledge the receipt of a SIGNAL message or a PROTOCOL PARAMETER
STATUS	AN to LE	Report of the PSTN user port state
STATUS ENQUIRY	LE to AN	Request for a report of a PSTN user port state
DISCONNECT	Bothway	Indication of clearing the speech path
DISCONNECT COMPLETE	Bothway	To acknowledge the receipt of a DISCONNECT message
PROTOCOL PARAMETER	LE to AN	To change a protocol parameter in the access network

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Layer-3 Message Handling (Continued)

Common control

This table gives the set of messages used by the layer-3 Common Control.

Message	Direction	Description
COMMON CONTROL	Bothway	Information for Common Control functions
COMMON CONTROL ACK	Bothway	To acknowledge the receipt of a COMMON CONTROL message

Port Control

This table gives the set of messages used by Port Control layer-3.

Message	Direction	Description
PORT CONTROL	Bothway	Information for Port Control functions
PORT CONTROL ACK	Bothway	To acknowledge the receipt of a PORT CONTROL message

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Layer-3 Message Handling (Continued)

BCC protocol

This table gives the set of messages used by the BCC Protocol Control.

Message	Direction	Description
ALLOCATION	LE to AN	Request to allocate a bearer channel
ALLOCATION COMPLETE	AN to LE	Completion of a bearer channel allocation by the access network
ALLOCATION REJECT	AN to LE	Rejection of a bearer channel allocation by the access network
DE_ALLOCATION	LE to AN	Request to release a bearer channel
DE_ALLOCATION COMPLETE	AN to LE	Completion of a bearer channel release by the access network
DE_ALLOCATION REJECT	AN to LE	Rejection of a bearer channel release by the access network
AUDIT	LE to AN	Request to audit the status of a bearer channel allocation
AUDIT COMPLETE	AN to LE	Report of the status of a bearer channel allocation
AN FAULT	AN to LE	Report of a fault which occurred in the access network
AN FAULT ACK	LE to AN	Acknowledgment of the receipt of an AN FAULT message
PROTOCOL ERROR	AN to LE	Report of an protocol error found in the access network

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Layer-3 Message Handling (Continued)

Protection protocol

This table gives the set of messages used by the layer-3 Protection Protocol

Message	Direction	Description
SWITCH-OVER REQ	AN to LE	Requests switch-over to particular physical C-channel
SWITCH-OVER COM	LE to AN	Initiates switch-over
OS-SWITCH-OVER COM	LE to AN	Initiates switch-over on request of operator
SWITCH-OVER ACK	AN to LE	Acknowledges switch-over
SWITCH-OVER REJECT	Bothway	Indicates switch-over can not be performed
PROTOCOL ERROR	AN to LE	Indicates sent messages contain protocol error
RESET SN COM	Bothway	Indicates state variables (send/receive sequence numbers) will be set to zero due to misalignment
RESET SN ACK	Bothway	Acknowledges state variables will be set to zero

Link control protocol

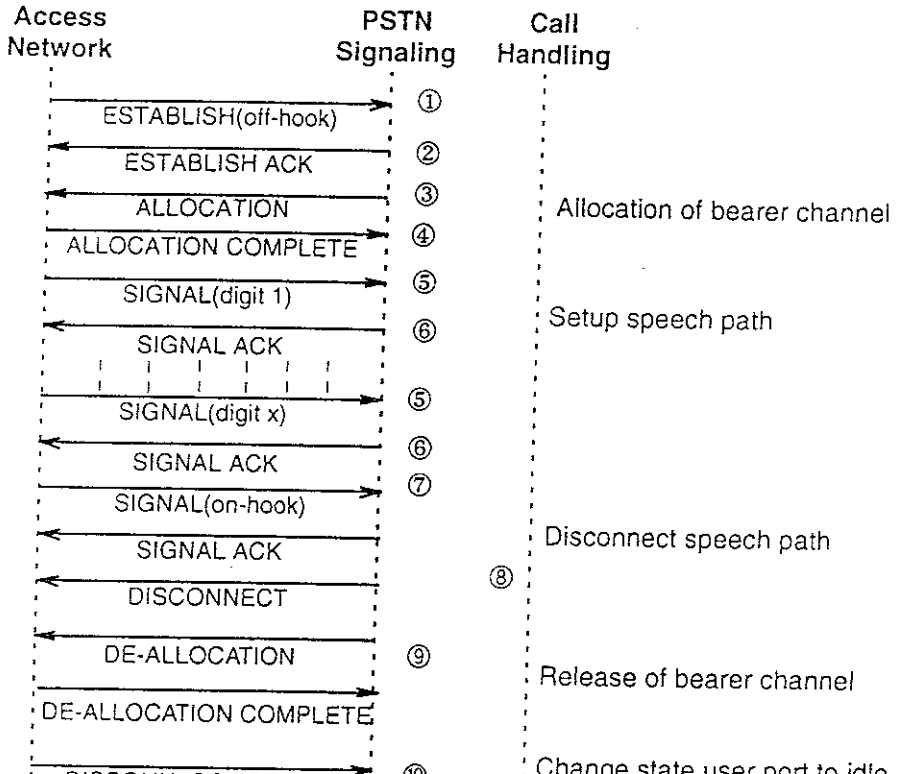
This table gives the set of messages used by the layer-3 Link Control protocol

Message	Direction	Description
LINK CONTROL	Bothway	Conveys control function information
LINK CONTROL ACK	Bothway	Acknowledges the receipt of a LINK CONTROL message

Scenario of a V5 PSTN Call

Example

As an example, a scenario of a call originating in the access network, is given in the following figure. For terminating calls, the scenario is similar. Note that this example is a simplification of the reality; additional messages may be transferred during the flow of the call. Please note that this call flow is for a V5.2 release1 or V5.2 interface, since it contains the allocation of a bearer channel.



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Scenario of a V5 PSTN Call (Continued)

Call processing

The following table gives the stages in call processing. The numbers are also named in the example on the previous page.

Stage	Description
1	From the access network, the PSTN Signaling receives an ESTABLISH message, with in the *Information Element* part, the off-hook signal, and reports this to the call handling function.
2	This function requests the PSTN Signaling to send the ESTABLISH ACK message to the AN.
3	The local exchange sends the ALLOCATION message to indicate to the AN the allocation of a bearer channel.
4	By returning an ALLOCATION COMPLETE message, the AN indicates to the LE that the allocation of the requested bearer channel has been successfully completed.
5	Subscriber hears the dial tone and responds by dialing the digits. Digits can be transferred by DTMF or by sending the seperate digits in SIGNAL messages.
6	The AN collects the digits and sends them in the *Information Element* part of a SIGNAL message to the exchange. The PSTN Signaling receives the SIGNAL message and reports the digits to the call handling function, which uses them to route the call to the called party. Subsequently, the PSTN Signaling sends the SIGNAL ACK message to the access network.
7	When the calling party goes on-hook, the PSTN Signaling receives, from the AN, a SIGNAL message with in the *Information Element* part the on-hook signal, and reports this to the call handling function. This function starts disconnecting the speech path to the called party. In the meantime the PSTN Signaling sends the SIGNAL ACK message to the AN
8	After the call handling function finishes disconnecting the speech path to the called party, the PSTN Signaling sends a DISCONNECT to the AN.
9	By sending the DE-ALLOCATION and DE-ALLOATION COMPLETE messages, the used bearer channel is released.
10	The AN responds with a DISCONNECT COMPLETE message. The PSTN Signaling changes the user port state of the calling party to idle.

(Continued on next page)

Scenario of a V5 PSTN Call (Continued)

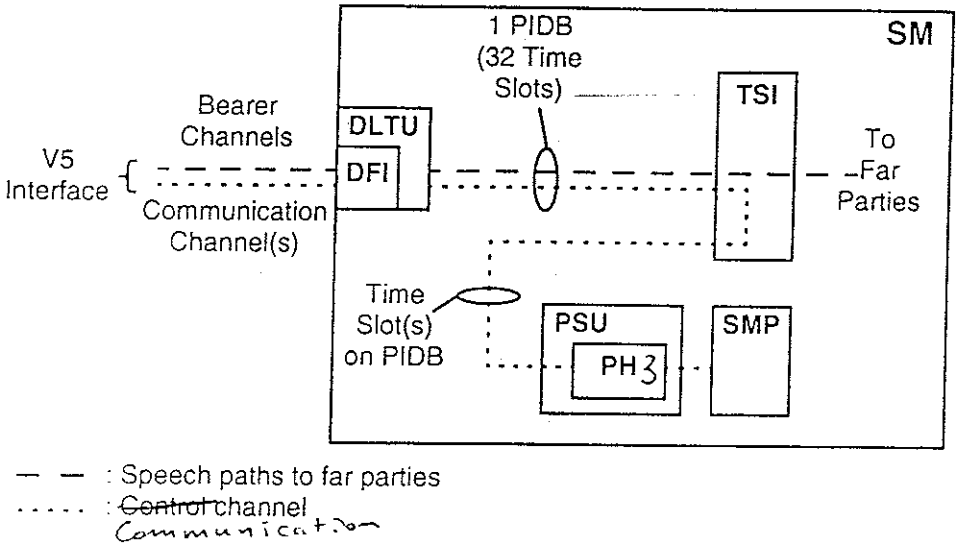
Glare

A glare (or path collision) occurs when both the access network and the exchange simultaneously send an ESTABLISH message for the same subscriber port. Whether the call from the exchange or the access network has priority is market dependent.

Data Flow Within the Exchange

Channels

The flow of the bearer and communication channel data within the exchange is shown in this figure.



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Data Flow Within the Exchange (Continued)

Hardware

The V5 interface terminates on the exchange side on a DFI (Digital Facility Interface) in a DLTU (Digital Line and Trunk Unit). Both the bearer channels and the communication channel(s) are transferred from the DFI via a PIDB (Peripheral Interface Data Bus) to the TSI (Time Slot Interchanger).

The communication channels are nailed-up through the TSI via a PIDB to a designated PH3 (Protocol Handler) in the PSU (Packet Switch Unit). Each communication channel occupies one time-slot on the PIDB. The PH3 demultiplexes the different messages received on the communication channel and passes it to the SMP (Switching Module Processor) for further processing. The PH3 must be loaded with an ISDN software image.

The bearer channels are standard 64 kbit/s transparent channels that are switched in the TSI and are directly routed to their destinations. The TSI switches the incoming bearer channels using the information from the SMP based on the signaling information.

The relation between a communication channel and a PH-channel is fixed; it is defined during provisioning of the V5 interface. A PH-channel is a 16 kbit/s channel connected to the PH; to handle one 64 kbit/s communication channel four PH-channels are required.

Engineering considerations

Hardware impact

The facilities for the V5 interface terminate on DFIs in the SM-2000 or classic SM. The Communication Channels require PIDB timeslot connections to the PSU (Packet Switch Unit) to process signaling and control information on the C-channels.

