Part No. 214280-C Rev 00
March 2004

4555 Great America Parkway
Santa Clara, CA 95054

Implementing ISDN-PRI QSIG on Passport 4460

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Preface

This document provides reference material for implementing QSIG features in Passport 4460 systems.

Text conventions

This guide uses the following text conventions:

angle brackets (< >)	Indicate that you choose the text to enter based on the description inside the brackets. Do not type the brackets when entering the command. Example: If the command syntax is `ping <ip_address>`, you enter `ping 192.32.10.12`
`bold Courier text`	Indicates command names and options and text that you need to enter. Example: Use the **`dinfo`** command. Example: Enter **`show ip`** {**`alerts`**|**`routes`**}.
braces ({})	Indicate required elements in syntax descriptions where there is more than one option. You must choose only one of the options. Do not type the braces when entering the command. Example: If the command syntax is `show ip {alerts|routes}`, you must enter either `show ip alerts` or `show ip routes`, but not both.
brackets ([ ])	Indicate optional elements in syntax descriptions. Do not type the brackets when entering the command. Example: If the command syntax is `show ip interfaces [-alerts]`, you can enter either `show ip interfaces` or `show ip interfaces -alerts`.

ellipsis points (. . .)	Indicate that you repeat the last element of the command as needed. Example: If the command syntax is `ethernet/2/1 [<parameter> <value>]...`, you enter `ethernet/2/1` and as many parameter-value pairs as needed.
italic text	Indicates new terms, book titles, and variables in command syntax descriptions. Where a variable is two or more words, the words are connected by an underscore. Example: If the command syntax is `show at <valid_route>`, `valid_route` is one variable and you substitute one value for it.
`plain Courier text`	Indicates command syntax and system output, for example, prompts and system messages. Example: `Set Trap Monitor Filters`
separator (>)	Shows menu paths. Example: Protocols > IP identifies the IP command on the Protocols menu.
vertical line (|)	Separates choices for command keywords and arguments. Enter only one of the choices. Do not type the vertical line when entering the command. Example: If the command syntax is `show ip {alerts|routes}`, you enter either `show ip alerts` or `show ip routes`, but not both.

Product documentation

The Passport 4400 product documentation is delivered on the product CD and is also available from Nortel Networks* Web site (www.nortelnetworks.com).

Refer to the release notes (*Passport 4400 Release Notes for Release x.x*) for a list of available manuals for the product release you are using.

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Technical Solutions Center	Telephone
North America	(800) 4NORTEL or (800) 466-7835
Europe, Middle East & Africa (EMEA)	00800-8008-9009
Sydney, Australia	61-2-8870-8800
China	(800) 810-5000
Tokyo, Japan	0120-382-533
Asia Pacific	(61) (2) 9927-8800



Note: Additional and updated information for the Nortel Networks Technical Solutions Centers is available from the www.nortelnetworks.com/help/contact/global URL.

An Express Routing Code (ERC) is available for many Nortel Networks products and services. When you use an ERC, your call is routed to a technical support person who specializes in supporting that product or service. To locate an ERC for your product or service, go to the http://www.nortelnetworks.com/help/contact/erc/index.html URL.

Acronyms and definitions

This guide uses the following acronyms and definitions:

ANF	Additional Network Feature
BRI	Basic Rate Interface
CLI	Command Line Interface
CSS	Common Channel Signaling
DSS1	Digital Subscriber Signalling 1
ECMA	European association for standardizing information and communication systems
ETS	European Telecommunication Standard
ETSI	European Telecommunication Standards Institute
GF	Generic Functions
GUI	Graphical User Interface.
MVP	Multipurpose Voice Platform
PINX	Private Integrated services Network Exchange: a generic term used to cover various types of corporate networking equipment such as PBX, CENTREX, and so forth.
PRI	Primary Rate Interface
PSS1	Private Signaling System 1

Chapter 1
QSIG Overview

This chapter presents an overview of the QSIG functionalities that are available for use in Passport 4460 networks.

Topics in this chapter:

- "QSIG – General Overview" on page 13
- "Reference model" on page 14
- "QSIG protocol stack" on page 15

QSIG – General Overview

The QSIG interswitch protocol provides signaling for Private Integrated services Network eXchange (PINX) devices. Using QSIG signaling on a PRI interface, the Passport 4460 can route incoming voice calls from a PINX across a WAN to a Passport 4460, Passport 6400, or Passport 7400, which then transports the signaling and voice packets to a destination PINX. QSIG is an open, international standard supported by the world's leading PBX suppliers

QSIG is based on the ITU-T Q.93x series of recommendations for basic services and generic functions and the Q.95x series for supplementary services. Therefore QSIG ensures a service compatibility between the public ISDN and the private ISDN.

