
Meridian 1

ISDN Basic Rate Interface

Product Description

Document Number: 553-3901-100

Document Release: Standard 6.0

Date: June 1999

© 1992, 1999

All rights reserved

Printed in the United States of America

Information is subject to change without notice. Nortel Networks Corporation reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant. This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC rules, and the radio interference regulations of Industry Canada. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

SL-1 and Meridian 1 are trademarks of Nortel Networks Corporation.

Revision history

June 1999

Issue 6.00 released as Standard for Generic X11 Release 24.2x.

October 1997

Issue 5.00 released as Standard for Generic X11 Release 23.

August 1996

Issue 4.00 released as Standard for Generic X11 Release 22.

December 1995

Issue 3.00 released as Standard for Generic X11 Release 21B.

July 1995

Issue 2.00 released as Standard for Generic X11 Release 21A.

December 1994

Issue 1.00 released as Standard for Generic X11 Release 20.

July 1994

Standard version released for Generic X11 Release 20.0x.

July 1993

Standard version released.

Contents

About this guide	1
Applicability of this guide	1
How this guide is organized	1
Related documents	2
Functional description	3
ISDN Basic Rate Interface overview	3
General ISDN BRI capabilities	6
The OSI model	7
ISDN BRI line access	9
S/T interface configured for line access	9
U interface configured for line access	11
ISDN BRI Packet data transmission	14
Packet data transmission using the DPN-100	14
Packet data transmission using the Meridian 1 Packet Handler ...	17
ISDN BRI trunk access	21
ISDN BRI Local Exchange/CO/DID connectivity	22
Clock synchronization, automatic switching and recovery for ISDN BRI to local exchange connectivity	29
ISDN BRI MCDN Tie trunk connectivity	31
ISDN BRI QSIG connectivity	34
ISDN QSIG-BC and QSIG-GF Compliance Update	36
Engineering guidelines	37
Hardware Requirements	37

line application	37
Packet handling	40
trunk application	45
Hardware functional descriptions	47
Physical capacity	60
Physical capacity without the BRSC	60
Physical capacity with the BRSC	62
Memory capacity	63
Protected data store	63
Unprotected data store	66
ISDN BRI configuration guidelines	70
Physical parameters	70
Functional parameters	75
Transmission characteristics	79
SILC DSL line configuration	79
SILC DSL trunk configuration	91
UILC DSL line configuration	92
Terminal addressing and service profile assignment	97
ISDN BRI terminal interface specification	104
S/T interface specification	104
U interface specification	106
Compatible ISDN BRI terminals	107
Features on ISDN BRI	109
Introduction	109
ISDN BRI specific features	110
Calling Line Identification Presentation and Restriction	110
ISDN BRI National ISDN-1 Conference	111
ISDN BRI circuit-switched data calls	114
ISDN BRI Special Call Forward Busy	118
ISDN BRI Special Hunting	118
ISDN BRI ETSI Call Forwarding Unconditional	119
ISDN BRI ETSI Conference	123
ISDN BRI National ISDN-1 Call Forward All Calls	125

ISDN Basic Rate Interface Connected Line	
Presentation/Restriction	128
NI-1 BRI Compliance Enhancements	131
Set-based ISDN BRI features on Meridian 1 ISDN BRI terminals	133
Generic X11 features	134
ISDN BRI Lines — Generic X11	134
Features supported by ISDN BRI as a Line	159
Features partially supported by ISDN BRI as a line	164
ISDN BRI Trunk Access features: Generic X11	172
ISDN PRI features interaction with ISDN BRI	172
ISDN PRI features not supported	172
Generic X11 International features — lines and trunks	174
Generic X11 International features interaction	174
Generic X11 International features partially supported	193
List of terms	209

List of figures

Figure 1	
OSI model	8
Figure 2	
ISDN Basic Rate Interface S/T interface configured as a line	10
Figure 3	
ISDN Basic Rate Interface U interface configured as a line	12
Figure 4	
ISDN BRI/1TR6 terminal connectivity	13
Figure 5	
Packet data transmission using the external packet handler	15
Figure 6	
Packet data transmission using the external packet handler with a BRSC	16
Figure 7	
Packet data transmission using the MPH	19
Figure 8	
Packet data transmission using the MPH and a BRSC	20
Figure 9	
ISDN BRI trunk access for local exchange connectivity	22
Figure 10	
ISDN BRI trunk access Tie trunk connectivity — first configuration	31
Figure 11	
ISDN BRI Tie trunk connectivity — second configuration	32
Figure 12	
ISDN BRI Tie trunk connectivity — third configuration	33

Figure 13	
QSIG ISDN BRI trunk connectivity	35
Figure 14	
ISDN BRI line application architecture, with a BRSC	39
Figure 15	
ISDN BRI DPN-100 packet data architecture, with a BRSC	41
Figure 16	
ISDN BRI MPH packet data architecture, with a BRSC and an MCU	44
Figure 17	
ISDN BRI trunking architecture (CO connectivity)	46
Figure 18	
Tandem connections with the MPH	57
Figure 19	
S/T digital subscriber loop wiring example for ISDN BRI lines	81
Figure 20	
Point-to-point DSL	83
Figure 21	
Short passive SILC DSL	85
Figure 22	
Extended passive SILC DSL	87
Figure 23	
Branched passive SILC DSL	89
Figure 24	
Point-to-Point UILC DSL	93
Figure 25	
UILC DSL used as an extension for an S/T interface loop	96
Figure 26	
Physical and logical address components	98
Figure 27	
Multiple logical terminals on one physical termination	100
Figure 28	
Terminal initialization and service profile assignment examples	103

List of tables

Table 1	
Physical capacity without the BRSC	61
Table 2	
Physical capacity with the BRSC	62
Table 3	
Protected data memory requirements for line application (Sheet 1 of 2)	63
Table 4	
Protected data memory requirements for trunk application	65
Table 5	
Unprotected data memory requirements for line application (Sheet 1 of 2)	66
Table 6	
Unprotected data memory requirements for trunk application (Sheet 1 of 2)	68
Table 7	
Cable types and characteristics	82
Table 8	
Cable types and point-to-point DSL lengths.	84
Table 9	
Cable types and short passive SILC DSL lengths	86
Table 10	
Cable types and extended passive SILC DSL lengths	88
Table 11	
Cable types and branched passive SILC DSL lengths	90

Table 12	
Maximum recommended U DSL length	94
Table 13	
U DSL cable calculations	95
Table 14	
S/T interface connector specification, from NT1 to terminal	105
Table 15	
U interface connector specification	106
Table 16	
ISDN BRI terminals	107
Table 17	
Generic X11 features on ISDN BRI lines	136
Table 18	
Generic X11 International features on ISDN BRI	175

About this guide

This document describes Integrated Services Digital Network Basic Rate Interface (ISDN BRI) concepts, functional and physical characteristics of ISDN Basic Rate operation, and general engineering guidelines on configuring ISDN BRI functions and features. It also explains the levels of support provided on ISDN BRI for Generic X11 software.

Note: Not all features and services are available in all markets. For example, ISDN BRI trunking is not supported in the United States. For more information, please contact your local Northern Telecom representative.

Applicability of this guide

The intended audience of this publication is installation and maintenance personnel, field support personnel, and anyone requiring a general information base for ISDN BRI functionality on Generic X11.

How this guide is organized

This publication has been organized according to the following sections.

Functional description provides an overview of ISDN and Open System Interconnect (OSI) protocols pertaining to ISDN BRI, and describes the general ISDN BRI system functions and components.

Engineering guidelines explains the basic rules to follow when planning the Meridian 1 ISDN BRI service. It describes system capacity, hardware requirements and attributes, configuration guidelines, transmission characteristics of DSLs, and ISDN BRI interface specifications.

Generic X11 features on ISDN BRI describes interworking of Generic X11 features on ISDN BRI, segregated according to the level of support provided — full support, partial support, and no support.

List of terms defines the terms used in the discussions of this feature.

Related documents

ISDN BRI NTPs:

- ISDN Basic Rate Interface Installation 553-3901-200
- ISDN Basic Rate Interface Administration 553-3901-300
- ISDN Basic Rate Interface Acceptance Testing 553-3901-330
- ISDN Basic Rate Interface Maintenance 553-3901-500

Note: This guide does not contain any information related specifically to Meridian 1 system Option 11. This information is contained in the Northern Telecom publication *Option 11 ISDN BRI Administration and Maintenance 553-3011-311*.

Functional description

This chapter describes ISDN BRI system functions, the operation of the Multi-Purpose ISDN Signaling Processor (MISP), the Basic Rate Signaling Concentrator (BRSC), the S/T Interface Line Card (SILC), the U Interface Line Card (UILC), and the two forms of packet handlers - external and integrated. It also describes the Digital Subscriber Loop (DSL) concepts and how to initialize and assign service attributes to ISDN BRI terminals and trunks assigned to a DSL.

ISDN Basic Rate Interface overview

ISDN Basic Rate Interface (ISDN BRI) is a digital connection that provides three digital channels. These channels consist of two 64 kbps Bearer channels (B-channels) and one 16 kbps signaling channel (D-channel). This 2B+D connection is known as a Digital Subscriber Loop (DSL). The DSL can be configured to provide line access, trunk access, or packet data transmission.

Line Access provides a digital connection from a Meridian 1 ISDN BRI card to ISDN terminals that comply with CCITT, ANSI, ETSI NET-3 and ETS 300 403 (including EuroISDN), INS NET-64 (including Japan D70), National ISDN-1 (NI-1), ITR6, and Numeris VN2 standards; examples of terminals are telephone sets, FAX machines, personal computers and video display terminals.

Trunk Access provides Meridian 1 to Meridian 1 Meridian Customer Defined Networking (MCDN)¹ Tie trunk connectivity, QSIG ISDN BRI trunk connectivity, and CO/DID trunk connectivity to local exchanges that support Numeris VN3, ITR6, ETSI NET-3 and ETS 300 403 (EuroISDN), INS NET-64 (including Japan D70), Australia ETSI, and Asia-Pacific protocols.

1. MCDN is a Northern Telecom proprietary protocol.

Note: ISDN BRI trunk access is not supported in North America.

The Meridian 1 supports both B-channel and D-channel **packet data** transmission through an external DPN-100 packet handler, or an integrated Meridian 1 Packet Handler.

B-channels and D-channel

B-channels can be automatically assigned and reassigned to different voice and data terminals in circuit-switched applications, they can be dedicated to specific terminals for packet data applications, or configured for ISDN BRI trunk applications.

For ISDN BRI line access, the ability to dynamically connect different terminals on one DSL provides more flexibility, connectivity, and service diversity than the conventional “hard wired” connections where each channel is dedicated to one terminal. The D-channel is used for signaling and low speed packet data transmission.

For ISDN BRI trunk access, one ISDN BRI trunk may be assigned to each B-channel in the 2B+D configuration. The D-channel is used for signaling.

ISDN BRI interfaces to the Meridian 1

ISDN BRI provides two types of interface to the Meridian 1 — the S/T interface or an U interface. The DSLs may be configured for either an S/T or U interface, and may be configured for either line or trunk access.

The **S/T interface** is a globally accepted standard interface. This interface is provided by the SILC line card, which supports 8 DSLs.

The **U interface** is implemented as an ANSI standard interface only (2B1Q line encoding). This interface is provided by the UILC line card, which also supports 8 DSLs.

Data link and network processing

The ISDN BRI data link and network layering processing functions are carried out by the **Multi-Purpose ISDN Signaling Processor (MISP)**, or the **Basic Rate Signaling Concentrator (BRSC)**; these functions, as well as the functions of the other system hardware, are detailed in the “Engineering guidelines” section of this document.

Note: the BRSC cannot be used for trunk access; therefore, the BRSC only performs the data link processing.

General ISDN BRI capabilities

The most important capabilities of ISDN BRI are:

- for line access
 - simultaneous voice and circuit-switched data over a single DSL
 - B-channel and/or D-channel packet data transmission over a single DSL
 - multiple physical terminals connected to a single DSL
 - multiple logical devices associated with each DSL
 - diverse ISDN-compliant third party terminals (compliant with CCITT, ANSI, ETSI NET-3 and ETS 300 403, INS NET-64, National ISDN-1, 1TR6, Numeris VN2, and EuroISDN standards)
- for trunk access
 - MCDN ISDN BRI Tie trunk connectivity
 - QSIG ISDN BRI Tie trunk connectivity
 - CO/DID trunk connections to local exchanges that support Numeris VN3, 1TR6, ETSI NET-3 and ETS 300 403 (EuroISDN), INS NET-64 (Japan D70), Australia ETSI, and Asia-Pacific protocols

The OSI model

ISDN standards follow the Open System Interconnect (OSI) protocol model to control ISDN functions. The OSI model defines seven layers required to perform all ISDN functions from establishing an end-to-end connection between two terminals or trunks, to making a decision about the type of application that is to be activated. Figure 1 shows the seven layer OSI model. ISDN BRI utilizes only the first three layers. These are:

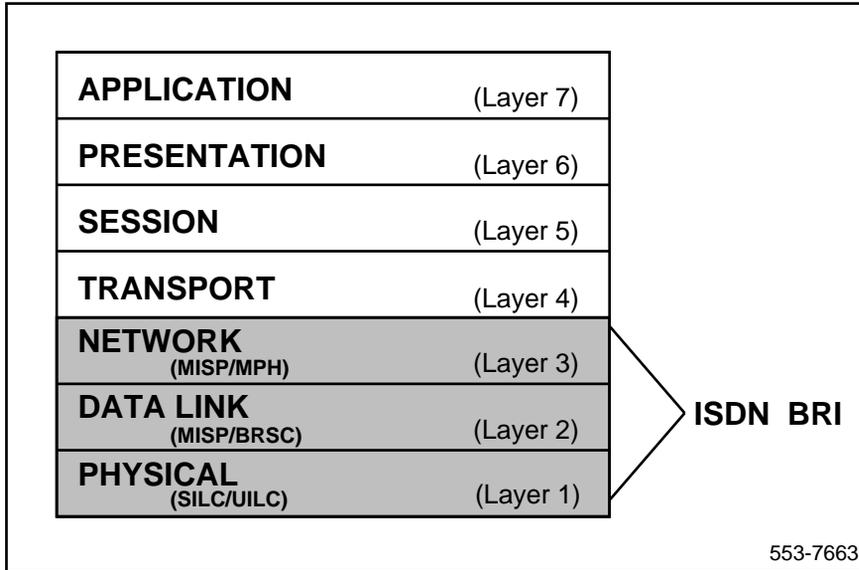
- **Physical layer** (layer 1) that provides a network-to-terminal or trunk connection (**SILC/UILC**).
- **Data link layer** (layer 2) that provides signaling used to establish a communication link between terminals or trunks over ISDN (point-to-point signaling for terminals, and point-to-multipoint signaling for trunks). It also performs some error checking and error recovery (**MISP/BRSC**).

Note: the BRSC applies to terminals only.

- **Network layer** (layer 3) that controls initialization procedures and assigns service attributes to terminals and trunks. It also controls the call processing procedures (**MISP, MPH**).

Once these three layers are established, the functional role of ISDN BRI in the OSI protocol sequence is complete. The higher layers of the OSI protocol model are handled by the end-user application software.

Figure 1
OSI model



ISDN BRI line access

ISDN BRI line access provides 2B+D ISDN service to terminating equipment such as ISDN telephone sets and data terminals. ISDN BRI line connections are configured on a per DSL basis, that is, DSL line connections may be configured on any given DSL for any SILC or UILC.

The B-channels are dynamically assigned to different voice and data terminals in circuit-switched line applications. In case of packet data applications, the B-channels are dedicated connections. The D-channel is used for signaling and dynamic D-channel packet data.

S/T interface configured for line access

Figure 2 illustrates a typical ISDN BRI configuration showing a Meridian 1 with an ISDN BRI S/T interface and the ISDN BRI terminals connected to it; the terminals must comply with CCITT, ANSI, ETSI NET-3 (including EuroISDN), INS NET-64 (including Japan D70), National ISDN-1, 1TR6, and Numeris VN2 standards.

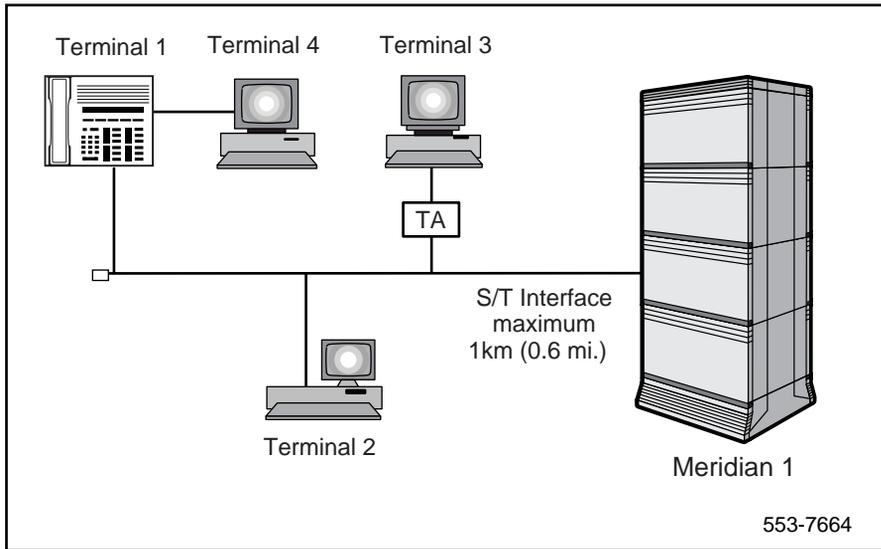
The S/T interface is a four-wire, polarity-sensitive interface which, configured for line application, can support eight physical voice and data terminals, and up to 20 logical terminals on one DSL. A physical terminal is any device directly connected to a DSL. The terminals labeled 1, 2 and 3 in Figure 2 are physical terminals.

A logical terminal (terminal 4 in Figure 2) is any terminal that can communicate with the Meridian 1 over a DSL. It may be directly connected to the DSL through its own physical termination or it may be indirectly connected through a common physical termination. Please refer to the “Terminal addressing and service profile assignment” section of the Engineering Guidelines chapter for an illustration of how a single physical termination may actually connect multiple logical terminals. All of the logical terminals connected to the DSL share the two B-channels provided by the S/T interface.

Note: The Terminal Adapter (TA) that is shown in the illustration is used to adapt non-ISDN BRI terminals to ISDN BRI line interface standards.

The length of an S/T interface DSL depends on the specific terminal configuration and the DSL wire gauge, however, it should not exceed 1 km (3280 ft).

Figure 2
ISDN Basic Rate Interface S/T interface configured as a line



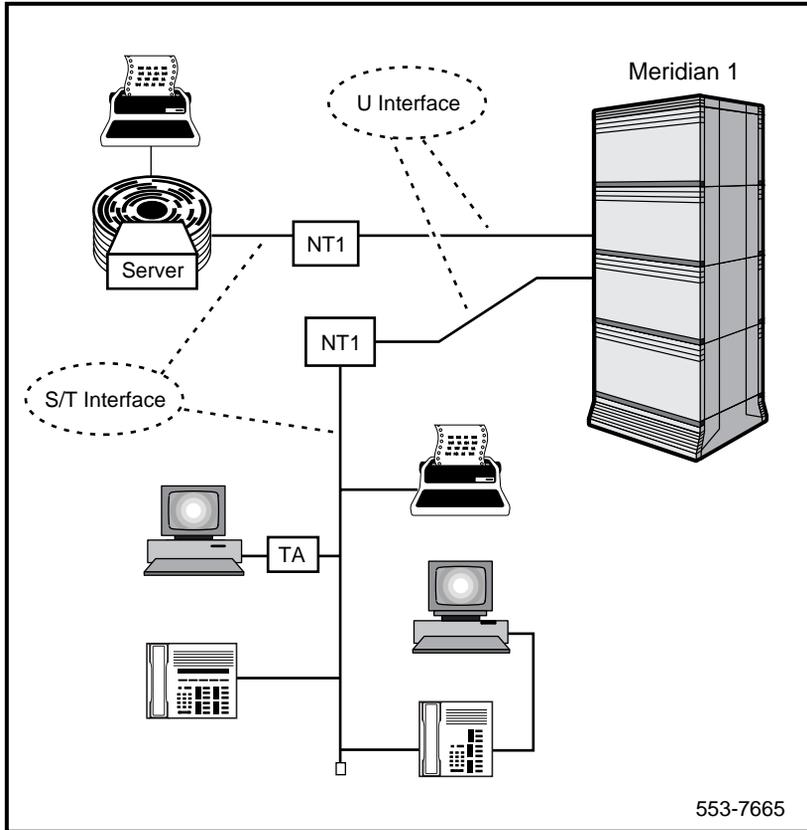
U interface configured for line access

The U interface is a two-wire interface that provides point-to-point connection over a DSL. Each U interface provides two B-channels and one D-channel and supports only one physical termination. This termination may be to a Network Termination 1 (NT1) or directly to a single U interface terminal that contains an internal NT1. Normally this physical termination is to an NT1, which provides a conversion from a U interface to an S/T interface that allows up to eight physical terminals to be connected.

The length of a ULC DSL depends on the specific terminal configuration and the DSL wire gauge, however, it should not exceed 5.5 km (3.3 mi). When connected to an NT1 the DSL length is effectively extended to 6.5 km (3.9 mi) and utilizes the multi-terminal capability of an S/T interface.

Figure 3 illustrates a typical ISDN BRI configuration showing a Meridian 1 with an ISDN BRI U interface. ISDN BRI terminals can be connected to the NT1 through the S/T interface; the terminals must comply with CCITT, ANSI, ETSI NET-3 (including EuroISDN), INS NET-64 (including Japan D70), National ISDN-1, ITR6, Numeris VN2 standards), Australia ETSI, and Asia-Pacific protocols.

Figure 3
ISDN Basic Rate Interface U interface configured as a line

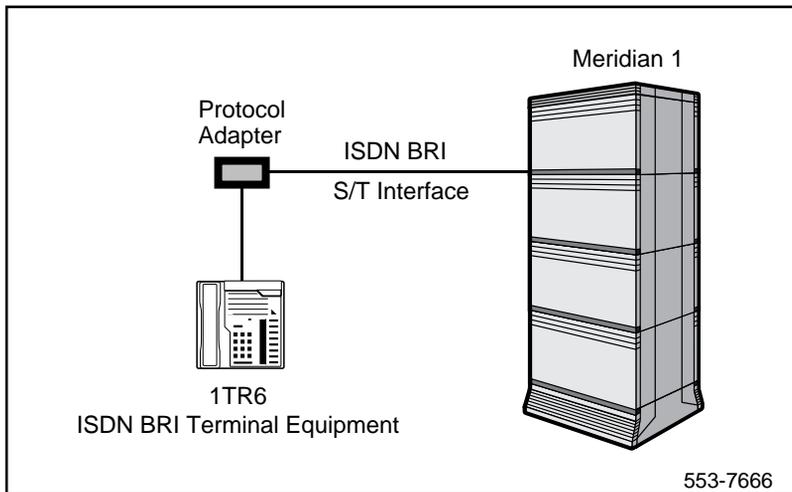


1TR6 terminal connectivity

1TR6 terminals may be connected to the Meridian 1 via a protocol adapter, which has been specifically designed to interface with Meridian 1 ISDN BRI and 1TR6 terminals. Its main function is to convert the 1TR6 protocol sent from the 1TR6 ISDN Terminal Equipment into the European Telecommunication Standard Institute (ETSI) protocol required for ISDN BRI, and vice versa. This conversion is necessary because the layer 3 requirements for 1TR6 and ETSI are different.

Figure 4 shows a 1TR6 ISDN BRI terminal connected to the protocol adapter, which is used to access the Meridian 1 through an S/T interface.

Figure 4
ISDN BRI/1TR6 terminal connectivity



ISDN BRI Packet data transmission

ISDN BRI on the Meridian 1 supports both B-channel and D-channel packet data transmission. Packet data transmission is done using either an external packet handler, via Northern Telecom's Data Packet Network (DPN-100), or the integrated Meridian 1 Packet Handler (MPH).

Packet data transmission using the DPN-100

D-channel packet data transmission

D-channel packet data from each DSL is transmitted to the MISP or BRSC for separation. The MISP or BRSC separates the packet data from signaling and transmits the packet data to the ISDN PRI. From the ISDN PRI, the data is transmitted to the external packet handler over 64 kbps clear channels.

If the system is to uniquely identify the transmitted and received D-channel packet data for each terminal on a DSL, the Meridian 1 must use an internal identification number. This identification number is called Logical Terminal Identifier (LTID), which must be used together with the Logical Terminal End-point Identifier (LTEI) number during ISDN BRI configuration to uniquely define a logical terminal on a DSL. The LTEI is configured in Overlay 27.

D-channel packet data service is determined separately for each MISP or BRSC during ISDN BRI service configuration.

B-channel packet data transmission

The B-channel packet data from each DSL is sent over dedicated connections to the ISDN PRI. A dedicated ISDN PRI B-channel handles the B-channel packet data between the ISDN PRI and the DPN-100 external packet handler. The number of dedicated B-channel connections is limited to the number of available ISDN PRI channels.

The B-channels on a DSL are dedicated to the packet data transmission by assigning the packet mode data call to one or more B-channels on one or more DSLs during ISDN BRI service configuration.

Figure 5 illustrates the Meridian 1 external packet handling flow diagram, showing the B-channel and the D-channel packet data routes starting at the line cards and arriving at the external packet handler through dedicated B-channels and dedicated D-channels. Figure 6 presents the same concept, with the addition of a BRSC.

Figure 5
Packet data transmission using the external packet handler

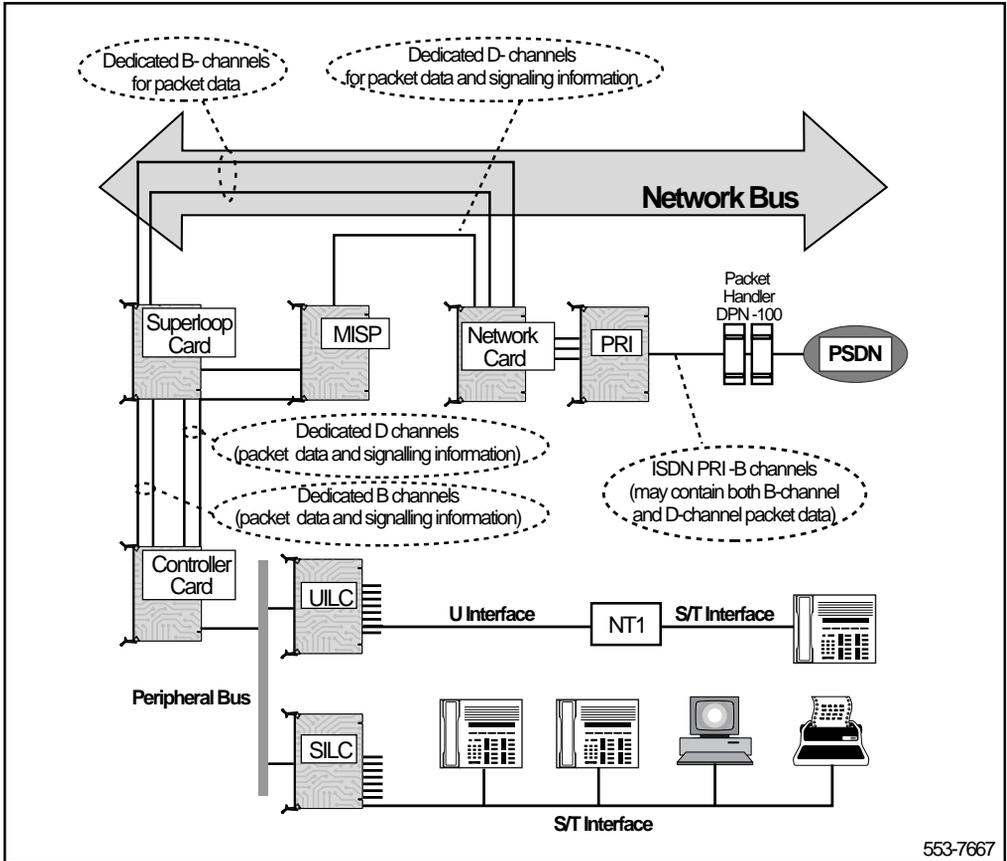
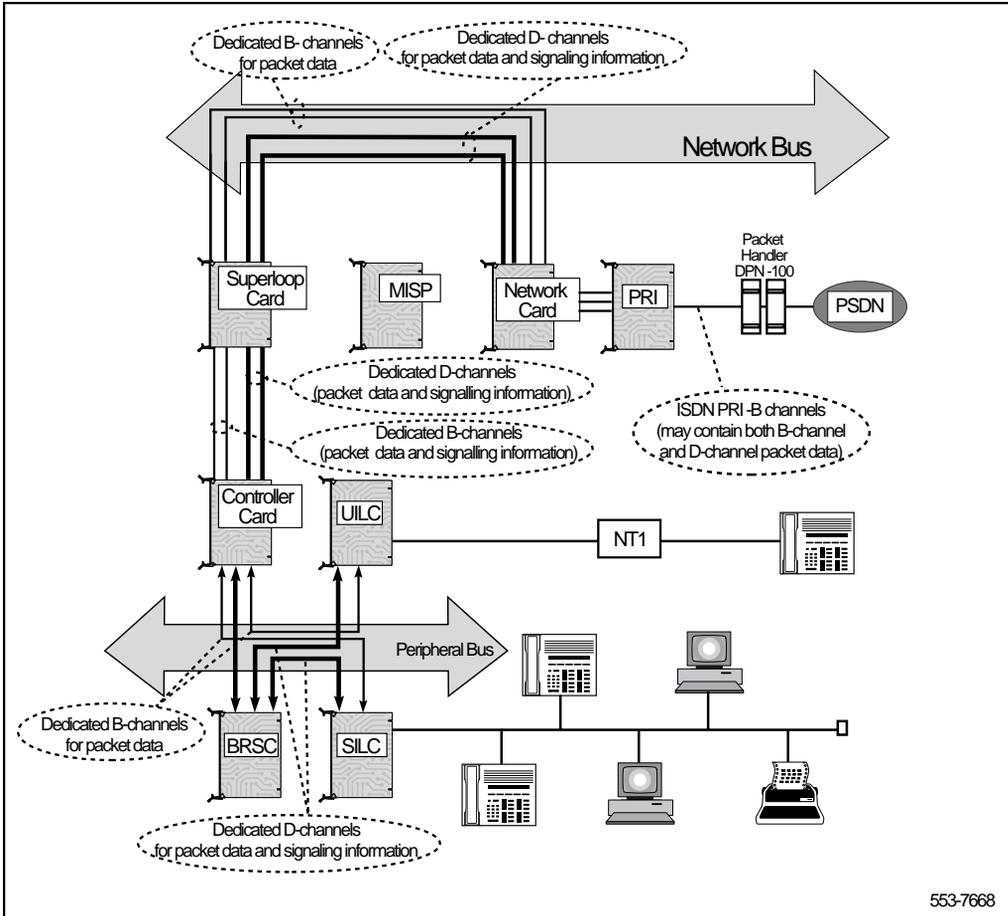


Figure 6
Packet data transmission using the external packet handler with a BRSC



Packet data transmission using the Meridian 1 Packet Handler

The Meridian 1 Packet Handler (MPH) uses a dedicated MISP as a hardware platform to run the packet handler application. Routing from the MPH to the PSDN is through dedicated connections either from a Meridian Communication Unit (MCU) data module and a synchronous modem, or from a dedicated ISDN PRI B-channel (64 kbps clear).

The MPH supports both B-channel and D-channel packet data transmission.

D-channel packet data transmission with the MPH

The MISP line application or the BRSC(s) separate the D-channel packet data from signaling and transmit the data packets on a dedicated PRI D-channel over its network connection to the MPH.

When using an MPH, the digital subscriber loop (DSL) and the Terminal Endpoint Identifier (TEI) are used to identify the Logical Terminal instead of the Logical Terminal Identifiers (LTIDs) which is used by the DPN-100 configuration.

The TEI uniquely identifies to the MPH the transmitted and received packet data for each terminal on a DSL. The TEI number is entered during ISDN BRI configuration to uniquely define a logical terminal on a DSL for the MISP. To configure a terminal for D-channel packet data service, a specific TEI is assigned to an unused static TEI and this information is sent to the MISP.

D-channel packet data service is determined separately for each MISP or BRSC during ISDN BRI configuration. When this data transmission method is selected during system configuration, the user is prompted to enter the MPH loop number to specify the dedicated connection to the MPH. The Meridian 1 CPU sets up the dedicated D-channel to the MPH and informs the MISP or BRSC on which network connection the dedicated D-channel is located.