V5.2 interface on an SM

This table shows the maximum of subscribers that can be connected on multiple V5.1 or V5.2 interfaces on a SM.

Interface	C-channels per V5	Max Facs.	No. of DFI2s	No. of DFI1s	No. of PH3s	No. of subscribers
V5.1	1	15	8	15	2	450
V5.1	2	15	8	15	2	435
V5.1	3	15	8	15	3	420
V5.2	1	15	8	15	2	8769
V5.2	2	15	8	15	2	8749
V5.2	3	15	8	15	2	8729

V5 interface on an SM-2000

This table shows the maximum of subscribers that can be connected on multiple V5.1 or V5.2 interfaces on a SM-2000.

Interface	C-channels per V5	Max Facs.	No. of DFI2s	No. of PH3s	No. of subscribers
V5.1	1	126	63	7	3780
V5.1	2	120	60	10	3480
V5.1	3	112	56	14	3136
V5.2	1	134	67	2	78352
V5.2	2	134	67	2	78181
V5.2	3	134	67	2	78002

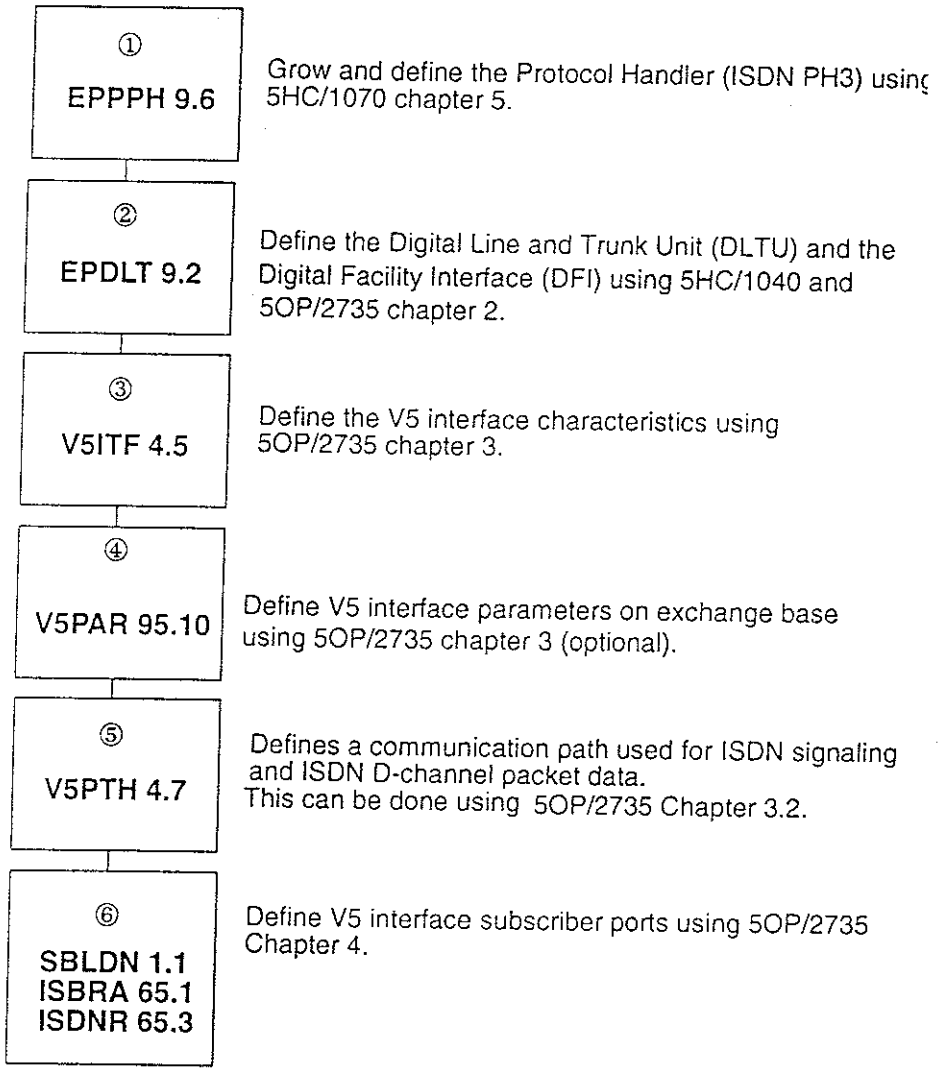
Since the V5.1 interface does not support any concentration at the AN, the maximum number of subscribers are equal to the number of available B-channels.

Provisioning the V5 Interface

Installation steps

Installation of a V5 interface to an access network at the exchange side is performed with the following RC/V forms. The procedural manuals needed, are also listed:

There are some differences in provisioning between the V5.1 and V5.2 interfaces. The most important differences lay in the mapping of communication channels.



Defining the Hardware

Protocol handler

The growth procedure is described in 5HC/1070. The growth procedure for a PH using V5 is not different from the normal PH growth procedure. The RC/V form used for defining the PH is 9.6 EPPPH.

DLTU and DFI

The Digital Line Trunk Unit (DLTU) and Digital Facility Interface (DFI) are needed to terminate the V5 interface. For information on how to grow these units, refer to 5HC/1040.

The procedure to define the DLTU and DFI can be found in 5OP/2735 and can be divided in the following steps:

Step	Action
1	Enter the 9.2 EPDLT form in insert mode
2	Enter the data (information about the data can be found in the next blocks). Put the FAC EQSTAT to G (growth)
3	Insert the form and return to the class menu.
4	Enter the 9.2 EPDLT form in update mode.
5	Change the FAC EQSTAT to O (operational)
6	Update the form.

The next pages show the RC/V screens needed to complete this procedure. Only the parameters relevant for the V5 interface are shown.

(Continued on next page)

Defining the Hardware (Continued)

EPDLT screen 1

This screen is used to define the Digital Line Trunk Unit hardware.

```
SCREEN 1 OF 7                          RECENT CHANGE 9.2 EPDLT

                    DIGITAL LINE TRUNK UNIT PACK

 *1.  SM            024
 *2.  DLTU          0
 *3.  DFI           02
 *4.  FAC IND       3
 #5.  TYPE          V5
 #6.  CLI           1006
 #7.  CHNLIND       32
 #8.  INTF UNIT     0
 #9.  CI            0
 #10. PICB          12
```

Parameters

Only the parameters important for the V5 interface are listed in the next table.

Parameter	Function	Value
TYPE	Digital line trunk unit pack type	This should be **V5** digital facilities interface
CHNLIND	Channel type indicator. Number of time slots	Can be 24 or 32. For V5 32.

(Continued on next page)

Defining the Hardware (Continued)

EPDLT screen 2

This screen is used to define DLTU Facility 0. Screen 5 is similar to screen 2 only screen 5 is for DLTU Facility 1.

```
SCREEN 2 OF 7                                  RECENT CHANGE 9.2 EPDLT
                    DIGITAL LINE TRUNK UNIT PACK

FACILITY 0 INFORMATION
 11. FAC0 APPL TYPE _____      HOST FAC
 12. FAC0 DI        1          21. FAC0 COMM LINK        N
 13. FAC0 PIDB      06
 14. FAC0 EQSTAT    O          REMOTE FAC
&15. FAC0 PATTERN   _          22. FAC0 SUBGRP RLI MUX   _
 16. FAC0 MODE      CCS        23. FAC0 PORT RLI MUX     _
 17. FAC0 FACILITY  _____
 18. FAC0 FRM SET   01
 19. FAC0 CGADLYID  00
&20. FAC0 DCME      ___
```

(Continued on next page)

Defining the Hardware (Continued)

Parameters

Only the parameters important for the V5 interface are listed in this table.

Parameter	Description	Value
EQSTAT	Equipment state	This should be **G** (growth) if inserting this form. It must be made operational after the form is inserted by updating this form and change this parameter to **O** (operational).
FAC0	DFI mode.	Should be HDB3 or CCS for V5 ?
FAC0 FRM SET	Fault rate monitor parameter set identity.	Up to 2 digits (0-15). 0 means that FRM is not used. It must be specified if FACIND is 0, 1 or 3.
FAC0 CGADLYID	Carrier Group Alarm delay identity.	Must be 0 if CHNLIND is 32 and TYPE is V5.
FAC0 COMM LINK	Communication link indicator. The communication link is the link between a host SM and an RSM.	Y or N. Will be No for V5

(Continued on next page)

Defining the Hardware (Continued)

EPDLT screen 3

This screen is used to define Facility 0 signaling bit information. Screen 6 is similar to screen 3 only screen 6 is for Facility 1.

```
SCREEN 3 OF 7                                  RECENT CHANGE 9.2 EPDLT

                        DIGITAL LINE TRUNK UNIT PACK

FACILITY 0 SIGNALING BIT INFORMATION 34. FAC0 N0                  _
 23. FAC0 SA5 FR0TS16          _       35. FAC0 N1 THRU N4        _ Y
 24. FAC0 SA7 FR0TS16          _       36. FAC0 SPARING           _
 25. FAC0 SA8 FR0TS16          _
 26. FAC0 ODD INTL             _
 27. FAC0 EVEN INTL            _
 28. FAC0 SA4 NATL0            _
 29. FAC0 SA5 NATL1            _
 30. FAC0 SA6 NATL2            _
 31. FAC0 SA7 NATL3            _
 32. FAC0 SA8 NATL4            _
 33. FAC0 IE AND IO            _
```

Parameters

The parameters important for the V5 interface are listed in the next table.

Parameter	Function	Value
FAC0 N1 THRU N4	Transmit national bits 1 through 4	This should be Y for V5

Defining the Interface

Interface characteristics

Use this procedure to define the V5 interface characteristics. The V5 characteristics are mapped to physical hardware (DFI).

Step	Action
1	Check for PH model 3 availability by reviewing the EUPHW form. PH3 AVAILABLE must be greater than **0** (zero). If PH3 is not available, grow PH3.
2	Enter RC/V form 4.5 V5ITF in insert mode
3	Type and enter parameters.
4	Insert the form.
5	Enter RC/V form 4.7 V5PTH in insert mode
6	Type and enter parameters.
7	Insert the form.
8	Define PSTN subscribers (using form 1.1. SBLDN) and ISDN subscribers (using forms 65.1 ISBRA and 65.3 ISDNR)

The next pages give the RC/V screens and the parameters that should be filled in.

NOTE:
The way the RC/V screens are filled out are examples.