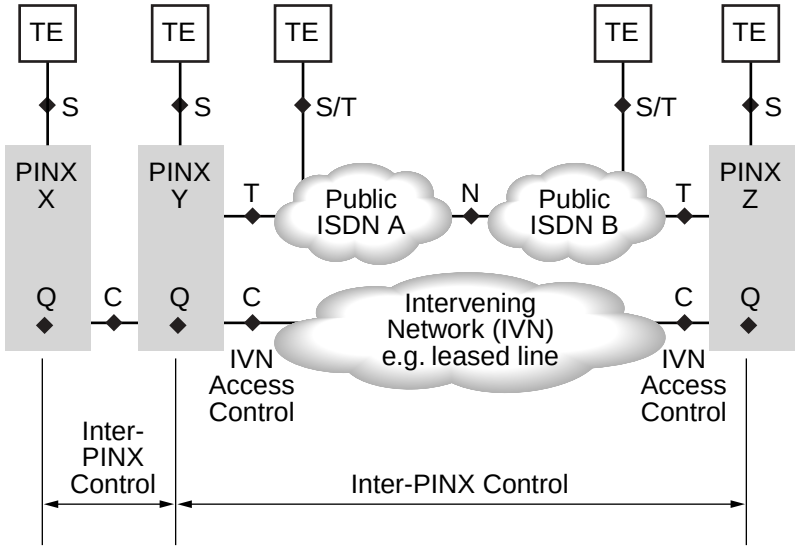
Originally developed in the late 1980s as a protocol to link ISDN PBXs in a private telecommunications network, QSIG has since evolved and found many other important applications. The most important of these currently are:

- Multi-vendor PBX networking
- Attachment of ancillary equipment (e.g., voice mail systems, paging equipment, wireless base-stations) to a PBX network
- Virtual Private Networks (VPN)
- Broadband private networks
- VoIP (H.323) applications

Reference model

The QSIG protocol is used across a virtual or logical interface between two Call Control entities in different PINXs. This is shown in the following “ITU-T ISDN reference model extended for corporate networks” diagram.

ITU-T ISDN reference model extended for corporate networks



The “Q” reference point is the logical signaling point between two PINXs. The physical connection to the PINXs is made at the “C” reference point. The Intervening Network (IVN) and can be either dedicated channels (analog or digital) or switched connections (for VPNs).

Within the public ISDN the two end PINXs are connected through two reference points using different ISDN protocols; namely DSS1 at the “T” reference point and ISUP within the public ISDN at the “N” reference point. For private ISDNs, only one protocol is necessary as the QSIG protocols have sufficient functionality to be used both within the network at transit nodes and on the outside at access nodes. Hence QSIG is used between all three PINXs.

If the “Q” reference point exists at all it is usually internal to a PINX. The only point at which you can physically see or “measure” the QSIG protocol is at the C reference point, which is usually a real interface between a PINX and, for example, a leased circuit.

QSIG protocol stack

The QSIG protocol stack is identical in structure to the DSS1 protocol stack. Both follow the ISO reference model. Both can have an identical layer 1 and layer 2 (LAPD). However, at layer 3 QSIG and DSS1 differ.

<table>
<tr><th>Layers</th><th colspan="2">Standards</th><th>Description</th></tr>
<tr><td>Layers 4 - 7</td><td colspan="2">Application mechanisms</td><td>End-to-end protocols, Network transparent</td></tr>
<tr><td rowspan="3">Layer 3</td><td colspan="2">Multiple standards</td><td>QSIG Procedures for Supplementary Services</td></tr>
<tr><td colspan="2">ETS 300 239, IS11582, ECMA 165</td><td>QSIG Generic Functional (GF) Procedures</td></tr>
<tr><td colspan="2">ETS 300 171/172, IS11574/11572, ECMA 142/143, Q931</td><td>QSIG Basic Call</td></tr>
<tr><td>Layer 2</td><td colspan="2">ETS 300 402, ECMA 141, Q921</td><td rowspan="3">Interface-dependent Protocols</td></tr>
<tr><td>Layer 1</td><td>Basic Rate Access
ETS 300 001
I430</td><td>Primary Rate Access
ETS 300 012
I431</td></tr>
<tr><td>Medium</td><td colspan="2">Copper Wire, Optical Fiber, Wireless</td></tr>
</table>

The protocol stack diagram shows the service-independent interface at layers 1 and 2 together with the relevant ITU-T, ECMA and ETSI standards. Because QSIG is defined for a “logical” reference point the protocol stack can be implemented for a variety of physical interfaces.

At layer 3, the protocols for three sub-layers are shown:

- The first sublayer is QSIG Basic Call (BC), which extends the public ISDN access protocol for use in private ISDNs.
- The second sublayer is QSIG Generic Functional procedures (QSIG GF). The QSIG GF protocol provides a standardized mechanism to exchange signaling information for the control of supplementary services and additional network features (ANFs) over a corporate network.

  To support supplementary service operations, the QSIG GF protocol provides a communication mechanism or association between respective application entities which are generally on different nodes. This association may be in the context of a call or it may be for a call independent supplementary service.

  QSIG GF protocol supports both a connection oriented and connectionless transport mechanism for call independent supplementary services and ANFs.
- The third sublayer of layer 3 defines specific QSIG procedures at the Q reference point for individual supplementary services. The list of standards continues to expand as new Supplementary Services are added to the list and standards developed in regional organizations (e.g. ECMA) that progress to become global standards (e.g. ISO/IEC).

Chapter 2
ISDN-PRI QSIG Services on Passport 4460

This chapter describes the QSIG services supported on Passport 4460 units that are provisioned for ISDN-PRI.