B-channel packet data transmission with the MPH

B-channel packet data is routed to the MPH directly through dedicated connections. The MPH routes B-channel packet data to the Packet Switched Data Network (PSDN) by means of dedicated channels through either the PRI B-channel (64 kbps clear) or through a Meridian Communication Unit (MCU) with a synchronous modem.

The B-channel packet data from each DSL is routed to the Controller and Superloop network cards. From the Superloop network card, the data is sent to the MPH.

The B-channels on a DSL are dedicated to the packet data transmission by assigning the internal packet data call type to one or more B channels on one or more DSLs during ISDN BRI configuration. These dedicated channels cannot be released by the B-channel packet data terminal. The user is prompted to enter the MPH loop and channel number to specify the dedicated connection to the MPH.

Packet data transmission between the MPH and the PSDN

If using an MPH with an ISDN PRI loop, configure the ISDN PRI loop (LD17), define an ISDN customer (LD15), define a Tie trunk route for packet data (LD16), and define a Tie trunk for packet data (LD14). Then, configure the MISP for an MPH (LD27).

If using an MPH with an MCU data module, define a Tie trunk route for packet data (LD16), define a Tie trunk for packet data (LD14), and configure the MCU (LD11). Then, configure the MISP for an MPH (LD27).

Figure 7 illustrates packet data transmission for ISDN BRI line application, using the MPH.

Figure 7
Packet data transmission using the MPH

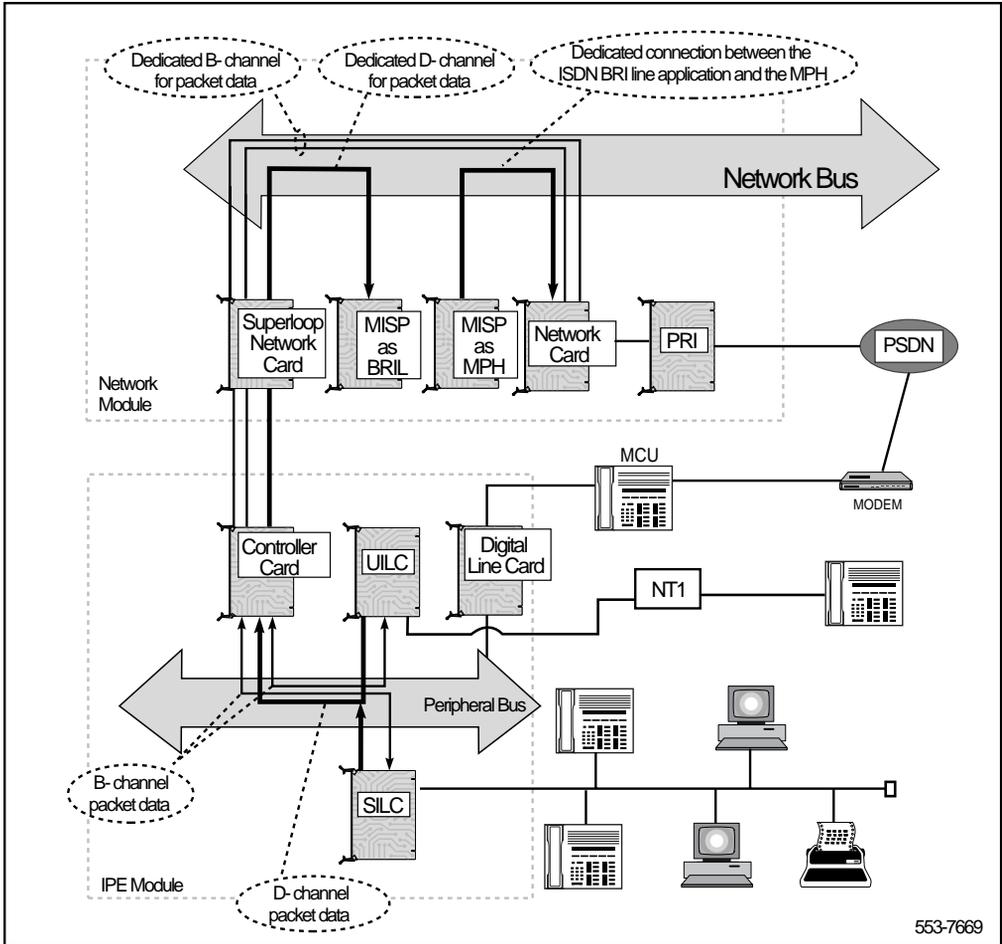
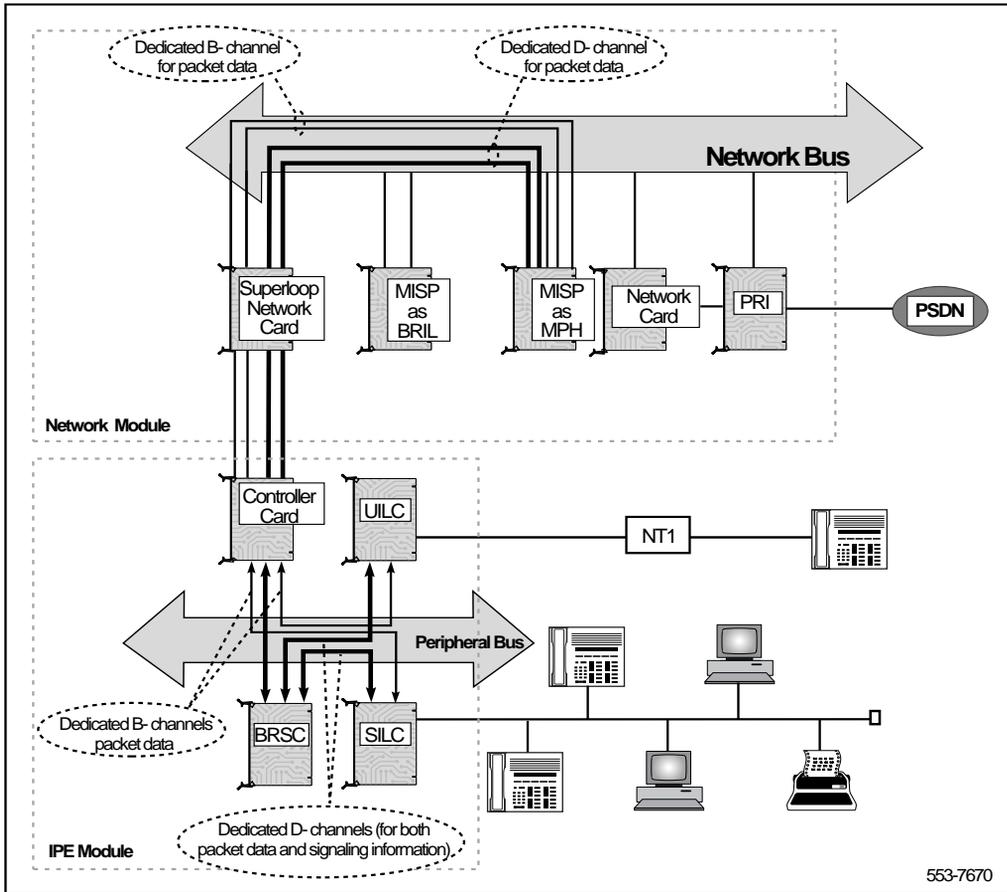


Figure 8 illustrates packet data transmission for an ISDN BRI line application, using the MPH and a BRSC.

Figure 8
Packet data transmission using the MPH and a BRSC



ISDN BRI trunk access

ISDN BRI trunks may be configured for either local exchange/CO/DID trunk connectivity, MCDN Tie trunk connectivity, or QSIG trunk connectivity. ISDN BRI trunk connections are configured on a per DSL basis, that is, DSL trunk connections may be configured on any given DSL for any SILC or UILC. The trunks can be accessed using both ISDN BRI terminals and non ISDN BRI devices (such as digital and analog telephones).

ISDN BRI Local exchange CO/DID connectivity is accomplished via a MISP card and an S/T interface, using the SILC line card. This connectivity is supported for Numeris VN3, 1TR6, ETSI NET-3 and ETS 300 403 (EuroISDN), INS NET-64 (Japan D70), Australia ETSI, and Asia-Pacific protocols; refer to Figure 9.

ISDN BRI MCDN Tie trunk connectivity is achieved via a MISP card and either S/T or U interfaces, using the SILC and UILC line cards respectively. This connectivity may be:

- between two Meridian 1 PBXs through a local exchange acting as a passive facility; the local exchange must support Numeris VN3, 1TR6, ETSI NET-3 and ETS 300 403 (EuroISDN), INS NET-64 (Japan D70), Australia ETSI, or Asia-Pacific protocols; refer to Figure 10.
- directly between two Meridian 1 PBXs; refer to Figure 11 and Figure 12.

ISDN BRI QSIG connectivity is achieved through an MISP card and either S/T or U interfaces, using the SILC and UILC line cards respectively. This connectivity is supported within a Private Telecommunications Network (PTN) between two Private Telecommunications Network Exchanges (PTNXs); examples may be a Centrex-to-Centrex connection, or a Centrex-to-PBX connection; refer to Figure 13 in the section “ISDN BRI QSIG connectivity” on page 34.

Note: The BRSC cannot be utilized for ISDN BRI trunk access.

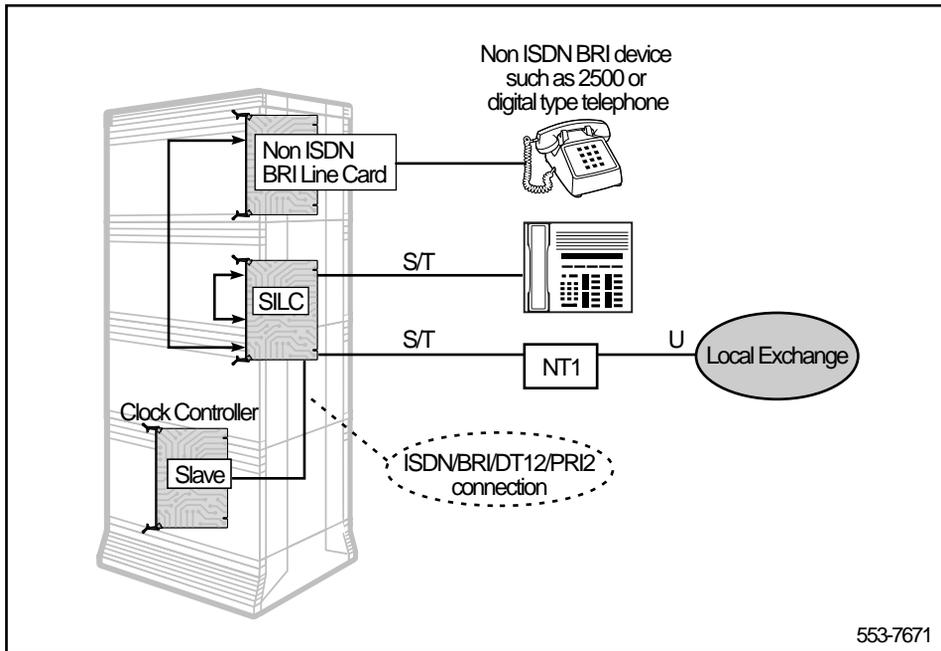
These configurations are explained in greater detail in the sections that follow.

ISDN BRI Local Exchange/CO/DID connectivity

ISDN BRI Local Exchange connectivity is supported in markets equipped with local exchanges that conform to Numeris VN3, 1TR6, ETSI NET-3 and ETS 300 403 (EuroISDN), INS NET-64 (Japan D70), Australia ETSI, or Asia-Pacific protocols.

Figure 9 illustrates the ISDN BRI Local Exchange connectivity. The ISDN BRI Local Exchange DSL is connected to a Network Termination (NT1) device, which is physically located on the same premises as the Meridian 1. The NT1 device connects to the Local Exchange via a U interface. (The NT1 device is typically owned by the Local Exchange/Post Telegraph and Telephone allowing the Local Exchange/PTT to use any type of U interface, including proprietary implementations). The distance limitation of the NT1 from the Local Exchange depends on the distance supported by the Local Exchange.

Figure 9
ISDN BRI trunk access for local exchange connectivity



1TR6 local exchange connectivity

1TR6 local exchange connectivity provides 2B+D connectivity to a local exchange that supports 1TR6 protocol via an S/T interface. The ISDN BRI 1TR6 local exchange connectivity provides the following basic call and supplementary services:

Note: Support for any feature is dependent upon the terminal equipment being used.

- Basic call service
- Circuit switched voice and data on the B-channel
- Calling Line Identification Presentation and Restriction
- Connected Number Delivery
- support for TIE, COT, DID, DOD trunk types
- Channel negotiation

Note: in cases where several ISDN BRI trunks (and hence several DSLs) are configured on a route, if Channel Negotiation fails to yield an acceptable channel on any of these DSLs, it is not possible to use another channel on another DSL.

- Overlap sending
- Flexible Numbering Plan
- Indication of Call Charging to the calling party
- Network-wide interworking with ISDN BRI ETSI terminals

Numeris VN3 local exchange connectivity

The Numeris local exchange connectivity provides 2B+D connectivity through an S/T interface to a local exchange that supports Numeris VN3 protocol. The ISDN BRI/Numeris VN3 local exchange connectivity provides the following basic call and supplementary services:

- Basic call service
- Circuit switched voice and data on the B-channel
- Called/calling party subaddress (network-wide)
- Support for TIE, COT, DID, DOD trunk types
- Channel negotiation

Note: in cases where several ISDN BRI trunks (and hence several DSLs) are configured on a route, if Channel Negotiation fails to yield an acceptable channel on any of these DSLs, it is not possible to use another channel on another DSL.

- 64 kbps clear bearer capability
- Flexible Numbering Plan
- Advice of charge during call and at end of call
- Network-wide interworking with ISDN BRI Numeris terminals

Japan D70 (INS NET-64) local exchange connectivity (non-Asia Pacific protocol)

The Japan D70 (INS NET-64) local exchange connectivity (non-Asia Pacific protocol) provides 2B+D connectivity through an S/T interface to a local exchange that supports the D70 protocol (D70 is the Japanese version of the INS NET-64 protocol). The ISDN BRI/Japan D70 local exchange connectivity provides the following basic call and supplementary services:

- Basic call service
- Circuit switched voice and data on the B-channel
- Called/calling party subaddress (network-wide)
- Support for TIE, COT, DID, DOD trunk types
- 64 kbps clear bearer capability
- Flexible Numbering Plan
- Advice of charge at end of call
- Channel Negotiation

Note: in cases where several ISDN BRI trunks (and hence several DSLs) are configured on a route, if Channel Negotiation fails to yield an acceptable channel on any of these DSLs, it is not possible to use another channel on another DSL.

EuroISDN connectivity

The EuroISDN connectivity provides an interface between Meridian 1 PBXs and Central Offices/Public Exchanges that comply to the European Telecom Standards Institute (ETSI) specification ETS 300 102 for the Layer 3. The interfaces provided by this feature also comply with the country-specific Application Documents for Austria, Belgium, Commonwealth of Independent State (Russia and the Ukraine), Denmark, Finland, Germany, Holland, Ireland, Italy, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

The Meridian 1 on the EuroISDN connectivity provides the following call services, for the complying countries:

- Basic call service
- Circuit switched voice and data on the B Channel
- Calling Line Identification Presentation and Restriction (CLIP and CLIR)
- Connected Line Presentation and Restriction
- Calling and connected sub-addresses
- Support for TIE, COT, DID, and DOD trunk types
- Overlap sending and receiving
- Overlap and enbloc dialing
- Flexible Numbering Plan
- Channel negotiation

Note: in cases where several ISDN BRI trunks (and hence several DSLs) are configured on a route, if Channel Negotiation fails to yield an acceptable channel on any of these DSLs, it is not possible to use another channel on another DSL.

Asia-Pacific connectivity

The ISDN PRI Meridian 1 to Asia Pacific connectivity provides ISDN Primary Rate Interface (PRI) connectivity between the Meridian 1 and Public Exchange/Central Offices in the following Asia Pacific markets:

- Australia (private or alternative carrier)
- China
- Hong Kong
- India
- Indonesia
- Japan
- Malaysia
- New Zealand
- Philippines
- Singapore
- Taiwan
- Thailand

The Asia Pacific connectivities support the following ISDN features:

- Basic Call Service
- Back-up D-Channel, for Hong Kong
- Advice of Charge, for Japan (considered a basic service)
- Malicious Call Trace, for Australia
- Advice of Charge (AOC) at End of Call, for Australia
- Incoming Trunk Programmable CLID for analog trunks, for Australia. This feature is available for use in a private or alternative carrier network, as required in Australia.
- nB+D, for Japan (up to 215 B-channels/nine interfaces), for New Zealand (up to 120 B-channels/four interfaces), for Malaysia (up to 120 B-channels/four interfaces), and for Hong Kong

- Calling Line Identification Presentation and Restriction (CLIP and CLIR)
- Connected Line Identification Presentation and Restriction (COLP and COLR), for India, Philippines, Taiwan, and Indonesia
- Circuit switched voice and data on the B-channel
- Direct Dialing Inward (DDI/DID), for Indonesia
- Overlap Sending (supported by all interfaces except Japan, Philippines)
- Overlap Receiving, for India, Indonesia, China, Malaysia, and Thailand
- COT, DID, DOD, and TIE trunk call types, as applicable
- 64 kbps clear digital information
- Flexible Numbering Plan
- Sub-addressing (supported only when information is received from the Asia Pacific ISDN interfaces and passed through a tandem node)
- Channel Negotiation (for all countries except Singapore. See the note which follows).

Note: As part of the Singapore enhancement introduced with X11 Release 24, Channel Negotiation is not supported for Singapore. The CNEG option must be set to 1 (the default) in LD 17.

Note: The Asia Pacific interface does not support the Meridian 1 Packet Handler (MPH) across the CO.

Clock synchronization, automatic switching and recovery for ISDN BRI to local exchange connectivity

System clock synchronization may be achieved by having the Meridian 1 slave to the local exchange; the clock source may be derived either from the ISDN BRI Local Exchange connection or from other ISDN BRI/PRI2/DTI2 local exchange connections if available. The clock source is input to the Clock Controller card on the Meridian 1, and the system clock is then synchronized with the network clock. This functionality is shown in Figure 10.

Refer to *ISDN BRI Installation* for procedures on how to provide clock references to the Clock Controller in an ISDN BRI local exchange connectivity.

Automatic switching

The S/T software cannot detect misframes, loss of signal, and bit error rates, conditions that would cause automatic switching of the clock source; rather, the S/T relies on the clock controller to provide feedback on the quality of the clock, and performs automatic switching and recovery as appropriate. If a clock controller error is detected, the system switches to the backup clock controller, without affecting the reference clock that is being tracked.

If the SILC DSL with clock reference is disabled, and re-enabled, clock tracking is restored as follows:

- if DSL #0 has been assigned as the primary reference clock, but the clock controller is tracking on the secondary reference or is in **free run mode**, the clock is restored to tracking on primary;
- if DSL #1 has been assigned as the secondary reference clock, but the clock controller is in **free run mode**, the clock is restored to tracking on secondary.

Tracking on the primary or secondary reference clock is automatically switched as follows:

- if the system software is unable to track on the assigned primary reference clock, it switches to the secondary reference clock;
- if the system software is unable to track on the assigned secondary reference clock, it switches to **free run mode**.

Clock recovery

The SILC is configured in the slave-slave mode when acting as a trunk interface. This is set up through the Maintenance Signaling Channel (MSC). The microcontroller configures the S/T chips on the SILC as appropriate.

Automatic clock recovery is done upon the expiration of the free run guard timer. Tracking is restored to the primary reference clock, if defined. If the primary reference clock is disabled, tracking is restored to the secondary reference clock, if defined.

T0 (2B+D) backup for T2 (30B+D)

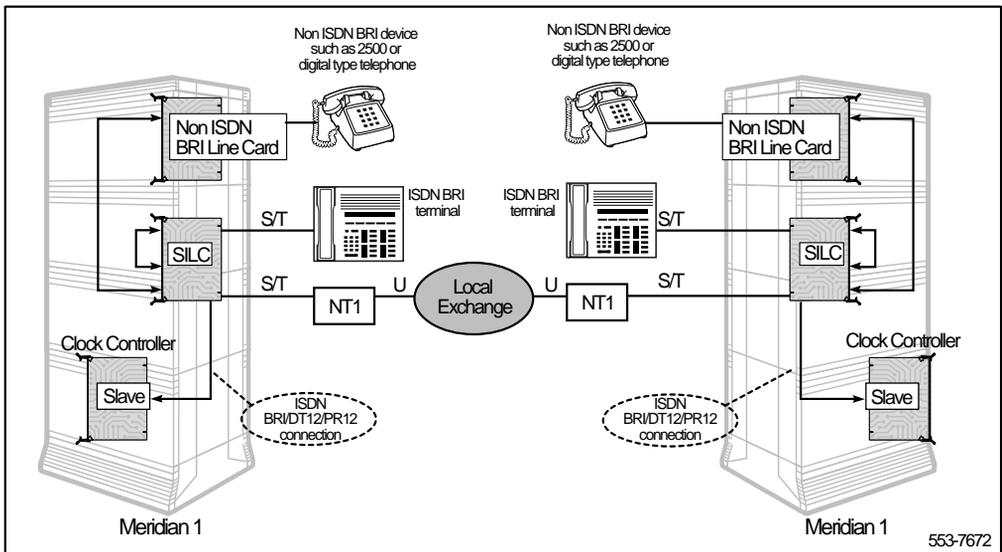
Note: Japan D70 connectivity uses T0 (2B+D) for T1 (23B+D) backup.

When configuring clock synchronization, ISDN BRI trunks can be configured as backup for ISDN PRI trunks using either ESN Route Selection, or Route Hunting. Clock synchronization may be set up with the ISDN BRI clock source configured as a secondary clock reference for an existing ISDN PRI clock source; and although the reverse is supported, that is, the ISDN BRI clock source may be configured as the primary clock reference with the ISDN PRI clock source as the secondary reference, this configuration is not recommended because a ISDN PRI clock source is more reliable than a ISDN BRI clock source.

ISDN BRI MCDN Tie trunk connectivity

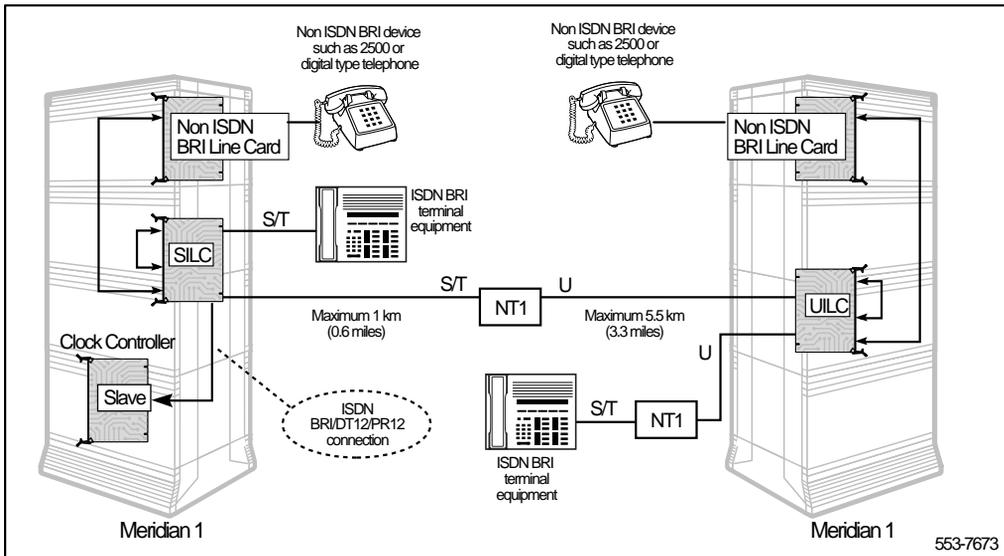
MCDN ISDN BRI Tie trunk connectivity may have three implementations. In the first configuration (refer to Figure 10), a Meridian Customer Defined Networking (MCDN) Tie trunk connection may be implemented by connecting two Meridian 1s to the ISDN BRI leased line through the local exchange via two SILC cards. The S/T interface is connected to the local exchange using the NT1 supplied by the PTT. There is no distance limitation on this configuration. System clock synchronization may be achieved by having the Meridian 1 slave to the local exchange; the clock source may be derived either from the ISDN BRI local exchange connections or from other ISDN BRI/PRI2/DTI2 local exchange connections if available.

Figure 10
ISDN BRI trunk access Tie trunk connectivity — first configuration



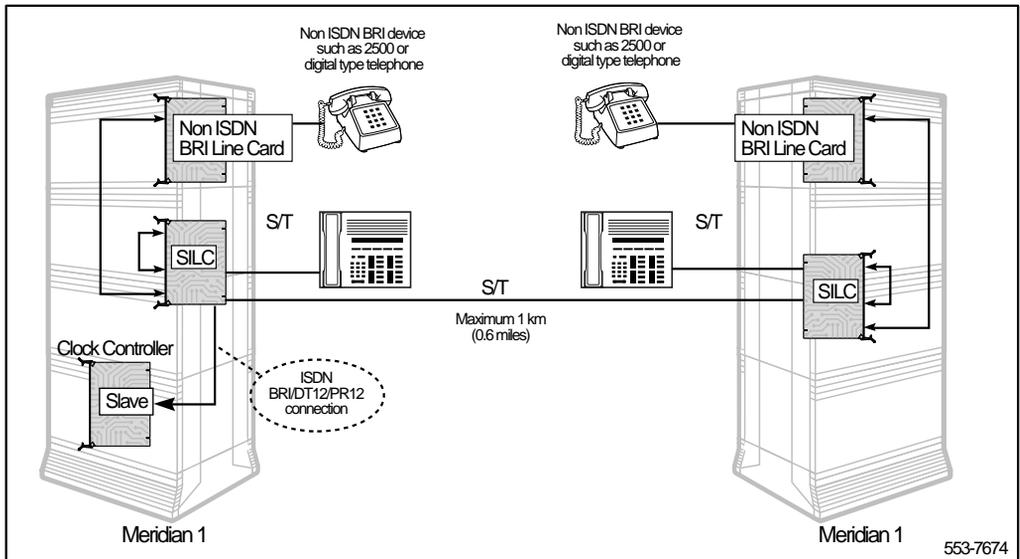
In the second configuration (Figure 11), a MCDN Tie trunk connection may be achieved by connecting two Meridian 1s through an NT1 device. With this configuration, there is a distance limitation of 6.5 km (3.9 miles), without any signal amplification device. System clock synchronization may be achieved by having the Meridian 1, equipped with the SILC, derive clock reference from the ISDN BRI Tie trunk connection or from other ISDN BRI/PRI2/DTI2 connections if available. The Meridian 1 equipped with the UILC interface may be allowed to operate in free-run mode or derive the clock source from other ISDN BRI/PRI2/DTI2 connections if available

Figure 11
ISDN BRI Tie trunk connectivity — second configuration



The third configuration (refer to Figure 12), although not recommended because of the lack of protection devices and because of the distance limitation of 1 km (0.6 mile), may establish a MCDN Tie trunk link by connecting two Meridian 1s via a direct line between two back-to-back SILC interfaces. This configuration would be applied only to multiple buildings on a contiguous property with no exposed cable (with the 1 km limitation between buildings). System clock synchronization may be achieved by having one of the Meridian 1s derive clock reference from the ISDN BRI Tie trunk connection or from other ISDN BRI/PRI2/DTI2 connections if available. The other Meridian 1 may be allowed to operate in free-run mode or derive the clock source from other ISDN BRI/PRI2/DTI2 connections if available.

Figure 12
ISDN BRI Tie trunk connectivity — third configuration



ISDN BRI QSIG connectivity

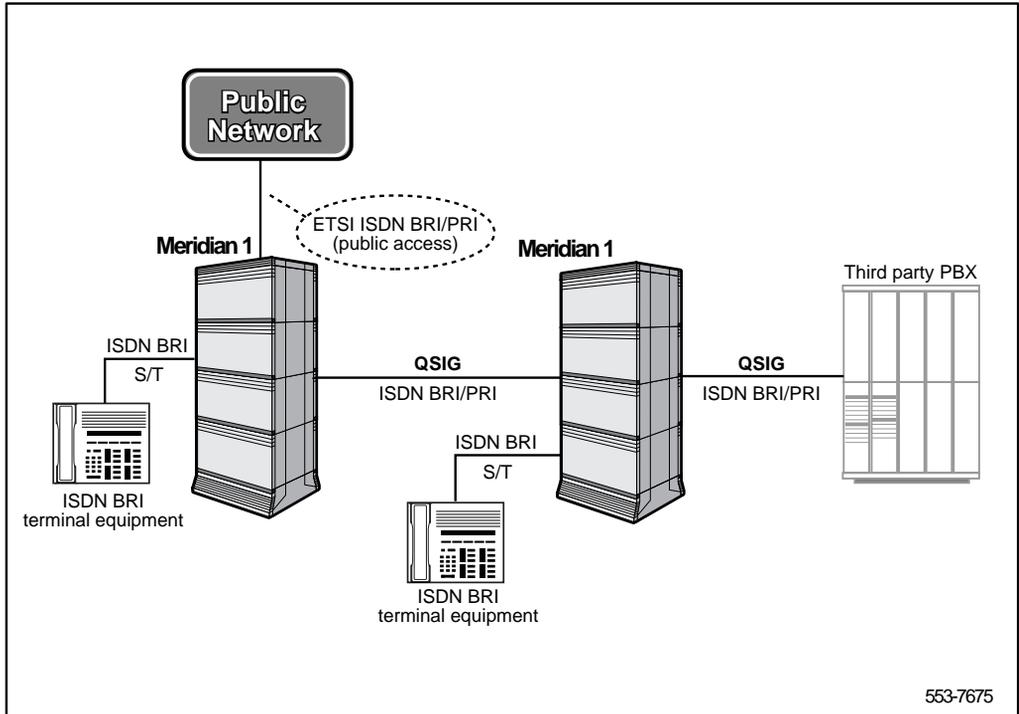
The European Computer Manufacturer's Association (ECMA) has defined an ISDN protocol that specifies the Layer 3 signaling requirement for support of circuit switched call control at the "Q" reference point between Private Telecommunications Network Exchanges (PTNXs) connected within a Private Telecommunications Network (PTN). This protocol has been adopted by the European Telecommunications Standards Institute (ETSI) and the International Standards Institute (ISO). Most of the major European PTNX manufacturers will be supporting ISDN BRI (as well as ISDN PRI) connectivity based on the ISDN QSIG (ETSI and ISO) standard.

QSIG is oriented towards signaling and services that occur between peer-to-peer connectivity, that is, between two PBXs, between two Centrex, or between a PBX and a Centrex; the signaling for services would be exchanged across a "Q" reference point. Figure 13 illustrates an example of QSIG trunk connectivity. For ISDN BRI, the QSIG interface will provide the following capabilities:

- Compliant Multi-vendor PBX/Centrex Private ISDN interworking (connectivity between the Private ISDN PBXs may be via PRI or ISDN BRI trunks)
- ETSI or ISO version of basic call service
- 64 kbps clear data
- Overlap Sending/Receiving
- Channel Negotiation
Note: in cases where several ISDN BRI trunks (and hence several DSLs) are configured on a route, if Channel Negotiation fails to yield an acceptable channel on any of these DSLs, it is not possible to use another channel on another DSL.
- Calling Line Identification Presentation (CLIP)
- Calling Line Identification Restriction (CLIR)
- Connected Line Identification Presentation (COLP)
- Connected Line Identification Restriction (COLR)
- Flexible Numbering Plan

- Support for Tie trunk call types
- Transit Count information transmitted when ISDN Call Connection Limitation (ICCL) is present (supported for ETSI QSIG only)
- Party Category (partially supported on ETSI QSIG)

Figure 13
QSIG ISDN BRI trunk connectivity



ISDN QSIG-BC and QSIG-GF Compliance Update

This feature applies to Basic Rate Interface connections. Refer to the ISDN PRI section of the guide called *Networking* for more information about this feature.

Engineering guidelines

This chapter describes engineering guidelines that should be used to configure an ISDN BRI system. It describes hardware requirements, system capacity, configuration guidelines, digital subscriber loop transmission characteristics, and interface specifications. For further information about Meridian 1 general engineering guidelines, refer to *System engineering* (553-3001-151).