(Continued on next page)

Defining the Interface (Continued)

V5ITF screen 1

This figure gives screen 1 of form 4.5 V5ITF.

```
SCREEN 1 OF 3                          RECENT CHANGE 4.5 V5ITF

                    V5 INTERFACE DEFINITION

 *1.  V5 IDENTIFIER            00403
  2.  V5 EXTERNAL IDENTIFIER   403
 #3.  V5 VERSION               V52
  4.  V5 VARIANT               0
  5.  PSIG LCC                 2
 &6.  BC USAGE                 X00000000000000000000000000000000
  7.  L1 RECOVERY MODE         DELAYED
  8.  REMARKS                  ____________________
```

(Continued on next page)

Defining the Interface (Continued)

Parameters

The parameters of V5ITF screen 1 are named in the next table:

Parameter	Description	Value
V5 IDENTIFIER	V5 interface identification	Up to 5 digits (0 to 65534)
V5 EXTERNAL IDENTIFIER	V5 interface external identification	Up to 8 digits (0 to 16777214)
V5 VERSION	V5 version number	V51, V51P or V52
V5 VARIANT	V5 variant	Up to 3 digits (0-127)
PSIG LCC	V5 Logical Communication Channel carrying PSTN signaling	Up to 5 digits (0 to 65534)
BC USAGE	Bearer Channel Usage	Up to 32 alphanumeric characters. Timeslot 31 (left) up to timeslot 0 (right). Only used for V5.1. For non V5.1 interfaces all bearer channels are marked as not used (0) 0= Channel is not used (free for allocation). 1= Channel is in use (as bearer- or communication channel.) ⇒ NOTE: C1= timeslot 16, C2= timeslot 15, and C3= timeslot 31. Bearer channels timeslots are defined on parameter (B1,2) V51 TIMESLOT on SBLDN and ISBRA.
L1 RECOVERY MODE	V5 Layer 1 recovery mode, indicates when V5 layer 1 is restored	DELAYED, or IMMEDIATE. Default is IMMEDIATE.
REMARKS	remarks	Up to 16 alphanumeric characters.

(Continued on next page)

Defining the Interface (Continued)

V5ITF screen 2 and screen 3

This figure gives screen 2 of form 4.5 V5ITF. Screen 3 of form 4.5 V5ITF contains a continued list containing the same parameters as on screen 2, but for LINKS number 9 to 16.

NOTE:
This is an example of the way how communciation channels can be defined.

In this example 4 LCCs are defined. On link 1 on TS 16, 15 and 31 resp. and on link 3 on TS 16. Standby LCC are defined on link 2on TS 16, 15 and 31 resp.

```
SCREEN 2 OF 3                                  RECENT CHANGE 4.5 V5ITF

                        V5 INTERFACE DEFINITION

8. LINKS
   DEN          ID   TYP C1ISCN  C1LCC  C2ISCN  C2LCC  C3ISCN  C3LCC
1) 024000021    21    P  005024    1    005032    2    003016    3
2) 024000030    30    S  003012         003020         003024
3) 024000031    31    R  003016    4
4) _________    __    _  ______        ______         ______
5) _________    __    _  ______        ______         ______
6) _________    __    _  ______        ______         ______
7) _________    __    _  ______        ______         ______
8) _________    __    _  ______        ______         ______
```

(Continued on next page)

Defining the Interface (Continued)

Parameters

The parameters of screen 2 and 3 of form V5ITF are named in the next table:

Parameter	Description	Value
DEN (1-16)	Digital Equipment number	9 digits, in the format: <SM><DLTU><DFI><FAC> This number can be derived from screen 9.2 EPDLT
ID (1-16)	Link identifier	Up to 3 digits (0-254)
TYP (1-16)	V5 Link Type	P (Primary), S (Secondary) or R (Regular) For V5.1, V5.1+ and single link V5.2, TYP must be R. For multiple link V5.2, one link must be P, one S and the remaining R.
C1ISCN (1-16)	Integrated Service Channel Number for Communication Channel 1	6 digits, in the format: <PSU><DSL><PH> When filled out, TS 16 is assigned as C-channel.
C1LCC (1-16)	Logical Communication Channel 1	Up to 5 digits (0-65534) When not filled out, C-channel acts as standby.
C2ISCN (1-16)	Integrated Service Channel Number for Communication Channel 2	6 digits, in the format: <PSU><DSL><PH> When filled out, TS 15 is assigned as C-channel.
C2LCC (1-16)	Logical Communication Channel 2	Up to 5 digits (0-65534) Acts as STBY when not filled out
C3ISCN (1-16)	Integrated Service Channel Number for Communication Channel 3	6 digits, in the format: <PSU><DSL><PH> When filled out, TS 31 is assigned as C-channel.
C3LCC (1-16)	Logical Communication Channel 3	Up to 5 digits (0-65534) Acts as STBY when not filled out

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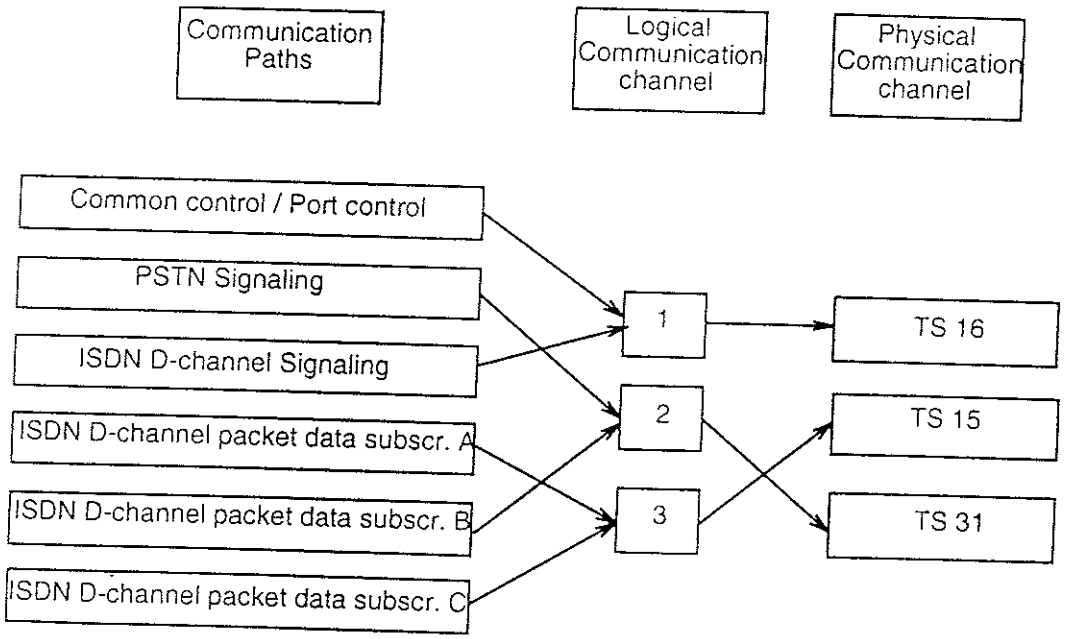
Defining the Interface (Continued)

Mapping of C-channels on V5.1

On a V5.1 interface at least one logical communication channel must be defined on TS 16. When only PSTN subscribers are provisioned a maximum of two logical communication channels can be defined. When ISDN subscribers are provisioned up to 3 logical communication channels can be defined.

For the V5.1 interface, the common and port control information will always be assigned to communication channel 1. The other communication paths may be assigned to any of the communication channels (including communication channel 1. The first logical communication channel must be assigned to the physical communication channel on TS 16, the second on TS 15 and the third on TS 31. The numbers of the LCCs can be choosen freely.

Please note that the figure shown below is an example.



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Defining the Interface (Continued)

V5.2 C-channels Mapping rules

For the V5.2 interface mapping depends on whether one or more links are defined. When one link is defined, the V5.1 rules apply. When multiple links are defined mapping is done in the way described below.

Mapping of C-channels on V5.2

The initial mapping (provisioning) of communication paths to logical communication channels, and subsequently from logical communication channels to physical communication channels is largely done using RC/V.

After this initial mapping, the switch-over mechanism that is provided by the protection protocol, can re-assign logical communication channels to previously standby physical communication channels. Thus switching the standby C-channels to active and vice versa.

When C[1-3]ISCN are filled out on V5ITF, the TSs 16, 15 and 31 are assigned as physical communication channels. When C[1-3]ISCN are not filled out, the timeslots are available as bearer channels.

When C[1-3]LCC are filled out on V5ITF, the logical C-channels are assigned to (active) physical C-channels. When C[1-3]LCC are not filled out, the physical C-channels act as standby physical C-channels.

The protection protocol C-paths are not mapped to a logical communication channel but are mapped directly to the physical communication channel on TS 16 of the Primary and Secondary links.

The Common control, port control, link control and BCC C-paths are, also automatically, mapped to TS 16 of the Primary link. However, unlike the protection protocol C-paths, they can be reassigned to TS 16 of the secondary link, using the switch-over mechanism.

The other C-paths are mapped to any of the logical communication channels. The logical communication channels are mapped to any of the physical communication channels, expect on TS 16 of the Secondary link. They are mapped preferably in the following order:

— all timeslots 16 of all the remaining links

— timeslot 15, respectively 31 of the links

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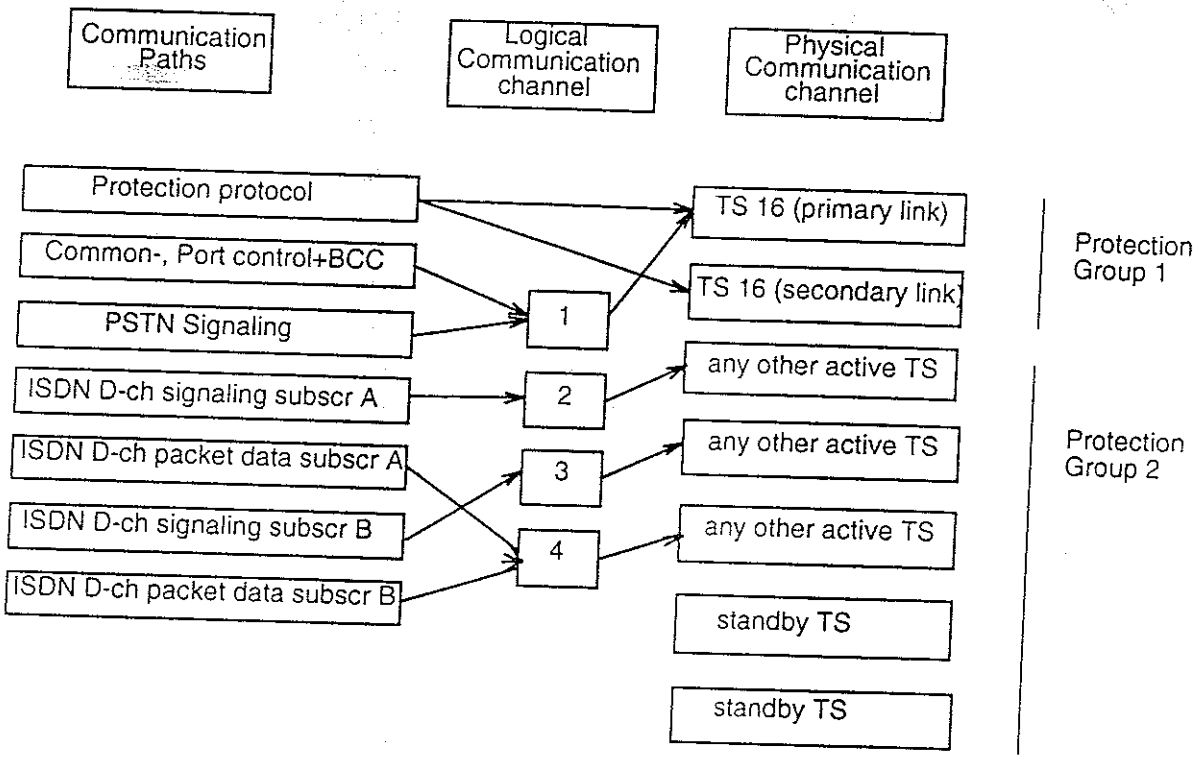
Defining the Interface (Continued)

The figure shown below is an example of the mapping of C-paths to C-channels.