Topics in this chapter:

- "Passport 4460 Support for QSIG" on page 17
- "Supported QSIG services" on page 19
- "Services description" on page 20
- "QSIG Data Calls" on page 28

Passport 4460 Support for QSIG

The Passport 4460 unit recognizes the QSIG commands to provide call setup, call tear down, and the channeling of the dialed digits to its counterpart at the remote end. Once communication is established, the B-channels are opened to the flow of two-way voice traffic. When call tear down is requested by the PBX, the associated Passport 4460 unit terminates the call.

Note that Passport 4430 and Passport 4450 support QSIG BRI only, while Passport 4460 supports QSIG PRI and QSIG BRI.

ISDN-PRI QSIG Services Application

The application for this feature is to service the mid-size businesses in the Global marketplace using one or two PRI voice interface(s) to support a complete Enterprise solution that is compatible with the majority of telephone systems sold with a common and standard (non vendor-proprietary) signaling system.

The Passport 4430, Passport 4450, and Passport 4460 BRI solution supports 1 to 4 BRI interfaces with up to 8 voice channels that support sites from 2 to approximately 50 people (depending on call traffic volume). Beginning with release 5.0, this solution on the Passport 4460 PRI (T1/E1) supports from 6 to either 46 or 60 voice channels for sites from that have from 25 to approximately 250 people.

Implementation

The Passport 4460 implementation supports ETSI and ISO Q.SIG protocols on ISDN-PRI interfaces (implemented over T1 or E1 lines) including Basic call, GF call associated messages, and several Supplementary Services consistent with the Passport 6400 features. Primary Rate digital voice support of QSIG implementation supports interoperability with Passport 6400 T1 and E1 MVPe Function Processors as well as the BRI interfaces on the Passport 4460.

The Passport 4460 implementation provides:

- A maximum of two PRI interfaces. (The Passport 4460 has two expansion slots. Existing T1 and E1 modules are used.)
- Ability to handle up to 46 voice channels for T1 links and 60 voice channels for E1 links. These correspond to PRI-ISDN specifications of (23B+D) for T1 and (30B+D) for E1. Each D channel supports a debit of 64Kbit/s.
- T1 and E1 modules are operating in either in NT or TE mode.
- T1 and E1 modules are able to either provide or receive clock.
- Either G711 or G729 can be used as voice profile digitizing rate QSIG calls

For more information

Passport 4400 ISDN BRI services are not addressed in this manual. Refer to the following manuals for information about BRI services:

- *Configuring and Operating the Passport 4400*
- *Reference for Passport 4400 / 6400 Interworking*

Supported QSIG services

Following are the QSIG services supported by the Passport 4460:

Table 1 QSIG services on Passport 4460

QSIG Service Name	ETSI or EN Standard	Notes
QSIG Basic Call	ETS 300 172, 3rd Edition	
Generic Function (GF) Procedures	ETS 300 239, 3rd Edition	
Transport of manufacturer specific information	ETS 300 239, 2nd Edition	
Name Identification	ETS 300 238, 2nd Edition	SS-CNIP and SS-CNOP
Call Diversion	ETS 300 257, 2nd Edition	QSIG-CF. Includes call diversion notification.
Path Replacement	ETS 300 259, 2nd Edition	Includes QSIG re-routing
QSIG Transit Counter	EN 301 301 047/048	Complies with ISO/IEC 15055 and 15056.
Call Offer (CO)	ETS 300 361/362	SS-CO
Call Completion	ETS 300 365/366	SS-CCBS, SS-CCNR
QSIG Segmentation and Reassembly	ETS 300 172, Annex ZA (1995)	
QSIG Calling/connected name identification restriction	ETS 300 237	
QSIG message waiting indicator	EN 301 260/255	SS-MWI
QSIG centralized voice mail	ETS 300 257, ETS 300 239, ETS 301 255 (2nd Edition)	
QSIG configurable cause codes		

Services description

Each of the supported services is described in the following sections:

- "Basic Call functionality" on page 20
- "Generic Functional Procedures (GF encapsulation)" on page 21
- "Transport of manufacturer specific information" on page 22
- "Name Identification (CNIP and CONP)" on page 22
- "Call Diversion Supplementary Service (QSIG-CF)" on page 23
- "Call Diversion Notification" on page 23
- "Path Replacement" on page 24
- "Re-routing" on page 24
- "QSIG Transit Counter" on page 24
- "Call Offer (CO)" on page 24
- "Call Completion" on page 25
- "QSIG Segmentation & Reassembly" on page 25
- "QSIG Calling/connected name identification restriction" on page 25
- "QSIG Message waiting indication" on page 26
- "QSIG Centralized voice mail" on page 26
- "QSIG Configurable cause codes" on page 26

Basic Call functionality

ETS 300 172

Supported services

Basic services supported:

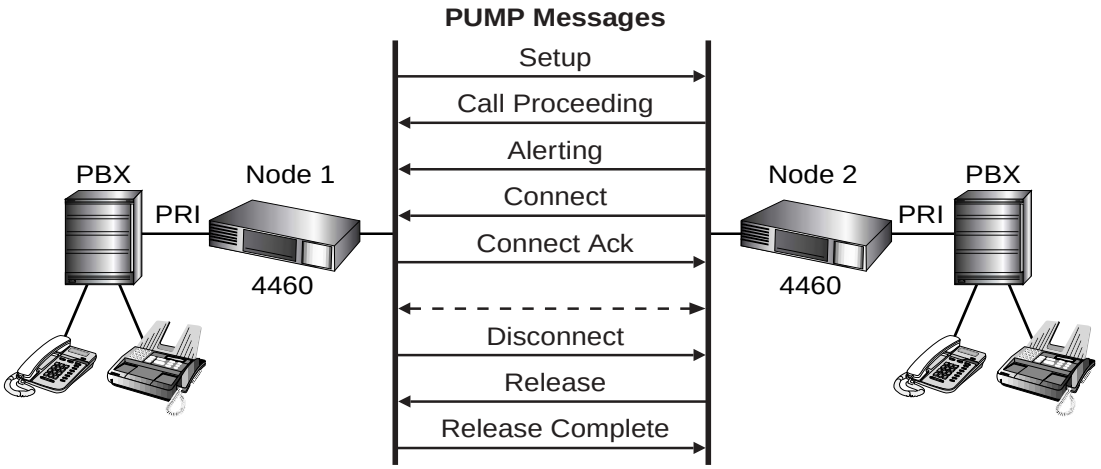
- Circuit-mode 64 kbit/s / 8 kHz structured bearer service category usable for speech information transfer.
- Circuit-mode 64 kbit/s / 8 kHz structured bearer service category usable audio information transfer.

Limitations

- The negotiation of service at call establishment time is not supported.
- The change of service during a call is not supported
- Unidirectional services feature is not supported

Message Sequence Diagram

The following diagram illustrates a simple message sequence using QSIG Basic Call in a Passport 4460 network.



Generic Functional Procedures (GF encapsulation)

ETS 300 239

The generic functional protocol provides the mechanism to exchange signaling information for the control of supplementary services over a PISN. It does not, by itself, control any supplementary service; rather, it provides generic services to specific SS-Control entities. Procedures for individual supplementary services based on these generic procedures are defined in specific standards or may be manufacturer specific. (Facility Message and Information Element)

Transport of manufacturer specific information

ETS 300 239

This feature permits inclusion of non-standard information messages that are specific to a particular design or a particular network. Manufacturer-specific information may exist in the PTN as a result of any of the following:

- Manufacturer-specific supplementary services
- Manufacturer-specific extensions to standardized supplementary services
- Manufacturer-specific notifications

Manufacturer-specific information is identified using Object identifiers. All Manufacturer-specific information must be encoded using codesets 6 or 7 (as described in Annex C of ETS 300 172).

This protocol is offered in conjunction with "Generic Functional Procedures (GF encapsulation)" on page 21.

Name Identification (CNIP and CONP)

ETS 300 238

Services supported:

- Calling Name Identification Presentation (CNIP) is a supplementary service offered to the called user. It provides the name of the calling user (calling party name) to the called user.
- Connected Name Identification Presentation (CONP) is a supplementary service offered to the calling user. It provides to the calling user the following:
- The name of the user who answers the call (connected party name);
- Optionally the name of the alerting user (called party name) and the name of the called that cannot be reached (busy party name).

Call Diversion Supplementary Service (QSIG-CF)

ETS 300 257

Call Diversion supplementary services (SS-DIV) are:

- Call Forwarding Unconditional (SS-CFU),
- Call Forwarding Busy (SS-CFB),
- Call Forwarding No Reply (SS-CFNR) and
- Call Deflection (SS-CD)

SS-CFU, SS-CFB, SS-CFNR and SS-CD permit a served user to have the PISN send all or specific incoming calls addressed to the served user's PISN number to another number.

SS-CFU enables a served user to have the PISN redirect to another user, calls which are addressed to the served user's PISN number.

SS-CFB enables a served user to have the PISN redirect to another user, calls which are addressed to the served user's PISN number and meet busy.

SS-CFNR enables a served user to have the PISN redirect to another user, calls which are addressed to the served user's PISN number, and for which the connection is not established within a predefined period of time.

Call Deflection from Alert (CDA) is covered by the signaling protocol of SS-CFNR,

Call Deflection Immediate (CDI) is covered by the signaling protocol of SS-CFU.

Call Diversion Notification

This facility is offered in conjunction with "Call Diversion Supplementary Service (QSIG-CF)" on page 23.

Path Replacement

ETS 300 259

Path replacement permits an active call's connection through the QSIG network to be replaced by a new connection, such as obtaining a more efficient or cost effective connection. For example, after call transfer any unnecessary “loops” can be eliminated.

Re-routing

Permits a busy call to be re-routed. This facility is offered in conjunction with “Path Replacement” on page 24.

QSIG Transit Counter

EN 301 047/048

The Transit Counter additional network feature (ANF-TC) may be invoked, in conjunction with a call request, when it is desired to limit the number of PINXs that the call can transit. The maximum number of PINXs that the call can transit is network dependent, in the range 1 to 31. If the transit counter exceeds a PISN-specific limit before the call reaches its destination or leaves the PISN, the call will be aborted. The Transit Counter feature complies with ISO/IEC 15055 and 15056.