Hardware Requirements

Hardware requirements for ISDN BRI line, packet handling, and trunk applications are as follows (please note that a functional description of each component will follow):

Note: The mean time between failures (MTF) is given as appropriate.

line application

- **MISP circuit card** — NT6D73; MTF = 29 years
- **Basic Rate Signaling Concentrator (BRSC) card** (optional) — NT6D72; MTF = 17 years
- **SILC circuit card** —
NT6D70AA (-48V North American) MTF = 47.3 years or
NT6D70BA (-40V International); MTF = 47.3 years
- **UILC circuit card** — NT6D71 (ANSI 2B1Q line encoding);
MTF = 46.8 years
- **Terminating resistor** — A0378866

— **ISDN BRI terminals**

- M5317TDX — Meridian 1 set equipped with voice and data transmission options and a hands-free feature; supports B-channel and D-channel packet data.
- M5209TDcp — Meridian 1 set equipped with voice and data transmission options and a hands-free feature; supports B-channel and D-channel packet data.
- Other terminals (any other terminal deemed compatible by Northern Telecom)

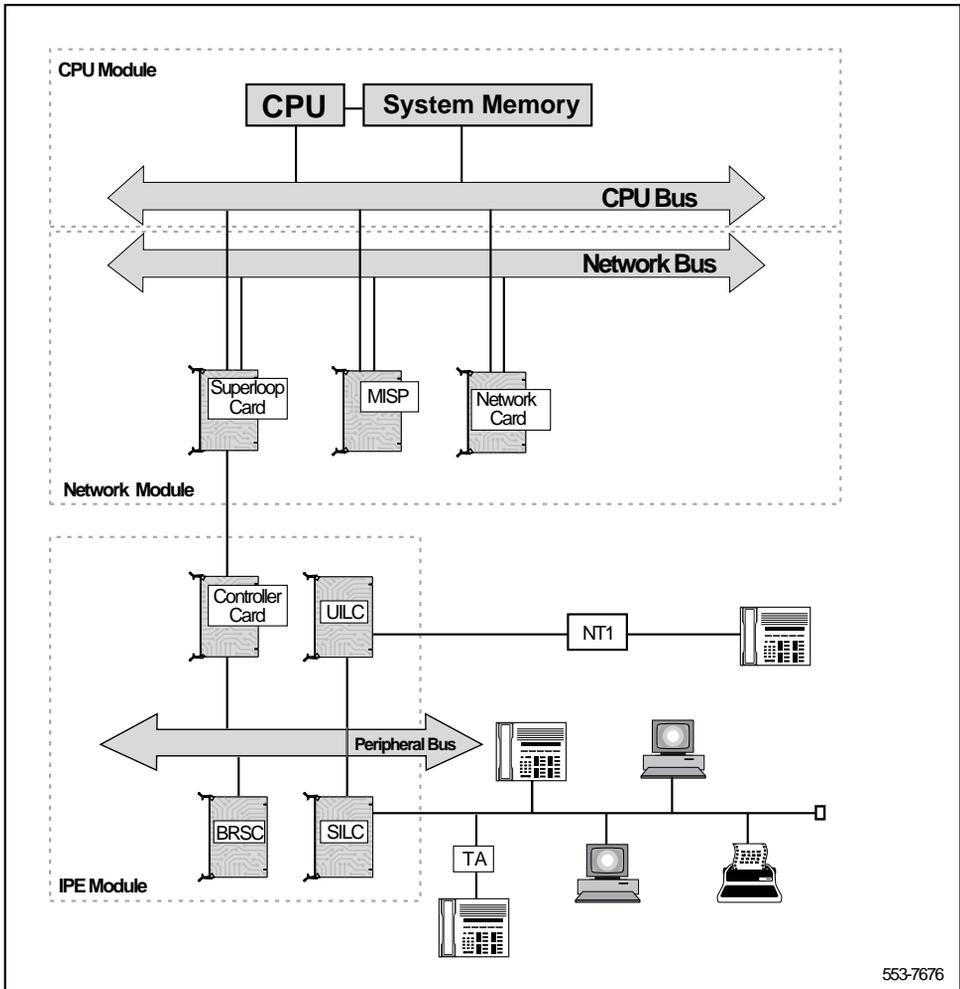
— **ISDN Terminal Adapter** — M5000TD-1, required if connecting non-BRI terminals to the ISDN BRI line interface

— **Network Termination 1 (NT1)**

Needed when conversion from a U to an S/T interface is required.

Figure 14 illustrates a basic ISDN BRI line application architecture, with an BRSC.

Figure 14
ISDN BRI line application architecture, with a BRSC



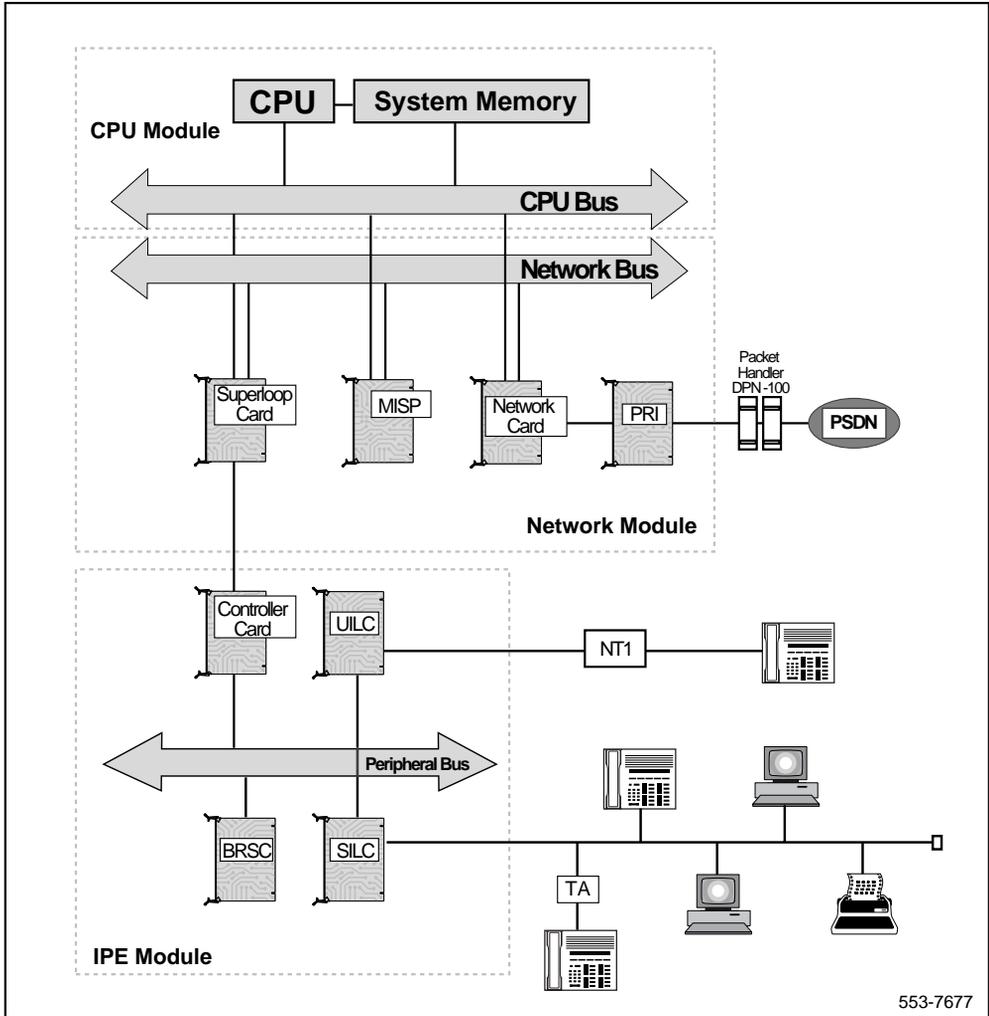
Packet handling

External packet handler (DPN-100)

- **MISP circuit card** — NT6D73; MTF = 29 years
- **Basic Rate Signaling Concentrator (BRSC) card** (optional) — NT6D72; MTF = 17 years
- **SILC circuit card** — NT6D70AA (-48V North American) or NT6D70BA (-40V International); MTF = 47.3 years
- **UILC circuit card** — NT6D71 (ANSI 2B1Q line encoding); MTF = 46.8 years
- **Terminating resistor** — A0378866
- **1.5 PRI circuit card** — QPC720 or the dual-port NT5D12
- **PRI2 circuit card** — NT8D72 or dual-port NTCK43
- **DPN-100 External Packet Handler**
- **ISDN BRI terminals**
 - M5317TDX — Meridian 1 set equipped with voice and data transmission options and a hands-free feature; supports B-channel and D-channel packet data.
 - M5209TDcp — Meridian 1 set equipped with voice and data transmission options and a hands-free feature; supports B-channel and D-channel packet data.
 - Other terminals (any other terminal deemed compatible by Northern Telecom)
- **ISDN Terminal Adapter** — M5000TD-1, required if connecting non-BRI terminals to the ISDN BRI line interface
- **Network Termination 1 (NT1)**
Needed when conversion from a U to an S/T interface is required.

Figure 15 illustrates a basic ISDN BRI DPN-100 packet data architecture, with an BRSC.

Figure 15
ISDN BRI DPN-100 packet data architecture, with a BRSC



Meridian 1 Packet Handler (MPH)

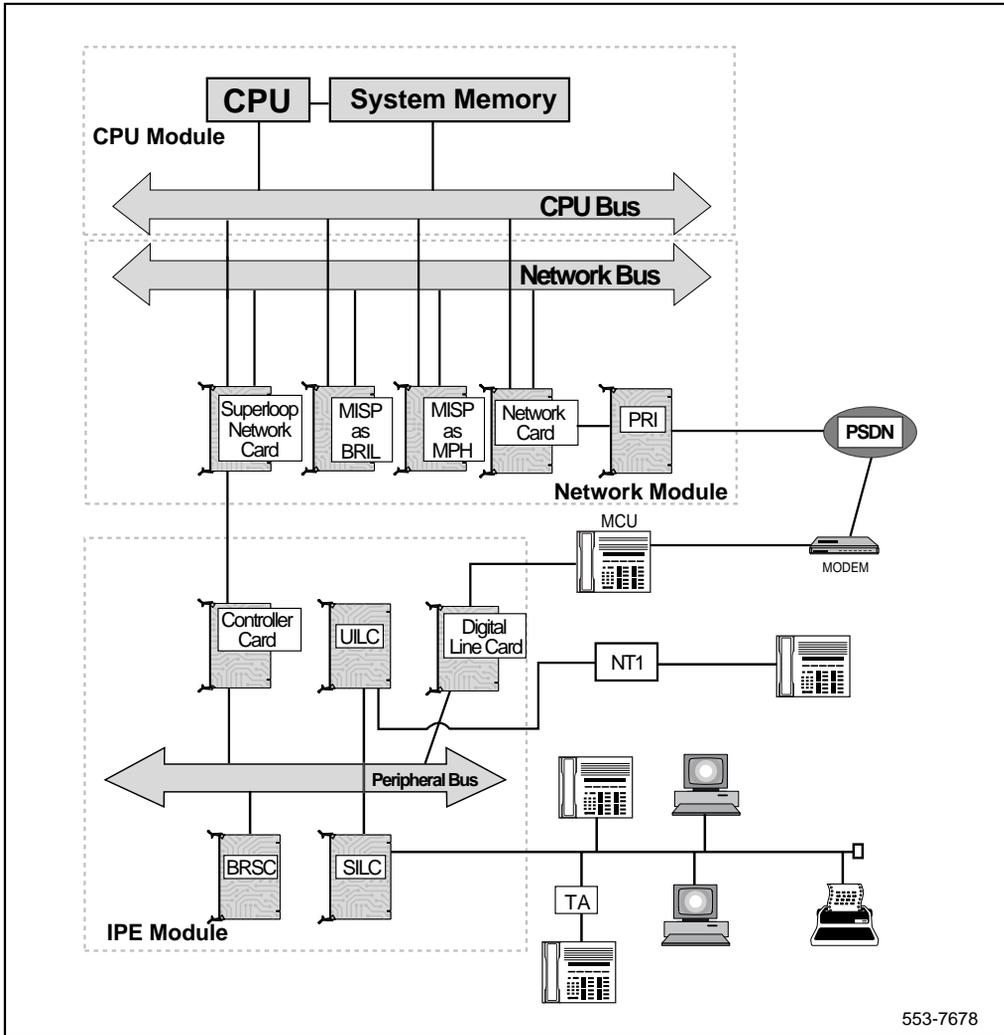
- **MISP circuit card** — NT6D73; MTF = 29 years
 - **Basic Rate Signaling Concentrator (BRSC) card** (optional) — NT6D72; MTF = 17 years
 - **SILC circuit card** — NT6D70AA (-48V North American) or NT6D70BA (-40V International); MTF = 47.3 years
 - **UILC circuit card** — NT6D71 (ANSI 2B1Q line encoding); MTF = 46.8 years
 - **Terminating resistor** — A0378866
 - **1.5 PRI circuit card** — QPC720 or the dual-port NT5D12
 - **PRI2 circuit card** — NT8D72 or dual-port NTCK43

(the use of a PRI card is optional, used if a PRI channel is used to access the PSDN instead of an MCU data module)
- or*
- **Meridian Communication Unit (MCU)** (optional, used if an MCU data module is used to access the PSDN instead of a PRI channel)
 - **modem or Digital Interface Unit** (optional, required if an MCU is used)
 - **Meridian 1 Packet Handler (MPH)** (downloadable to the MISP)
 - **ISDN BRI terminals**
 - M5317TDX — Meridian 1 set equipped with voice and data transmission options and a hands-free feature; supports B-channel and D-channel packet data.
 - M5209TDcp — Meridian 1 set equipped with voice and data transmission options and a hands-free feature; supports B-channel and D-channel packet data.
 - Other terminals (any other terminal deemed compatible by Northern Telecom)

- **ISDN Terminal Adapter** — M5000TD-1, required if connecting non-BRI terminals to the ISDN BRI line interface
- **Network Termination 1 (NT1)**
Needed when conversion from a U to an S/T interface is required.

Figure 16 illustrates a basic MPH packet data architecture, with an BRSC and an MCU.

Figure 16
ISDN BRI MPH packet data architecture, with a BRSC and an MCU



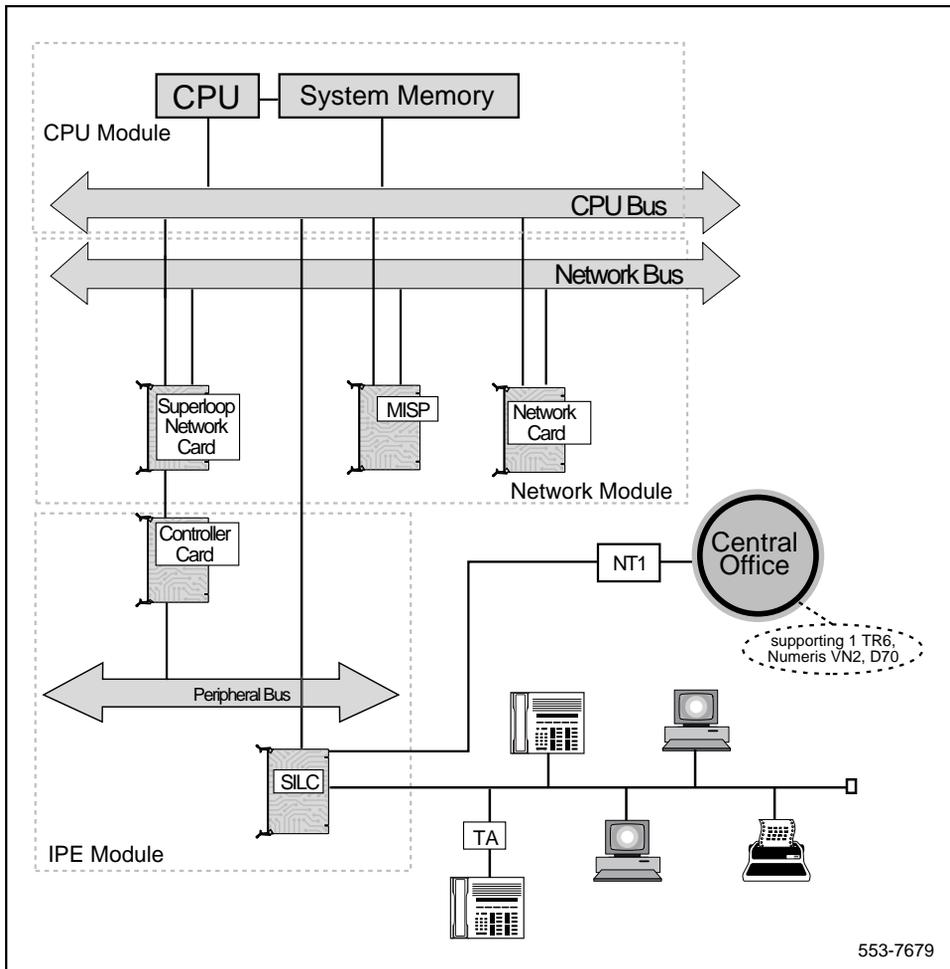
trunk application

- **MISP circuit card** — NT6D73; MTF = 29 years
- **SILC circuit card** (for CO/Tie connectivity; IPE card) — NT6D70AA (-48V North American) or NT6D70BA (-40V International); MTF = 47.3 years
- **UILC circuit card** (for Tie connectivity) — NT6D71 (ANSI 2B1Q line encoding); MTF = 46.8 years
- **Terminating resistor** — A0378866
- **Clock Controller** — QPC775/QPC471 (resides on the CPU shelf; required if the clock source is to be drawn from DSL0 or DSL1 of the SILC; DSL0 can only be configured as the primary source, while DSL1 can only be configured as the secondary source. The CC connects to the SILC clock port via cables)

Note: Vintage QPC775E is required for EuroISDN and Numeris VN2 applications, and for Meridian 1 Option 81/81C systems.
- **Clock Controller reference cables** — NTD70, NTND71, NTND72
- **ISDN BRI terminals**
 - M5317TDX — Meridian 1 set equipped with voice and data transmission options and a hands-free feature; supports B-channel and D-channel packet data.
 - M5209TDcp — Meridian 1 set equipped with voice and data transmission options and a hands-free feature; supports B-channel and D-channel packet data.
 - Other terminals (any other terminal deemed compatible by Northern Telecom)
- **ISDN Terminal Adapter** — M5000TD-1, required if connecting non-BRI terminals to the ISDN BRI line interface
- **Network Termination 1 (NT1)** — needed for conversion from a U to an S/T interface

Figure 17 illustrates a basic ISDN BRI trunking architecture, with the Meridian 1 connecting to a CO that supports a Numeris VN3, 1TR6, ETSI NET-3 (EuroISDN), INS NET-64 (including Japan D70), Australia ETSI, or Asia-Pacific protocol.

Figure 17
ISDN BRI trunking architecture (CO connectivity)



Hardware functional descriptions

NT6D72 Basic Rate Signaling Concentrator Card (BRSC)

The Basic Rate Signaling Concentrator (BRSC) Card can be used to process data link layer signaling messages from all ISDN BRI line cards and send the resulting network layer messages to the MISP. The BRSC also filters out D-channel Packet Switched Data (DSPD) from signaling information and routes it to the packet handler.

With a BRSC configured, fewer MISPs are needed for the same number of DSLs. Each BRSC can support a combination of 15 SILCs/UILCs per IPE Module, with a maximum of eight UILCs.

The BRSC can route the packet data from the line cards to a DPN100, the external packet handler, or to the MPH, the internal packet handler.

NT6D73 Multi-Purpose ISDN Signaling Processor (MISP)

The NT6D73 MISP is a microprocessor controlled signaling processor that provides a communication interface between the CPU and the peripheral devices. It utilizes the network and the CPU buses to communicate with the CPU, the SILCs, and the UILCs. Both buses are located on the Network Module backplane.

If a BRSC card is not configured in a Meridian 1, each MISP can support 32 D-channels and therefore can support 32 DSLs since each DSL has a D-channel. This is true only if the D-channels are not configured to carry packet data. If they are carrying packet data to the DPN-100, the MISP can support only 31 DSLs.

Note: Without a BRSC, one MISP may support up to four SILCs, which results in a maximum of 32 DSLs. Please note that even though every DSL on each SILC may not be defined, you cannot add another SILC (even though you are within the maximum number of 32 DSLs). This is due to the fact the MISP has two nail-ups for each SILC, and each nail-up controls four DSLs in sequential order. Therefore, there is no space in the MISP block to store more than four SILCs.

A BRSC card provides increased capacity, supporting up to 120 DSLs in the same IPE Module. One MISP can serve up to eight BRSCs and two line cards. This increases DSL capacity for the MISP from 32 to 976. This figure is derived as follows:

1 MISP supports 8 BRSCs and 2 line cards (SILC/UILCs)

1 BRSC supports 15 SILC/UILC cards, each having 8 ports:

- total $(8 * 15) = 120$

1 SILC/UILC card has 8 ports

- total $(8 * 120) = 960$

2 SILC/UILC cards each has 8 ports

- total $(8 * 2) = 16$

Therefore, total number of DSLs = $960 + 16 = 976$.

Each MISP can support directly the following combinations:

- four ISDN BRI line cards without any BRSCs
- three ISDN BRI line cards and one BRSC, or
- two ISDN BRI line cards and a maximum of eight BRSCs

The main functions of the MISP are to:

- communicate with the CPU to report ISDN BRI status and receive downloaded application software and configuration parameters
- execute Open System Interconnect (OSI) data link and network layer protocols
- provides the platform for the Meridian 1 Packet Handler
- process the signaling information received on the D-Channels from DSLs. D-Channels may also carry user packet data, which the MISP separates from signaling information and forwards to the external DPN-100 packet handler or internal packet handler (MPH)
- control terminal initialization and addressing
- assign B-channels for switched voice and data transmission
- send call control messages to ISDN BRI links over the D-channel

NT6D70AA/NT6D70BA S/T Interface Line card (SILC)

The SILC cards (NT6D70AA -48V North America, NT6D70BA -40 V International) provide a globally accepted standard interface. The SILC circuit cards support the OSI physical layer (layer 1) protocol.

The SILC provides eight S/T four wire full duplex polarity sensitive interfaces. Each S/T interface provides two B-channels and one D-channel and supports a maximum of eight physical connections that may be configured for ISDN BRI terminals or for CO/Tie trunk connectivity.

For line connectivity, each S/T interface can link up to 20 logical terminals on one DSL. A logical terminal is any terminal that can communicate with the Meridian 1 over a DSL. It may be directly connected to the DSL through its own physical termination or be indirectly connected through a common physical termination.

The length of a DSL depends on the specific terminal configuration and the DSL wire gauge, however, it should not exceed 1 km (0.6 mi.).

The SILC interface uses a 4 conductor cable that provides a differential Transmit and Receive pair for each DSL. The SILC has options to provide a total of 2 Watts of power on the Transmit or Receive leads, or no power at all. When this power is supplied from the S/T interface, the terminal devices must not draw more than the 2 Watts of power. Any power requirements beyond this limit must be locally powered.

A terminating resistor (AO378866) must be placed at the end of each DSL associated with an S/T interface to ensure proper operation.

Other functions of the SILC are:

- support point-to-point and point-to-multi-point DSL terminal connections
- execute instructions received from the MISP to configure and control the S/T interfaces
- provide channel mapping between ISDN BRI format (2B+D) and Meridian 1 system bus format
- enable and disable DSLs

- provide loopback control of DSLs
- for trunking applications, provide a reference clock to the clock controller

SILCs required for non-blocking conditions

Use the equations below to calculate the number of SILCs required to provide interfaces for the S/T type ISDN BRI terminals for non-blocking traffic conditions. To provide a non-blocking traffic condition on a DSL a maximum of 2 B-channel terminals may be connected.

$$\text{SILC B-channel terminals} \div 16 = \text{SILCs}$$

Note: A physical terminal that can use two or more B-channels simultaneously such as circuit-switched voice and data, should be counted as two terminals for the purpose of this calculation.

$$\text{SILC D-channel terminals} \div 8 \text{ (See Note)} = \text{SILCs}$$

Note: This assumes one D-channel terminal per DSL, however, you can install more than one such terminal if their combined packet data transmission speeds do not exceed the D-channel throughput of 16 kbps.

If the result is a fraction, round it off to the next highest number. The larger of the two results obtained from the above two equations defines the number of SILCs required.

SILCs required in blocking conditions

If you accept blocking traffic conditions on DSLs, you have the ability to install any combination of B-channel and D-channel terminals on a DSL as long as the total number of physical terminations connecting these terminals to the DSL does not exceed eight and the number of logical terminals does not exceed 20. The greater the number of terminals on a DSL, the greater the traffic blocking.

To calculate the number of SILCs for a combination of terminals on a DSL, follow the equations below:

$$\text{Total SILC B-channel terminals} \div (\text{number of B-channel terminals per DSL} \times 8) = \text{SILCs}$$

$$\text{Total SILC D-channel terminals} \div (\text{number of D-channel terminals per DSL} \times 8) = \text{SILCs}$$

If the result is a fraction, round it off to the next highest number. The larger of the two results obtained from the above two equations represents the SILCs for blocking conditions.

NT6D71 U Interface Line Card (UILC)

The NT6D71 UILC card supports the OSI physical layer (layer 1) protocol. The UILC is an ANSI defined standard interface.

The UILC provides eight two-wire full duplex (non polarity sensitive) U interfaces that are used to connect ISDN BRI compatible terminals over DSLs to the Meridian 1. Each U interface provides two B-channels and one D-channel and supports one physical termination. This termination may be to a Network Termination (NT1) or directly to a single U interface terminal. Normally this physical termination is to an NT1, which provides an S/T interface that allows up to 8 physical terminals to be connected.

The length of a U DSL depends on the specific terminal configuration and the DSL wire gauge; typically, however, it should not exceed 5.5 km (3.3 mi). Refer to Table 12 for maximum recommended U DSL length.

The main functions of the UILC are:

- provide eight ISDN U interfaces conforming to ANSI standards
- support point-to-point DSL terminal connections
- provide channel mapping between ISDN BRI format (2B+D) and Meridian 1 bus format
- enable and disable DSLs
- provide loopback control of DSLs

To calculate the number of **NT1s for non-blocking** operation take the larger resulting number from the two equations below:

$$\text{S/T B-channel terminals} \div 2 = \text{NT1's}$$

Note: A physical terminal that can use two B-channels simultaneously such as circuit-switched voice and data, should be counted as two terminals for the purpose of this calculation.

S/T D-channel terminals $\div 6 =$ NT1's. This calculation is application sensitive. Up to 18 logical D-channel terminals may be connected as long as through-put does not exceed 16 kbps on D-channel.

Note: The S/T D-channel terminals are divided by 6, since it is assumed that for non-blocking operation, the maximum number of physical connections is 8, and that 2 are used for B-channels.

To calculate the number of **NT1s where blocking is acceptable** to allow maximum number of terminations on a DSL, use the two equations below:

S/T B-channel terminals $\div 16 =$ NT1's

Note: This equation assumes that each S/T interface connects eight physical terminals where each physical terminal can use two B-channels simultaneously such as circuit-switched voice and data.

S/T D-channel terminals $\div 20 =$ NT1's (maximum of 20 TEIs per DSL)

In both cases use the larger of the two results. If the result is a fraction, round it off to the next highest number. Add the number of NT1s to the number of true U interface terminals to determine the total number of UILC-supported terminals as follows:

Total UILC terminals = Number of NT1s + Number of true U interface terminals

For the sake of this calculation its fair to assume that each true U interface terminal represents an actual physical termination on a U interface type DSL.

To calculate the required number of UILCs to support the total number of UILC terminals (number of NT1s + number of true U interface terminals) in the system, use the following equation:

UILCs = Total UILC terminals $\div 8$

If the result is a fraction, round it off to the next highest number.

NT8D72/NTCK43/NT5D97 PRI2 card or QPC720/NT5D12 PRI card

Note: This item is required for packet data implementation only.

For 2.0 MBit applications, the NT8D72 ISDN PRI2 card, the dual-port NTCK43 PRI2 card, or the NT5D97 dual-port DTI2/PRI2 card is required for packet data implementation, to connect the Meridian 1 to the external packet handler (DPN-100). For 1.5 MBit applications, the QPC720 ISDN PRI card or the dual-port NT5D12 PRI card is required. If the MPH is used for packet data without the MCU data module, the PRI card is used to provide a PRI channel to access the PSDN.

B and/or D-channel packet data is transmitted over clear 64 kbps PRI/PRI2 B-channels to the packet handler (a D-channel daughter board is not required). The maximum number of ISDN PRI channels available for communication with the packet handler should not exceed 30 with PRI2 or 23 with PRI (D-channel connections are not required for ISDN PRI access).

Note 1: Vintage NT8D72BA is required for EuroISDN applications. When setting the timers for EuroISDN PRI2 loops in Overlay 73, the following settings are required:

- If the Meridian 1 is connected to a local exchange that supports CRC-4 multiframing, enter CRC-4 in response to the MFF prompt, enter yes in response to the ACRC prompt (to select automatic CRC error reporting), and enter ALT in response to the ALRM prompt (to select alternate alarm mode).

If the Meridian 1 is connected to a local exchange that does not support CRC-4 multiframing, enter AFF in response to the MFF prompt, and enter ALT in response to the ALRM prompt (to select alternate alarm mode);

- In response to the PERS prompt, enter 50 to set the alarm persistence timer to 100ms;
- In response to the CLRS prompt, enter 1 to set the clearance persistence timer to 2ms.

For information on setting PRI2 timers, refer to the procedure “setting timers for PRI2” in *International PRA Administration* 553-2901-301.

Data Packet Network (DPN-100)

Note: The DPN-100 is required for external packet data implementation only, when the Meridian 1 does not process X.25 packets.

Northern Telecom's Data Packet Network (DPN-100) is used as the external packet handler to process the B and/or D-channel packet data sent to it over ISDN PRI2 B-channels.

Meridian 1 Packet Handler

Note: The MPH is required for packet data implementation only.

The MPH provides an alternative to the DPN-100, the external packet handler, for processing packet data. The MPH application resides on the MISP circuit pack. The MPH uses the dedicated MISP as the hardware platform to run the packet handler application. The Meridian 1 supports its administration, utilities and maintenance.

The MPH supports packet data on ISDN BRI B-channels and D-channels. D-channel packet data is routed to the MPH by the MISP line application or BRSC(s). B-channel packet data is routed to the MPH directly through dedicated connections. The MPH routes packet data to the PSDN by means of dedicated channels through either the Primary Rate Interface (PRI) or through a Meridian Communication Unit (MCU) with a synchronous modem. The MPH can support a combination of PRI or MCU connections, to a maximum of three.

The MPH can support three types of calls:

- local calls between packet data terminals connected to the same MPH without PSDN involvement
- calls between packet data terminals on separate MPH applications which must go through the PSDN
- calls to destinations not local to the MPH which are routed to the PSDN

A single MPH provides basic packet data handling functionality for up to 100 D-channels and 19 B-channel packet data terminals.

Numbering Plan supported by the MPH

The MPH supports the CCITT X.121 Numbering Plan, which consists of up to 14 digits to specify the Data Network Address (DNA) of a Data Terminal Equipment (DTE). The DNA consists of a four digit Data Network Identification Code (DNIC) and a one-10 digit National Terminal Number (NTN). The DNIC consists of a three digit Data Country Code (DCC) and a single Network Digit (ND).

In summary, the X.121 DNA is composed as follows:

$$\text{DNA} = \text{DNIC (DCC+ND)} + \text{NTN}$$

where

DNIC = zxxx (z can be 2-7; the digits 0 and 1 are reserved, and 8 and 9 are used for Telex; x can be 0-9)

NTN = 0000000001-9999999999 (1-10 digits)

Note: The DTA may be prefixed by a single digit (0-9), which, while transparent to the MPH, may have a local significance at the PSDN interface (typically used for international calls). This prefix may be entered in response to the PRFX prompt in LD 27, when configuring the MISP for the MPH.

Only one DNIC can be configured for each MPH. Tables of DNAs can be configured and assigned to PSDN interfaces to allow packet data terminals access to the PSDN.

The MPH and Permanent Virtual Circuits and Switched Virtual Circuits

The MPH allows Permanent Virtual Circuits (PVCs) and Switched Virtual Circuits (SVCs) to be established between two local terminals or between a local terminal and a remote destination in the PSDN. The MPH can support 64 simultaneous packet switched data calls.

A Logical Channel Number (LCN) is a numeric identifier at Layer 3. It identifies the particular call (SVC or PVC) where a packet belongs. This allows multiple packet data calls to be established across a single interface.