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Defining the Interface (Continued)

Standby C-channels

On the V5.2 interface, there are active and standby physical C-channels. A physical C-channel that carries a C-path is called an active physical C-channel. Standby physical C-channels do not carry C-paths. The protection protocol can switch logical C-channels to standby physical C-channels, thus reassigning logical C-channels and C-paths. After switching, (previously) standby physical C-channels, become active physical C-channels. A maximum of 3 standby C-channels can be defined on the V5.2 interface.

Physical C-channels are standby when the C[1-3]LCC parameter on form V5ITF is not filled out while the C[1-3]ISCN parameter is defined.

(Continued on next page)

Defining the Interface (Continued)

V5PAR screen

This screen is used to define V5 interface parameters on exchange level.

```
SCREEN 1 OF 1                          RECENT CHANGE 95.10 V5PAR

                        V5 EXCHANGE PARAMETERS

 *1. EXCHANGE          TEST_SWITCH

V5 TIMERS
#2. TBCC1              1.0
```

Parameters

Parameter	Value
Exchange	Exchange name.
TBCC1 - Bearer Channel Connection Timer number 1.	Two digits (0.5-1.5), in seconds. If this timer expires for the first time, the ALLOCATION Message is resent. If this timer expires or the second time, then the associated allocation process is terminated.

(Continued on next page)

Defining the Interface (Continued)

Parameters

The following table lists the parameters and their domains:

Parameter	Description	Value
V5 IDENTIFIER	V5 interface identification	Up to 5 digits (0 to 65534)
CPATH ID	V5 communication path identification	Up to 5 digits (0-65534) Value 65534 only for review
LOGICAL CC NBR	V5 Logical Communication Channel	Up to 5 digits (0-65534)
CPATH TYPE	V5 communication path type	PSIG (for PSTN signaling) ISIG (for ISDN signaling) PDAT (for ISDN D-channel packet data) ⇒ NOTE: The CPATH ID for PSIG is automatically inserted with value 65534 when RC/V form V5ITF is inserted.
REMARKS	Remarks	Up to 16 alphanumeric characters.

Defining the Interface (Continued)

Communication paths

Perform this procedure to define the path for the signaling and for the D-channel packet data of an ISDN subscriber. The procedure has the following steps.

Step	Action
1	Enter form 4.7 V5PTH in the insert mode
2	Type and enter data. The next blocks give the RC/V screens and the data that should be entered.
3	Insert the form

V5PTH form

This form maps communication paths to logical communication channels. There is a 1:N relation between logical communication channels and C-paths. More than one C-paths can be mapped to one LCC as long as the C-paths are of different types.

```
SCREEN 1 OF 1                          RECENT CHANGE 4.7 V5PTH

                V5 COMMUNICATION PATH DEFINITION

*1.  V5IDENTIFIER              403
*2.  CPATH ID                  00001
#3.  LOGICAL CC NBR            1
#4.  CPATH TYPE                ISIG
 5.  REMARKS                   _____________
```

(Continued on next page)

Defining Subscriber Ports

Procedure

The procedure followed to define a subscriber port is similar to the procedure to define subscriber lines (5OP/2510). There are specific differences in parameter settings for V5, that are indicated on the next pages.

To define V5 interface subscriber ports the following steps should be taken:

Step	Action
1	When PSTN subscribers need to be defined: Enter RC/V form 1.1 SBLDN in insert mode When ISDN subscribers need to be defined: Enter RC/V form 65.1 ISBRA and 65.3 ISDNR in insert mode
2	Enter data. This step is further described in the next block
3	Insert the form.
4	If another subscriber has to be inserted, repeat from step 2.

(Continued on next page)

Defining Subscriber Ports (Continued)

SBLDN screen 1

This figure shows the first screen of the 1.1 SBLDN form.

```
SCREEN 1 OF 4                                  RECENT CHANGE 1.1 SBLDN

                          LINE DIRECTORY NR
                    SUBSCRIBER BASIC CHARACTERISTICS

 *1.   DIR NR          16668143000    &14.   PBX ID        ____
 +2.   QUANTITY        1              &15.   PBX LN GRP    ____
  3.   LN EQ NR       V 00430P04300  &16.   LINE NR       ____
 &6.   ISLU SPARING    N              &17.   DIRECT ACC    N
 #7.   ROUTE INDEX     0              &18.   SERVICES      N
  8.   LOCAL AREA      1               19.   REMARKS       __________
 #9.   SB CLASS       JP1
#10.   COIN            N
#11.   KEY TONE        Y
 12.   BILL DIR NR    16668143000
&13.   SUB METER       0
```

Parameters

Parameters relevant for V5 are:

Parameter	Description	Value
DIR NR	Directory number of the subscriber.	5 to 10 digits (range of each digit 0-9).
LN EQ NR	Equipment number is used to identify a V5 subscriber by specifying the interface ID and layer3 address	V-<V5IF>P<L3A> The first part identifies the equipment number type and should be V for V5 and the second part identifies the line equipment number. This last part consists of the V5 interface ID and the Layer 3 address, separated by a P to differentiate PSTN from ISDN.

(Continued on next page)

Defining Subscriber Ports (Continued)

SBLDN screen 4

This screen shows the 4th screen of the 1.1 SBLDN form.

```
SCREEN 4 OF 4                              RECENT CHANGE 1.1 SBLDN

                          LINE DIRECTORY NR

 46.  INSTALL TST      N            #60.  NO TEST RSLT  Y
 47.  TEST TYPE        _____         61.  LNEQ          STDEQ
 48.  HOME METER       NONE          62.  LBRA          N
 49.  HM AUX           _____         63.  NO PAYMENT    N
 50.  HM PPMU          _____        &64.  CHANGE TIME   _____
 51.  SLIM INH         Y            &65.  NPAYLCC       ___
 52.  ALIT INH         Y             66.  CDA SUB       N
 53.  BAL NETWORK      0             67.  V51 TIMESLOT  __
 54.  PROG TERM NET    PTERM0        68.  BG INTERCEPT  N
 55.  TRANS CLASS      1             69.  INCPT BG ID   _____
&56.  FAULTY LN EQ NR  _ _____
#59.  NO MON RSLT      Y
```

(Continued on next page)

Defining Subscriber Ports (Continued)

Parameters

Parameters relevant for V5 are:

Parameter	Description	Value
SLIM INH	Defines whether SLIM (Subscriber Line Instrument Measurements) is inhibited on the line with this directory number.	Y (Yes), N (No). Must be Yes for V5.
ALIT INH	Prohibit line insulation test - defines whether line testing by ALIT (Automatic Line Insulation Test) equipment is inhibited on the line with this directory number.	Y (Yes), N (No). Must be Yes for V5
NO MON RSLT	No monitor RSLT (Remote Subscriber Line Testing) - prevents the subscriber line from being monitored. Protects the line from interruptions by automatic measuring equipment.	Y (Yes), N (No). Must be Yes for V5
NO TEST RSLT	No test RSLT - prevents the subscriber line from being tested. Protects the line from interruptions by automatic measuring equipment.	Y (Yes), N (No). Must be Yes for V5.
V51 TIMESLOT	V5.1 bearer channel time slot.	Up to 2 digits (1-31). Should only be entered when the V5 VERSION is V5.1, because V5.1 does not have concentration.

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Defining Subscriber Ports (Continued)

ISDN

The procedure to define a ISDN subscriber port is similar to the procedure to define a PSTN subscriber port. For ISDN subscribers form 65.1 ISBRA is used.

ISBRA screen 1

This screen shows the first screen of the 65.1 ISBRA form.

```
SCREEN 1 OF 5                                  RECENT CHANGE 65.1 ISBRA

                    ISDN BASIC RATE ACCESS DEFINITION

 *1.   EQ NR              V 00430I4350  #15.   TYPE OF USER     USER
 &4.   FAULTY EQ NR       _ __________   16.   MSN              N
 #7.   D ISCN             005056         17.   CGPN TREAT       OPT
  8.   D REL PIDB         __             18.   CDPN TREAT       OPT
  9.   D TIMESLOT         __             19.   MAX CALLS        2
 10.   D QTR TS           _              20.   MAX BRA CW       __
 11.   B1 SERV            CSDV           21.   TERM PORT SUB    Y
 12.   B2 SERV            CSDV           22.   GRP FEAT CNTRL   N
 13.   BRA CONFIG         PP             23.   PBX ID           0
#14.   MAX TERMS          2              24.   PART BARRING     N

 25.   REMARKS            ________________
```

(Continued on next page)

324-53-00 0007P00001
324-53-01 0007P00002

Defining Subscriber Ports (Continued)

Parameters

Parameters relevant for V5 are:

Parameter	Description	Value
LN EQ NR	Equipment number is used to identify a V5 subscriber by specifying the interface ID and EF address.	V - <V5IF> I <EF address>— The first part identifies the equipment number type and should be V for V5. This last part consists of the V5 interface ID and the EF address, separated by an I to differentiate ISDN from PSTN.
D ISCN	D-channel integrated services channel number - PH (Protocol Handler) channel assigned to the D-channel of an access.	6 digits in the format: <PSU><DSL><PH> Must be located on the same PH as the LCC.

(Continued on next page)

Defining Subscriber Ports (Continued)

ISBRA screen 5

This screen has a number of parameters for the V5 interface. Please note that the layout of the screen can be different depending on the actual place of these parameters.

```
SCREEN 5 OF 5                          RECENT CHANGE 65.1 ISBRA

                ISDN BASIC RATE ACCESS DEFINITION

V5 FIELDS
 71. B1 V51 TIMESLOT        __
 72. B2 V51 TIMESLOT        __
 73. V5SDATA CP ID          1
 74. V5PDATA CP ID          ____
```

(Continued on next page)

Defining Subscriber Ports (Continued)

Parameters

Parameters relevant for the V5 interface. The RC/V screens containing the SLIM INH and NO TEST RSLT are not shown.