Call Offer (CO)

ETS 300 361/362

This service permits a calling user to request that the call be offered to the user at a busy destination and that the called user be given the choice of accepting, rejecting or ignoring the waiting call.

Call Completion

ETS 300 365/366

This category provides two supplementary services:

- Completion of Calls to Busy Subscribers (CCBS): A calling user encountering a Busy destination can request that the call be automatically completed when the busy destination becomes free.
- Completion of Calls on No Reply (CCNR): The calling user, encountering a destination that remains unanswered can request that the call be automatically completed when the called destination is next used and becomes free again.

These services are also referred to as Call Back When Free and Call Back When Next Used, respectively.

QSIG Segmentation & Reassembly

ETS 300 172, Annex ZA (1995)

This featured provides Q.SIG message segmentation and reassembly between the Passport 4460 and an attached PBX, when provisioned. Message segmentation and reassembly is used when the size of a message exceeds the maximum size of the data link layer information field size (260 octets).

QSIG Calling/connected name identification restriction

ETS 300 237

Calling/connected Name Identification Restriction (SS-CNIR) is a supplementary service that is offered to a user to restrict presentation of that user's name to another user.

QSIG Message waiting indication

EN 301 260/255

Message Waiting is a QSIG supplementary service, defined in ISO/IEC 15505 and 15506, that provides for transparent centralized voice mail and other integrated messaging applications. The service allows the activation and deactivation of a message-waiting indicator for a user located at a remote network node. The message waiting service also allows a user to verify the current state of his or her message-waiting indicator.

QSIG Centralized voice mail

ETS 300 257, ETS 300 239, ETS 301 255 (2nd Edition)

This featured is provided in conjunction with the "QSIG Message waiting indication" on page 26, "Call Diversion Supplementary Service (QSIG-CF)" on page 23, and "Call Diversion Notification" on page 23 features.

QSIG Configurable cause codes

To enhance interoperability with Passport 6400 MVPe E1 voice Function Processors, the Passport 4460 now supports configurable ("flexible") cause codes.

Flexible Cause Codes allow substitution of standard network connection "failure" cause codes with values provisioned through element management, thereby providing these benefits:

- This allows for changing the way that a PBX responds to network congestion or other events so that it can activate (or not, as appropriate) alternate routing choices.
- Customer PBX systems will respond as desired to Passport network conditions that are recognized and communicated back to the originating PBX.
- This capability allows you to exactly match the cause value required by an originating PBX to establish a call on an alternate route.

Refer to ITU-T Recommendation Q.850 for a complete list of cause codes.

Definable internal cause codes

The following table describes the definable internal cause codes and typical clearing reasons.

Cause	Typical clearing reason(s)
Cause 27 in Q.850 – Destination out of order	• A SETUP message is to be sent over PANL and the link is not in the “ready” state; • A restart procedure is in progress; • The PANL link is being torn down while the call is in the “ringing” state; • Cannot allocate a buffer for a new UIPE message.
Cause 34 in Q.850 – No circuit/channel available	Cannot assign a DLCI (no available DLCI, Passport 4400 acting as DCE, or the maximum number of DLCIs has been reached).
Cause 41 in Q.850 – Temporary failure	An address resolution fails or an error response is received from the SVC LMI when requesting set up of an SVC.
Cause 42 in Q.850 – Switching equipment congestion	The claimed bandwidth for a DLCI exceeds the available bandwidth.
Cause 44 in Q.850 – Requested circuit/channel not available	An incoming call on a channel has a restriction set in the voice profile or switching profile (busy-out mode or outcall restriction set), or an incoming call is requesting a specific B channel that already has a call on it.
Cause 47 in Q.850 – Resource unavailable, unspecified	Cannot allocate resources for a new DLCI.
Cause 63 in Q.850 – Service or option not available, unspecified	A call is received without a Channel Id IE, or a call is requesting a B channel that is not installed (the channel number is higher then the number of B channels on that D channel).
Cause 79 in Q.850 – service or option unimplemented, unspecified	Communicating over PANL with equipment that does not support SEGMENTATION and, after message stripping, the message is still too long.
Cause 88 in Q.850 – Incompatible destination	Passport 4400-to-Passport 4400 IE does not match the Passport 4400 type in the global context.

CLI support for flexible cause codes

Release 5.1 provides CLI command support for defining new values for cause codes. You use the following command to set a new value for a cause code:

```
define isdn physicalIf causeMap <parameter> <index> <newValue>
```

This command takes the following parameters:

```
EgressLinkOutOfServ
ChanOrCircNotAvail
TemporaryFailure
SwitchCongest
ReqChanOrCircNotAvail
ResourceUnavail
ServNotAllowed
ServOrOptNotImpl
IncompatDestination
```

For Example:

```
define isdn physicalIf causeMap egressLinkOutOfServ 1310721 27
```

See “Definable internal cause codes” on page 27 for a description of the cause codes. Note that a zero value for any of these parameters means that the disconnect cause code is propagated unchanged.