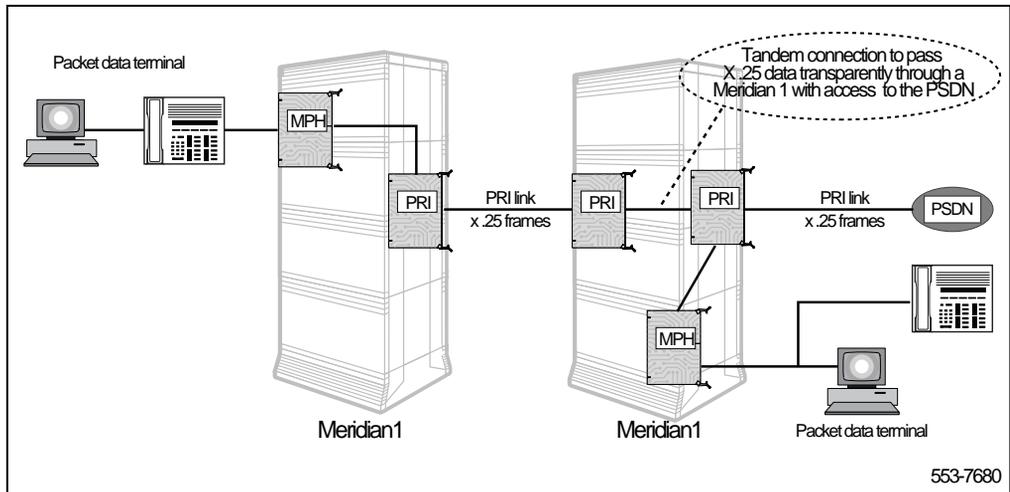
For a PVC, a permanent logical connection is established by the MPH between the two endpoints. PVCs are mapped by LCNs at each interface. The LCN and the interface are the only identifiers used for routing packets across a PVC. A PVC establishes a permanent call between the two endpoints using the specified LCNs at each interface (without the use of call setup packets). An MPH supports a maximum of four PVCs. Each PVC is defined in the MPH configuration in LD 27. SVCs are established by call request packets originating from an ISDN BRI terminal or the PSDN. The MPH identifies the appropriate destination based on the called DNA in the call request packet.

The MPH dynamically allocates an LCN at the destination interface. The MPH does not support dynamic Layer 2 establishment (that is, terminals using either B-channels or D-channels must have all parameters (Layer 2 and Layer 3) configured and operational to receive and/or transmit calls).

The MPH and tandem connections

The MPH allows the Meridian 1 with access to the PSDN, to pass packet data transparently from other Meridian 1 switches in a private network to the PSDN by means of tandem connections. This allows the private network to make optimum use of the number of links to the PSDN. Figure 18 illustrates a tandem connections which involves dedicating a channel on two separate PRI loops on the same switch.

Figure 18
Tandem connections with the MPH



Call Detail Recording for MPH

MPH has two CDR record types: internal and external. The internal packet data call is a data call within an MPH which may cross different customer numbers. The external packet data call is a data call which goes to/comes from the PSDN. This includes calls between two different MPH applications on the same switch. An internal record is generated when internal CDR is equipped on either one or both for the originating data packet terminal or the terminating data packet terminal. If both data packet terminals have internal CDR equipped, then a single record is generated. For an example of this report, refer to *ISDN Basic Rate Interface Administration*.

Characteristics of the MPH application

The following list summarizes the main characteristics and capabilities of the MPH.

- The MPH application and the ISDN BRI line application must reside on separate MISPs
- There is no routing between MPH applications. The MPH supports routing only between terminals logically attached to it and the PSDN
- The MPH supports the X.121 numbering plan only

- Each MPH application supports a maximum of three links to the PSDN
- There is a maximum of eight D-channel packet data separators, MISPs or BRSCs
- Each MPH application supports a maximum of 100 D-channel terminals
- The MPH can process input from a PRI/PRI2 pack over a 64Kbps or 56Kbps link
- The maximum number of PVCs for each MPH is four
- The maximum simultaneous Packet Switched Data calls for each MPH, including PVCs, is 64
- The maximum B-channel terminations for each MPH application is 19
- Tandem connections apply to PRI links only
- An MPH network interface supports a maximum of four DNA tables
- PVCs have no CDR because there is no call establishing process involved
- The packet size supported is 128 or 256
- The maximum window size is seven

Meridian Communication Unit (MCU)

The MCU is a data module used to interface between the MPH and the PSDN, when an NT8D72 ISDN PRI2 card is not used (the MCU is the only data module that supports the MPH/PSDN interface, due to the proprietary protocol used between the MPH and the MCU that allows X.25 data to pass through the interface).

The MCU requires a nailed-up connection to be established between the MPH and the MCU. The MCU is connected to a modem or Digital Interface Unit (DIU), which in turn is connected to the PSDN via a voice grade or leased line. The communication between the MCU and modem uses data packets framed in HDLC format via a dial-up synchronous modem connection. A Northern Telecom proprietary protocol allows the X.25 data to pass through the MCU and the modem. The maximum data rate supported by any single connection is 64 Kbps.

Network Termination 1 (NT1)

The stand-alone NT1 product, which is typically installed at the user's work area, consists of the following units:

- the NT1 unit
- the optional NT1 power supply
- a mounting plate

The stand-alone NT1 unit is a two-part molded housing 210 mm (8.27 in.) by 108 mm (4.25 in.), its depth tapering from about 50 mm (2 in.) to about 32 mm (1.25 in.). On the unit's housing are four LED status indicators and three connectors. The bottom of the unit holds four rubber feet for desk-mounting the unit, and four slides that are used to attach the unit to the mounting plate. The unit contains the single NT1 circuit pack assembly. The stand-alone NT1 is powered by one of two methods:

- 1** The NT1 power supply unit which converts 110 V ac input to provide -48 V dc for the NT1, and optionally for the TEs on the S/T bus.
- 2** A customer-provided -48 V dc supply rated a 2 W minimum for NT1 powering. Additional power may be provided to power the TEs on the S/T bus.

The NT1 power supply unit is virtually identical to the NT1 unit. It is a two-part molded housing of 210 mm (8.27 in.) by 108 mm (4.25 in.), its depth tapering from about 50 mm (2 in.) to about 32 mm (1.25 in.). On the units housing are three connectors, one of which is a captive power cord. The bottom of the unit holds four rubber feet for desk-mounting the unit, and four slides that are used to attach the unit to the mounting plate. The unit contains a single circuit pack assembly.

Two cables are provided with the NT1 power supply unit:

- a 178 mm (7 in.) cable (A0346581) for connecting between the power supply and the NT1 unit.
- a captive power cord for connection the an ac power outlet.

Terminating Resistor

A terminating resistor (A0378866) is required at the end of each DSL to reduce signal reflection.

Physical capacity

Physical capacity without the BRSC

Without a BRSC, the number of network loops depends on the number of Superloop Network cards in the Network Module(s). Each Superloop Network card supports up to two IPE Modules or 32 conventional time compression multiplexing (TCM) line and trunk cards, or up to 512 ports. The number of total ports supported by the same system option with ISDN BRI services is smaller and depends on the ratio of conventional ports to ISDN BRI ports.

The reduction of the total number of ports exists because:

- each MISP supports any combination of four SILCs and UILCs
- each SILC and UILC has eight ports

To illustrate these two points, the physical capacity for ISDN BRI systems is calculated for the following two traffic conditions assuming that ISDN BRI ports make up 10% of all the ports in the system:

- non-blocking, where each loop has a voice and data terminal and there is no contention for the B-channels on a DSL
- average traffic load of 6 CCS for voice and 12 CCS for data, where there are more terminals than the system can simultaneously connect

Table 1 shows the number of ISDN BRI ports and the number of TCM ports supported by each system option, assuming 10% ISDN BRI and 90% TCM ports.

Table 1
Physical capacity without the BRSC

	Option 21E		Option 51/51C		Option 61/61C		Option 71		Option 81/81C	
	NB*	B*	NB	B	NB	B	NB	B	NB	B
Capacity	NB*	B*	NB	B	NB	B	NB	B	NB	B
Groups	7/8	7/8	1/2	1/2	1	1	5	5	5	5
Modules	1	1	1	1	2	2	10	10	10	10
Connections	540	300	360	240	720	600	3600	3000	3600	3000
MISPs	1	3	1	2	1	4	7	19	7	19
Super-loops	4	2	3	2	6	5	30	25	30	25
DSLs	32	96	32	64	32	128	224	608	224	608
TCM Loops	205	576	133	648	310	1514	1541	7594	1541	7594

Note: * NB = non-blocking, B = blocking

The Meridian 1 with ISDN BRI reduces the total number of combined ports; however, ISDN BRI DSL ports can connect up to eight physical terminations that may comprise up to 20 logical terminals. This provides greater port capacity than the conventional TCM voice and data ports at the cost of call blocking on the DSL.

Physical capacity with the BRSC

With the BRSC, the physical capacity of the network also determines ISDN BRI system capacity. The exceptions are option 71 and option 81/81C where the Meridian 1 CPU Real Time impact is the deciding factor for overall system capacity. ISDN BRI Real Time impact is equivalent to a digital telephone. The capacity for an ISDN BRI switch (all ISDN BRI loops) in terms of the number of DSLs that can be supported is shown in Figure 2. For Options 21E/21C, 51/51C, and 61/61C, the numbers are the physical capacity of those machines calculated assuming 15% trunking, 25% circuit switched data, and traffic at 6 CCS per voice line.

Table 2
Physical capacity with the BRSC

	Option 21E/21C	Option 51/51C	Option 61/61C	Option 71	Option 81/81C
Blocking capacity					
DSLs	864	648	1296	4200	4200

Memory capacity

The following tables describe the ISDN BRI requirements only. Refer to *Upgrades Systems Installation (553-3001-250)* for complete instruction on how to upgrade your system. Refer to *Memory calculations* for details on memory and capacity.

Protected data store

Protected data in the main system memory contains terminal identification and service profile data. Table 3 and Table 4 show protected data memory requirements for ISDN BRI line application and trunk application, respectively.

Table 3
Protected data memory requirements for line application (Sheet 1 of 2)

Data	Memory Requirements
Protocol Groups Data	48 words per system maximum
USID Map Data	16 words per DSL maximum
TSP Data	1,072 words per DSL maximum
Other Data	approximately 10 words per system
MISP loop block	37 words
MSDL MISP block	22 words
Socket ID table	49 words
Physical IO block	5 words
IO polling table	1 word per MISP
TN line basic block	21 words
Office Data Administration System (ODAS)	3 words
Class of Service (EFD, HUNT, EHT)	12 words (4x3)
DSL data	14 words (as a non-key function)

Table 3
Protected data memory requirements for line application (Sheet 2 of 2)

Data	Memory Requirements
LTID data	40 words (as a non-key function)
USID map	16 words
Template (base)	15 words
Template (features - LTID, EFD, HUNT, EHT)	1 word each
TSP data block	66 words
ISDN BRI block	7 words for each ISDN BRI DN

Table 4
Protected data memory requirements for trunk application

Data	Memory Requirements
Protected Trunk Block (Trunk DSLs use the Protected Trunk Block instead of the Protected BCS Block)	3 words added.
Route Data Block	16 words added for RURC prompt and 1 word added for STAT prompt, for Advice of Charge for Euro ISDN. 6 words added, to store the country for EuroISDN.
ISDN BRI Protocol Data Block	2 words added
Configuration Record	6 words added, to store the country for EuroISDN.
Protected D-channel block	10 words added to store the protocol-specific D-channel information, for the Universal ISDN Protocol Engine (UIEP).
Protected MSDL/MISP block	24 words added, to support the increase from 8 to 32 of the number of supported applications per MSDL/MISP.

Unprotected data store

Unprotected data in the main system memory is used for *data link* (layer 2) and *network* (layer 3) information message storage during system operation. Table 5 and Table 6 show memory requirements for temporary data storage during system operation for ISDN BRI, for line application and trunk application, respectively.

Table 5
Unprotected data memory requirements for line application
(Sheet 1 of 2)

Data	Memory Requirements
MISP input buffer	140 words per system
MISP expedited input buffer	128 words per system
MISP loop block	82 words
MISP output buffer (transmit receive)	260 words
MISP expedited output buffer	512 words
MISP output request buffer	80 words
MSDL MISP block	95 words
Socket ID table	48 words
Meridian 1 expedited receive buffer	128 words
Meridian 1 receive buffer	140 words
Meridian 1 expedited transmit buffer	528 words

Table 5
Unprotected data memory requirements for line application
(Sheet 2 of 2)

Data	Memory Requirements
MISP traffic accumulating block	30 words
MISP traffic holding block	30 words
TN line block	32 words (16x2)
Incoming call reference table	33 words
Outgoing call reference table	33 words
Incoming call reference usage map	4 words
Outgoing call reference usage map	4 words
Incoming message call reference table	33 words
Outgoing message call reference table	33 words
DSL data block	3 words

Table 6
Unprotected data memory requirements for trunk application
(Sheet 1 of 2)

Data	Memory Requirements
MISP Call Register Data Block	2 words
Global Variable Data Block	8 words
Trunk Card Block (all ISDN BRI unprotected card block use the Trunk Card Block)	<p>For Advice of Charge For EuroISDN4:</p> <p>For AOC at call set-up:</p> <ul style="list-style-type: none"> - 24 words to store the Start of Time value of the Real Time Clock - type of charging - charged item - charging rate - rate type - currency identifier - currency amount - multiplier - length of time unit - scale of time unit - granularity - scale of granularity <p>For AOC during the call:no.of words</p> <ul style="list-style-type: none"> - type of charging information - recorded charges - currency identifier - currency amount - multiplier - number of charging unit - billing identification <p>For AOC at the end of the call:no.of words</p> <ul style="list-style-type: none"> - type of charging information - recorded charges - number of charging unit - currency identifier - currency amount - multiplier - number of charging unit - billing identification

Table 6
Unprotected data memory requirements for trunk application
(Sheet 2 of 2)

Data	Memory Requirements
Trunk Line Block	6 words
DCH global area, for messaging	1 word
MISP global area, for messaging	2 words
Unprotected MSDL/MISP block	185 words added, to support the increase from 8 to 32 of the number of supported applications per MSDL/MISP.

ISDN BRI configuration guidelines

Meridian 1 modular design permits flexible engineering. Systems can be tailored to a customer's system size and port type requirements. ISDN BRI line cards can be mixed with conventional TCM line and trunk cards in the same IPE module.

The I/O panels on the IPE modules are the same regardless of the type of line cards installed in the module. Therefore, the external communication cables between Meridian 1 and Main Distribution Frame (MDF) are the same for DSLs and the conventional telephone sets.

Physical parameters

The physical parameters specific to ISDN BRI are listed here.

- MISP location in the Network module
- BRSC location in the IPE module
- DSL configuration (line application or trunk access)

MISP location in the Network module

A Network module can contain one or more MISPs. This number is governed by contention for the network card slots and network loop addresses between the MISP and the Superloop Network cards, among other network cards.

Each MISP occupies one network card slot and two network loop addresses. The Superloop Network card also occupies one network card slot, but it requires four network loops, two of its own and two of the adjacent card slot.

Since the MISP uses one network loop for communication with ISDN BRI cards, the MISP must be located in the same Network module as the Superloop Network card. To prevent conflict between the MISP and the Superloop Network card, the MISP should always be installed into a card slot with loop addresses that are not used by a Superloop Network card.

BRSC location in the IPE module

The BRSC can be located in any IPE module, provided it is in the same module as the ISDN BRI line card it serves.

DSL configuration (line application)

Digital Subscriber Loops configured for line application connect the Meridian 1 to ISDN BRI terminals. A DSL consists of a cable connecting the ISDN BRI DSL port to the Main Distribution Frame (MDF). From the MDF, the loop is cross-connected to the office wiring, which terminates into 8-pin modular jacks (wall outlets). From these outlets, module cables of a maximum length of 10 meters (33 feet) connect to ISDN BRI terminals.

To provide reliable voice and data transmission between Meridian 1 and ISDN BRI terminals, DSLs must be engineered with the following basic considerations in mind:

- number of terminals connected
- loop length (cable type and wire gauge)
- distribution of terminals on a DSL
- type of terminals connected to a DSL

Refer to “Transmission characteristics” in this chapter for a detailed description of the DSL bus configurations and their characteristics. These types are:

- point-to-point SILC DSL (see Figure 20)
- short passive SILC DSL (see Figure 21)
- extended passive SILC DSL (see Figure 22)
- branched passive SILC DSL (see Figure 23)
- point-to-point UILC DSL (see Figure 24)

Loop lengths for specific configurations are controlled by the differential round-trip time delay to the SILC. A short passive bus uses fixed timing and must maintain the differential round-trip delay between 10 and 14 microseconds. An extended or branched passive loop uses adaptive timing to maintain the differential round-trip delay within two microseconds. A point-to-point passive bus uses adaptive timing with the delay from 10 to 42 microseconds. Please refer to Table 7 for the loss and delay parameters of the various cable types used in determining the S/T DSL configuration limits.

Some commonly used **types of cable** with different wire gauges are shown in Table 7 through Table 11 of this section. Please refer to these tables for maximum recommended cable length

The SILC interface supports a four-wire S/T bus consisting of a transmit pair and a receive pair per DSL. The same wiring polarity must be maintained for all physical terminals on the S/T bus. Refer to *System installation* 553-3001-210 for standard wiring practices. The SILC supplies up to 2 Watts of power per DSL as an optional terminal power source PS1 by providing -48 volts (ANSI) or -40 volts (international) DC on the transmit pair signal with respect to receive pair. One additional pair of wires may be used in the office wiring to supply power from an auxiliary power source PS2.

The UILC interface supports a two-wire point-to-point loop consisting of a twisted pair engineered for 2B1Q line encoding on the DSL. One physical termination is allowed at the end of the loop. This may be an NT1 device that interfaces with an S/T bus on the subscriber's premises. Refer to *System installation* 553-3001-210 for standard wiring practices. The U interface is not polarity sensitive. The UILC does not provide power to the terminal.

The cables used to connect the terminals to ISDN BRI cards normally come in one of three wire gauges: 22, 24, and 26 AWG. The larger gauge wire such as 22 AWG has less transmission loss. This means it is actually able to provide a DSL of almost twice the length of the 26 AWG wire for the same loop configuration.

Distribution of terminals on a DSL depends on the type of loop used and the type of interface connected to the loop. For the SILC interface, use the following rules:

- On a short passive bus, up to eight terminals can be distributed anywhere on the loop.
- On an extended passive bus, the terminals must be clustered at the far end of the loop and no more than 4 terminals should be connected.

- On a branched passive bus, two branches may exist at the end of S/T loop. Up to two terminals per branch can be connected.

Note: For each of the bus configurations described above, a terminating resistor (Part number A0378866) must be used to connect the last device.

- Where there is only one terminal connected to the loop in a point-to-point configuration, the terminal must be connected at the end of the loop at the terminating resistor jack.

Type of terminal used depends on the customer requirements. The ISDN BRI terminals can be circuit-switched voice or data, B-channel packet data, or D-channel packet data terminals. A DSL can support up to eight physical terminations each linking one or more terminals to the DSL.

The following recommendations should be considered when connecting terminals to DSLs:

- The total number of physical terminations on an S/T DSL may not exceed eight. Up to 20 logical terminals may be connected to an S/T DSL. A logical terminal may be directly connected to the DSL through its own physical termination, or it may be indirectly connected through a common physical termination.

For non-blocking traffic conditions: Two B-channel circuit-switched voice or data terminals may be connected on each S/T DSL. More than two B-channel terminals may be connected, however, only two will be able to communicate simultaneously. If more than two terminals are connected this could create a blocking condition where the terminals will contend for available B-channels. Any other terminals connected to this DSL can only be D-channel terminals. You can install more than one D-channel terminal if their combined packet data transmission speeds do not exceed the D-channel throughput of 16 kbps.

For blocking traffic conditions: If you accept blocking traffic conditions on DSLs, you have the ability to install any combination of B-channel and D-channel terminals as long as the total number of physical terminations connecting these terminals to the DSL does not exceed eight. These physical terminations may link up to 20 logical terminals. The greater the number of terminals on a DSL, the greater the probability for traffic blocking.

- Only one termination may be connected at the end of a UILC DSL. This termination may be to a Network Termination (NT1) or directly to a single U interface terminal. Normally this physical termination is to an NT1, which provides an S/T interface that allows up to 8 physical terminals to be connected. These terminals communicate to the Meridian 1 through the NT1 and the UILC interface.
- Determine the type of DSL bus configuration you wish to use to connect your terminals keeping in mind the wire type, the length, and the layout of your office wiring

DSL configuration (trunk application)

When configuring DSLs for trunk access the following basic considerations must be kept in mind:

- type of trunk connection to be configured (TIE or CO/DID)
- whether to draw the system reference clock source from the ISDN BRI trunk connection, and the associated clock reference cabling connections
- whether the ISDN BRI trunks are to be configured as the backup trunks for ISDN PRI trunks

Type of trunk connection — Digital Subscriber Loops configured for trunk access allows either a TIE trunk connection from either an S/T interface or U interface, or a CO/DID trunk connection from an S/T interface (please refer to the detailed information described earlier in the “ISDN BRI trunk access” section of the “Functional description” chapter).

System reference clock source — If the system reference clock source is drawn from the ISDN BRI trunk connection (the Meridian 1 on the USER side), the connection from the SILC line card to the Clock Controller must be from DSL#0 or DSL#1 of the SILC card (please refer to the detailed information described earlier in the “ISDN BRI trunk access” section of the “Functional description” chapter). The clock reference cables have to be connected following the procedures described in *ISDN BRI Installation*.

ISDN BRI trunks as backup for ISDN PRI trunks — ISDN BRI trunks can be configured as backup trunks for ISDN PRI trunks, through ESN Route Selection or Route Hunting. As well, an ISDN BRI clock source can be configured as a secondary clock reference for an existing ISDN DTI/PRI clock source.

Functional parameters

Functional parameters must be considered during ISDN BRI configuration procedures. These procedures are used to create an ISDN BRI database and to configure ISDN BRI functions and features when administering the system. These functional parameters apply to:

- ISDN BRI database generation
- DSL addressing

ISDN BRI database generation

When installing ISDN BRI in the system for the first time, configure these components in the order listed below. See *ISDN Basic Rate Interface Administration* for detailed procedures on configuring ISDN BRI.

When changing existing ISDN BRI service, following this order is unnecessary. However, be aware of the relationship of one component to another and whether changing one component necessitates changing other components.

Configurations for an **ISDN BRI line application** are:

- LAPD protocol group
- Multi-purpose ISDN Signaling Processor (MISP)
- Basic Rate Signaling Concentrator (BRSC) (optional)
- S/T line card/U line card (optional)
- Digital subscriber loop (DSL)
- Terminal Service Profile (TSP) on DSL
- Terminals (for example, M5317TDX, M5209TDcp)
- Traffic (LD02) (optional)

To **add an MPH** to a Meridian 1 with an existing ISDN BRI configuration, perform the following configurations in the order shown. Use LD 27 except where noted otherwise:

- Configure the LAPD protocol group
- Configure the LAPB protocol group

- Configure the X.25 packet protocol group
- Configure the DNA table associated with the MPH network interface
- Configure the ISDN Primary Rate Interface (PRI) for packet data:
 - the ISDN PRI loop (LD 17).
 - the ISDN customer (LD 15).
 - the tie trunk route for packet data (LD 16).
 - the tie trunk for packet data (LD14).

OR, if an MCU is used instead of a PRI pack:

- Configure
 - the tie trunk route for packet data (LD 16).
 - the tie trunk for packet data (LD14).
 - the Meridian Communication Unit (MCU) (LD11).
- Perform changes at a centralized MPH location or at a remote location to enable tandem connections (optional) (LD14).
- Configure a Multi-purpose ISDN Signaling Processor (MISP) for an MPH.
- Disable the MISP and modify the MISP for line cards or BRSCs to support D-channel packet data.
- Modify the TSP for D-channel packet data.
- Modify the DSL for B-channel packet data and define new TSP.
- Configure Permanent Virtual Circuits (PVCs) (optional)
- Change terminal configurations (M5317TDX, M5209TDcp, M5000TD-1).
- Configure Customer Data Record (CDR) (LD 15 and LD 27). (optional)

To **add an external packet handler (DPN-100)** to a Meridian 1 with an existing ISDN BRI configuration, configure the following steps in the order shown. Use LD 27 except where noted otherwise:

- LAPD protocol group

-
- Packet data transmission:
 - the ISDN PRI loop (LD 17)
 - the ISDN customer (LD 15)
 - the tie trunk route for packet data (LD 16)
 - the tie trunk for packet data (LD14)
 - Multi-purpose ISDN Signaling Processor (MISP)
 - Basic Rate Signaling Concentrator (BRSC) Card (optional)
 - S/T Interface Line Card (SILC)/U Interface Line Card (UILC) (optional)
 - Digital subscriber loop (DSL)
 - Terminal Service Profile (TSP) on DSL
 - Terminals (for example, M5317TDX, M5209TDcp)

Configurations for an **ISDN BRI trunk application** are:

- ISDN customer (LD 15)
- Trunk pad tables (LD 73) (optional)

Note: The digital pad provides gain or attenuation values to condition the level of the digitized transmission signal according to the network loss plan. This determines transmission levels for the B-channel circuit-switched voice calls.

- LAPD Protocol Group
- ISDN BRI trunk route data block (LD 16)
- MISP
- SILC (for CO/Tie connectivity) and/or UILC (for Tie connectivity)
- Trunk DSL
- If the SILC clock is configured, enter the ISDN BRI trunk clock reference (LD 73)

DSL addressing

ISDN BRI DSL addressing corresponds to standard TN addressing. A DSL address is uniquely defined as TN (l, s, c, dsl#) where:

- **l** is the number of the network superloop by which it is controlled
- **s** is the number of the IPE module (shelf number) where it is located
- **c** is the card slot position of the SILC/UILC in the module
- **dsl#** is the port number on the card

Meridian 1 restricts the use of address location TN(0,0,0,0). For this reason a DSL should not be configured at this address.

Transmission characteristics

ISDN BRI provides two different types of interfaces: the S/T interface provided by the SILC and the U interface provided by the UILC. Each interface has unique physical and transmission characteristics and requires different considerations when configuring DSLs for lines or trunks.

SILC DSL line configuration

The SILC supports both point-to-point and point-to-multipoint transmission. The maximum DSL length must not exceed 1 km (3,280 ft); however, the actual length depends on the cable wire gauge, the number of terminals connected to the loop, and the differential round-trip time delay limits.

When you are configuring DSLs for lines, follow these basic rules:

- maintain wiring polarity for both the transmit and receive pairs
- use a maximum of 10 m (33 ft) modular cable to connect each ISDN BRI terminal to the DSL
- keep the length of the cable stub (distance between the RJ-45 receptacle and the DSL cable) to less than 1 m (3.3 ft)
- don't allow bridge taps or split pairs on the DSL and make sure that the differential pairs (Tx-/Tx+ and Rx-/Rx+), each consist of a twisted pair along the entire length of the DSL
- make sure ISDN BRI terminals powered through the DSL do not exceed the total power of 2 Watts
- connect a maximum of two ISDN BRI terminals requiring B-channel transmission or one terminal using both circuit-switched voice and data to each DSL for a non-blocking configuration. For maximum concentration per DSL, connect up to 8 physical BRI terminals, and up to 20 logical terminals to use two B-channels and the 16 kbps capacity of the D-channel.

- Select the appropriate Network Terminal line sampling mode (NTFS for fixed and NTAS for adaptive) when configuring the DSL in LD 27.

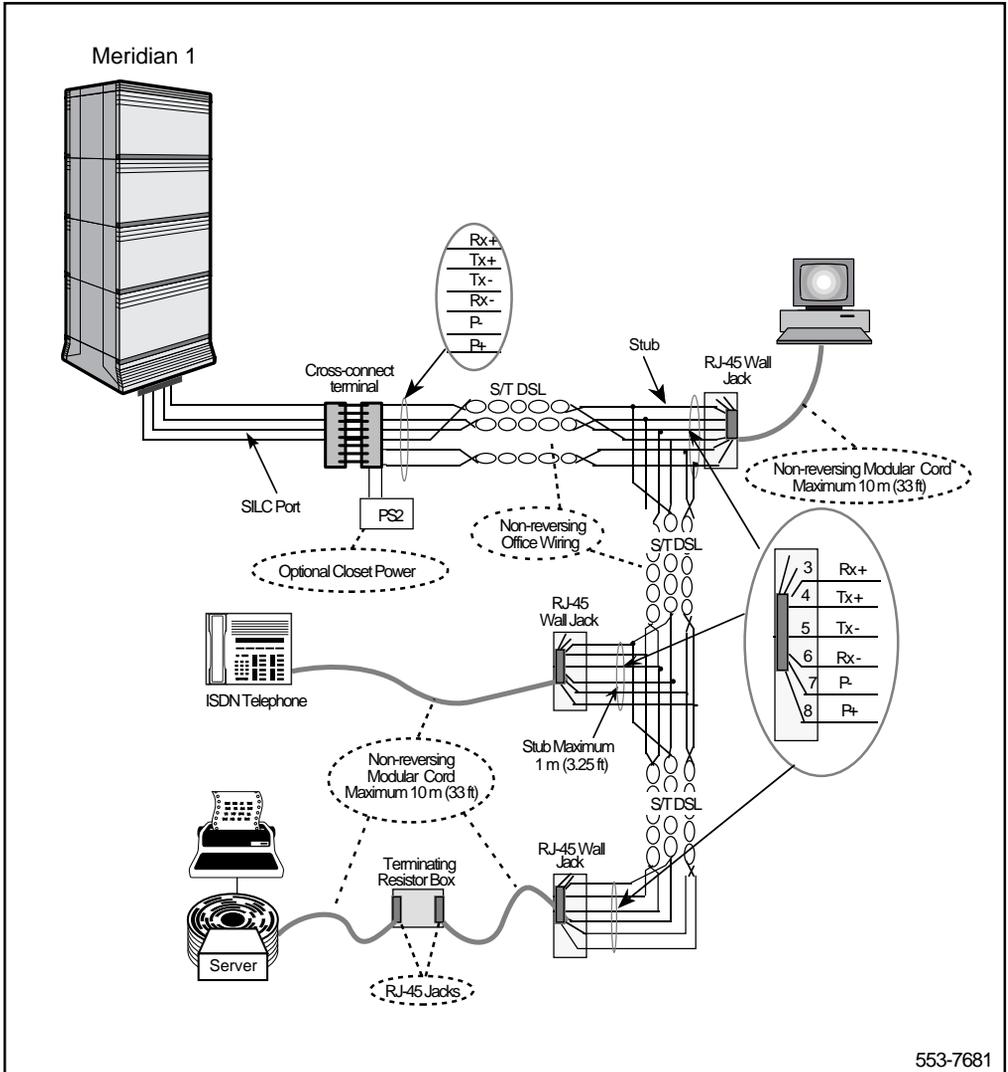
NT Mode Fixed Sampling (NTFS) may be selected when the device is in an NT on a passive bus wiring configuration up to approximately 200 meters in length (depending on cable type). In this mode, multiple terminals (up to eight) may be connected anywhere along the passive bus.

NT Mode, Adaptive Sampling (NTAS) should be selected when the device is in an NT on any wiring configuration up to the maximum specified length for operation. Multiple terminals, if required, must be grouped within approximately 100 meters of each other (depending on cable type).

- place the terminating resistor (A0378866) at the end of the loop, depending on the configuration (refer to Figure 19).

Figure 19 shows a wiring example of an SILC DSL with multiple physical terminations and the terminating resistor at the end of the loop. An SILC DSL consists of a six-wire twisted pair cable, but only four wires carry the signal and two wires provide conduit for an auxiliary power source. This external power source can be used when the total power consumption exceeds 2 Watts on each DSL. In this case the terminals need to be configured to use the auxiliary power source (PS2) or other auxiliary power supplies as part of their product packages.

Figure 19
S/T digital subscriber loop wiring example for ISDN BRI lines



Cable characteristics

Table 7 lists the parameters of the various cable types used in determining the S/T DSL configuration limits. The cables listed are those used for telephony wiring applications, and the characteristics listed are for Northern Telecom cable at 96 kHz and 20°C (68° F).