Parameter	Description	Value
B1 V51 TIMESLOT	V5.1 time slot number for B1 channel.	Up to 2 digits (1-31). Should only be entered when the V5 VERSION (form V5ITF) is V51.
B2 V51 TIMESLOT	V5.1 time slot number for B2 channel.	Up to 2 digits (1-31). Should only be entered when the V5 VERSION (from V5ITF) is V51.
V5SDATA CP ID	V5 communication path identifier for D-channel signaling data	Up to 5 digits (0-65533) Note that the C-path must be defined on form V5PTH first
V5PDATA CP ID	V5 communication path identifier for D-channel packet switching data.	Up to 5 digits (0-65533) Note that the C-path must be defined on form V5PTH first
SLIM INH	Defines whether SLIM (Subscriber Line Instrument Measurements) is inhibited on the line with this directory number.	Y (Yes), N (No). Must be Yes for V5 interface.
NO TEST RSLT	No test RSLT - prevents the subscriber line from being tested. Protects the line from interruptions by automatic measuring equipment.	Y (Yes), N (No). Must be Yes for V5 interface.

(Continued on next page)

Defining Subscriber Ports

ISDN directory number

The 65.3 ISDNR is used to define the ISDN directory number. Parameters of this screen have been explained before.

```
SCREEN 1 OF 2                          RECENT CHANGE 65.3 ISDNR

                        ISDN DIR NR DEFINITION

 *1.  DIR NR      1666927321      12.  LANGUAGE          1
  2.  EQ NR       V 00430I4350   &13.  SUB METER
                                 #14.  ORIG DENIED      N
      BEARER SERVICE GROUPS      #15.  TERM DENIED      N
 &5.  GROUP 1                    16.  NO PAYMENT        N
 &6.  GROUP 2                   &17.  CHANGE TIME
 &7.  GROUP 3                    18.  MAX CALLS         2
 &8.  GROUP 4                    19.  MAX BCHAN         2
 &9.  GROUP 5                    20.  VER CHARGE        N
                                 21.  EXPCALL MON       N
#10.  SB CLASS    JP1           22.  LINE STUDY        N
 11.  LOCAL AREA  1             &23.  BUSY DENY        _
```

V5 Interface Change or Upgrade

Upgrade from V5.1 to V5.2 interface

Upgrading a V5.1 interface to the V5.2 (or V5.2 release 1) interface is not possible via RC/V. The reason for this is that the V5.1 interface uses a fixed bearer channel provisioning, while the V5.2 release 1 and V5.2 interfaces use a dynamic bearer channel assignment.

Updating a V5.1 interface to a non V5.1 interface requires deleting the subscribers from the existing V5.1 interface, defining a new V5.2 (or V5.2 release 1) interface and growing the subscribers on the new interface.

Upgrade from V5.2 release 1 to V5.2 interface

The steps required to grow a V5.2 release 1 interface to a V5.2 interface are shown in the ***procedure for V5 interface growth***.

Add new type of subscriber

The ***procedure for V5 interface growth*** also shows what needs to be done to add ISDN (resp. PSTN) subscribers to a interface that previously only consisted of PSTN (resp. ISDN) subscriber. The V5 interface does not need to be taken out of service for this, so the procedure can started at step 7.

Changing ISCNs or LCCs

Update on the LINKS list on V5ITF form are handled in order of communication channels 1 to 3 and links 1 to 16 (from left to right and from top to bottom). This is important when moving ISCNs or LCCs. to positions earlier in the list. A move to an earlier position actually are two operations. First an update operation to delete the ISCN or LCC from the position and then an update to insert the ISCN or LCC to the new position.

Moves to a position later on the list, can be handled in one update of the V5ITF form.

(Continued on next page)

V5 interface change or upgrade (Continued)

Procedure for V5 interface growth

Use the following procedure for updating a V5.2 release 1 interface to V5.2 interface and to add PSTN or ISDN subscribers to the V5 interface.

Step	Action	Result
1	Take the V5.2 release 1 interface out-of-service.	The RMV-V5IF report is printed
2	On V5ITF, update the V5 VERSION parameter from V5.1P to V5.2	
3	Do more links need to be defined?	a. If **No**, continue with Step 4. b. If **yes**, go to Step 5.
4	Take the interface (which now is a V5.2 interface) in to service.	The RST-V5IF report is reported. **end of procedure**
5	Define Primary, Secondary link and any additional Regular links that are required	
6	Take the interface in to service.	The RST-V5IF report is reported
7	Do subscribers have to be added?	a. If **No**, end of procedure. b. If **yes**, go to Step 8.
8	Do PSTN subscribers need to be added for the first time?	a. If **No**, go to step 10 b. If **yes**, go to Step 9.
9	Define PSIG LCC on V5ITF	
10	Define PSTN V5 subscribers	Refer to "Define subscriber ports"
11	Do ISDN subscribers need to be added for the first time?	a. If **No**, go to step 13 b. If **yes**, go to Step 12.
12	Define C-paths for ISDN signaling or packet data on V5PTH.	
13	Define ISDN V5 subscribers	Refer to "Define subscriber ports"
14	End of procedure	

V5.2 Startup scenario

V5 interface startup

The V5 interface startup is used to bring a V5 interface into an operational state. The startup procedure can be performed by system management of both the AN and LE.

Reasons for V5 interface startup

The V5 interface startup procedure is performed:

- during system initialization of the LE
- when the V5 interface is taken into service
- upon recovery of the V5 interface
- in case of excessive datalink failures.

V5.2 interface startup phases

The general interface startup consists of a number of phases

- Datalink establishment procedure
- Link alignment procedure (V5.2 only)
- Variant and ID exchange
- Link Identification procedure (optional for V5.2 only)
- PSTN restart procedure (optional)
- Accelerated alignment procedure (V5.2 only)

The example shown here is the startup of a V5.2 interface which includes PSTN subscribers. When no PSTN is provisioned, the PSTN restart procedure can be omitted.

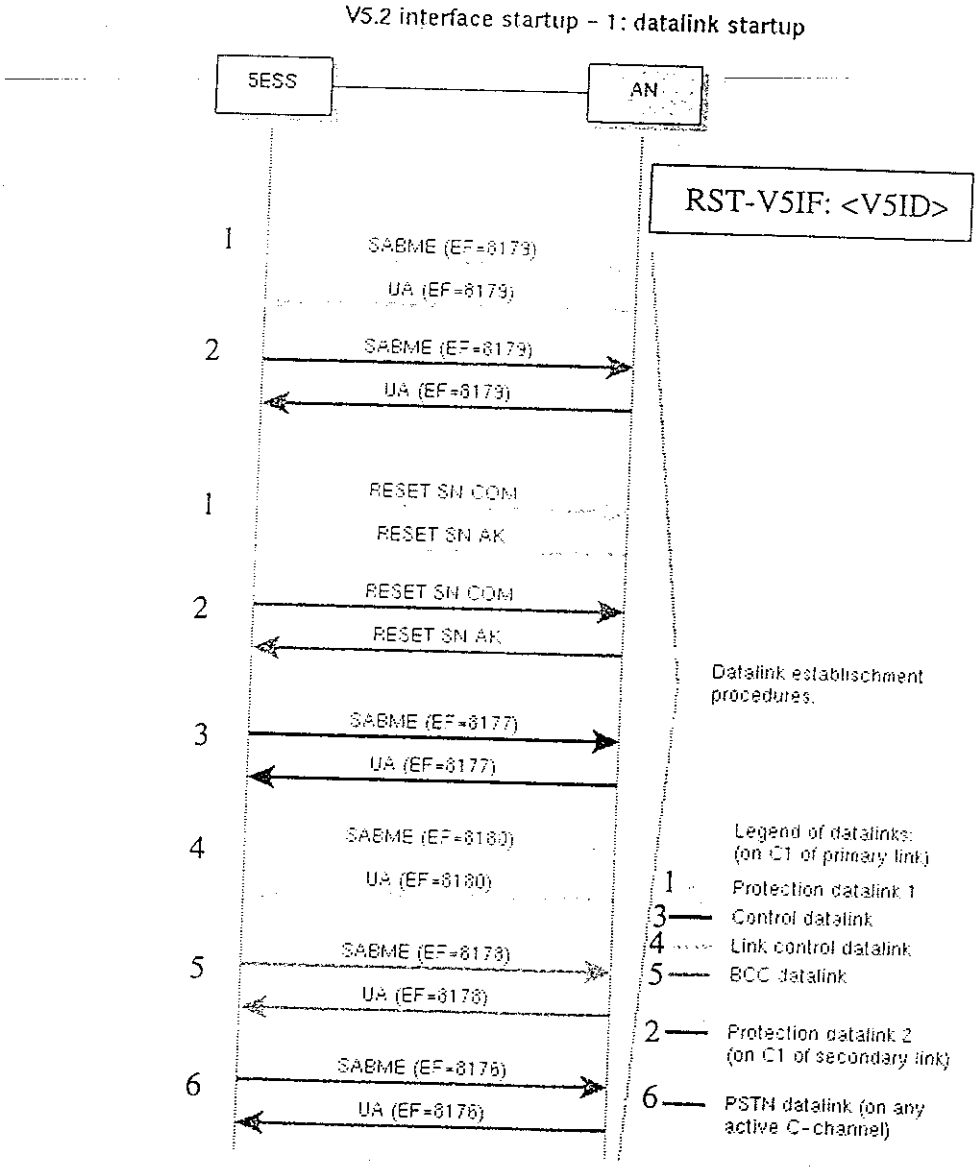
Please note that for the V5.1 and V5.2 release 1 interfaces the Link Identification procedure is not executed.