You can use the following “show” command to display the cause codes:

```
show isdn physicalIf causeMap
```

QSIG Data Calls

The Passport 4400 provides support for data calls on BRI and PRI interfaces. Prior to release 5.0, interworking with Passport 6400/7400 supported:

- Circuit-mode 64 Kbps / 8 kHz structured bearer service category usable for speech information transfer on BRI interface
- Circuit-mode 64 Kbps / 8 kHz structured bearer service category usable for 3,1 kHz audio information transfer on BRI interface

Starting with Release 5.1, circuit-mode 64 Kbps unrestricted 8 kHz (0 1 0 0 0) structured bearer service category is supported on BRI and PRI interfaces. If the information transfer capability is indicating a QSIG basic call with “Unrestricted digital information” then the Passport 4460 network properly negotiates bandwidth requirements, and data flow received on the B channel is transparently carried to the destination.



Note: This feature does not support interworking with Passport 6400 or Passport 7400.

Bearer capability information element structure

The bearer capability information element structure is as follows:

8	7	6	5	4	3	2	1	
0	0	0	0	0	1	0	0	Octet 1
	Information element identifier							
Length of bearer capability contents								Octet 2
1	Coding standard		**Information transfer capability**					Octet 3
1	Transfer mode		Information transfer rate					Octet 4
0/1	Layer ID (1)		User information layer 1 protocol					Octet 5

The information transfer capability (octet 3) can take these values:

Bits 5 4 3 2 1	**Meaning**
0 0 0 0 0	Speech
0 1 0 0 0	Unrestricted digital information
0 1 0 0 1	Restricted digital information (applicable only in interworking situations)
1 0 0 0 0	3,1 kHz audio
1 0 0 0 1	Unrestricted digital information with tones/announcements

All other values are reserved

Chapter 3
Configuring ISDN-PRI QSIG Services

This chapter provides instructions for configuring ISDN-PRI QSIG services on Passport 4460 units.

Topics in this chapter:

- "Configuration, using the CLI" on page 31
- "Configuration, using Passport 4400 Configurator" on page 33
- "Customer configuration examples" on page 36

Configuration, using the CLI

Following are instructions for configuring the unit for ISDN-PRI QSIG services, using the Passport 4400 command line interface.

General procedure

Use the following steps to configure the E1 or T1 card for ISDN-PRI services.

1. Use the following commands to set ccs_pri in the voice profile and the t1e1 profile:

```
set voice profile signalingType 1 ccs_pri
set t1e1 profile signalProtocol 1 ccs_pri
```

2. After issuing these commands, you must save and reset the unit.



Note: "set" commands do not typically require a save and reset. The commands shown above do, however, require a save and reset to take effect.

Once you set the profiles and reset the unit, the E1 or T1 card is configured as ISDN PRI.

3 You can verify this using the following command:

```
CLI>show system ifIndex operational
Ifindex   IfExtType        PPA  IfSlot
1         EthernetCsmacd   0    base
2         PropVirtual      0    base
3         Other            0    base
4         PropVirtual      1    base
5         PrimaryISDN      1    exp1
6         ds0              1    exp1
7         ds0              1    exp1
8         ds0              1    exp1
```

Note that the number of IfIndexes allocated for ds0 corresponds to the number of B channels.

4 Use the following “show” command to display the signalTable:

```
show isdn physicalIf signalTable operational table
```

```
Index            : 131072
IfIndex          : 0
Protocol         : qsig
CallingAddress   : "384000"
SubAddress       : "30"
BChannelCnt      : 30
InfoTrapStatus   : disabled
Status           : active
Side             : TE
```

Note that the index value for voice ports is a 32 bit number consisting of expansion slot ID in the most significant 16 bits and port number in the least significant 16 bits:

Exp/Port	**Port 1**	**Port2**
Expansion 1	131072	131073
Expansion 2	196608	196609

5 Use the following command to select NT or TE (Network or User side):

```
define isdn physicalIf signal priSide [NT|TE]
```

Note that the InfoTrapStatus, CallingAddress, and SubAddress parameters are not used for PRI interfaces.

6 Set the master clock source (optional):

```
set system masterClock 159
```

7 Set the T1 or E1 module to use the master clock source (optional):

```
set t1e1 profile clockSource 1 external
```

or

```
set t1e1 profile clockSource 1 backplane
```

8 Set other E1/T1 parameters according to the customer's network requirements:

```
set t1e1 profile    e1CRC4Status
                    e1IdleCode
                    e1LineCode
                    t1BuildOut
                    t1FrameFormat
                    t1IdleCode
                    t1LineCode
                    t1LoopbackStatus
```

Configuration, using Passport 4400 Configurator

Following are instructions for configuring the unit for ISDN-PRI QSIG services, using the Passport 4400 Configurator.

General procedure

Use the following steps to configure the E1 or T1 card for QSIG services:

1 Set the Signaling Type as "pri_css" for the voice profile that you are using:

- **a** Select *Configure, Voice, Channels* from the navigation window.
- **b** Select a profile, then click Modify.
- **c** Set the Signaling Type as pri_css.
- **d** Click Save.

2 Configure the T1/E1 line parameters to use “pri_css” as the Signal Protocol, for the line that you are using:

a Select *Configure, Voice, T1 / E1 Profiles*

b Choose Voice E1/T1 profile 1 or 2.

c Set the Signal Protocol to ccs_pri.

d Click on Save.