Table 7
Cable types and characteristics

Cable type	Gauge AWG	Loss dB/km (dB/kft.)	Delay µs/km (µs/k ft.)
Outside PIC	22	1.6 (5.4)	1.7 (5.5)
Outside pulp	22	1.8 (6.0)	1.6 (5.3)
Outside PIC	24	2.3 (7.6)	1.7 (5.6)
Outside pulp	24	2.5 (8.2)	1.7 (5.5)
Outside PIC	26	3.3 (11.0)	1.8 (5.9)
Outside pulp	26	3.3 (11.0)	1.7 (5.7)
Inside riser	22	1.6 (5.2)	1.6 (5.2)
Inside riser	24	2.3 (7.5)	1.7(5.6)
Inside riser	26	3.2 (10.5)	1.8 (5.9)
Inside Z station (FT1)	22	1.6 (5.2)	1.8 (5.9)
Inside Z station (FT4)	22	2.0 (6.6)	2.0 (6.6)
Inside type D (3 and 4 pair)	24	2.6 (8.5)	1.9 (6.2)
Inside type D (25 pair)	24	2.9 (9.5)	2.0 (6.6)

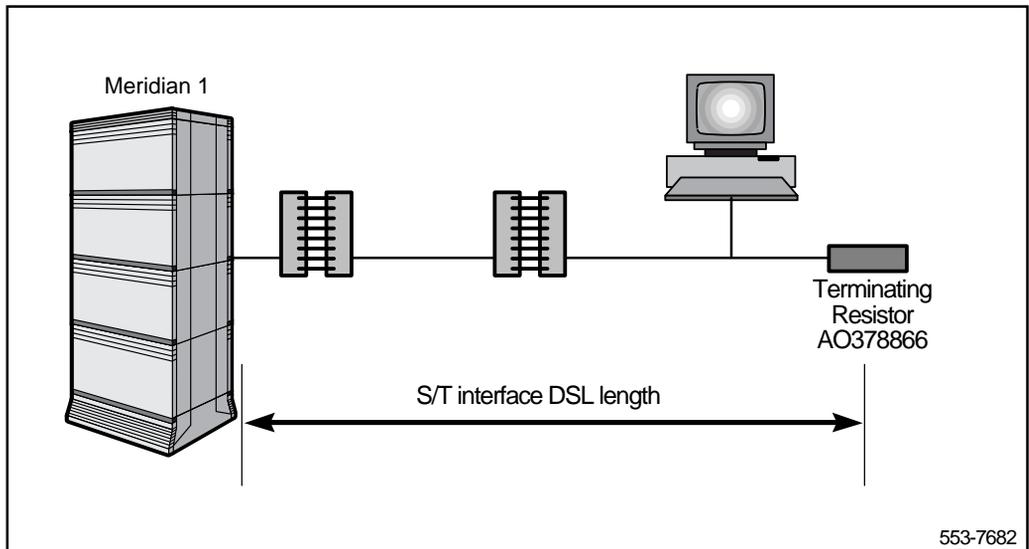
The following examples show some typical SILC DSL configurations. These are:

- point-to-point DSL
- short passive DSL
- extended passive DSL
- branched passive DSL

Point-to-point SILC DSL

This configuration is shown in Figure 20. It represents the simplest type of bus configuration.

Figure 20
Point-to-point DSL



The Point-to-Point bus provides the longest SILC DSL length.
Recommended rules:

- Configure the DSL as adaptive mode through overlay 27 (MODE = NTAS)
- Use a terminating resistor (A0378866) at the end of the DSL.

- Connect only one terminal.
- Cable loss must not exceed 6 dB.

Maximum DSL length depends on the cable type and wire gauge. For a point-to-point bus, the SILC DSL length is as shown in Table 8.

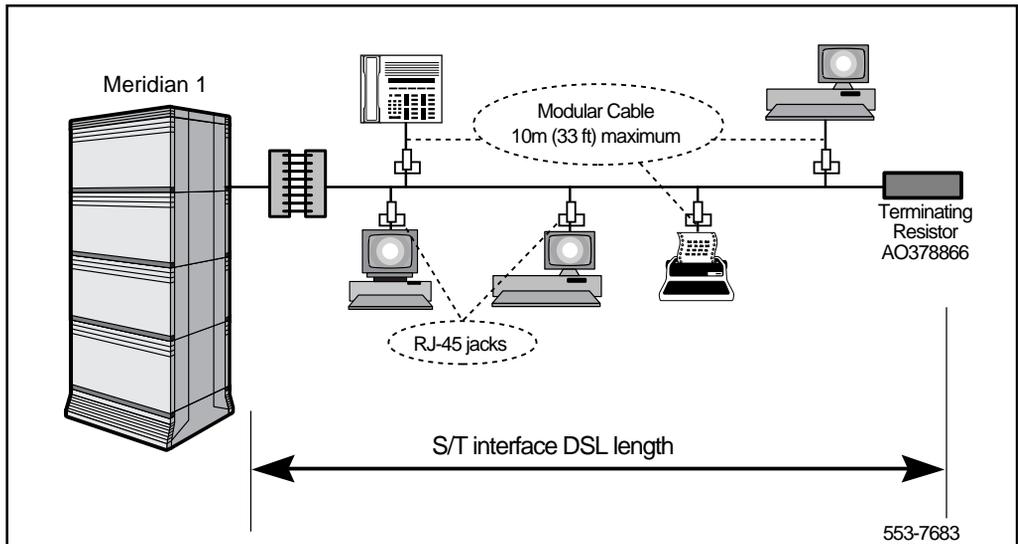
Table 8
Cable types and point-to-point DSL lengths.

Cable type	Gauge AWG	Maximum DSL length m (ft.)
Outside PIC	22	1110 (3640)
Outside PIC	24	790 (2590)
Outside PIC	26	540 (1770)
Outside pulp	22	1000 (3280)
Outside pulp	24	730 (2390)
Outside pulp	26	540 (1770)
Inside riser	22	1150 (3770)
Inside riser	24	800 (2620)
Inside riser	26	570 (1870)
Inside Z station (FT1)	22	1150 (3770)
Inside Z station (FT4)	22	910 (2980)
Inside type D (3 and 4 pair)	24	700 (2300)
Inside type D (25 pair)	24	630 (2070)

Short passive SILC DSL

This configuration is shown in Figure 21.

Figure 21
Short passive SILC DSL



In the short passive SILC DSL configuration the Meridian 1 and terminals may be located anywhere along the SILC DSL. This configuration has the shortest length, but the maximum number of terminals are allowed with no restrictions on the location of the Meridian 1 and the terminals.

Recommended rules:

- Configure the DSL as fixed timing mode through overlay 27 (MODE = NTFS).
- A maximum of eight physical terminals may be connected.
- Use a 100 $\frac{3}{4}$ terminating resistor (A0378866) at the end of the DSL.
- Terminate both ends of the DSL if the NT is not located at the end of the DSL. In this case the distance between the Meridian 1 and the SILC DSL should not exceed 30 ft (9 m).

— The maximum round trip delay for the selected DSL cable is 2 μ s.

Maximum DSL length depends on the cable type and wire gauge. For a short passive SILC DSL, the length is as shown in Table 9.

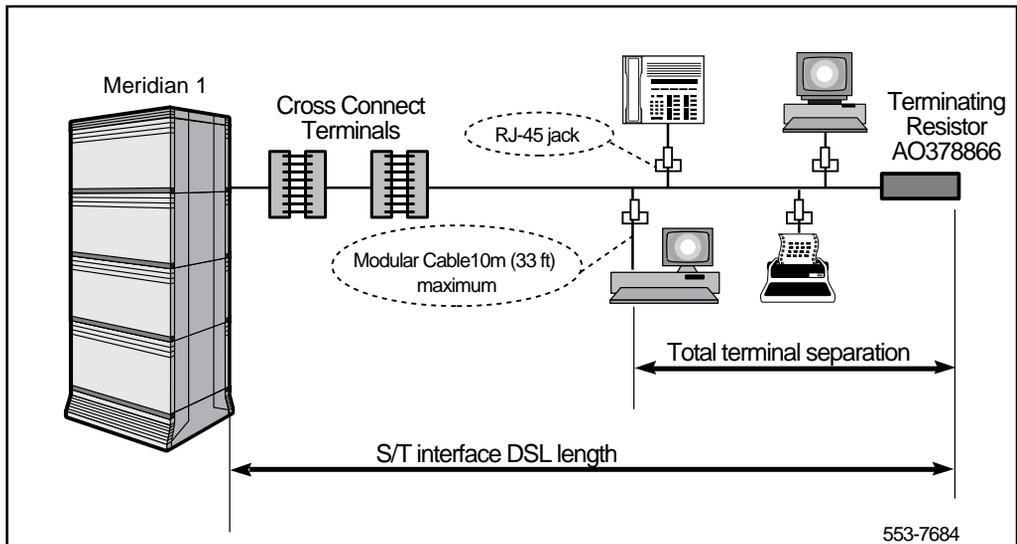
Table 9
Cable types and short passive SILC DSL lengths

Cable type	Gauge AWG	Maximum DSL length m (ft.)
Outside PIC	22	170 (560)
Outside PIC	24	165 (540)
Outside PIC	26	155 (510)
Outside pulp	22	170 (560)
Outside pulp	24	170 (560)
Outside pulp	26	160 (520)
Inside riser	22	180 (590)
Inside riser	24	165 (540)
Inside riser	26	150 (490)
Inside Z station (FT1)	22	150 (490)
Inside Z station (FT4)	22	140 (460)
Inside type D (3 and 4 pair)	24	150 (490)
Inside type D (25 pair)	24	145 (480)

Extended passive SILC DSL

This bus configuration is shown in Figure 22.

Figure 22
Extended passive SILC DSL



The extended passive bus is designed to allow up to four terminals to be located a long distance from the SILC. The length of the SILC DSL and the separation between each terminal are the significant factors in this configuration.

Recommended rules:

- Configure the DSL in adaptive mode through overlay 27 (MODE = NTAS).
- Use a 100 $\frac{3}{4}$ terminating resistor (A0378866) at the end of the SILC DSL.
- Configure no more than four terminals.
- The cable loss must not exceed 3.8 dB.

The maximum SILC DSL length and separation between terminals is given in Table 10. Configure the first terminal at the end of the terminated SILC DSL, then calculate the distance from the farthest to the nearest terminal. For every terminal (less than four) not configured, you may add 15 ft (5 m) to the distance of total terminal separation.

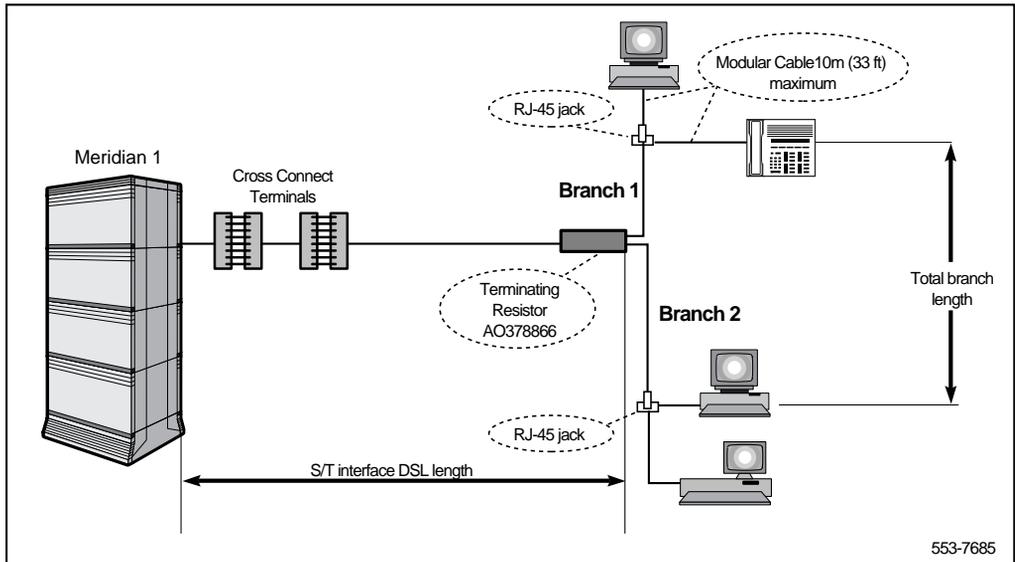
Table 10
Cable types and extended passive SILC DSL lengths

Cable type	Gauge AWG	Maximum DSL length m (ft.)	Total terminal separation m (ft.)
Outside PIC	22	700 (2300)	40 (130)
Outside PIC	24	500 (1640)	40 (130)
Outside PIC	26	340 (1110)	36 (120)
Outside pulp	22	630 (2070)	42 (140)
Outside pulp	24	460 (1510)	40 (130)
Outside pulp	26	340 (1110)	36 (120)
Inside riser	22	730 (2390)	42 (140)
Inside riser	24	500 (1640)	38 (125)
Inside riser	26	360 (1180)	35 (115)
Inside Z station (FT1)	22	730 (2390)	35 (115)
Inside Z station (FT4)	22	570 (1870)	33 (110)
Inside type D (3 and 4 pair)	24	440 (1443)	35 (115)
Inside type D (25 pair)	24	400 (1310)	35 (115)

Branched passive SILC DSL

This bus configuration is shown in Figure 23.

Figure 23
Branched passive SILC DSL



The branched passive bus configuration uses the existing building wiring where the SILC DSL is terminated in a telephone wiring closet. The significant factors in this configuration are the maximum SILC DSL length, the total length of the two branches, and the difference between two branch lengths.

Recommended rules:

- Configure the DSL as adaptive mode through overlay 27 (MODE = NTAS).
- Configure no more than four terminals.
- Configure no more than two terminals per branch.
- Use a 100 $\frac{3}{4}$ terminating resistor at the end of the SILC DSL.

— The cable loss must not exceed 3.8 dB.

Maximum SILC DSL length depends on the cable type and wire gauge. For a branched passive bus, the DSL length is typically:

- 1,919 ft (585 m) for Inside Z station type cable 22 AWG
- 1,197 ft (365 m) for Inside type D cable 24 AWG
- 1,033 ft (315 m) for Inside riser type cable 26 AWG

Calculate the length of the SILC DSL, the sum of the branches, and difference in the length of the branches. Refer to Table 11 for maximum allowable limits.

Table 11
Cable types and branched passive SILC DSL lengths

Cable type	Gauge AWG	Maximum DSL length m (ft.)	Branched lengths m (ft.)
Outside PIC	22	340 (1115)	105 (345)
Outside PIC	24	270 (885)	105 (345)
Outside PIC	26	215 (705)	100 (330)
Outside pulp	22	315 (1030)	110 (360)
Outside pulp	24	255 (835)	105 (345)
Outside pulp	26	215 (705)	95 (310)
Inside riser	22	350 (1150)	110 (360)
Inside riser	24	270 (885)	105 (345)
Inside riser	26	220 (720)	100 (330)
Inside Z station (FT1)	22	350 (1150)	100 (330)
Inside Z station (FT4)	22	295 (965)	95 (310)
Inside type D (3 and 4 pair)	24	250 (820)	100 (330)
Inside type D (25 pair)	24	770 (235)	95 (310)

SILC DSL trunk configuration

When you are configuring trunk DSLs, follow these basic rules:

- spread the two B-channels out as members of the Route Data Block, so that if a trunk DSL is out of service, the search for an idle trunk will not be impaired.
- do not exceed the maximum loop length of 1km (0.6 mi) for the S/T interface.
- if the system reference clock source is to be drawn from the SILC, the connection to the clock controller can only be from DSL#0 and DSL#1 of the SILC card. DSL#0 may only be configured as the primary clock reference and DSL#1 as the secondary clock reference. Also, ensure that the proper cable connections are made between the SILC and the clock controller, following the procedures described in *ISDN BRI Installation*.

UILC DSL line configuration

The UILC supports only point-to-point transmission. The maximum length of the U interface DSL is determined by the maximum loop loss, but typically should not exceed 5.5 km (3.3 mi). Table 12 gives the maximum recommended U DSL length. The maximum loss is 46 dB @ 40 kHz.

However, to meet the mandatory bit error rate performance of 10^{-7} or better in all cases, a maximum limit of 40 dB cable loss is recommended.

Note: This interface is designed to utilize most of the existing non-loaded twisted pair wiring in North America. Not all the twisted pair cables are suitable for ISDN BRI application. Before you use a section of this cable, you must verify its suitability by performing the following tests:

- determine the type and length of the cable, and the total signal loss of the DSL (calculated using Table 13)
- determine total signal loss contributed by the bridge taps on the DSL (1.7 db/kft(km) and up to 5.1 db for each bridge tap length)
- verify that there are no consistent or random noise sources that may affect the transmission quality (i.e., using a Bit Error Rate tester, the result should be better than 10^{-7} error rate for at least 30 minutes)

Note: All calculated losses above should total less than 40dB @ 40 kHz (BER $\leq 10^{-7}$).

- determine the outlet pinout at the terminal location

Figure 24 shows a typical U interface DSL with an NT1 terminating the DSL and providing an S/T interface to an ISDN BRI terminal.

Figure 24
Point-to-Point UILC DSL

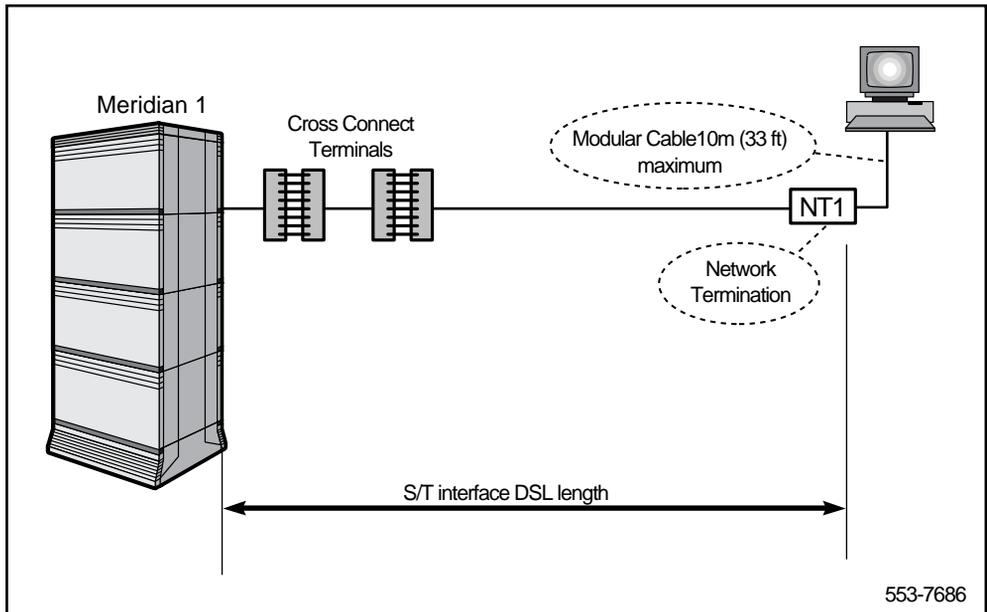


Table 12 lists the maximum recommended loop length which should be considered in U interface DSL installations **without any bridge taps** (refer to Table 12 for a guideline for calculating DSL loop loss for U interface DSL installations with bridge taps).

Table 12
Maximum recommended U DSL length

Cable gauge AWG	Maximum recommended length km (kft.)
26	4.40 (14.5)
24	6.55 (21.5)
22	8.80 (29.0)
mix	5.50 (18.0)

Table 13 is recommended as a guideline for calculating selected U interface DSL loop loss. Use the **Length km (kft.)** and **Loss dB** columns to record your calculations. Select the corresponding loss (dB/kft) based on the type of cable used and multiply by the cable length. After calculating all the losses due to the DSL used, calculate losses due to bridge taps. For any bridge tap with length exceeding 3 kft, only add 5.1 dB. Add all the losses due to the DSL and due to bridge taps, and record your calculations. The total loss should not exceed the recommended maximum loss of 40 dB.

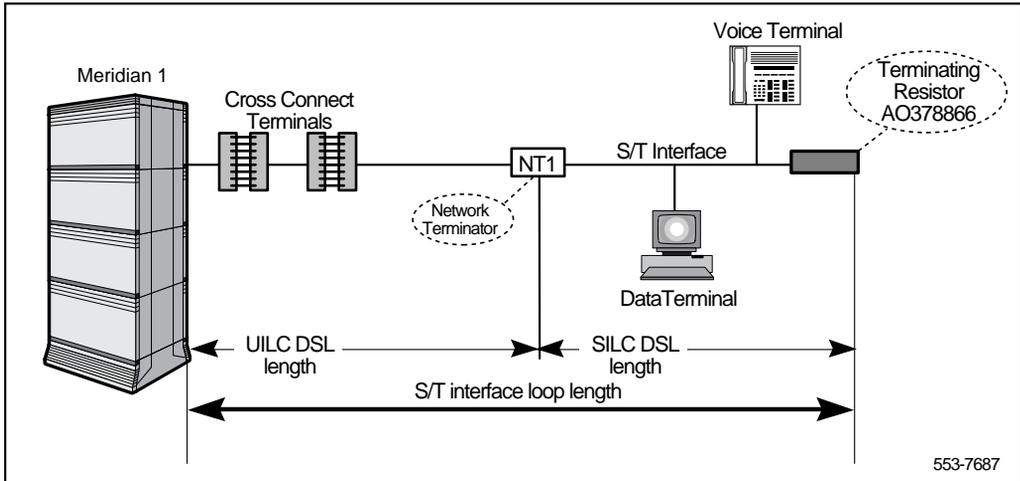
Note: The bridge taps are not terminated and are left unused. A complete knowledge about the characteristics of the DSL selected is recommended. Keep the DSL as simple and as short as possible to obtain maximum performance.

Table 13
U DSL cable calculations

Item	Gauge AWG	Insulation type	Loss dB/km (dB/kft.)	Length km (kft.)	Loss dB
1	19	PIC	1.0 (3.3)		
2	19	pulp	1.1 (3.6)		
3	22	PIC	1.4 (4.6)		
4	22	PIC	1.5 (4.9)		
5	24	PIC	1.8 (5.9)		
6	24	pulp	1.9 (6.3)		
7	26	PIC or pulp	2.8 (9.2)		
8	Customer premises wiring		1.8 (5.9)		
9	Local exchange wiring		2.8 (9.2)		
10	bridge tap 1				
11	bridge tap 2				
12	bridge tap 3				
13	bridge tap 4				
14	bridge tap 5				
15	bridge tap 6				
Total loss in dB (add items 1 through 15)					
Recommended maximum loss = 40 dB					

Figure 25 shows a DSL extension where the U interface is used to extend the loop to an NT1 and from the NT1 it shows an S/T interface connecting two ISDN BRI terminals.

Figure 25
UJLC DSL used as an extension for an S/T interface loop



Terminal addressing and service profile assignment

Terminal Service Profiles (TSPs) are service profile specifications stored in the database that can be associated with various terminals during terminal initialization and that define the terminal DN, class of service, call restriction levels, and other service and feature attributes. ISDN Terminal initialization occurs when a terminal is installed, every time the system is sysloaded, or when the MISP or the line card to which the terminal is connected is replaced.

ISDN BRI terminal addressing

An ISDN BRI terminal connected to a DSL is addressed by using both the physical address and the logical address, where:

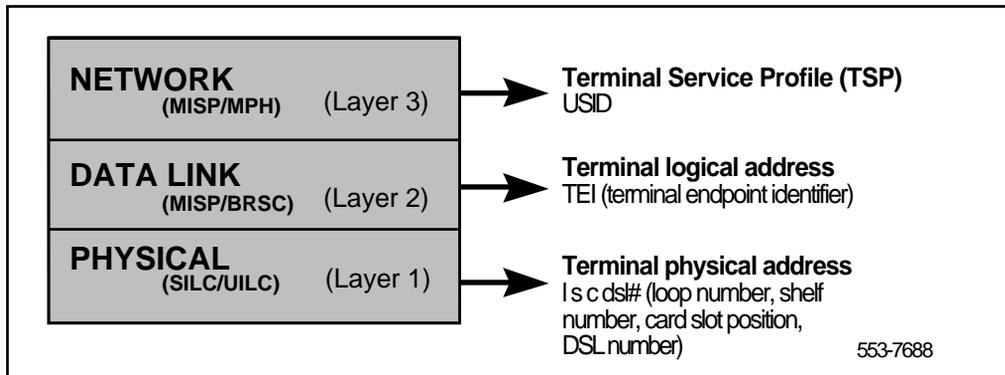
- the physical address is **l, s, c, dsl#**, representing the *physical* (layer 1) identifier
- the logical address is defined as Terminal End-point Identifier (TEI), which is a *data link* (layer 2) identifier and the Terminal Service Profile (TSP), which is a *network* (layer 3) identifier

The User Service Identifier (USID) uniquely identifies the Terminal Service Profile (TSP) number (there may be up to **16 TSPs** per DSL.) The Service Profile ID (SPID) is a reference to the TSP, which contains the DN.

The SPID is an identification number (any combination of 1-20 alphanumeric characters) that is configured in overlay 27. The SPID is entered in overlay 27, in association with the TSP, and is also entered on the terminal keypad during initialization. All the terminals on a DSL that share the same TSP will have the same USID.

Figure 26 shows the relationships of the physical and logical address components to the OSI model.

Figure 26
Physical and logical address components



Assigning the Terminal End-point Identifier (TEI)

A TEI is associated with establishing the *data link* (layer 2) connection between a terminal and the network. The TEI is a terminal logical address that is used by the MISP to address a terminal during the exchange of layer 2 information messages with that terminal. Each logical terminal is associated with one unique TEI. Up to 20 TEIs can be assigned to the logical terminals on one DSL.

Meridian 1 provides two types of TEIs based on their assignment method. These are:

- dynamic TEI, automatically assigned by the MISP
- static TEI, entered into the terminal by the user on the terminal key pad

Dynamic TEI

Terminals supporting the dynamic TEI assignment receive their TEI automatically when the terminal is connected to the DSL. The MISP detects the terminal on the loop and assigns to it an unassigned TEI. The range of the automatically assignable TEI numbers is from 64 to 126. TEI 127 is used for sending broadcast messages. A different TEI may be dynamically assigned by the system every time it is initialized.

Static TEI

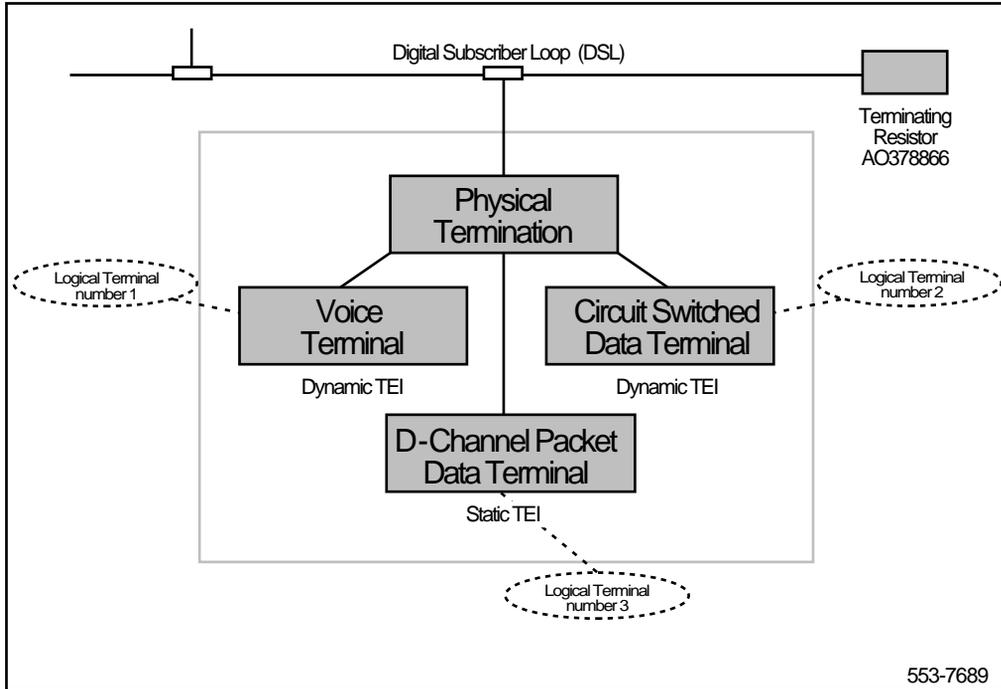
The terminals that do not support dynamic TEI assignment use static TEI assignment. The TEI can be uniquely identified at the data link layer 2). It can be assigned to one logical terminal at a time, that is, there is a one-to-one mapping of TEI to logical terminal.

The static TEI assignment is performed by entering an unassigned TEI number from 0 to 63 directly into the terminal using its key pad. This TEI is assigned to that terminal as long as the terminal is operational. If the terminal becomes inoperative, the associated DSL has to be reinitialized.

Note: A packet data terminal must be of the static TEI type.

Figure 27 illustrates how a single physical termination may actually connect multiple logical terminals. Each ST-interface DSL can support up to eight physical terminations, and up to 20 logical terminals. Each logical terminal has assigned one unique TEI, which represents the layer 2 logical address for that terminal.

Figure 27
Multiple logical terminals on one physical termination



Types of ISDN BRI terminals

ISDN BRI terminals are divided into four categories based on layer 3 and layer 2 initialization procedures:

- initializing terminal with dynamic TEI assignment
- initializing terminal with static TEI assignment
- non-initializing terminal with dynamic TEI assignment
- non-initializing terminal with static TEI assignment

Initializing terminal with dynamic TEI assignment

Each initializing terminal has an identification number called a Service Profile ID (SPID) that is entered into the terminal by the user when the terminal is installed. This number is usually the directory number with one or two alphanumeric characters appended to it, although it can be any alphanumeric number up to 20 digits long. The SPID is used by the MISP to identify the terminal and to assign to it specific service attributes during layer 3 initialization.

Before layer 3 terminal initialization can start, layer 2 must be fully established, which includes TEI assignment. The TEI may be Dynamic (the MISP assigns an unassigned TEI) or Static (the TEI is manually entered on the terminal key pad). The terminal must then have its SPID number entered at the terminal key pad.

Layer 3 initialization with dynamic TEI assignment starts when the terminal transmits its SPID to the MISP using an information message. The MISP acknowledges the message and sends an end-point identifier message that contains two identification parameters; the User Service Identifier (USID) and the Terminal Identifier (TID).

Initializing terminal with static TEI assignment

For an initializing terminal that does not support the dynamic TEI assignment, the end-point identification parameters USID and TID are not automatically assigned by the MISP. Before layer 3 terminal initialization can start, the terminal must have its SPID entered at the terminal keypad

Layer 3 initialization starts when the terminal transmits its SPID to the MISP using an information message. The MISP acknowledges the message and assigns a TSP to the terminal.

Non-initializing terminal with dynamic TEI assignment

A non-initializing terminal does not support the dynamic TEI assignment and is not associated with a SPID number. However, non-initializing terminals may support dynamic TEI assignment where the MISP automatically assigns an unassigned TEI when the terminal is installed or when the system or the cards are reset.

The range of the automatically assignable TEI numbers is from 64 to 126. Because these terminals do not support layer 3 initialization procedures, the MISP assigns the same default TSP to all terminals of this type on a specific DSL. The default TSP is defined by specifying USID = 0 in overlay 27.