(Continued on next page)

V5.2 Startup scenario (Continued)

Datalink establishment procedure

In the first stage of a V5.2 interface startup or restart the different datalinks are started using SABME messages containing the EF addresses corresponding with those datalinks



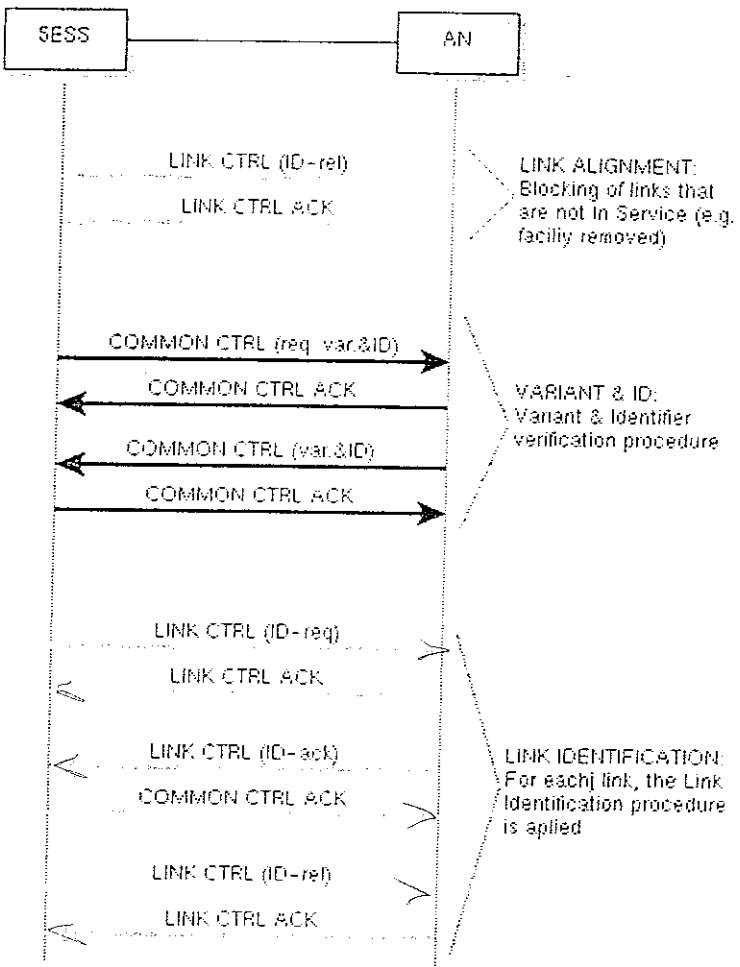
(Continued on next page)

V5.2 Startup scenario (Continued)

Link Alignment, Variant&ID and link identification

In the second stage of the V5.2 interface startup, links are aligned. After that it is checked that at both AN and LE, the V52 variant and the V5 identifier are identical. When those checks are successful, the link identification procedure is started to ensure there is no mismatch between the ends of the links.

V5.2 interface startup – 2: link alignment, V&ID and link identification



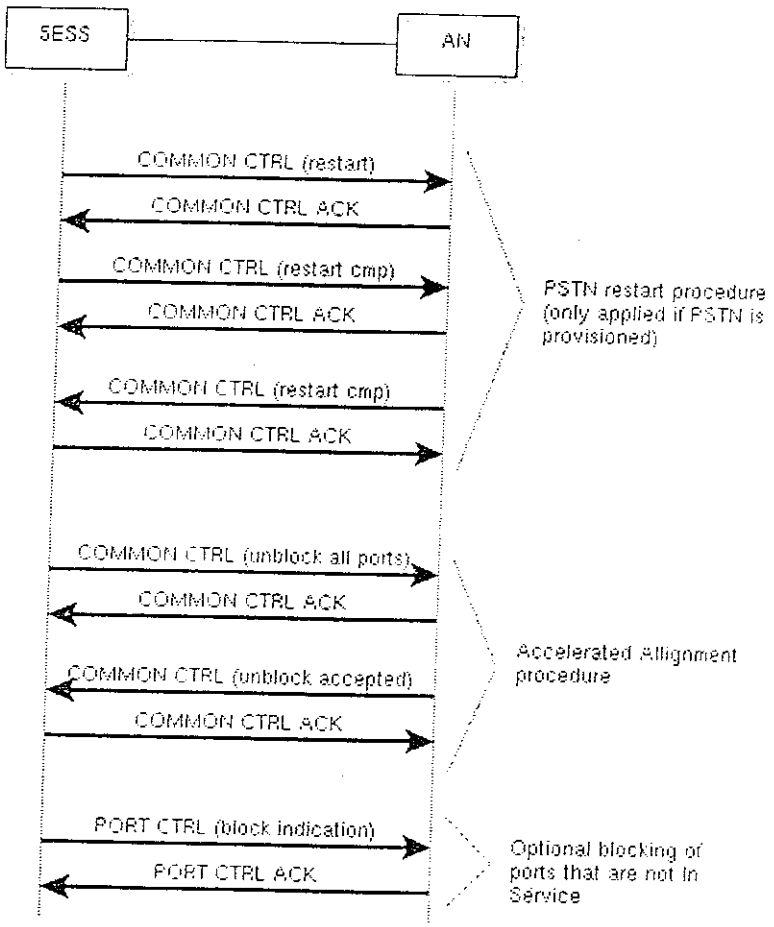
(Continued on next page)

V5.2 Startup scenario (Continued)

PSTN Restart and accelerated alignment

The final stage in the V5.2 interface startup consists of the PSTN restart procedure (if PSTN is provisioned). The accelerated alignment procedure is used to unblock all ports without exchanging messages for each port individually. Finally it is possible to block any ports that are not in service. This last stage concludes the V5.2 interface startup and the V5.2 interface is now operational.

V5.2 interface startup – 3: PSTN restart and accelerated alignment

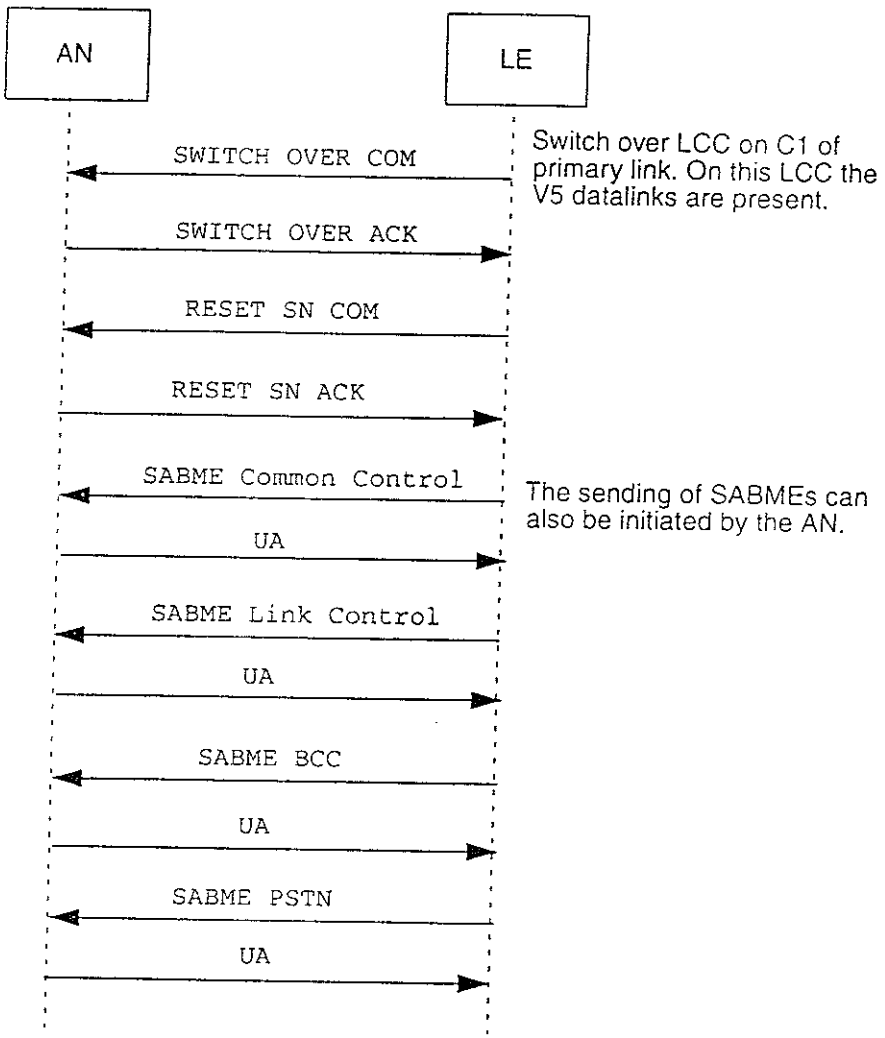


Interface operational

Switch over scenario

Switch over scenario

The following scenario shows the messages that are transmitted between AN and LE for a regular switch-over scenario. Shown is a startup on the secondary link in case of the failure of the protection datalink on the primary link. It also shows events and reports leading up to the switch-over.



(Continued on next page)

Switch over scenario (Continued)

Events and reports related to switch over

1. Active Communication channel becomes not operational.

```
+++ NBG-V5-ID 26-05-98 15:11:50 MTCE 5563 #070277 >
*C REPT V5 ERROR - INTERFACE ID=205 LCC=1
   LCC NOT OPERATIONAL
END OF REPORT #070277 ++-
```

2. Protection datalink on primary goes out of service.

```
+++ NBG-V5-ID 26-05-98 15:11:54 MTCE 5381 #070278 >
   REPT V5 INTERFACE ID 205 -
   LAYER 2 PROTECTION PROTOCOL 1 DL OOS
END OF REPORT #070278 ++-
```

3. There still is the protection datalink on the secondary link to transfer protection information.
4. The V5 protocol messages are now exchanged between AN and LE. Refer to the switch-over scenario shown previously.

(Continued on next page)

Switch over scenario (Continued)

Events and reports related to switch over (continued)

5. After the RESET SN ACK message the LCC is switched.

```
+++ NBG-V5-ID 26-05-98 15:12:35 MTCE 5551 #070287 >
   REPT V5 - INTERFACE ID=205 LCC=1
   SWITCH OVER TO CC=C1 ON LINK ID=61 COMPLETED
END OF REPORT #070287 ++-
```

One can check this by lst-v5cc:v5id;), re-establish all V5 datalinks.

```
M  ORIGINATING COMMAND # = 000163.0009
LST V5CC ID=205
LINKID CC ACTIVE/STANDBY LCC   DEN              STATUS
60     C1 STANDBY             DEN=1-2-6-16     OPERATIONAL
61     C1 ACTIVE          1   DEN=1-2-6-48     OPERATIONAL
REPORT COMPLETED
```

6. LCC1 is operational.

```
+++ NBG-V5-ID 26-05-98 15:12:39 MTCE 5550 #070288 >
   REPT V5 - INTERFACE ID=205 LCC=1 LCC OPERATIONAL
END OF REPORT #070288 ++-
```

V5 Interface MML Commands

MML commands for V5 interface

The following MML commands are available for the V5 interface. For more information on the parameters of the commands, refer to the 5CR manual.

MML command	Description
OPST-V5IF: ID=a;	Outputs the status of a V5 interface. Also shows ISDN or PSTN is degraded and whether the datalinks are in service.
RMV-V5IF: ID=a [,MODE=b];	Removes a V5 interface from service.
RST-V5IF: ID=a [,LID=b] [,OP=c]	Restores a V5 interface to service.
STP-V5IF: ID=a;	Force the current restore or remove procedure to stop.

MML commands for V5 links

The following MML commands are available for V5 links. For more information on the parameters of the commands, refer to the 5CR manual.

MML command	Description
OPST-V5LK: ID=a, LINKID=b;	Outputs the status of a dynamically assigned bearer channel on the V5 interface.
OPLST-V5LK: ID=a;	Outputs the status of the bearer channels of the links of a V5 Interface.
RMV-V5LK: ID=a, LINKID=b;	Removes a V5 link from service.
RST-V5LK: ID=a, LINKID=b;	Restores a V5 link to service.
ST-V5LID: ID=a [,LINKID=b];	Starts a link identification procedure for either a specific link or for all links of the V5 interface specified.