Note that the signaling index value for voice ports is a 32 bit number consisting of expansion slot ID in the most significant 16 bits and port number in the least significant 16 bits:

Exp/Port	Port 1	Port2
Expansion 1	131072	131073
Expansion 2	196608	196609

3 After setting these values in the profiles, you must save and reset the unit.

Once you set the profiles and reset the unit, the E1 or T1 card is configured as ISDN PRI.

4 Select NT (network termination) or TE (terminal endpoint) for the port that you are configuring:

a Select *Configure, Physical Interfaces, ISDN* from the navigation pane.

b Click on *Signaling (D-Channel)* a the top of the window.

The Signaling D-Channel Configuration window opens.

c Click Modify in the row that shows the signaling index number for the port you are modifying.

The Signaling D-Channel Configuration - MODIFY window opens.

d Set the PRI Side parameter to NT or TE

e Click on Save.

Note that the InfoTrapStatus, CallingAddress, and SubAddress parameters are not used for PRI interfaces.

5 Set a master clock source (optional):

a Select *Configure, System, Master Clock* in the navigation pane.

b Use the pull down menu to select the desired clock source.

This is the port that will provide clock to the backplane. Other ports on the unit will have the option of choosing it as their clock source.

c After you have made your selection, click Save.

The Master Clock setting takes effect immediately. A system reset is not required.

6 Set the T1 or E1 module to use the master clock source (optional):

a Select *Configure, Voice, T1/E1 Profiles* from the navigation window.

b Select Backplane as the Clock Source.

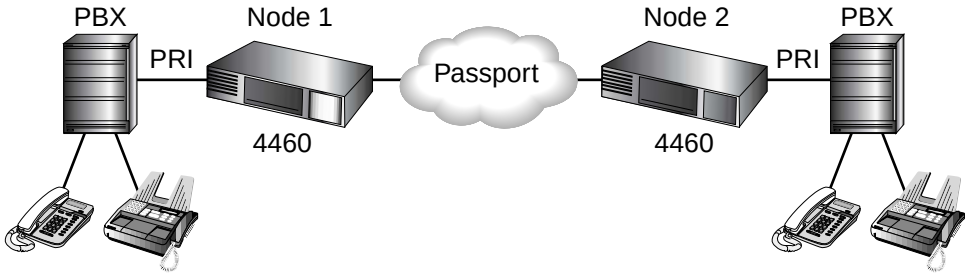
The module will take its clock from the master clock, set in step 5.

7 Set other E1/T1 parameters according to the customer's network requirements.

Customer configuration examples

PRI Tie Trunk Application

The trunk side of each PBX is physically connected to a Passport 4460 PRI interface. Communication between the two Passport 4460 units is by switched connection over the Passport cloud.



As an example, assume that a telephone user attached to the PBX station at Node 1, intends to call PBX station 1234 at Node 2. To do that, the caller first dials trunk access code 6, and waits for a second dial tone from its PRI module. Next, the caller dials a string of digits that uniquely identify the Passport 4400 unit at Node 2, followed by 1234. Connection is established when the user at station 1234 goes off-hook.

If the call-initiating PBX is connected to a Passport PRI interface, then the destination PBX can be connected to:

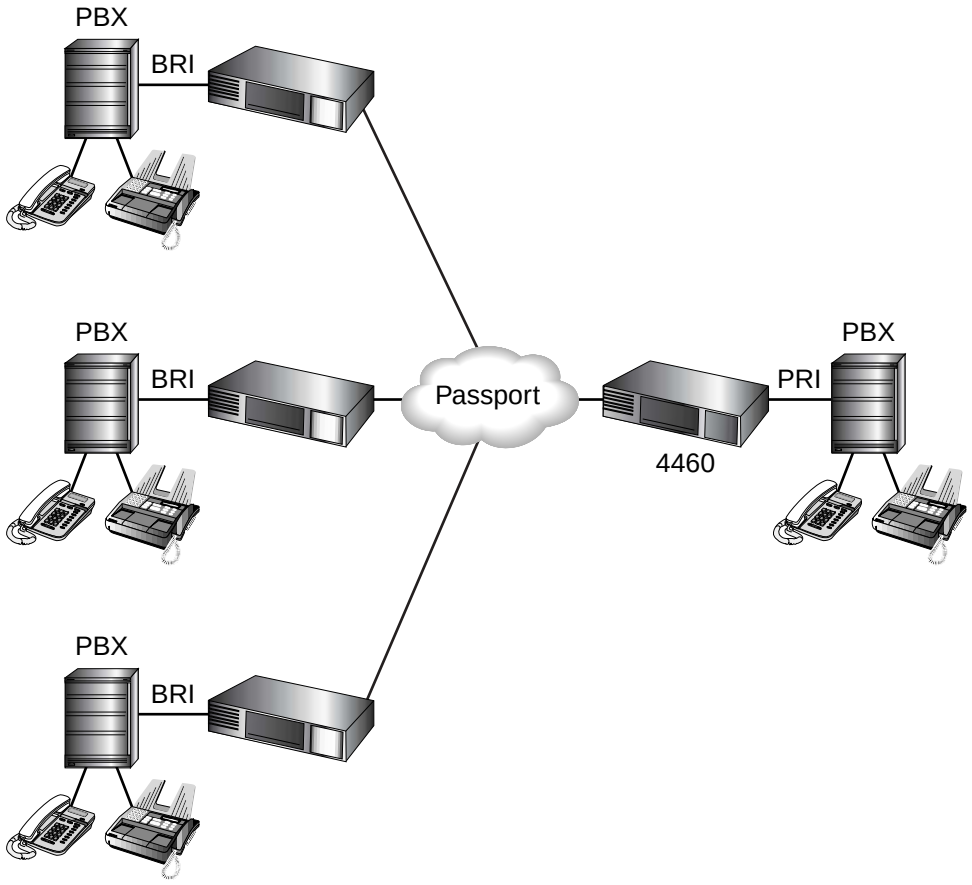
- a Passport 4460 unit that has PRI module provisioned as QSIG
- a Passport 4460 or 4430/50/55 unit that has BRI module provisioned either as QSIG or Euro-ISDN
- a Passport 6400 or a Passport 7400 unit that has a PRI module provisioned