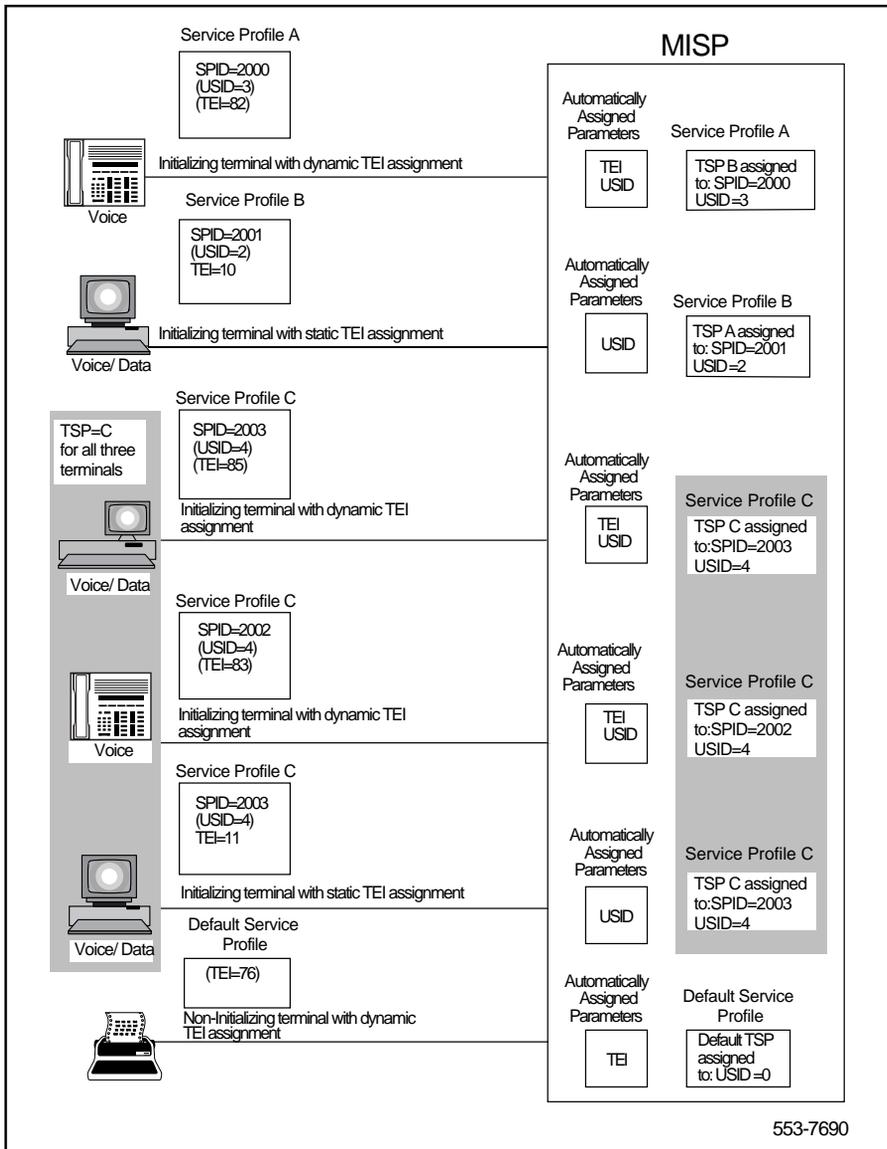
Non-initializing terminal with static TEI assignment

A non-initializing terminal does not support the dynamic TEI assignment and is not associated with a SPID number. The non-initializing terminals may support static TEI assignment where the user assigns an unassigned TEI by entering the TEI number on the terminal key pad when the terminal is installed or when the system or the cards are initialized.

The static TEI assignment is performed by entering an unassigned TEI number from 0 to 63 directly into the terminal using its key pad. Because these terminals do not support layer 3 initialization procedures, the MISP assigns the same default TSP to all terminals of this type on a specific DSL. The default TSP is defined by specifying USID = 0 in overlay 27.

Figure 28 shows different types of terminals and their relationship to each other when they are connected to the same DSL. It also shows how the terminal initialization parameters are handled for different types of terminals.

Figure 28
Terminal initialization and service profile assignment examples



ISDN BRI terminal interface specification

ISDN BRI provides two types of interfaces. They are:

- S/T interface
- U interface

A terminal connected to an interface over a DSL must meet the interface specification requirements. Each terminal must provide a jack of the appropriate type and with the appropriate pinouts for the interface.

S/T interface specification

The S/T interface uses an 8-conductor modular cable terminated with an 8-pin RJ-45 plug. An 8-pin RJ-45 jack located on the terminal is used to connect the terminal to the DSL using this modular cable. Table 14 shows the connector pin assignment for the jack and the plug, from the NT1 side to the terminal. It also shows the signal names for each interface pin at the SILC and at the terminal.

Note: Power Sink 2 provides an optional means of powering the terminal from a common supply in the wiring closet. Power Source 3 provides the power from the terminal to the NT1 if the NT1 does not have a local power source. Up to 2 watts of power is supplied by the SILC to the terminals on the DSL. This power is simplexed over the Tx and Rx pairs provided by -48 V (-40 V for Europe) supply on the SILC. The Rx pair is positive with respect to the Tx pair.

Table 14
S/T interface connector specification, from NT1 to terminal

Pin number	Terminal pin signal name	SILC pin signal name
1	Power Source 3	Not applicable
2	Power Source 3	Not applicable
3	Tx +	Rx +
4	Rx +	Tx +
5	Rx -	Tx -
6	Tx -	Rx -
7	Power Sink 2 (-)	Not applicable
8	Power Sink 2 (+)	Not applicable

U interface specification

The U interface uses a 2-conductor twisted pair cable terminated with a RJ-45 jack. An RJ-45 jack located on the terminal is used to connect the terminal to the DSL using this twisted pair cable.

The connector pin assignments for the jack and plug are shown in Table 15. The table also shows the signal names for each interface pin at the UILC and at the terminal.

Note: The U interface meets all the safety protection requirements specified by UL (1459), CSA, TUV, and FCC (68.302 and 68.304). These requirements provide protection against inside and outside plant foreign voltages. In addition to other protection components used on the board, 1-Amp (125V voltage rating) fuses are used in series to ensure all the safety requirements. These fuses must be replaced if needed with the same type and rating only to continuously protect against the risk of fire.

Table 15
U interface connector specification

Pin Number	Terminal Pin Signal Name	UILC Pin Signal Name
1	Not used	Not applicable
2	Not used	Not applicable
3	Not used	Not applicable
4	Transmit or Receive	Transmit or Receive
5	Transmit or Receive	Transmit or Receive
6	Not used	Not applicable
7	Not used	Not applicable
8	Not used	Not applicable

Compatible ISDN BRI terminals

The list of terminals deemed compatible may change without notice. Refer to Table 16.

To obtain the latest list of compatible terminals and ordering codes, contact your Northern Telecom representative.

Table 16
ISDN BRI terminals

Terminal type	Description
M5317TDX	A Meridian 1 telephone equipped with voice transmission options and circuit-switched or packet data options. Note: M5317TX is voice only.
M5209TDcp	A Meridian 1 telephone equipped with voice transmission options and circuit-switched or packet data options. Note: M5209T is voice only.
M5000TD-1	ISDN Terminal Adapter provides a connection to an analog telephone and supports circuit-switched or packet data.

Features on ISDN BRI

Introduction

This chapter summarizes the level of support provided for Generic X11 features on ISDN BRI. The features have been divided in sections based on full support, partial support, or no support. The features that are fully supported or not supported at all are simply listed in a table format, whereas a description is provided for the partial support given to a feature.

The chapter is divided into the following sections:

- ISDN BRI specific features including set-based ISDN BRI features on Meridian 1 ISDN BRI terminals (the M5317TDX and the M5209TDcp)
- Generic X11 features
 - ISDN BRI Lines
 - ISDN BRI Trunks—TIE
- Generic X11 International features
 - ISDN BRI Lines and Trunks

Note: For a more detailed description on all Meridian 1 features supported on Generic X11 software, please refer to *X11 features and services* 553-3001-306.

ISDN BRI specific features

The following unique ISDN BRI features are described in this section:

- Calling Line Identification Presentation/Calling Line Identification Restriction
- ISDN BRI circuit-switched data calls
- ISDN BRI National ISDN-1 Conference
- ISDN BRI Special Call Forward Busy
- ISDN BRI Special Hunting
- ISDN BRI ETSI Call Forwarding Unconditional
- ISDN BRI ETSI Conference
- ISDN BRI National ISDN-1 Call Forward All Calls
- ISDN BRI Connected Line Presentation (COLP)/Restriction (COLR)
- NI-1 BRI Compliance Enhancements

Note: Information on how to configure these features, where applicable, is contained in *ISDN Basic Rate Access Administration*.

Calling Line Identification Presentation and Restriction

This feature allows or restricts the display of a Calling Line ID on the called party terminal. Calling Line ID Presentation (CLIP) controls the called party terminal's choice to display the calling line identification for incoming calls.

Presentation (PRES) controls the calling terminal's choice to send or PRES restricts sending the Calling Line ID when placing an outgoing call. The calling terminal can choose to send or restrict sending the calling line identification on a call-by-call basis. The PRES button on the ISDN BRI terminal can be set to YES to allow sending the calling line identification or set to NO to restrict sending the calling line identification to the called terminal. The PRES button on the terminal overrides the PRES parameter. CLIP and PRES parameters are configured for an ISDN BRI DN when configuring the TSP using LD 27.

The calling party number is contained in the calling party information element in the setup message. The information element is optional and need not be contained in the setup message. If the information element is not presented, the default DN selected in the TSP is used as the calling party DN.

If the call is originated from a non-ISDN BRI to an ISDN BRI terminal, the calling party number is based on the class of service of the non-ISDN BRI terminal. The class of service can be set for PDN which uses the primary DN of the non-ISDN BRI terminal as the calling party number or LDN which uses the listed DN of the non-ISDN BRI terminal customer as the calling party number.

If the calling party is using an ISDN BRI terminal and has called party number restricted, the called party's display shows the trunk access code rather than the ISDN BRI DN.

ISDN BRI National ISDN-1 Conference

This version of ISDN BRI Conference is based on National ISDN-1.

Terminals which are supported are:

- Northern Telecom's M5317TDX (version 2.3a and above)
- Northern Telecom's M5209TDcp (version 2.28 and above), and
- third-party vendor manufactured terminals which are deemed compatible

ISDN BRI terminals can conference in both ISDN BRI and non-ISDN BRI terminal users. An ISDN BRI terminal can also be conferenced into a call by a non-ISDN BRI terminal.

Meridian 1 ISDN BRI supports two versions of Conference: A03, a 3-party Conference and A06, a 6-party Conference. See ISDN Basic Rate Interface administration (5533901300) for configuration details.

ISDN BRI Conference operates under the following conditions:

- the user employs the National ISDN-1 protocol (PRID=6) on the DSL
- the user is subscribed to Conference in its Terminal Service Profile.
- the Feature Activation Identifier and the Feature Indication Identifier are configured both in LD 27 and on the ISDN BRI terminal.

- the logical terminal is the controller of only one conference call.
- the bearer capability of the call associated with the conference request is speech or 3.1 kHz audio.

Invoke Conference while making a call

The ISDN BRI user may make a conference request by means of a pre-defined softkey or programmable key while dialing the outgoing digits. The provision of this capability is dependent on the implementation of the ISDN BRI terminal.

Invoke Conference during an established call

An ISDN BRI user can invoke Conference after the network successfully translates the dialed digits, or while the called party is being rung, or while the user is on an answered call.

Add a conferee

The ISDN BRI user can add a conferee with Consultation Hold, add a held call to an active conference, or add an active call to a held conference providing:

- the Conference Controller (an ISDN BRI user who is subscribed to Conference) is connected to only one active speech or 3.1 kHz audio call
- both the active call and the held call have been answered
- neither the active call nor the held call is undergoing call clearing
- the controller's conference size is not exceeded
- the B-channel to which the Conference Controller is connected can be used to complete the conference
- both calls are not conference calls

Conference disconnect

If the controller requests a disconnect signal, the network disconnects the entire conference if:

- only one party will remain after the controller disconnects
- none of the calls that will remain has been answered

- only two parties remain and both are outgoing trunk calls
- more than two parties remain and all are trunk calls

Otherwise, only the controller is disconnected and the rest of the conferees remain.

Call Transfer during Conference

Using the Conference feature, a Call Transfer can be achieved in the following way:

Ann makes a call to Bob. Bob answers the call and conferences Carl. After Carl answers the call, Bob completes the conference. Then Bob can disconnect himself from the conference, thus transferring Ann to Carl.

The same conditions that determine whether the remaining parties in a conference should be dropped when one party disconnects from the conference apply here. For example, Bob makes a call to Ann. Then Bob conferences in Carl. If both Ann and Carl are on a remote node (that is, both calls made by Bob to Ann and Carl are outgoing trunk calls), then as Bob disconnects from the conference, both Ann and Carl will be dropped as well. Call Transfer cannot be achieved in this scenario.

Feature implementation

Refer to *ISDN Basic Rate Access Administration*.

ISDN BRI circuit-switched data calls

ISDN BRI to ISDN BRI circuit-switched data calls

Circuit-switched data calls between two ISDN BRI terminals are supported for all bearer capability encodings. The Meridian 1 screens for the validity of its bearer capability codepoints only; it does not screen for protocol compatibility between two ISDN BRI devices. The Meridian 1 presents the call to the terminating party; the two ISDN BRI devices determine whether they can communicate with the specified bearer capability. If the ISDN BRI terminals decide that the protocol is incompatible, either terminal may drop the call.

ISDN BRI accessing Meridian 1 data modules

Meridian 1 offers data access through special data adapters (for example, ASIM). These adapters provide Northern Telecom proprietary DM-DM protocol for data transmission. The ISDN BRI terminal cannot communicate with these adapters because of protocol incompatibility. Calls from an ISDN BRI terminal to these data modules are blocked; similarly, calls from these data modules to an ISDN BRI terminal are also blocked.

ISDN BRI terminals can communicate with these data modules under one condition: ISDN BRI terminals that support the TLINK protocol can communicate with these Meridian 1 data adapters if the circuit-switched data call is placed across an ISDN PRI or DTI link. This access is possible because the ISDN PRI or DTI pack provides protocol conversion from TLINK to DM-DM and vice versa.

ISDN BRI accessing Meridian Communication Adapters

The MCA operates in three modes: DM-DM, TLINK and PSDS. An MCA operating in TLINK mode communicates with ISDN BRI terminals that support TLINK protocol. Calls from an ISDN BRI terminal (with the appropriate bearer capability encodings) to an MCA and vice versa are allowed to terminate; however, if the protocol exchange fails between the ISDN BRI and MCA devices, if the MCA is not operating in TLINK mode, for example, then the call may be dropped by either device.

The following describe the bearer capability encodings used by ISDN BRI terminals that support TLINK protocol. Only calls originating from ISDN BRI with these bearer capability encodings are allowed to terminate to a MCA:

— 64k clear:

- Octet 3 = unrestricted digital information, octet 4 = 64 kbits/s, no octet 5s are included.

— 64k restricted:

- Octet 3 = restricted digital information,
- octet 4 = 64 kbits/s, no octet 5s are included.

— 56k:

- Octet 3 = restricted or unrestricted digital information,
- octet 4 = 64kbits/s, octet 5 = v.110 and octet 5a = 56kbits/s.

ISDN BRI accessing ADM trunks

ADM trunk is not a trunk; it groups ADM devices in a route to allow an idle ADM device defined in the given route to be searched or hunted easily when the route access code is dialed. The Meridian Communication Unit (MCU) may be defined as an ADM trunk with the MCU trunk as a subtype. Because MCU can support TLINK protocol, an ISDN BRI terminal accessing this type of ADM route is allowed to terminate to an idle device found in the route and the conditions described for accessing MCA apply here. However, if the ADM route is not an MCU trunk subtype, then ISDN BRI is blocked from accessing the ADM routes because of incompatible protocols.

ISDN BRI terminals may access an ADM trunk that are not MCU subtype under one condition: ISDN BRI terminals that support TLINK protocol can access an ADM trunk if the circuit-switched data call is placed across an ISDN PRI or DTI link. This access is possible because the ISDN PRI or DTI pack provides protocol conversion from TLINK to DM-DM and vice versa.

ISDN BRI accessing ISDN PRI

The ISDN PRI interface supports three bearer capability encodings:

- 64k clear:
 - Octet 3 = unrestricted digital information, octet 4 = 64 kbits/s, no octet 5s are included.
- 64k restricted:
 - Octet 3 = restricted digital information, octet 4 = 64 kbits/s, no octet 5s are included.
- 56k:
 - Octet 3 = restricted or unrestricted digital information, octet 4 = 64kbits/s, octet 5 = v.110 and octet 5a = 56kbits/s.

ISDN BRI originated circuit-switched data calls are allowed access to ISDN PRI trunk if these encodings are used.

ISDN BRI devices using other bearer capability encodings can communicate with another ISDN BRI device across ISDN PRI under these conditions:

- the ISDN PRI interface is Meridian 1, Japan D70, or 4ESS/5ESS;
- and
- the remote capability for ISDN BRI interworking is turned on (in LD 17) for all ISDN PRI interfaces involved in the call.

ISDN BRI accessing DTI trunks

ISDN BRI circuit-switched data call can access a DTI trunk only if the bearer capability is:

- 56k:
 - octet 3 = restriction or unrestricted digital information, octet 4 = 64 kbits/s, octet 5 = v.110 and octet 5a = 56 kbits/s

ISDN BRI terminals using V.120 protocol at 56 kbps are not supported over DTI trunks.

ISDN BRI circuit-switched data call tandem across ISDN PRI

In the ISDN PRI and DTI pack, a protocol convertor is inserted by default to convert DM-DM protocol to TLINK at the tandem node and vice versa.

Because of this, an ISDN BRI circuit-switched data call tandem across ISDN PRI, DTI trunks or a combination of ISDN PRI and DTI trunks is supported only for ISDN BRI terminals that use TLINK protocol. ISDN BRI terminals using other protocols, such as V.110 and V.120, require the Transparent Data Networking feature to provide transparent data channel through the tandem nodes.

Public Switched Data Service

Public switched data service provides a pure 56 kbps data transmission. The data module on both ends must establish identical parameters manually before the data call is made.

ISDN BRI terminals can access Public Switched Data Service provided a dedicated data route is used; when a voice/data shared route is used, the ISDN BRI terminal must generate a burst of tone to the network provider to turn off the echo cancellation.

ISDN BRI accessing analog line by means of a modem trunk

ISDN BRI circuit-switched data calls accessing analog lines through modem trunks are supported only if the data module connected to the modem uses TLINK, V.110 or V.120 protocol.

An ISDN BRI device with the TLINK protocol can access analog lines through modem trunk configuration using a DTE type MCU, because the MCU supports TLINK protocol. ISDN BRI devices cannot communicate with other Meridian 1 DTE type data modules that connect to modems because they use the DM-DM protocol.

ISDN BRI terminals may access analog lines through modem trunk configurations using DM-DM type data modules under one condition: ISDN BRI terminals that support TLINK protocol can access these modem trunks if the circuit-switched data call is placed across an ISDN PRI or DTI link. This access is possible because the ISDN PRI or DTI pack provides protocol conversion from TLINK to DM-DM and vice versa.

ISDN BRI Special Call Forward Busy

This feature is activated for a call terminated at a DSL. The call is forwarded to the attendant when a call encounters the following busy conditions:

- the maximum number of calls on a DSL is exceeded, and
- an ISDN BRI DN has Call Forward busy enabled as configured in TSP using LD 27
- ISDN Hunting is not allowed or the call fails to find an idle hunt DN.

The calling party receives a busy tone in all other cases.

With Call Forward Busy, Special Hunting, if both B-channels are defined and there is not a second DN, the result is Busy.

ISDN BRI Special Hunting

This feature is activated when a call terminating at a DSL encounters the following busy conditions:

- the maximum number of calls on a DSL is exceeded, or
- the total number of calls including active, on hold, waiting, and in progress exceeds the number of B-channels provided for the incoming call type

Hunting routes the call through predetermined steps until an idle DN is found for that call. Internal and external hunt DNs are configured in the DSL and Hunting Allowed and Call Forward by Call type are configured in the TSP using LD 27.

If Hunting is not allowed or the call fails to find an idle DN, the following occurs.

- a busy tone is given if the number of calls exceeds the maximum calls specified for that DSL and call forward busy does not succeed.

Note: The call is forwarded only if it is a DID call

- the call is presented as Call Waiting if the maximum number of calls for that DSL is not exceeded.

An ISDN BRI terminal originating the call is not updated to show on its display that the call was redirected to a different DN as a result of Hunting. This is due to a lack of standard for layer 3 messages used to update the terminal display.

ISDN BRI ETSI Call Forwarding Unconditional

The European Telecommunication Standards Institute (ETSI) Call Forwarding Unconditional (CFU) supplementary service allows an incoming call to an ISDN BRI terminal to be forwarded to a predetermined destination, within or outside the Meridian 1 system. The call is forwarded regardless of whether the user is busy or idle.

Voice and data basic services can be individually forwarded to the same DN. Also, calls can be forwarded to an ISDN BRI terminal or a non-ISDN BRI terminal. When the CFU feature is activated, outgoing calls can still be made from the ISDN BRI terminal.

The Call Forwarding capabilities may be provided to all users on the access (i.e., all the DNs defined under a DSL), or an individual user (i.e., a DN).

The following functionalities are currently supported:

- When a call is forwarded, if the caller is using an ISDN BRI set they will be notified by the Meridian 1 that the call has been forwarded. In addition, the caller is provided with the forwarded-to number.
- When a call is forwarded from an ISDN BRI terminal that has CFU activated, the terminating terminal will be notified by the Meridian 1 that the ISDN BRI terminal forwarded the call.

Operating Parameters

The ETSI CFU supplementary service is based on the Meridian 1 Call Forwarding All Calls feature. Therefore, Meridian 1 Call Forwarding All Calls feature limitations also apply to this feature.

ETSI CFU basic service is limited to speech, 3.1 kHz audio, unrestricted digital information and restricted digital information.

Interrogation of all served users in TSP 0 will be supported. However, if the number of DNs is too large to fit into one message, interrogation of all served users in TSP 0 will not be supported.

ETSI public ISDN partial rerouting will not be supported. According to ETSI standards, when the Meridian 1 receives a local exchange call and the call is forwarded within or outside of the system, the Meridian 1 should send a message to the local exchange to make the call directly to the forwarded-to user.

During a data dump, the forwarded-to user's address will not be saved because of protected data storage space. In LD 17, the CFWS prompt, which enables users to save Call Forwarding feature activation during data dump so that during SYSLOAD the feature will be activated, will be ignored for users of ISDN BRI.

The following hardware is required:

- Multi-purpose ISDN Signaling Processor
- S/T Interface Line Cards/U Interface Line Cards, and
- ISDN BRI terminals that support ETSI Call Forward Unconditional supplementary service

Feature interactions

Call Waiting

User requesting all calls to be forwarded – ETSI CFU takes precedence over Call Waiting.

Forward-to user – A forwarded call can invoke Call Waiting.

Conference Call, Add-on

Calling user – If a conference controller calls a person who has CFU activated to establish a conference, the forwarded-to user will be alerted and added to the conference call after the call is answered.

Forwarded-to user – A call that has been forwarded to the conference controller can be added to an existing conference. A forwarded-to user can establish a conference using the existing forwarded call provided that the call is in the active state.

Call Forward All Calls

The Meridian 1 Call Forward All Calls feature allows only calls to the Prime DN or a single appearance DN to be forwarded. For an ISDN BRI set, calls are forwarded based on this basic service. Since ETSI CFU supplementary service is developed based on the Call Forward All Calls feature, all the existing feature interactions of Call Forward All Calls apply to ISDN BRI terminals.

BRI Special Call Forward Busy Call Forward No Answer

The ETSI CFU supplementary service takes precedence over BRI Call Forward Busy, and Call Forward No Answer.

Call Forward and Busy Status

Call Forward and Busy Status allows a user to forward calls and monitor the Call Forward and Busy Status from the forwarded-to user. This requires a Busy/Forward Status key. An ISDN BRI terminal cannot monitor other set's Call Forward Busy Status and in turn its Call Forward Busy Status cannot be monitored by other sets.

Remote Call Forward

Remote Call Forward allows a user to program Call Forwarding from a remote set. Call Forwarding remotely to an ISDN BRI terminal is supported. However, using Remote Call Forward from an ISDN BRI terminal is not supported.

Attendant and Network-wide Remote Call Forward

This feature allows the configuration of Call Forward from an Attendant Console and a remote set across a Meridian Customer Defined Network (MCDN). For an ISDN BRI terminal, Remote Call Forward is allowed from a set, or from an Attendant Console, but not from a BRI set either locally or network wide. When Call Forward is activated, it is assumed that the Call Forward for the BRI set is voice, not data.

Call Forward/Hunt Override via Flexible Feature Code

This feature allows all attendants and sets with Call Forward/Hunt Override Allowed (CFHA) Class of Service to override Call Forward All Calls (CFAC). Since an ISDN BRI terminal cannot access Flexible Feature Codes, it cannot override CFAC on other sets. However, an ISDN BRI set's Call Forward Unconditional can be overridden by a set having CFHA Class of Service or by an attendant in both standalone and network environments.

Internal Call Forward

An ISDN BRI terminal cannot activate the internal Call Forward feature.

Call Forward Reminder Tone

The Call Forward Reminder Tone is supported on ISDN BRI sets that have the Call Forward Unconditional feature active.

Call Forward Confirmation Tone

During activation or deactivation of Call Forward from a BRI terminal, a Call Forward confirmation tone is not provided to the BRI terminal. Instead, confirmation is done by sending a BRI message to the terminal.

Feature packaging

There is no new feature package defined for this feature; however, the following feature packages are required for ISDN BRI:

- Basic Rate Interface (BRI) package 216
- Basic Rate Interface Line Application (BRIL) package 235, and
- Meridian 1 Extended Peripheral Equipment (XPE) package 203.

Feature implementation

Refer to *ISDN Basic Rate Access Administration*.

ISDN BRI ETSI Conference

The ISDN BRI Supplementary Services European Telecommunication Standards Institute (ETSI) Conference feature provides a subset of the Conference capabilities to ISDN BRI users connected to a Meridian 1 using ETSI protocols.

The following capabilities are supported:

- Conference invocation (beginning the conference from the active call state)
- Adding a conferee
- Disconnection by a conferee
- Termination of the conference (this subfeature will not be implemented as ETSI specifies. ETSI specifies that when a conference controller disconnects, all conferees will be disconnected; however, this subfeature follows the current Meridian 1 Conference feature in that when a conference controller disconnects the conference continues for the remaining parties).

An ISDN BRI user can conference a maximum of three or six parties depending on the Terminal Service Profile (TSP) configuration administered through LD 27. The ETSI Conference feature can be invoked by a user while the user is on an established call. Once conference is invoked, the user can add another party (active or held) to the conference call.

Operating Parameters

ISDN BRI terminals must support both ETSI basic call and ETSI Conference Supplementary service signaling protocols.

ETSI Conference only supports speech or 3.1 kHz; other bearer services such as 7 kHz, unrestricted digital information, and restricted digital information are not supported.

In a conference call, a maximum of two parties (including conference controller and conferees) can be from the same Digital Subscriber Loop (DSL), due to the availability of only two B-channels per ISDN BRI interface.

The Meridian 1 only sends notification messages to conferees or the conference controller when conference operations are requested and performed if they are ISDN BRI users. If a user is on another node across ISDN or non-ISDN trunks, the Notify message will not be sent.

Feature interactions

Conference

ISDN BRI terminals can conference in both ISDN BRI and non-ISDN BRI terminal users; similarly, an ISDN BRI terminal can also be conferenced into a call by a non-ISDN terminal. However, in either case, the ISDN BRI terminal display will not be updated due to lack of protocol to support it.

ISDN PRI Network Call Redirection

When an ISDN BRI conference call is dropped to a simple call, if a party in the simple call is an ISDN BRI user, the corresponding BRI name and number will be updated on the other party's non-ISDN set display. However, the ISDN BRI display will not be updated due to lack of standard protocol to support this function.

Held Call Clearing

Held Call Clearing allows a set to clear both active calls and held calls by going on-hook. This will not apply to an ISDN BRI set.

ISDN BRI Trunk Access

ISDN BRI ETSI Conference is supported across ISDN BRI trunks.

Feature packaging

There is no new feature package defined for this feature; however, the following feature packages are required for ISDN BRI:

- Basic Rate Interface (BRI) package 216
- Basic Rate Interface Line Application (BRIL) package 235, and
- Meridian 1 Extended Peripheral Equipment (XPE) package 203.

Feature implementation

Refer to *ISDN Basic Rate Access Administration*.

ISDN BRI National ISDN-1 Call Forward All Calls

The ISDN BRI National ISDN-1 Call Forward All Calls feature enables a user to have calls redirected from the user's directory number to another directory number. Calls are redirected regardless of the busy or idle status of the interface to the user. Call Forward is assigned on the basis of the directory number and call type (i.e., the user may have voice calls forwarded, while data calls terminate normally).

This feature is invoked using the National ISDN-1 Feature Key Management interface. When Call Forward is activated the Feature Activation Information Element (IE) is sent from the base DN to the Meridian 1 system for either feature activation or deactivation. The Feature Activation IE consists of the feature identifier which represents the combination of the Call Forward feature, the DN, and the call type. There are two methods of feature activation: Call associated; and Non-call associated. In both cases the Feature Activation Information Element is used to activate the feature for the DN and Call Type.

Operating Parameters

This feature is based on the Meridian 1 Call Forward All Calls feature; therefore, it is subject to the same limitation as the Meridian 1 Call Forward All Calls feature.

ISDN BRI terminals must support the Feature Key Management protocol.

When a DN from a Terminal Service Profile (TSP) activates or deactivates the Call Forward feature, it applies to all appearances of the same DN from different TSPs on the same Digital Subscriber Loop (DSL). For example, if a boss and a secretary each has their own BRI terminal and the secretary has her boss' DN on her set, when the boss activates Call Forward the call will not be terminated on the secretary's set. If the secretary deactivates the feature, the call will be terminated on the boss' and the secretary's sets.

Data dump does not store the Call Forward numbers and Call Forward status for BRI terminals. Therefore, after SYSLOAD the Call Forward feature is no longer activated and the Call Forward numbers are not saved in the Meridian 1.

There is no confirmation tone provided from the Meridian 1 when the Call Forward feature is invoked from an ISDN BRI terminal.

Only one BRI terminal from a Digital Subscriber Loop (DSL) is allowed to activate or deactivate the Call Forwarding feature at a time. If two BRI terminals try to activate or deactivate at the same time only the first action is allowed. The second terminal is denied the service.

Feature interactions

Call Forward All Calls

Meridian 1 Call Forward All Calls only allows calls to a prime DN or single appearance DN to be forwarded. For the BRI interface, the terminology of prime DN and single appearance DN does not apply. When Call Forward has been activated for a DN and Call Type, calls to the DN/Call Type are forwarded regardless of which Terminal Service Profile (TSP) that the DN/Call Type is assigned. In addition, redirecting information about the BRI terminal is delivered to the remote DN. If the remote DN is an ISDN BRI terminal, the redirecting information is passed in the Redirecting Number IE of the SETUP message to the BRI terminal.

When an ISDN BRI terminal has activated the Call Forward feature, it is treated as if it is a set from the Meridian 1 activating the feature. The Meridian 1 features that are normally applicable to the set will also be applicable to the BRI terminal.

Call Forward No Answer Busy

As in the case of Call Forward All Calls, the National ISDN 1 Basic Rate Interface (BRI) Call Forward All Calls feature takes precedence over Call Forward No Answer, and Call Forward Busy.

Network Call Redirection

When a call to the BRI interface is forwarded, the redirecting DN and the reason for call redirection are passed to the remote user if the remote user is connected by ISDN. The redirecting information is encoded in the ISDN SETUP message for display purposes. In addition, Call Forward to another node from an ISDN BRI terminal is counted as one for the ISDN network Call Redirection counter which is defined in the customer data block.

Call Forward and Busy Status

This feature is not supported for ISDN BRI terminals.

Remote Call Forward

Remote Call Forward allows a user to program Call Forwarding from a remote set. Call Forwarding remotely to an ISDN BRI terminal is supported. However, using Remote Call Forward from an ISDN BRI terminal is not supported.

Attendant and Network-wide Remote Call Forward

This feature allows the configuration of Call Forward from an Attendant Console and a remote set across a Meridian Customer Defined Network (MCDN). For an ISDN BRI terminal, Remote Call Forward is allowed from a set, or from an Attendant Console, but not from a BRI set either locally or network wide. When Call Forward is activated, it is assumed that the Call Forward for the BRI set is voice, not data.

Internal Call Forward

An ISDN BRI terminal cannot activate the internal Call Forward feature.

Call Forward/Hunt Override via Flexible Feature Code

This feature allows all attendants and sets with Call Forward/Hunt Override Allowed (CFHA) Class of Service to override Call Forward All Calls (CFAC). Since an ISDN BRI terminal cannot access Flexible Feature Codes, it cannot override CFAC on other sets. However, an ISDN BRI set's Call Forward All Calls can be overridden by a set having CFHA Class of Service or by an attendant in both standalone and network environments.

Call Forward Reminder Tone

The Call Forward Reminder Tone is supported on ISDN BRI sets that have the Call Forward All Calls feature active.

Call Forward Confirmation Tone

During activation or deactivation of Call Forward from a BRI terminal, a Call Forward confirmation tone is not provided to the BRI terminal. Instead, confirmation is done by sending an ISDN BRI message to the terminal.

Call Forward Save on SYSLOAD

Call Forward Save on SYSLOAD is not supported for ISDN BRI terminals.

Feature packaging

There is no new feature package defined for this feature; however, the following feature packages are required for ISDN BRI:

- Basic Rate Interface (BRI) package 216
- Basic Rate Interface Line Application (BRIL) package 235, and
- Meridian 1 Extended Peripheral Equipment (XPE) package 203.