(Continued on next page)

V5 Interface MML Commands (Continued)

MML commands for V5 communication channels

The following MML commands are available for V5 communication channels. For more information on the parameters of the commands, refer to the 5CR manual.

MML command	Description
SW-V5LCC: ID=a, LCC=b [,LINKID=c, CC=d] [,OVERRULE=e];	Forces a LCC (logical communication channel) to switch to another communication channel. For example to switch V5 datalinks to the secondary link.
OP-V5CC: [ID=a] [,LINKID=b, CC=c] [,LCC=d] [,DEN=e];	Requests a report providing information for a specific CC (communication channel).
LST-V5CC: ID=a [,LINKID=b];	Outputs list of the status of the communication channels on all links or on a specific link.

(Continued on next page)

V5 Interface MML Commands (Continued)

V5 commands for V5 subscriber ports

The following commands are used to obtain information about or to manipulate V5 PSTN or ISDN subscribers.

MML command	Description
RST-V5LN: {V5USP=w-x|V5DSL=w-y} [,CH=o][,MODE=UCL] [,STATE=p][,QUAL=q] [,OPRESTN=r][,SUPINF=s];	Restores a V5 user port, given its V5 interface identifier, subscriber address or digital subscriber address.
RMV-V5LN: {V5USP=w-x|V5DSL=w-y} [,CH=o][,MODE=UCL] [,STATE=p][,QUAL=q] [,OPRESTN=r][,SUPINF=s];	Removes a V5 user ports, given its V5 interface identifier, subscriber address or digital subscriber address.
OP-V5LN: {V5USP=a-b|V5DSL=a-c};	Outputs the status of a V5 subscriber, given its V5 interface identifier, subscriber address and digital subscriber address.
OPST-V5LN: {V5USP=a-b|V5DSL=a-c};	Outputs the status of a specific V5 user port.
OPLST-V5LN: ID=z [,FORM=FULL] [,STATE=a][,QUAL=b] [,OPRESTN=c][,SUPINF=d] [,MODE=e];	Outputs the status of the members of a V5 interface.
OPCNV-V5LN: {V5USP=a-b|V5DSL=a-c};	Obtains translation information for a V5 User Port or DSL. No physical location will be printed for this type of port since it does not reside on the switch.
TRC-UTV5: V5USP=a-b	Traces a V5 user port.
TRC-UTV5D: V5DSL=a-c	Traces a V5 ISDN port.

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V5 Interface MML Commands (Continued)

PSTN and ISDN V5 subscribers are referred to using V5USP and V5DSL respectively. To show how the V5 subscribers are referred to in the MML commands the OP-V5LN report is shown.

```
OP-V5LN:{V5USP=a-b|V5DSL=a-c}
```

The parameters that are used are shown below.

Parameter	Description
V5USP	V5 analog user port
V5DSL	V5 ISDN user port
a	V5 interface identifier (0 - 65534)
b	V5 subscriber address (0 - 32766)
c	V5 digital subscriber address (0 - 8175)

Diagnose And Clear Trouble In V5 Interface

Reason for execution of procedure

The procedures must be executed when the restoring of the V5 interface is not successful.

The successful restoring of a V5 interface is indicated by either a RST V5IF COMPLETED report (the result of an RST-V5IF command) or a REPT V5 INTERFACE IN SERVICE (the result of spontaneous recovery such as an SM recovery or AN fault).

If restoral fails, a report with the failure reason is printed. Refer to the 5CR manual for an explanation of the report.

Diagnose and clear trouble in V5 interface procedure

To solve problems that might occur on a V5 interface, the following procedure must be followed.

Step	Action	Result
1	Type: OPST-V5IF: ID=a;	The OPST-V5IF report is printed, giving the status of the V5 interface.
2	Is the only status INTERFACE=OPERATIONAL ?	a. If **yes**, end of procedure b. If **no**, continue with next step.
3	Check the statuses of the OPST-V5IF report	Execute the corrective actions indicated in ***"OPST-V5IF statuses"***
4	Type: OPLST-V5LK: ID=a;	The OPLST-V5LK report is printed. The statuses of the V5 links are given.
5	Is the only status IS LINKS ?	a. If **yes**, end of procedure b. If **no**, continue with next step.
6	Check the other statuses of the OPLST-V5LK report	Execute the corrective actions indicated in ***"OPST-V5LK statuses"***
7	Type: LST-V5CC;	The LST-V5CC report is printed.

Step	Action	Result
8	Does the report only indicate OPERATIONAL Communication Channels	a. If **yes**, end of procedure b. If **no**, continue with step 11.
9	Check the status of facilities that are used for the V5 interface. For facilities that are OOS, enter: RST-FAC: UNIT=a-b-c-d	The RST-FAC report is printed.
10	Is the V5 facility restored to service?	a. If **yes**, continue with step 11. b. If **no**, diagnose the hardware, refer to 5MP/4005 chapter 6 and repeat from step 1. End of procedure
11	Type: OPST-DTRK: DEN=a-b-c-d;	The OPST-DTRK report is printed. The status of the D-trunk is given.
12	Is the status of the D-trunk IS ?	a. If **yes**, end of procedure ⇛ NOTE: The layer 2 datalink is down, V5 will continue to attempt to recover the datalink. b. If **no**, diagnose and clear trouble in the D-trunk. Refer to 5MP/4005, chapter 10.

(Continued on next page)

Diagnose And Clear Trouble In V5 Interface (Continued)

OPST-V5IF statuses

The following statuses might be the result of the OPST-V5IF command. Depending on the status action needs to be taken to solve the problem. The steps mentioned in the table refer to the steps in the *Diagnose and clear trouble in V5 interface procedure*.

If OPST-V5IF STATUS is:	Then:
INVALID V5ID	Re-enter the RST-V5IF command with the correct Interface ID and repeat from step 1 of the *Diagnose and clear trouble in V5 interface procedure*
INTERFACE MANUALLY REMOVED	Execute RST-V5IF and repeat from step 1 of the *Diagnose and clear trouble in V5 interface procedure*
MANUAL REMOVE IN PROGRESS	The interface is being removed from service by the craft. Upon successful removal, execute RST-V5IF and repeat from step 1 of the *Diagnose and clear trouble in V5 interface procedure*
MANUAL RESTORE IN PROGRESS	The interface is being restored from service by the craft. Upon successful restoral, execute RST-V5IF and repeat from step 1 of the *Diagnose and clear trouble in V5 interface procedure*
LINK IDENTIFICATION IN PROGRESS	If this link status persists for one or more links on the interface, go to step 4.
NOT ALL LINKS IS	Go to step 4.
PRIM AND SEC LINK OOS	Go to step 4.
LINK OOS	Go to step 4.

If OPST-V5IF STATUS is:	Then:
LVL2ERR PP1	Go to step 7.
LVL2ERR PP2	Go to step 7.
LVL2ERR CTRL [ISDN]	Go to step 7.
LVL2ERR BCC	Go to step 7.
LVL2ERR PSTN	Go to step 7.
LVL2ERR LC	Go to step 7.
LVL3ERR PSTN	Execute RST-V5IF, OP=RESTART and go to step 7.
NOT ALL LCCS IS	Go to step 7.
NOT ALL STBY CCS IS	Go to step 7.
PSTN DEGRADED	Go to *Clear trouble in PSTN subscriber ports procedure*
ISDN DEGRADED	Go to *Clear trouble in ISDN subscriber ports procedure*

(Continued on next page)

Diagnose And Clear Trouble In V5 Interface (Continued)

OPLST-V5LK statuses

The following statuses might be the result of the OPST-V5LK command. Depending on the status, action needs to be taken to solve the problem

If OPLST-V5LK STATUS is:	Then:
REMOVE IN PROGRESS	Wait for the remove to complete, execute RST-V5LK for the link and repeat from step 1.
OOS BLOCKED BY AN	Check Access Network side Repeat from step 1.
OOS FACILITY REMOVED	The FACILITY is removed, go to step 9. Check the CGA status on the link.
OOS HWFAIL	Diagnose the hardware, refer to 5MP chapter 6. Repeat from step 1.
OOS LINK IDENTIFICATION FAILED	Check if the Link IDs used by the LE are the same as the Link IDs used by the AN. If the Link IDs are different, update them at the 5ESS®-2000 side on the V5ITF view, or at the AN. If the Link IDs are the same, check the wiring of the links between the LE and the AN. When the problem is resolved, execute the RST-V5LK command and wait for the LINK IDENTIFICATION IN PROGRESS message to disappear from the output of the OPST-V5IF commands or restart the link identification procedure by executing the ST-V5LID command. Repeat from step 1.
OOS BLOCKED BY LE	Restore the link by executing the RST-V5LK command and continue with step 4.
LINK STOPPED	The link is stopped because the interface is being removed. Execute the RST-V5LK command and go to *Diagnose and clear trouble in V5 interface procedure*.

(Continued on next page)

Diagnose And Clear Trouble In V5 Interface (Continued)

Clear trouble in PSTN subscriber ports procedure

Use this procedure to clear trouble in the V5 PSTN Subscriber Ports.

Step	Action	Result
1	Type: **OPST-V5IF:ID=<V5 identifier>;**	The OPST-V5IF report is printed.
2	Is the status of the OPST-V5IF message PSTN DEGRADED?	a. If **yes**, continue with Step 3. b. If **no**, go to Step 4.
3	Type: **RST-V5IF:ID=<V5 identifier>;**	V5 INTERFACE SUSCRIBER UNBLOCKING COMPLETED or LAYER 3 PSTN PROTOCOL RESTART COMPLETED is printed. ⇒ NOTE: If LVL3ERR PSTN was also reported in the OPST-V5IF report, execute: RST-V5IF: ID=a, OP=RESTART;
4	Type: **OPLST-V5LN:ID=<V5 identifier>;**	The OPLST-V5LN report is printed.
5	Are all V5 PSTN subscriber ports in service?	a. If **yes**, end of procedure. b. If **no**, continue with Step 6.
6	What is the status of the V5 PSTN subscriber?	a. **OOS BLKD AN**, refer to AN maintenance personel. b. **OOS MTCE V5**, refer to *Diagnose and clear trouble in V5 interface procedure.* c. For other conditions, refer to 5MP4005, Chapter 14

(Continued on next page)

Diagnose And Clear Trouble In V5 Interface (Continued)

Clear trouble in ISDN subscriber ports procedure

Use this procedure to clear trouble in the V5 ISDN Subscriber Ports.