Limitation

It cannot communicate with any other voice channel within the Passport network unless that voice channel meets these criteria.

BRI-to-PRI Application

A cluster of branch offices communicates with a headquarters office at the central site. Each branch office is configured with one to four BRI voice modules connected to the trunk side of an ISDN PBX; each BRI line shown represents one to four BRI connections (2 B + D).



The central site is also has a Passport 4460 unit connected to a PBX over an E1 PRI line, with a capacity of 30 64-kbps B-channels and a 64-kbps D-channel. The 64-kbps D-channel uses QSIG protocol.

Chapter 4
ISDN/Analog/CAS Interworking

This chapter describes the ISDN/Analog/CAS voice call interworking support that is provided by Passport 4460, beginning with release 5.2.

Topics in this chapter:

- "Analog/Digital voice call interworking" on page 39
- "Voice interworking matrix" on page 40

Analog/Digital voice call interworking

The Passport 4460 provides support for calls between Passport 4460 analog and digital interfaces. Further, the Passport 4460 can accept calls from analog and digital interfaces that are received from the Passport 6400 or Passport 7400 side (for example, from a Passport 7400 QSIG ISDN interface to a Passport 4460 analog interface).

Analog and digital voice modules are an integral part of the Passport 4460. The Passport 4460 supports FXS and E&M analog expansion cards, T1 and E1 digital expansion cards running CAS signaling, and BRI/PRI expansion cards running QSIG or Euro ISDN (BRI interface only for the latter).

Starting with Release 5.2, the Passport 4460 can handle and convert analog/CAS to ISDN QSIG signaling and vice versa. This means that an analog or CAS originated call can have a QSIG (BRI or PRI) destination and a QSIG originated call can be completed to an analog/CAS destination.

Voice interworking matrix

The following matrix shows the protocols that are tested and supported when interworking Passport 4460 (Release 5.2 or higher) with Passport 6400/7400 units.

	Passport 6400/7400 Protocols			
Passport 4460 Protocols	CAS	QSIG	Euro ISDN	MCDN
Analog	yes	yes	yes	yes
CAS	yes	yes	yes	yes
QSIG (BRI and PRI)	yes[1]	yes	yes[2]	no
Euro ISDN (BRI)	no	no	yes	no

1 basic call

2 basic call

Notes and limitations

The following notes and limitations apply to Passport 4460 release 5.2:

- Passport 4460 Release 5.2 provides full support for calls between Passport 4460 and Passport 4430/50/55, with the exception of Euro ISDN.
- Voice and FAX calls are supported over IP, Frame Relay (RFC 1490), and PANL networks.
- These is no support in this release for supplementary services; only basic call service is supported.
- Passport 4460 Release 5.2 has no support for Passport Voice Networking gateway functionality or signaling (as described in the Passport 6400 and Passport 7400 documentation; see MD-1998.0124)

User Interface

This feature is implemented in the base software and requires no user operation.

Appendix A
Compliance with Standards

This appendix identifies compliance information for QSIG signaling protocols on Passport 4460 systems. The Passport 4460 complies, in general, with the ETSI QSIG standards listed in Table 2, Passport 4460 Compliance with standards.

Table 2 Passport 4460 Compliance with standards

ETSI Standard	Details
ETS 300 172, 3rd Edition	Basic call (call related APDU transport), call related notification transport, connection orientation call independent APDU transport).
ETS 300 239, 3rd Edition	Generic Function Procedures.
ETS 300 172, Annex ZA (1995)	Segmentation and reassembly
ETS 300 239, 2nd Edition	Transport of manufacturer specific information.
ETS 300 238, 2nd Edition	Name identification.
EN 301 048, V1.1.1	Transit counter
ETS 300 257, 2nd Edition	Call diversion.
ETS 300 259, 2nd Edition	Path replacement.
ETS 300 362, 2nd Edition	Call offer
ETS 300 366, 2nd Editioin	Call completion
ETS 300 237, 2nd Edition	Calling/connected name identification restriction.
ETS 301 360/255, 2nd Edition	Message waiting indication
ETS 301 257, 360 239, ETS 301 255 2nd Edition	Centralized voice mail

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