Feature implementation

Refer to *ISDN Basic Rate Access Administration*.

ISDN Basic Rate Interface Connected Line Presentation/Restriction

ISDN Basic Rate Interface Connected Line Presentation/Restriction is a supplementary service that enables the Meridian 1 to either allow or restrict the presentation of a connected party's ISDN number and sub-address on the display of an ISDN BRI terminal. The presentation of a ISDN number and sub-address to the calling party occurs when the connected party's ISDN BRI terminal answers the call. In addition to the BRI terminal, this service can be applied to Meridian 1 proprietary and Analog (500/2500 type) sets.

The Connected Line Presentation (COLP) service applies to the calling party. COLP allows the presentation of the connected party's ISDN number and sub-address to the calling party.

The Connected Line Restriction (COLR) service applies to the connected party. COLR restricts the presentation of the connected party's ISDN number and sub-address to the calling party. COLR is activated on the ISDN BRI terminal of the connected party.

The connected party's identification is only provided to the calling party, if the ISDN BRI terminal of the connected party supports this feature.

When COLP/COLR feature is activated, the system monitors the configuration of the terminal service profiles on the calling and connected parties ISDN BRI terminals. Depending on this configuration, the system determines whether or not information is allowed or restricted to the calling party.

Operating parameters

Through configuration, the Meridian 1 BRI terminal interface controls the provisioning of the connected party's information on the interface (COLP prompt). This avoids sending COLP when the terminal does not support this supplementary information.

With the presentation restricted option activated, some BRI terminals may not have the capability to restrict the presentation of digits from the connected party. The Meridian 1 BRI terminal interface has the capability to restrict sending the connected party information the calling party if COLR is activated (COLP prompt).

ISDN BRI COLP/COLR coding is based on ETSI protocol. COLP/COLR from or to the public network is available to all countries, using the EuroISDN DSS1 protocol on the BRI interface.

The construction of the ISDN BRI connected number follows the same rules that apply to Calling Line Identification when sending an extension number over the same interface. National and local prefixes can be added. The type of numbering plan can be modified the same way they are modified for other types of terminals.

Feature interactions

Digital Terminal Display

When a calling party's digital terminal with display receives the connected party's information element, the display is updated with the received number depending on the presentation status. The presentation status applies to calls originating from non-ISDN extensions.

ISDN BRI terminals

Depending on the configuration of the Terminal Service Profiles, there is or is not full transparency for connected number and connected sub-address exchange between ISDN BRI terminals.

ISDN Central Office Trunks

When a call from a ISDN Central Office (CO) is answered by a ISDN BRI terminal, the ISDN BRI terminal's connected number is sent over the ISDN CO trunk interface, provided that COLP/COLR service is supported. The existing rules to generate the connected number on the ISDN CO interfaces are not modified by COLP/COLR. With the exception of EuroISDN trunks, the connected number is passed only if a redirection occurs.

ISDN Private Trunks

When a call from a QSIG interface is answered by a ISDN BRI terminal, the ISDN BRI terminal's connected number is sent over the QSIG interface. This connected message is given, even though no prior redirection occurred.

When a call from a Meridian Customer Defined Network (MCDN) interface is answered by a ISDN BRI terminal, the ISDN BRI terminal's connected number is sent over the MCDN interface. A connect message is sent no matter how the D-channel is configured and only after a redirection has occurred.

ISDN Calling Line Identification Enhancement

The ISDN Calling Line Identification Enhancement allows the choice of National and Local prefixes. This is applicable to connected numbers received from a ISDN BRI terminal and sent over a ISDN trunk.

EuroISDN Continuation

The EuroISDN Continuation capability adds National and Local prefixes to the connected number being sent. This is programmed on a route basis and is applicable to connected numbers received from a ISDN BRI terminal and sent over a ISDN trunk.

DPNSS/DASS2

The mapping of the connected number information element in a connect message from or to a ISDN BRI terminal and the connected line identification in a CRM message from or to a DPNSS or DASS2 interface is supported.

Feature packaging

ISDN Basic Rate Interface Connected Line Presentation/Restriction requires the following packages:

- Basic Rate Interface Line Application (BRIL) package 235,
- Basic Rate Interface (BRI) package 216, and
- Extended Peripheral Equipment (XPE) package 203.

Feature implementation

Refer to *ISDN Basic Rate Access Administration*.

NI-1 BRI Compliance Enhancements

This feature enhances the Meridian 1 functional protocol to be compatible with the National ISDN-1 (NI-1) ISDN Basic Rate Interface (BRI) voice and data standard for line application. The NI-1 protocol is configured in Overlay 27, which is used for ISDN BRI administration, by entering “6” against the PRID prompt. This protocol information is downloaded to the Multi-purpose ISDN Signaling Processor’s (MISP) network layer for handling ISDN BRI line application interface with NI-1 compatible terminals.

Another enhancement introduced by this feature is that the alphanumeric value for the Service Profile Identification (SPID) has been expanded from 9 to 20 characters (although the NI-1 standard only requires that the SPID range be from 9-20, the Meridian 1 implementation supports 1-20). The SPID is configured in Overlay 27 (by administering the Terminal Service Profiles) for the network side, and programmed on NI-1 compatible ISDN BRI terminals for the user side (both entries for the SPID must be the same).

Operating parameters

There are no operating parameters for this feature.

Feature interactions

There are no feature interactions for this feature.

Feature packaging

The following packages are required:

- ISDN Basic Rate Interface (BRI) package 216
- ISDN BRI Line application (BRIL) package 235
- Multi-purpose Serial Data Link (MSDL) package 222

Feature implementation

Refer to *ISDN Basic Rate Access Administration*.

Set-based ISDN BRI features on Meridian 1 ISDN BRI terminals

The following features are supported on M5317TDX terminals:

- AutoDial Keys (up to 9 keys each with 20 digit numbers)
- Inspect Key
- Data Port Configuration from the menu
- HandsFree
- Conference - Soft Key (recommended key #15)
- DiscData Soft key for Disconnecting Data Calls
- English/French Language Support
- Set based Ringing Patterns
- Set based Clock

The following features are supported on M5209TDcp terminals:

- Last Number Redial (invoked by ##)
- Set based Speed Call (Can store up to five 25 digit numbers)
- Store Number Redial (multiple keys)
- Conference (recommended key #9)
- DiscData Soft key for Disconnecting Data calls
- English/French Language Support
- Set based Ringing Patterns

Generic X11 features

ISDN BRI Lines — Generic X11

This section begins with a quick reference table (Table 17) of features with a column that indicates how this feature is supported by ISDN BRI lines. Reference to the notes at the end of the table provide some detail about the support of the feature.

The following legend and notes apply to Table 17.

Legend

yes = fully supported

n/a= Not Applicable or transparent to ISDN BRI

no = not supported due to ISDN BRI Standards limitations

P= partially support with description of limitation

Features labeled with "***" have a more detailed description later in this chapter.

For complete information on these features, refer to the *Features and Services Guide* 553-3001-306.

Note 1: ISDN BRI Terminal can ONLY initiate calls to the user equipped with this feature.

Note 2: ISDN BRI Terminal CAN NOT invoke this feature, however, the non-ISDN BRI calling party (calling an ISDN BRI user) will have access to this feature.

Note 3: Feature is ISDN BRI Terminal dependent.

Note 4: Automatic Number Identification, as used here, refers to the Hotel/Motel ANI feature. Please refer to "Calling Party Number" feature listed above for CLID.

Note 5: Camp-on feature can not be invoked against an ISDN BRI Terminal.

Note 6: Feature is not available to ISDN BRI user, however, ISDN BRI Terminal calling other non-ISDN BRI set equipped with this feature will receive appropriate call handling treatment.

Note 7: ISDN BRI Terminal display, if equipped, will not be updated to reflect call modification.

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
— A —		
Access Restrictions**	yes	See details later in this chapter
Access to Paging**	yes	See details later in this chapter
Access to Recorded Telephone Dictation**	yes	See details later in this chapter
ACD/CDR Q Record Option.	no	
ACD Night Call Forward without Disconnect Supervision	no	
Activity Codes for Not Ready State	no	
Application Module	n/a	
ARIES Automatic Gain Control	n/a	
ARIES Handsfree Download	n/a	
Attendant Administration	no	
Attendant Alternative Answering**	P	See Note 1 and details later in this chapter
Attendant Barge-in	no	
Attendant Blocking of DN	no	
Attendant Break-in	no	
Attendant Busy Verify	no	
Attendant Call Party Name Display.	yes	
Attendant Call Selection	n/a	
Attendant Calls Waiting Indication	n/a	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Attendant consoles	no	
Attendant End-to-End Signaling**	yes	See details later in this chapter
Attendant Incoming Call Indicators	n/a	
Attendant Interpositional Transfer	n/a	
Attendant Lockout	n/a	
Attendant Overflow Position**	P	See Note 1 and details later in this chapter.
Attendant Overflow Position Busy	no	
Attendant Position Busy. See also Night Service	n/a	
Attendant Recall**	P	See Note 2 and details later in this chapter.
Attendant Release**	P	See details later in this chapter.
Attendant Secrecy	yes	
Attendant Splitting	yes	
Attendant Supervisory Console	n/a	
Attendant Trunk Group Busy Indication	n/a	
Audible Message Waiting	yes	See Note 3
Audible Reminder of Held Call	no	
Autodial	yes	See Note 3
Autodial with Authorization Code.	no	
Automatic Answerback	no	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Automatic Call Distribution**	P	See Note 1 and details later in this chapter.
Automatic Hold	no	
Automatic Line Selection	yes	See Note 3
Automatic Number Identification	no	See Note 4
Automatic Number Identification on DTI	no	See Note 4
Automatic Preselection of Prime DN	yes	See Note 3
Automatic Redial	no	
Automatic Set Relocation	no	
Automatic Timed Reminders**	P	See Note 5 and details later in this chapter.
Automatic Trunk Maintenance	n/a	
Automatic Wake Up	no	
Automatic Wake Up Flexible Feature Code Delimiter	no	
Auxiliary Processor Link	n/a	
Auxiliary Signaling	no	
— B —		
B-Channel Overload Control	no	
Background Terminal	no	
Barge-in	no	
Basic Alternate Route Selection	yes	
Basic Authorization Codes	no	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Basic Call, North American ISDN PRI Connectivity**	yes	See details later in this chapter
Bearer Capability in CDR	no	
Boss/Secretary Filtering Enhancement	no	
Bridging	no	
Busy Lamp Field Array	no	
Busy Tone Detection for Japan	no	
Buzz - See Manual Signaling (Buzz)	no	
— C —		
Call-Back Queuing	no	
Call-Back Queuing/Conventional Main	no	
Call Capacity Report Enhancement	no	
Call Detail Recording	yes	
Call Detail Recording Expansion	yes	
Call Detail Recording 100 Hour Call	no	
Call Detail Recording on Busy Tone	yes	
Call Detail Recording Outpulsed Digits	no	
Call Forward All Calls**	P	See details later in this chapter
Call Forward, Break-in and Hunt Internal or External Network Wide	no	
Call Forward Busy-	yes	See ISDN BRI Special Call For Busy
Call Forward Destination Deactivation	yes	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Call Forward External Deny	no	
Call Forward and Hunt by Call Type**	yes	See details later in this chapter
Call Forward No Answer**	yes	See details later in this chapter
Call Forward No Answer/ Flexible	yes	See Note 7
Call Forward/Save on Dump	no	
CFNA, Second Level for MWA stations	yes	See Note 7
Call Forward/Hunt Override via FFC	no	
Call Forward No Answer, Second Level	yes	See Note 7
Call Hold**	yes	See details later in this chapter
Call Hold, Deluxe	no	
Call Hold, Individual Hold Enhancement	no	
Call Hold, Permanent	no	
Calling line identification**	P	See details later in this chapter
Calling line identification presentation	yes	See details later in this chapter
Calling line identification restriction	yes	See details later in this chapter
Call Page Network Wide	yes	
Calling Party Privacy	no	
Calling Party Privacy Override	no	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Call Park**	P	See details later in this chapter
Call Park Network Wide	no	
Call Park on Unsupervised Trunks	no	
Call Party Name Display**	P	See details later in this chapter
Call Pickup	no	
Call Pickup, Directed	no	
Call Pickup Network Wide	no	
Call Processor Card NT5D10	n/a	
Call Redirection by Day	no	
Call Selection	n/a	
Call Splitting	yes	
Call Status Indication	n/a	
Call Transfer**	P	See Note 2 and details later in this chapter
Call Waiting/Internal Call Waiting**	yes/yes	See details later in this chapter
Called Party Control on Internal Calls	no	
Called Party Disconnect Control**	P	See details later in this chapter
Calling Line Identification**	P	See details later in this chapter
Calling Line Identification Presentation and Restriction**	yes	See details later in this chapter

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Calling Party Number	yes	
Calling Party Privacy Override	no	
Charge Account and Calling Party No	yes	See Note 1
Calls Waiting Indication (Attendant)	n/a	
CAMA Trunks	no	
Camp-on	no	
Capacity Expansion	yes	
Centrex Switchhook Flash	no	
Code Restriction	yes	
Charge Account and Calling Party Number **	P	See details later in this chapter
Charge Account, Forced	no	
CLASS: Calling Number and Name Delivery	no	
CLASS: Visual Message Waiting Indicator	no	
Class of Service	yes	
CO Trunk Priority Option - Call Pickup	no	
Conference	no	See Note 2
Conference Control	n/a	
Console Digit Display	n/a	
Console Presentation Group Level Services	no	
Control of Trunk Group Access	n/a	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Controlled Class Of Service	no	
Controlled Class of Service, Enhanced	no	
Coordinated Dialing Plan	yes	
Coordinated Call-Back Queuing	no	
Coordinated Call-Back Queuing - Main	no	
— D —		
Data access via Data Modules	P	See Note 2
Data Port Hunting	yes	
Data, Circuit Switched**	yes	See details later in this chapter
Data, Packet**	yes	See details later in this chapter
Deluxe Hold	no	
Departmental Listed Directory Number (LDN)**	yes	See details later in this chapter
Dial Access to Group Call	no	
Dial Intercom	no	
Dial Pulse/Dual Tone Multifrequency Conversion	n/a	
Dialed Number Identification Service	P	See Note 7
Digit Display	yes	See Note 7
Digital Trunk Interface	yes	
Direct Inward System Access	yes	
Directed Call Pickup	no	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Directory Number	yes	
Directory Number Expansion**	yes	See details later in this chapter
Display of Access Prefix on CLID	no	
Distinctive/New Distinctive Ringing	no	
Distinctive Ringing by DN	no	
Distinctive Ringing for Dial Intercom	n/a	
Do Not Disturb**	yes	See details later in this chapter
DSN Station Loop Preemption	no	
Dual Value Added Server Identification	n/a	
— E—		
E.164/ESN Numbering Plan Expansion	yes	
Electronic Brandlining	no	
Electronic Switched Network	yes	
Emergency Services Access	yes	
End-to-End Signaling	yes	
Enhanced Controlled Class of Service	no	
Enhanced End-to-End Signaling	yes	
Enhanced Flexible Hot Line**	P	See Note 2
Enhanced Music	yes	
Enhanced Night Service	no	
Enhanced 911 Interface	no	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Electronic Lock Network Wide/Electronic Lock on Private Lines	no	
Equal Access Compliance	yes	
ESN Queuing	no	
Exclusive Hold	no	
— F —		
Fast Tone Digit Switch	n/a	
FCC Compliance for DID Answer Supervision	n/a	
Flexible Attendant DN	n/a	
Flexible Call Forward No Answer	yes	
Flexible Direct Inward Dialing	no	
Flexible ESN "0" Routing	yes	
Flexible Hot Line	P	See Note 2
Flexible Feature Codes	no	
Flexible Line Lockout	no	
Flexible Numbering Plan	no	
Flexible Numbering Plan Enhancement	no	
Flexible Orbit Prevention Timer	yes	
Flexible Tones and Cadences	no	
Flexible Voice/Data Terminal Number	no	
Forced Charge Account	no	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
— G —		
Global CDR Record	no	
Group Call	no	
Group Hunt**	P	See details later in this chapter
Guest Entry of Automatic Wake Up	no	
— H —		
History File	yes	
Hot Line	P	See Note 2
Hold	yes	Not supported by 1TR6 protocol
Hospitality Screen Enhancements	no	
Hotel/Motel features —	no	
— Automatic Wake-Up	no	
— Background Terminal	no	
— Controlled Class of Service	no	
— Maid ID	no	
— Property Mgmt. Sys. Interface	no	
— Room Service	no	
Hunting	yes	See ISDN BRI Special Hunting
— I, J—		
IMS/VMS**	P	See details later in this chapter

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
In-Band ANI	n/a	
Incoming DID Digit Conversion**	P	See Note 7 and details later in this chapter
Incremental Software Management**	yes	See details later in this chapter
Incoming Call Indicators	n/a	
Incoming Trunk Group Exclusion	n/a	
Incoming Trunk Programmable CLID	n/a	
Individual Hold	no	
INIT ACD Queue Call Restore	no	
Inspect key	yes	See Note 3
Instant ISM	no	
Integrated Messaging System Link	P	See IMS/IVMS
Integrated Voice and Data	yes	
Intercept Treatment**	yes	See details later in this chapter
Internal Call Detail Recording	yes	
Internal Call Waiting	yes	
Interpositional Transfer	n/a	
ISDN Application Protocol	no	
ISDN Call Connection Limitations	yes	
ISDN BRI Calls to MCA/MCU	yes	
ISDN BRI Circuit- Switched Data Call Accessing DTI Trunk	yes	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
ISDN BRI Connected Line Presentation/Restriction	yes	
ISDN BRI to ISDN BRI Circuit Switched Data Call	yes	
ISDN BRI Circuit-Switched Data Call over PRI	yes	
ISDN BRI Circuit- Switched Data Call for Tandem	yes	
ISDN BRI Network Ring Again	yes	
ISDN NI-1 BRI Compliance Enhancements	yes	
ISDN BRI Special Call Forward Busy	yes	
ISDN BRI Special Hunting	yes	
ISDN Calling Line Identification Enhancements	yes	
ISDN QSIG Alternate Routing	no	
ISDN QSIG Basic Call	no	
ISDN QSIG Call Completion	no	
ISDN QSIG Call Completion Enhancement	no	
ISDN QSIG Call Diversion Notification	yes	BRI sets are supported.
ISDN QSIG Call Diversion Notification Enhancement	yes	BRI sets are supported.
ISDN QSIG Call Transfer Notification	yes	BRI sets are supported.
ISDN QSIG Generic Functional Transport	no	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
ISDN QSIG/ETSI Generic Functional Transport Enhancement	no	
ISDN QSIG Name Display**	P	See details later in this chapter
ISDN QSIG Path Replacement	no	
ISDN QSIG Supplementary Services - Name Display Enhancements**	yes	
ISDN Semi-permanent Connection for Australia	no	
Japan TTC Common Channel Signaling	no	
— L —		
Last Number Redial	yes	See Note 3
Limited Access to Overlays	yes	
Line Load Control	no	
Line Lockout	no	
Listed Directory Numbers	n/a	
Lockout	n/a	
— M —		
Maid Identification	no	
Maintenance Telephone	no	
Make Set Busy	no	
Make Set Busy Enhancement	no	
Make Set Busy Improvement	no	
Malicious Call Trace**	P	See Note 2 and details later in this chapter

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Manual Line Service	n/a	
Manual Signaling (Buzz)	no	
Manual Trunk Service	yes	
MCDN Alternate Routing	no	
MCDN End to End Transparency	no	
Meridian 1 Attendant Console Enhancement	n/a	
Meridian Communications Adapter (MCA) Data Module**	P	See details later in this chapter
Meridian Companion Enhanced Capacity	N/A	
Meridian Hospitality Voice Services	no	
Meridian MAX	n/a	
Meridian Mail	yes	Audible Indication
Meridian Mail Trunk Access Restriction**	P	See details later in this chapter
Message Center**	P	See details later in this chapter
Message Registration	no	
Message Waiting Lamp Maintenance	no	
Message Waiting Indicator by Directory Number	no	
Message Waiting (Meridian Mail)**	yes	See Note 3 and details later in this chapter
Modem Trunk Hunting	no	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
MSDL Idle Code Selection	N/A	
MSDL Port Overload Counter	N/A	
MSDL Status Enquiry Message Throttle	N/A	
Multiple Appearance Directory Number (DN)**	P	On the same DSL ONLY. See details later in this chapter
Multiple Appearance Redirection Prime	no	
Multi-Language Wake Up	no	
Multi-Party Operation**	p	See details later in this chapter
Multiple-Customer Operation	yes	
Multiple-Console Operation	n/a	
Multiple DID Office Code Screening	n/a	
Multiple-Tenant Service	no	
Music	yes	
Music Broadcast	no	
Music, Enhanced	yes	
Music on Hold**	yes	See details later in this chapter
— N —		
N Digit DNIS	no	
Network Automatic Call Distribution	P	See Note 1
Network Alternate Route Selection**	yes	See details later in this chapter

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Network Attendant Service**	p	See details later in this chapter
Network Authorization Codes	no	
Network Call Transfer**	P	See Note 2 and details later in this chapter
Network Call Redirection Service**	P	See details later in this chapter
Network Call Trace and Call Diagnostics	no	
Network Class of Service**	yes	See details later in this chapter
Network Intercom	no	
Network Message Center	P	See Message Center
Network Message Services (Meridian Mail)	yes	
Network Call Party Name Display	P	
Network Signaling	yes	
Network Signaling for Network ACD**	P	See details later in this chapter
Network Speed Call	P	See Note 2
Network Traffic	n/a	
New Distinctive Ringing	no	
New Flexible Code Restriction	yes	
NI-2 Call By Call Service Selection	no	
Night Key for DID Digit Manipulation	no	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Night Service/TAFAS**	P	See Note 1 and details later in this chapter
Night Service by Time of Day	P	See Note 6
No Hold Conference	P	See Note 2
NPI and TON in CDR tickets	no	
— O —		
Off-Hook Alarm Security	no	
Off-Hook Queuing	no	
Off-Net Number Recognition	yes	
Off-Premise Extension	n/a	OPX — applicable to analog sets only
Office Data Administration System	no	
On-Hook Dialing	yes	See Note 3
Option 11 Set based installation	no	
Optional Outpulsing Delay	no	
Optional Privacy	no	
Outgoing Trunk Hunting	n/a	
Overflow Tone	yes	
Overlay Cache Memory	yes	
Override	no	
Outpulsing of Asterisk and pound**	yes	See details later in this chapter
— P —		
Packet Switched Data Service	yes	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Paging	yes	
Permanent Hold	n/a	
Position Busy	n/a	
Preference Trunk Usage	yes	
Pretranslation**	yes	See details later in this chapter
Pretranslation and System Speed Call Enhancement	no	
Prime DN	n/a	
Priority Override**	p	See details later in this chapter
Privacy	no	
Privacy Override	no	
Privacy Release	no	
Private Line Service	no	
Property Management System Interface	no	
Packet Switched Data Service	yes	Supported for both B and D channels

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
— R —		
Recall (Attendant)**	P	See Note 2 and see details later in this chapter
Recall After Parking	no	
Recall to Same Attendant**	P	See details later in this chapter
Recorded Announcement**	yes	See details later in this chapter
Recorded Announcement Broadcast	no	
Recorded Overflow Announcement	yes	
Recorded Telephone Dictation	yes	
Recovery on Misoperation at the Attendant Console	no	
Remote Call Forward	no	
Remote Peripheral Equipment	no	
Remote Virtual Queuing	no	
Restricted Call Transfer	no	
Ring Again	no	
Ring Again on No Answer	no	
Ringing Number Pickup	no	
Room Status	no	
Round Robin Trunk Hunting	n/a	
— S —		
7 Digit DNIS for MAX	n/a	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Schedule Access Restriction	no	
Secrecy (Attendant)	yes	
Secretarial Filtering	no	
Selectable Conferee Display and Disconnect	no	
Short Buzz for digital sets	n/a	
Signal source and destination	no	
Single Appearance DN	yes	
Six Party Conference for 2500 Sets	yes	See Note 3
Software Capacity Expansion	yes	
Special Dial Tone	P	Message Waiting Indication
Special Service prefix (SPRE)	no	
Speed Call	P	See Note 2
Speed Call Delimiter	no	
Speed Call with Authorization Codes	no	
Speed Call, System	no	
Splitting** (See Attendant Splitting)	yes	See details later in this chapter
Station Category Indication	no	
Station Hunting--see ISDN BRI special hunting	yes	
Station Loop Preemption	no	
Station Camp-on	no	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Station-to-Station-Calling	yes	
Station-to-Station Call Waiting	yes	
Stored Number Redial	yes	See Note 3
Supervisory Attendant Console	n/a	
System Capacity Expansion	yes	
Switched 56 Kbps Service**	P	See details later in this chapter
— T —		
Time and Date	yes	See Note 3
Time Forced Disconnect** (See Paging)	yes	See details later in this chapter
Tones, Flexible Incoming	no	
Transfer**	P	See Note 2 and details for Call transfer later in this chapter
Trunk Answer From Any Station	no	
Trunk Anti-Tromboning	no	
Trunk Barring	yes	
Trunk Group Access Restrictions (TGAR)	yes	
Trunk Group Busy Keys/Indication**	yes	See details later in this chapter
Trunk Hunting	n/a	
Trunk Signaling Arrangements	n/a	
Trunk to Trunk Connection	no	

Table 17
Generic X11 features on ISDN BRI lines

Features and services	Supported	Comments
Trunk Verification from a Station	no	SPRE codes are not supported
— U —		
Uninterrupted Line Connections	no	
Uniform Dialing plan	yes	
— V —		
VIP Wake up	no	See Automatic Wake Up
Virtual Network Services in the UK with DASS2/DPNSS1 Bearers	no	
Virtual Network Services Virtual DN Expansion	no	
Voice Call	yes	See Note 3

The following two sections list the Generic X11 features that are tagged in the above table with a "***". These descriptions provide further details of the interaction of the feature with ISDN BRI

Features supported by ISDN BRI as a Line

The following descriptions provide additional information for the features tagged with "***" in Table 17.

Access Restrictions

Access restriction for an ISDN BRI terminal is based on assigned class of service, trunk group access restriction, and area and exchange codes dialed by the terminal.

Class-of-service and trunk group access restriction for an ISDN BRI terminal are defined when configuring DSL using Service Change ISDN BRI Program LD 27.

The same access restrictions apply to all voice and data ISDN BRI DN's defined for a DSL.

Access to Paging

An ISDN BRI terminal can access paging equipment by dialing a paging trunk access code. End-to-end signaling must be provided by the ISDN BRI terminal.

Access to Recorded Telephone Dictation

An ISDN BRI terminal can access dictation equipment by dialing an equipment access code. End-to-end signaling must be provided by the ISDN BRI terminal.

Attendant End-to-End Signaling

This feature is supported for ISDN BRI terminals where the attendant can signal to an ISDN BRI terminal and an ISDN BRI terminal can dial the attendant and request access to services requiring end-to-end signaling.

Call Forward No Answer

This feature is supported for calls originated by an ISDN BRI terminal and calls terminated at an ISDN BRI terminal. Internal and external call forward no answer DN's are defined in the DSL, and call forward no answer enable and call forward by call type are defined for ISDN BRI DN's in the TSP using Service Change ISDN BRI Program LDp27.

An ISDN BRI DN can be defined as a call forward no answer DN allowing the features available on the ISDN BRI terminal to control the call.

Call forward no answer and second level call forward no answer are activated if FNA and SFA are selected for a DN when configuring the TSP using Service Change ISDN BRI Program LD 27. If a call is not answered after a predetermined timer expires, the initial call setup is released from the DSL and call forward no answer routes the call to an alternate DN.

An ISDN BRI terminal originating the call is not updated to show on its display that the call was redirected to a different DN as a result of call forward no answer. This is due to lack of standard for layer 3 messages used to update the ISDN BRI terminal display

Call Hold (not supported by 1TR6 protocol)

This feature is activated by pressing the Hold key on the terminal. This feature allows an ISDN BRI terminal to place an active call on hold to accept or originate another call. You can dial a new call and go back to the call on hold.

An ISDN BRI terminal can place an ISDN BRI or non-ISDN BRI terminal on hold.

Deluxe hold and permanent hold do not apply to an ISDN BRI terminal, however a non-ISDN BRI terminal can place an ISDN BRI terminal in deluxe hold or permanent hold.

Call Waiting

This feature alerts a busy ISDN BRI terminal that a call is waiting to be answered. To answer a waiting call, the ISDN BRI terminal must place the active call on hold or release the active call. If the ISDN BRI terminal user tries to answer a call waiting call when no B-channel is available, the call is released from the ISDN BRI terminal and extended to the attendant.

When both B-channels on a DSL are busy, an incoming call is presented to the DSL as call waiting as long as the number of calls on this DSL does not exceed the maximum number of calls specified, which include active calls, calls waiting, and calls on hold. This maximum number of simultaneous calls allowed is specified when configuring the DSL using Service Change ISDN BRI Program LD 27.

A call waiting from an ISDN BRI terminal is presented to a non-ISDN BRI terminal as a normal call waiting call.

Call waiting for a call terminating at a DSL will be activated only if do-not-disturb and hunting for this DSL are not enabled or fail to handle the call. ISDN BRI call waiting is subject to call forward no answer as defined in the Meridian 1.

Departmental LDN

This feature allows specified terminals to share the same numbering plan and to access the attendant console or consoles dedicated to a departmental LDN.

Directory Number Expansion

ISDN BRI terminal DNs can be increased from a maximum length of four digits to a maximum length of seven digits when the DN Expansion option is equipped.

Do-Not-Disturb

The attendant can place an ISDN BRI DN in do-not-disturb mode, which allows the terminal to make outgoing calls but it makes it look busy to incoming calls.

Incremental Software Management

Software pricing is implemented based on the number of ISDN BRI DSLs (United States only).

Intercept Treatment

A call originated by an ISDN BRI terminal that is intercepted can be routed to the attendant, given a busy tone, given an overflow tone, or routed to a recorded announcement. There is no special treatment for ISDN BRI terminals.

Message Waiting (Meridian Mail)

This feature is supported by ISDN BRI terminals if this feature is enabled for an ISDN BRI DN when configuring the TSP using Service Change ISDN BRI Program LD 27. Audible message is supported, however visual message display indicator is not supported due to lack of standards for layer3 messages.

When an ISDN BRI terminal with an active message waiting initiates a call, the system replaces the standard dial tone with a message waiting tone to alert the user that a message is waiting. If a terminal cannot get a dial tone, it also cannot get a message waiting tone.

A call terminating at an ISDN BRI DN can be redirected to Meridian Mail or Network Message Services-Meridian Mail (NMS-MM) through call forward no answer. A call originating from an ISDN BRI terminal to a non-ISDN BRI terminal can also be redirected to Meridian Mail or NMS-MM through call redirection on the non-ISDN BRI terminal.

An ISDN BRI terminal can access the mailbox and retrieve its messages by dialing Meridian Mail or NMS-MM DN. An ISDN BRI terminal does not have a message waiting or conference key.

An ISDN BRI terminal connected to Meridian Mail or NMS-MM cannot use Call Sender feature.

Message waiting forward busy redirects a DID call from a busy DSL interface to Meridian Mail or NMS-MM through FDN defined for a DSL. This feature is enabled on a customer basis for an ISDN BRI DN by setting call forward busy allowed and message waiting allowed class of services when configuring the TSP using Service Change ISDN BRI Program LD 27.

Music on Hold

ISDN BRI terminals on hold and terminals placed on hold by an ISDN BRI terminal can receive music if so configured. An ISDN BRI terminal can also access a music trunk by dialing the route access code.

Pretranslation

An ISDN BRI DN can be assigned to a first digit pretranslation group.

The first digit dialed on an ISDN BRI terminal can be pretranslated into a DN while making a call.

Pretranslation is configured for a DSL therefore all DNs for a DSL are assigned to the same pretranslation group.

An ISDN BRI DN can also be assigned as a translated DN in a pretranslation group's speed call list.

Recorded Announcement

An ISDN BRI terminal can be connected to a recorded announcement machine by an intercept condition, by the attendant, by an ACD agent, or by direct access to a recorded announcement machine.

Departmental listed directory number groupings are supported for ISDN BRI and are configured for a DSL using Service Change ISDN BRI Program LD 27. This allows assignment of a DSL to one of the four listed directory number groups. All DNs for a DSL are assigned to the same departmental LDN.