Step	Action	Result
1	Type: **OPST-V5IF:ID=<V5 identifier>;**	The OPST-V5IF report is printed.
2	Is the status of the OPST-V5IF message ISDN DEGRADED?	a. If **yes**, continue with Step 3. b. If **no**, go to Step 4.
3	Type: **RST-V5IF:ID=<V5 identifier>;**	The RST-V5IF report is printed at the ROP.
4	Type: **OPLST-V5LN:ID=<V5 identifier>;**	The OPLST-V5LN report is printed at the ROP
5	Are all V5 ISDN subscriber ports in service?	a. If **yes**, end of procedure. b. If **no**, continue with Step 6.
6	What is the status of the V5 ISDN subscriber?	a. For explanation of D-channel status OOS BLKD AN, refer to AN maintenance personnel. b. For explanation of D-channel status OOS MTCE V5, refer to *Diagnose and clear trouble in V5 interface procedure.* c. For explanation of B-channel statuses and other report parameters, refer to 5CR/2065.

Traffic Measurements

Traffic measurements for V5 interface

For the V5 interface a number of traffic measurements have been defined.

1. V5 Interface report (V5)
2. V5 Communication Channel report (V5CC)
3. ISDN BRA traffic report for V5 Interface (V5BRA)

V5 Traffic measurement commands

The following MML commands are used to retrieve the different type of V5 traffic measurement reports:

To retrieve:	Use MML command:
V5	OP-TRFV5: RPT=a, ID=b;
V5	OP-TRRV5: RPT=a, ID=b, TIME=c;
V5CC	OP-TFVCC: RPT=a, CC=b-c;
V5CC	OP-TRVCC: RPT=a, CC=b-c, TIME=d;
V5BRA	OP-TFVEN: RPT=a, VEN=b-c;
V5BRA	OP-TRVEN: RPT=a, VEN=b-c, TIME=d;

(Continued on next page)

Traffic Measurements (Continued)

V5 Interface report

The V5 Interface report provides measurements for a specific V5 Access Network per V5 Interface Identifier. The report is provided in the C-interval.
The OP-TRFV5 command retrieves the last collection interval.
The OP-TRRV5 command retrieves the same report for a specific time interval.

```
OP TRFV5 V5                                              PART a OF b
DATE          c          ID       START       END
PROGRAM                  d          e          f
PERIOD                   g          h          i
INTERVAL                 j          k          l
                         DATA {IS VALID|MAY BE INVALID [m]}
V5 INTERFACE REPORT
V5ID     V5PSTNOC  V5PSTNTC  V5PSTNOM  V5PSTNTM V5PCTRL  V5CCTRL
n        o         p         q         r        s        t

V5ID     V5ISDNOC  V5ISDNTC  V5ISDNERR V5BCC    V5BCCBLO V5BCCERR
n        u         v         w         x        y        z

V5ID     V5L3PERR  V5CCTRLER V5PCTRLER V5IFERR
n        aud       bud       cud       dud
```

Parameters

The TRFV5 report parameters can be divided in the following categories.:

Category	Parameters	Description
General information	a - n	These parameters give information on which report is printed, number of pages it consists of and period and times related to this report. Also the V5 identifier is listed
Number of successes	o - v, x	Number successful calls originating/ terminating on the V5 interface and number of successful send messages.
Number of errors	w, y, z, aud - hud	Number of errors in protocol messages or allocation of timeslots.

(Continued on next page)

Traffic Measurements (Continued)

V5 Communication Channel report

The V5 Communication Channel report provides measurements for a specific V5 Access Network per V5 Communication Channel.
The OP-TFVCC command retrieves the last collection interval.
The OP-TRVCC command retrieves the same report for a specific time interval

```
OP TFVCC V5CC                                        PART a OF b
DATE          c          ID      START      END
PROGRAM                  d         e         f
PERIOD                   g         h         i
INTERVAL                 j         k         l
                         DATA {IS VALID|MAY BE INVALID [m]}
V5 COMMUNICATION CHANNEL REPORT
V5ID      CC        V5CBYTEX V5CBYTER V5COCCX  V5COCCR
n         o         p        q        r        s

V5ID      CC        V5CEFERR V5CDLERR
n         o         t        u
```

Parameters

The parameters of the OP-TFVCC report can be divided in 3 categories that are listed in the next table:

Category	Parameters	Description
General information	a - o	These parameters give information on which report is printed, number of pages it consists of and period and times related to this report. Also the V5 identifier an communication channel identifier is listed
Number of successes	p - s	Number successful transmitted and received bytes, occupancy level
Number of errors	t, u	Number of LAPV5, control, or data errors detected on V5 communication channel.

(Continued on next page)

Traffic Measurements (Continued)

ISDN BRA traffic report for V5 interface

The V5 Interface report provides measurements for a specific V5 Access Network per V5 Interface Identifier. The report is a component report provided in the C-interval.
The OP-TFVEN command retrieves the last collection interval.
The OP-TRVEN command retrieves the same report for a specific time interval.

```
OP TFVEN V5BRA                                        PART a OF b
DATE        c          ID      START      END
PROGRAM                d         e         f
PERIOD                 g         h         i
INTERVAL               j         k         l
                       DATA {IS VALID|MAY BE INVALID {m}}
                       n
                       AVG 100_SECOND SCAN o
BASIC RATE ACCESS REPORT FOR V5 INTERFACE

          ORIGINATING                              TERMINATING

VEN       USAGE    SEIZE    ATTMPTS ANS      USAGE    ATTMPTS ANS
p         q        r        s        t       u        v       w

                      CIRCUIT MODE ORIGINATING

          SPEECH             64 kbps          3.1 kHz AUDIO

VEN       ATTMPTS USAGE    ATTMPTS USAGE    ATTMPTS USAGE
p         x       y        z       aud        bud      cu

          UDI-T/A

VEN       ATTMPTS USAGE
p         dud       eud
```

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Traffic Measurement (Continued)

Traffic event report

The OP-TRFV5 EVENT report makes a late acknowledgment of the OP-TRFV5 command to obtain traffic reports from the last collection interval.

```
OP TRFV5 a EVENT b c [d]
```

Parameters

The following parameters are used:

Parameter	Description
a	V5 - V5 interface report.
b	Event number.
c	Disposition of request: (NG, RL)
d	V5 interface identifier.

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Traffic Measurement (Continued)

Communication Channel event report

The OP-TFVCC EVENT report makes a late acknowledgment of the OP-TFVCC command to obtain traffic reports from the last collection interval.

```
OP TFVCC a EVENT b c [d e]
```

Parameters

The following parameters are used:

Parameter	Description
a	a V5CC - V5 communication channel report.
b	Event number.
c	Disposition of request: (NG, RL)
d	V5 interface identifier.
e	V5 communication channel identifier.

(Continued on next page)

Appendix A: Terminology

Terms

The following table explains the terms used with regard to the V5 interface.

NOTE:
The term V5 refers to (general) principles, terms or concepts that do not depend on the type of V5 interface, but are the same for both V5.1 and V5.2 interfaces.

Active C-channel	Physical C-channel which is currently carrying a logical C-channel. An active C-channel becomes a standby C-channel when it is not carrying a logical C-channel.
AN	Access Network, a system implemented between the Local Exchange (LE) and the user, replacing (part of) the local distribution network.
BCC protocol	Bearer Channel Connection protocol which allows the LE to instruct the AN to allocate bearer channels, either singly or in multiples, on demand.
B-channel	V5 bearer channel, a 64 kbit/s time slot on a digital facility carrying traffic from an ISDN or PSTN subscriber.
C-channel	Communication channel, a 64 kbit/s time slot on a V5 interface provisioned to carry communication paths.
C-path	Communication path, layer 2 datalink carrying PSTN signaling messages, Control protocol, ISDN data from one or more user ports, BCC protocol (not V5.1), Link Control protocol or Protection protocol (V5.2 only).
LAPD	Link Access Protocol for ISDN D-channel
Logical C-channel	Logical Communication channel, group of one or more C-paths, all of different types (excluding C-path for the Protection protocol).
Physical C-channel	Physical Communication channel, a 64 kbit/s time slot on a V5 interface which has been assigned for carrying logical C-channels. A physical C-channel may not be used for carrying bearer channels.

Primary Link	2,048 kbit/s link in a multilink V5.2 interface whose physical C-channel in time slot 16 carries a C-path for the protection protocol and on V5.2 initialization, also the C-path for the control protocol, link control and BCC protocol. Other C-paths may also be carried in the time slot 16.
Protection Group	a group of physical C-channels, that act as standby C-channels for logical C-channel.
Secondary Link	2,048 kbit/s link in a multilink V5.2 interface whose time slot 16 carries a C-path for the protection protocol and on V5.2 initialization, acts as the standby C-channel for the control protocol, link control and BCC protocol and any other C-paths initially carried in the time slot 16 of the primary link.
Standby C-channel	a physical C-channel which is not carrying a logical C-channel, but is used for the protection of logical C-channels. Once it is used to carry a logical C-channel, a standby C-channel becomes an active C-channel.

Appendix B: ETSI Standards for V5 interfaces

Standards

The V5 standards are described in the following ETSI (European Telecommunications Standards Institute) standards.

ETS 300 324-1	Signaling Protocols and Switching (SPS) V interfaces at the digital Local Exchange (LE) V5.1 interface for the support of Access Network (AN) Part 1: V5.1 interface specification
AMENDMENT ETS 300 324-1	Amendment to ETS 300 324-1 Signaling Protocols and Switching (SPS) V interfaces at the digital Local Exchange (LE) V5.1 interface for the support of Access Network (AN) Part 1: V5.1 interface specification
ETS 300 347-1	Signaling Protocols and Switching (SPS) V interfaces at the digital Local Exchange (LE) V5.2 interface for the support of Access Network (AN) Part 1: V5.2 interface specification
AMENDMENT ETS 300 347-1	Amendment to ETS 300 347-1 Signaling Protocols and Switching (SPS) V interfaces at the digital Local Exchange (LE) V5.2 interface for the support of Access Network (AN) Part 1: V5.2 interface specification

The electrical and physical characteristics of the interface (layer 1) conform to the International Telecommunications Union, sector Telecommunication (ITU-T) recommendations G.703 and G.704.

Appendix C: Overview differences V5.1 and V5.2

Differences

The following table summarizes the most important differences and resemblances between the V5.1 and V5.2 interfaces.

Characteristic	V5.1 interface	V5.2 interface
facilities	one 2,048 kbit/s link	up to 16 2,048 kbit/s link
concentration	No	Yes
Timeslots for physical C-channels	C1 = TS16, C2 = TS15 C3 = TS31	C1 = TS16, C2 = TS15 C3 = TS31
timeslot allocation	static allocation	dynamic allocation
C-path protection	No	Yes
ETSI standards	— ETS 300 324-1 — amendment to ETS 300 324-1	— ETS 300 347-1 — amendment to ETS 300 347-1
Common Control protocol	Yes	Yes
Port Control protocol (ISDN+PSTN)	Yes	Yes
Bearer Channel Connection protocol	No	Yes
Link Control Protocol	No	Yes
Protection protocol	No	Yes