Network Alternate Route Selection

ISDN BRI terminals can have the following networking capabilities: simple network access codes, uniform dialing plan, digit manipulation, automatic least-cost routing, time-of-day routing, automatic on-net to off-net overflow, network control through network class of service, traveling class of service and facility restriction level, routing control through network class of service based on time-of-day schedule, 11 digit translation, free calling area screening, expensive route warning tone, network call detail recording, and network speed dial.

Network Class of Service

An ISDN BRI DSL can be assigned a network class of service to control access to routes, ability to receive expensive route warning tone, and ability to access network speed dial. All DNs for a DSL are assigned to the same NCOS.

Outpulsing of Asterisk and Outpulsing of Pound

Routes can be dedicated for the outpulsing of asterisks (*) and pound (#) when an ISDN BRI terminal is making a trunk call.

Splitting

The attendant selectively talks to either party of an established call made by an ISDN BRI terminal by excluding one party from the conversation or the other using the Exclude Source or Exclude Destination key.

Timed Forced Disconnect

An ISDN BRI terminal is disconnected if it uses the paging trunk longer than a preset time.

Trunk Group Busy Keys/Indication

When all trunks in a trunk group or its hunting groups are busy, a user-selectable tone is returned to the calling ISDN BRI terminal.

Features partially supported by ISDN BRI as a line

The following descriptions provide additional information for the features tagged with:**: in Table 17.

Attendant Alternative Answering

An ISDN BRI DN cannot be assigned as an attendant alternative answering DN. Calls originating from an ISDN BRI terminal can be forwarded to an attendant alternative answering DN defined for the attendant console when the attendant does not answer the call. The originating ISDN BRI terminal display is not updated.

Attendant Overflow Position

An ISDN BRI DN cannot be assigned as an attendant overflow position DN. Calls originated by ISDN BRI terminals can be automatically routed to a predefined DN, however, the terminal display will not be updated to show the call modification.

Attendant Recall

An ISDN BRI terminal communicating with a non-ISDN BRI terminal is recalled to the attendant as the source party if the recall is initiated by the non-ISDN BRI terminal. An ISDN BRI terminal cannot initiate an attendant recall.

Attendant Release

The attendant has no control over disconnection of an ISDN BRI terminal if the call is with another ISDN BRI terminal. The ISDN BRI terminal can release the call even if the attendant has not pressed the Release key.

Automatic Timed Reminders

A call made by an ISDN BRI terminal can be extended by the attendant to an ISDN BRI or non-ISDN BRI terminal and timed for slow answer or call waiting recall. When the timer expires, the call is recalled to the attendant.

Camp-on recall is not supported by the ISDN BRI DN.

Automatic Call Distribution

An ISDN BRI terminal cannot be an ACD agent terminal, however, an ISDN BRI terminal can place a call to an ACD agent.

Call Forward All Calls

An ISDN BRI terminal does not support call forward all calls. Calls originating from an ISDN BRI terminal can be forwarded if call forwarding is activated by a non-ISDN BRI terminal. The calling ISDN BRI terminal display is not updated to show the call change. An ISDN BRI DN can also be defined as a call forward DN.

Call Park

An ISDN BRI terminal cannot be parked nor can it park a call, however it can retrieve a parked call through a system park DN. An ISDN BRI DN can be used as a station park DN.

Call Party Name Display

Names are not displayed on ISDN BRI terminals, however, a name for an ISDN BRI DN can be defined using Calling Party Name Display Program LD 95 to allow a non-ISDN BRI terminal with display to identify the ISDN BRI terminal that originated the call. This name can be transmitted across ISDN PRI network.

Called Party Disconnect Control

A disconnect signal from an incoming trunk call to an ISDN BRI terminal is ignored by the terminal.

A call originating from an ISDN BRI terminal and to an outgoing trunk can be disconnected from either end.

Call Transfer

An ISDN BRI terminal can be transferred by a non-ISDN BRI terminal and a non-ISDN BRI terminal can transfer a call to an ISDN BRI terminal. In either case, the ISDN BRI terminal display is not updated to indicate call modification.

Calling Line Identification

Calling line identification is sent across ISDN PRI to and/or from ISDN BRI terminals. Trunk access code is displayed at the called ISDN BRI terminal instead of the calling line identification if it has calling party number restricted.

If a network call is redirected the calling line identification is not updated.

Charge Account/Calling Party Number

Charge account cannot be activated by an ISDN BRI terminal, however, a non-ISDN BRI terminal communicating with an ISDN BRI terminal can activate charge account and enter an ISDN BRI DN as the calling party number to be included in the call detail recording report.

Enhanced Flexible Hotline

Hotline is not available on an ISDN BRI terminal, however, an ISDN BRI DN can be defined as a hotline number.

Group Hunt

Group Hunt is partially supported on ISDN BRI terminals, as explained below:

- an ISDN BRI terminal cannot be a member of a group hunt list, due to lack of support of FFC (Group Hunt Deactivation is not possible);
- an ISDN BRI terminal cannot access a group hunt list, since FFCs are not supported;
- a call from an ISDN BRI terminal to another ISDN BRI terminal may be hunted, or call forwarded no answer, to a Group Hunt Pilot DN FFC.

Incoming DID Digit Conversion

An ISDN BRI DN can be defined as the converted DN, however, the dialed number identification service number will not be displayed on an ISDN BRI terminal.

IMS/IVMS

Calls originated from an ISDN BRI terminal may be redirected to IMS/IVMS and leave a text or voice message for the called party.

For voice messages, an ISDN BRI terminal that can generate end-to-end signaling can access other options available.

Calls terminated on an ISDN BRI terminal may be redirected to IMS/IVMS through call forward no answer or hunting, but the ISDN BRI DN will not have a mailbox defined and a caller may not leave a message for an ISDN BRI DN.

ISDN BRI Network Ring Again

The Network Ring Again feature cannot be activated from nor offered to an ISDN BRI terminal due to a lack of standardized functional protocol for supporting the feature. For non-ISDN terminals encountering a busy ISDN BRI terminal, the Network Ring Again feature is not offered to the non-ISDN terminals for the same reason.

ISDN QSIG Name Display

Calling Party Privacy (CPP) Flexible Feature Code is not supported on BRI sets. Therefore, Calling/Connected Name Identification Restriction on a per-call basis is not supported on BRI sets.

Malicious Call Trace

An ISDN BRI terminal cannot activate malicious call trace. A non-ISDN BRI terminal can activate malicious call trace on a call connected to an ISDN BRI terminal.

Meridian Mail Trunk Access Restriction

This feature does not support Call transfer from ISDN BRI sets.

Message Center

A call originating by an ISDN BRI terminal to a non-ISDN BRI terminal may be redirected to Network Message Service - Message Center. The associated MIK/MCK and the lamp states are not supported for the corresponding ISDN BRI terminal.

Multiple Appearance Directory Number

Multiple ISDN BRI terminals on the same DSL can have the same DN. An ISDN BRI and a non-ISDN BRI terminal cannot have the same DN.

ISDN BRI multiple appearance DN is not allowed across different DSLs and is also not allowed for non-ISDN BRI terminals.

Multi-Party Operations

Call Join

The Call Join feature allows a controlling party to conference-in or transfer an active party to a held party. The controlling party can then hang up. The controlling party's terminal must be equipped with a Conference 3/6 key, and at least one secondary DN or Call Waiting key.

ISDN BRI terminals cannot be the controlling party. If the ISDN BRI terminal is the active party or held party, the Call Join feature is supported as described; however, the ISDN BRI terminal display is not updated.

Three-Party Service

The Three Party Service feature allows a user of a 500/2500 terminal with Three Party Service Allowed (TSA) COS to toggle between an active party and a held party on an ISDN BRI terminal, through the use of the Call Hold feature. However, a three party conference cannot be formed.

AN ISDN BRI terminal may be placed on hold or placed in a three party conference by a controlling terminal that is a non-ISDN BRI terminal; however, the ISDN BRI terminal display is not updated.

Conference 6

The Conference 6 feature is an extension of Three-party service, allowing users of 500/2500 telephones, with TSA and C6A COS, the added capability of establishing a conference of up to six parties.

AN ISDN BRI terminal may be placed in a six party conference by a controlling terminal that is a non-ISDN BRI terminal; however, the ISDN BRI terminal display is not updated.

Recovery of Misoperation on Call Transfer

The Recovery of Misoperation of Call Transfer feature prevents external calls from being dropped due to misoperation of the Call Transfer feature. Optional treatments of a misoperation may be configured on a customer basis.

Recovery of Misoperation of Call Transfer is not available on ISDN BRI terminals. If the controlling station misoperates on a transfer of a call originating from an ISDN BRI terminal, the call receives the configured misoperation treatment; however, the ISDN BRI terminal display is not updated.

Network Signaling for Network ACD

ISDN BRI terminals cannot be configured as network ACD DNs, however, ISDN BRI terminals can make calls to the network ACD DNs.

Network Call Redirection Service

ISDN PRI redirection for ISDN BRI terminals is limited as follows:

- ISDN BRI terminals may be redirected across the PRI network, however, the terminal will not be notified about the redirection.
- ISDN BRI terminals may redirect a PRI call using hunting and call forward no answer. It may also redirect a call across PRI the same way.

Network Attendant Service

Network Attendant Service (NAS) provides the capability of stand alone attendant service, full or part time, across a Meridian 1 network.

NAS provides the following attendant features network wide:

- attendant routing, which allows calls to an attendant to be routed to any other destination within the network;
- night service;
- call extension, which allows calls to an attendant to be extended across a network;
- timed reminder recall, which allows unanswered calls to be recalled to the attendant. When the attendant extends a call to a destination at another node, the trunks are not released. This prevents call disconnection and gives the attendant control of the call, including the ability to exclude the source or destination;
- incoming call indication, which is received when a call reaches the attendant via NAS routing;
- Camp-on and Call Waiting;
- Break-in;

- attendant control, which gives the attendant control of the call, including control of disconnecting the call and the ability to exclude the source or destination;
- ring held party, which allows the attendant console to receive ringing if a terminal that originated a call to the attendant disconnects while attendant control is configured;
- attendant display of Calling Line Identification (CLID), which allows the CLID of the calling party to be displayed on the attendant console.

These feature are supported transparently for ISDN BRI, with the following exceptions:

- Camp-on;
- Break-in;
- network wide attendant control; when an ISDN BRI terminal disconnects from an attendant extended call, the call is released on the ISDN BRI side;
- ring held party; when an ISDN BRI terminal disconnects from an attendant extended call, the call is released on the ISDN BRI side.

The displays on ISDN BRI terminals are never updated

Network Call Transfer

An ISDN BRI terminal cannot transfer a call, but a call originating from an ISDN BRI terminal can be transferred to an ISDN BRI or a non-ISDN BRI terminal. The display on the ISDN BRI terminal will not be updated.

Night Service/TAFAS

A call originated by an ISDN BRI terminal to an attendant console in night service will be routed through a customer night DN. The display on the ISDN BRI terminal will not be updated to show call redirection.

Priority Override

Priority Override is partially supported on ISDN BRI terminals, as explained below:

- Priority Override to an ISDN BRI terminal is not possible, because Priority Override require Warning Tone Allowed Class of Service (ISDN BRI terminals are defaulted to WTD COS);
- Priority Override from an ISDN BRI terminal is not possible because feature keys and FFC are not supported for ISDN BRI;

Recall to Same Attendant

This feature is supported transparently; however, the displays on ISDN BRI terminals are not updated.

Switched 56 kbps Service

An ISDN BRI terminal can use switched 56 kbps service if a data route has been previously established or the ISDN BRI terminal can generate a 2100 Hz tone to the network. This 2100 Hz tone disables echo cancellation that is provided by the equal access carriers.

ISDN BRI Trunk Access features: Generic X11

ISDN PRI features interaction with ISDN BRI

All Meridian 1 networking features and services supported by ISDN PRI are also supported by ISDN BRI. The following exceptions apply:

ISDN PRI features not supported

The following ISDN PRI specific features are **not** supported by ISDN BRI:

- 1.5/2.0 Mb gateway
- 2 Mb gateway
- Automatic Trunk Maintenance
- Backup D-channel
- Channel negotiation - The channel negotiation capability applies at the DSL level. If channel negotiation fails on a route with several ISDN BRI trunks (several DSLs) there is no second call attempt on another DSL in the same route.
- Digital Private Network Signaling No. 1 (DPNSS 1) - ISDN BRI supports a gateway between IDA (DPNSS1 version of PRI) and MCDN protocols for basic call features. Ring again features are not supported.
- In Service Messaging
- Integrated Service Access (ISA)
- ISDN Primary Rate Access Meridian 1 to AXE-10 Sweden Connectivity
- ISDN Primary Rate Access Meridian 1 to AXE-10 Australia Connectivity
- ISDN Primary Rate Access Meridian 1 to SYS-12 Connectivity
- Integrated Service Digital Network Signaling Link (ISL)
- Non-Associated Signaling Channels (nB+D)
- Trunk Anti-tromboning - supported only over Virtual Network Services BRI trunks

- Trunk Optimization (SL-1 to SL-1 only)
- Virtual Network Services - VNS takes advantage of ISDN signaling through a private D-channel using the Public Exchange voice connections instead of TIE trunk connections. It is not possible to configure a D-channel of an ISDN BRI Trunk Access as a VNS D-channel. However, the voice connection through the Public Exchange of a VNS call may use an ISDN BRI Local Exchange trunk. Also, Trunk Anti-Tromboning is supported on VNS BRI trunks.

Other ISDN PRI features:

- The restrictions and limitations applicable to the remaining ISDN PRI features are similarly applicable to ISDN BRI trunks.

Generic X11 International features — lines and trunks

Generic X11 International features interaction

This section defines the Generic X11 International feature support and interaction with ISDN BRI. Table 18 indicates to what extent the Generic X11 International features are supported by ISDN BRI. A more detailed description of features partially supported by ISDN BRI is given following Table 18.

The following legend and notes apply to Table 18.

Legend

yes = fully supported

n/a = Not Applicable or transparent to ISDN BRI

no = not supported due to ISDN BRI Standards limitations

P= partially support with description of limitation

Features labeled with "***" have a more detailed description later in this chapter.

For complete information on these features, refer to the *Features and Services Guide 553-3001-306*, and the *International ISDN PRI features description and administration 553-2901-301*.

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
—A—		
ACD Answering Time in Night Service	no	
ACD Call Priority	no	
ACD Call Waiting Threshold	no	
ACD Calls on Hold	no	
ACD Enhancements	no	
— Call Delays	no	
— Dynamic Queue Threshold	no	
— Threshold Visual Indication	no	
ACD Least Call Queuing	no	
ACCL Enhancements	no	
Activity Codes for Not Ready State	no	
Advice of Charge for EuroISDN**	yes	See details later in this chapter
Advice of Charge for AXE-10 Australia and Japan D70**	yes	See details later in this chapter
Alternative Conference Pad Levels	yes	
Alternative Loss Plan	yes	

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
Asia Pacific CO Connectivity	yes	trunks only
Attendant and Network Wide Remote Call Forward**	P	See details later in this chapter
Attendant Blocking of DN**	P	See details later in this chapter
Attendant Display of Speed Call or Autodial	no	
Attendant Forward No Answer**	P	See details later in this chapter
Attendant Recall with Splitting Optional	no	
Attendant Through Dialing Network Wide	yes	trunks only
Australia ETSI	yes	
Autodial Tandem Transfer	no	
Automatic Gain Control Inhibit and Handset Volume Reset	no	
Automatic Guard Detection	yes	
Automatic Hold	no	
Automatic Redial	no	
— B —		
Bar Reciprocal Call Forward	no	
Bearer Capability in CDR	no	

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
Boss/Secretary Filtering Enhancement	no	
Break-in Features	no	
— Break-in to inquiry calls		
— Break-in to line lockout denied		
Busy Tone Detection for APAC and CALA	no	
Busy Tone to Night DN on Busy DN**	P	See details later in this chapter
Busy Verify on Calling Party Control	no	
— C —		
Call Capacity Report Enhancement	no	
Call Connection Restriction	yes	
Call Detail Recording Enhancement	no	
Call Detail Recording with Optional Digit Suppression	yes	
Call Forward and Busy Status	no	
Call Forward, Break-In and Hunt Internal or External Network Wide	no	
Call Forward/Hunt Override via FFC**	p	See details later in this chapter

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
Call Forward to Trunk Restriction	yes	
Call Page Network Wide	yes	
Call Park Network Wide	no	
Call Redirection by Day	no	
Camp-on to Multiple Appearance DN	no	
Card LED Status	no	
Centralized Multiple Line Emulation	no	
Charge Display at End of Call	no	
China #1 Signaling Features**	P	See details later in this chapter
CIS ANI Reception	yes	sets only
CIS ANI Digit Manipulation and Gateway Enhancement	yes	
CIS Multifrequency Shuttle	no	
CIS Toll Dial Tone Detection	no	
— D —		
Default Loss Plan	yes	
Dial Tone Detection	no	
DID to Network Calling	yes	

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
Digital Private Networking Signaling System 1 (DPNSS1)	no	
DISA on Unsupervised Trunks	no	
Display of Access Prefix on CLID	yes	trunks only
Display of Calling Party Denied	no	
Distinctive Ringing by DN	no	
Distinctive Ringing Network Wide	no	
DNIS Length Flexibility	no	
— E—		
E.64/ESN Numbering Plan Expansion	yes	
End Dialing on Direct Inward/Outward Dialing	yes	
End of Selection	yes	
End of Selection Busy	yes	
Enhanced Charge Display	no	
Enhanced Malicious Call Trace	no	
Enhanced Secrecy	no	
EuroISDN**	yes	See details later in this chapter

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
EuroISDN 7kHz/Videotelephony Teleservices	yes	
EuroISDN Continuation	yes	
EuroISDN Continuation Phase III	yes	trunks only
EuroISDN ETS 300 403 Compliance	yes	
EuroISDN Malicious Call Identification	yes	trunks only
EuroISDN Network Side	yes	
Executive Distinctive Ringing	no	
— F —		
510 Trunk Route Member Expansion	yes	
FCC Compliance for Equal Access	yes	
FCC Compliance for Equal Access - CAC Expansion	no	
First-Second Degree Busy Indication	no	
Flexible Attendant Call Waiting Threshold	no	
Flexible Busy Tone Timer	no	
Flexible Dial Tone Detection	no	

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
Flexible Direct Inward Dialing	no	
Flexible Features Codes	no	
Flexible Key Assignment	no	
Flexible Tone and Digit Switch Control	no	
Forced Camp-on**	P	See details later in this chapter
Forward No Answer Call Waiting for DID	no	
— G —		
Global Line Cards	no	
— H —		
Hold Features		
— Automatic Hold		
— Held Call Clearing		
Hunting by Call Type	yes	
Hunting and Speed Call Features**	P	See details later in this chapter
— I —		
Idle Extension Notification	no	
India Phase II	no	
Information Notification Service for Japan	yes	
Instant ISM	no	

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
Intercept Computer Interface Dial From Directory	no	
Intercept Computer Enhancements		
— Answering Machine enhancements	yes	
— Malicious Call Trace DN and TN print	yes	
— Call Forward interaction control**	P	See details later in this chapter
Intercept Computer Interface**	P	See details later in this chapter
Intercept Treatment Enhancement	no	
Interchangeable NPA	no	
IPE Completion	no	
IPE Loss Plan for China	no	
ISDN BRI Trunk Access for Japan	yes	
ISDN CLID Enhancements	yes	
ISDN QSIG Alternate Routing	no	
ISDN QSIG Basic Call	yes	
ISDN QSIG/EuroISDN Call Completion	yes	

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
ISDN QSIG/EuroISDN Call Completion Enhancement	yes	
ISDN QSIG Call Diversion Notification	yes	
ISDN QSIG Call Diversion Notification Enhancements	yes	
ISDN QSIG Call Transfer Notification	yes	
ISDN QSIG Generic Functional Transport	yes	
ISDN QSIG/ETSI Generic Functional Transport Enhancement	yes	
ISDN QSIG Name Display	yes	
ISDN QSIG Path Replacement	yes	trunks only
ISDN QSIG Supplementary Services - Name Display Enhancement	yes	
ISDN Semi Permanent Connection for Australia	no	
Italian Phase 2 Features for DT12	no	
— J —		
Japan (D70) PRI nB+D	no	

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
Japan TTC Common Channel Signaling	no	

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
— L —		
Loop Start Supervisory Trunks	no	
Loop Start Supervisory Trunks (incoming calls)	no	
— M —		
Make Set Busy	no	
Malicious Call Trace Enhancement	no	
Malicious Call Trace Idle	no	
Malicious Call Trace on DID	no	
Manual Service Recall to Attendant	no	
Meridian 1 to New Zealand NEAX-61 ISDN PRI connectivity**	yes	See details later in this chapter
Meridian Hospitality Voice Services	no	
Meridian Mail Trunk Access Restriction	no	
Message Intercept	no	
Message Waiting Indicator by DN	no	
Message Waiting Unconditional	no	
Multi Language Messages	no	

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
Multifrequency Compelled Signaling Features**	P	See details later in this chapter
MSDL Idle Code Selection	N/A	
MSDL Port Overload Counter	N/A	
MSDL Status Enquiry Message Throttle	N/A	
— N —		
N Digit DNIS	no	
Network Anti-tromboning	no	
Network Application Protocol Link Enhancement	no	
Network Call Pick-up and TAFAS	no	
Network Drop Back Busy and Off-hook Queuing	yes	
Network Individual Do Not Disturb	no	
Network Ring Again	no	
Network Signaling on VNS	no	
Network Tenant Service	no	
Network Wide LDN**	P	See details later in this chapter

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
Networking Features**	P	See details later in this chapter
Night Service Class of Service	no	
Night Service Improvements	P	See details later in this chapter
— O —		
On Hold on Loudspeaker	no	
Option 11 Downloadable D-channel	n/a	
Overlap Signaling	yes	
— P —		
Partial Dial Timing	no	
Periodic Camp-on Tone	no	
Periodic Clearing	no	
Periodic Pulse Metering**	P	See details later in this chapter
Phantom TNs	no	
Process Notification for Networked Calls	no	
Preventing Reciprocal Call Forward	no	
Pulsed E&M DTI2 Signaling	no	
— R —		

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
Radio Paging Improvements**	P	See details later in this chapter
Radio Paging Product Improvement Continuation	no	
Recall with Priority During Night Service	yes	
Recorded Announcement for Calls Diverted to External Trunks**	P	See details later in this chapter
Restricted DID Class of Service	yes	
Ring Again on No Answer	no	
Ring and Hold Lamp Status	no	
Ringling Change Key	no	
RPE (2Mb) Alarm Handling	no	
R2 Multifrequency Compelled (MFC) Signaling	yes	
R2 MFC Selective Route to Attendant	yes	
R2 MFC CNI/CDR Enhancements	yes	
R2 MFC Timer Control	no	
— S —		

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
Semi-automatic Camp-on	no	
Semi-compelled MFC and Calling Number Identification Changes	no	
Series Call	no	
Seizure Acknowledgment	yes	
Selectable Directory Number Size	yes	
Single Digit Access to Hotel Services	no	
Slow Answer Recall Modification	yes	
Source Included When Attendant Dials	no	
Spanish KD3 DID/DOD Interface	no	
Special Dialtone after Dialed Numbers**	P	See details later in this chapter
Source Included when Attendant Dials	no	
Speed Call DN Access	no	
Speed Call on Private Lines	no	
Standalone Meridian Mail	no	
Station Activity Record	yes	

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
Supervised CO Trunk Simplification		

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
— T —		
Taiwan R1 Modified Signaling	yes	sets only
Telelink Mobility Switch	no	
Telset Call Timer Enhancement	no	
Tone to Last Party	no	
Transfer Tone	no	
Trunk Direct Inward Dialing Digitone Receiver Acknowledgment	no	
Trunk Failure Monitor	no	
Trunk Hook Flash Enhancement	no	
— U —		
Universal ISDN Protocol Engine	yes	
— V —		
Variable Flash Timing and Ground Button	no	
Variable Guard Timing	yes	
Virtual Network Services	yes	

Table 18
Generic X11 International features on ISDN BRI

Features and services	Supported	Comments
Virtual Network Services in the UK with DASS2/DPNSS1 Bearers	no	
Virtual Network Services in the UK with Virtual DN Expansion	no	
Voice Call Override	no	

The following lists the Generic X11 International features that are tagged in the Table 18 with "***". These descriptions provide further details of the interaction of the feature with ISDN BRI.

Generic X11 International features partially supported

Attendant features

Attendant and Network Wide Remote Call Forward

Prior to Release 20, the Remote Call Forward (RCFW) feature allowed a user to administer call forward from a remote set within the Meridian 1 or from outside the Meridian 1 through the Direct Inward System Access (DISA) number. The RCFW feature was not available on a network wide basis, nor was it applicable to Attendant Consoles. This enhancement introduces the RCFW feature across the Meridian Customer Defined Network (MCDN), while also providing the attendant with RCFW capabilities.

The feature capabilities of the set-based (FFC activated) network wide application of the RCFW feature match those of the current standalone RCFW feature.

This feature is supported over ISDN BRI trunks within an MCDN environment; it is not supported on ISDN BRI sets

Attendant Blocking of DN

This feature allows a person to dial the attendant DN and request an external (long distance) call, and then disconnect while waiting for the call to be processed by the attendant. The requesting DN is idle and can receive and make calls.

When the attendant is ready to make the external (long distance) call, the Attendant Blocking of DN feature provides the attendant with the ability to block the DN while the external call request is being processed. The line appears busy to any caller attempting to contact the blocked DN. The blocked DN cannot be used to originate a call and will be connected to the attendant if it goes off hook. When the attendant has completed the external call, the blocked DN can be rung and the call extended. The attendant is guaranteed that the requesting DN is not busy and is available to take the call when the processing has been completed. This feature works in both standalone and Meridian Customer Defined Network (MCDN) environments.

This feature is supported over ISDN BRI trunks in an MCDN environment, if NAS is equipped. It is not supported if a call is extended to an ISDN BRI set.

Attendant Forward No Answer

This feature allows calls that are not answered by an attendant within a defined period of time, to be routed to the night DN or to another attendant. It also allows DID call that are not answered within a defined period of time, to be disconnected.

This feature is transparent to calling ISDN BRI terminals. However, originating a call routed by Attendant Forward No Answer cannot be updated. Also, an ISDN BRI terminal cannot be defined as a night terminal.

Busy Tone to Night DN on Busy DN

This feature allows busy tone, rather than ringback tone, to be provided to a night DN during night service.

This feature is supported transparently if the calling station is an ISDN BRI terminal; however, an ISDN BRI terminal cannot be supported as a night DN terminal.

Call Forward/Hunt Override via FFC

Call Forward/Hunt Override provides all telephone users (having a specific class of service) and attendants with the ability to override Intercept Computer Call Forward (ICP-CFW), Call Forward All Calls, Call Forward No Answer, Hunting and Make Set Busy by entering a Flexible Feature Code. Sets without Call Forward/Hunt Override denied (CFHD) class of service will not be able to use the Call Forward/Hunt Override Via Flexible Feature Code (FFC) feature.

Call Forward/Hunt Override Via FFC works in network environments with Meridian 1 nodes and Meridian Customer Defined Network (MCDN) links.

This feature is supported over ISDN BRI trunks in an MCDN environment, if NAS is equipped. It is not supported on ISDN BRI sets.

China #1 signaling features

Part 2 features

This group of features is comprised of the following:

- External Operator features, comprised of:
 - Call Back
 - Calling Party Control (CGPC);
 - Called Party Control (CDPC);
 - Toll Operator Break-in (TOBI).
- Multiple Frequency Compelled (MFC) Direct Outward Dial (DOD) with outgoing Calling Number Identification (CNI);
- Outgoing Toll Call Identification

The External Operator Call Back feature is used by CGPC, CDPC, and TOBI. It allows a calling station connected to a trunk call to be put on hold while going on hook. When the special operator signal is received over the trunk the system will ring the station again. CGPC allows the call to be kept on hold for a defined period of time, and to reconnect the call when the called party goes off hook. The call is released if the calling party goes on hook once more. CDPC allows an operator, involved in an operator-assisted call from a Meridian 1, to automatically recall a station without having to re-dial it. TOBI allows a toll operator to break in to an established call.

If an ISDN BRI terminal is the controlling party (that is, the called party in CDPC or the calling party in CGPC), the features are supported transparently, since disconnect messages from the trunk are ignored. If an ISDN BRI terminal is not the controlling party, when it goes on hook, this operation is not supported on ISDN BRI.

TOBI to an ISDN BRI terminal is not supported.

MFC DOD with outgoing CNI allows outgoing Calling Number Identification information on outgoing MFC trunk calls. CNI information is customer-related and terminal-related, both of which are supported for ISDN BRI. Terminal-related information is a category code defined in overlay 10 or 11. For ISDN BRI terminals, the category code is supported on a DSL basis. Overlay 27 has been modified to configure and print category codes, using the “category code” (CAC) prompt.

Outgoing Toll Call Identification allows outgoing toll calls to be identified in a new manner. This feature is supported transparently for ISDN BRI.

Addendum to Part 2 features

This group of features is comprised of the following:

- Operator call back feature enhancement;
- Special operator call back ringing;
- Malicious Call Trace enhancement;
- Tones and announcements;
- Active feature dial tone;
- Audible alarm.

The Operator call back enhancement allows Call Wait or Camp-On to Calling Party Control and Called Party Control calls, and Attendant Break-in to outgoing Calling Party Control calls and incoming Called Party Control calls. The Camp-on and Break-in capabilities are not supported on ISDN BRI, while the Call Wait capability is supported transparently for ISDN BRI.

The Special operator call back ringing enhancement provides operator control of ringing cadences used in Toll Operator Call Back. This capability is supported transparently for ISDN BRI.

The Malicious Call Trace enhancement allows a Meridian 1 to have Called Party Control on incoming calls when the Malicious Call Trace (MCT) feature is activated from a station, or when the Multifrequency Compelled (MFC) Idle Call Trace (IDCT) signal is sent. This enhancement is not provided on ISDN BRI.

The tones and announcement feature allows a howler tone to be given to indicate that a 500/2500 terminal is off-hook. This capability is not applicable to ISDN BRI terminals. This feature also provides new intercept treatments upon the reception of some MFC signals. This capability is supported transparently for ISDN BRI.

The active feature dial tone capability provides a distinctive dial tone to a station going off hook when it has the Do Not Disturb (DND) or Make Terminal Busy (MSB) feature active. This capability is not provided on ISDN BRI.

The audible alarm feature provides an alarm to be sounded when an emergency number has been dialed, or when the system is alerted of an incoming malicious call. This capability is supported transparently for ISDN BRI.

Part 4 - Ministry of Electricity and Industry (MOEI) features

This group of features is comprised of the following:

- KE Multifrequency Compelled Signaling;
- Flexible timers (dialtone, interdigit, and delayed answer);
- Calling party DN option;
- Flexible Feature Codes (FFCs).

KE Multifrequency Compelled Signaling is used to inform the Central Office that the call is a tandem call. This capability is supported transparently for ISDN BRI.

Flexible timers provides customer-defined parameters to control the following timeouts:

- the dialtone timeout, after the terminal has been placed off-hook and no digits dialed. After timeout, the terminal is placed in line lockout

- the interdigit pause timeout, between the first and second digits, and the interdigit pause timeout, after the second digit
- the delayed answer timer provides a customer-defined timeout to control the period that a terminal remains ringing before it is answered. If timeout occurs, the ringing and ringback stop, and the call is disconnected.

Flexible timers is not supported on ISDN BRI terminals.

Calling Party DN allows the Meridian 1 to send to the Toll Office the calling-party customer DN and, if applicable, the calling-party DID DN for all outgoing calls. This capability is supported when the calling party is an ISDN BRI terminal.

The Flexible Feature Code enhancement answers China's Ministry of Electronic Industry's requirement to access the following features from a 500/2500 telephone terminal, using Flexible Feature Codes:

- Autodial
- Call Waiting
- Make Terminal Busy
- Multiple Wake-up

This capability is not provided for ISDN BRI.

Forced Camp-on

Forced Camp-on allows a call to be camped on to a busy station while providing a warning tone. This is typically followed by the activation of Priority Override, which allows break-in to the established connection.

Forced Camp-on is activated automatically (if Automatic Forced Camp-on is defined); or, it can be activated manually using the Enhanced Override (EOVR) key on M1000 series and Meridian digital terminals or the Enhanced Override Flexible Feature Code on 500/2500 terminals. If the EOVR key is pressed again or the Enhanced Override Flexible Feature Code dialed again, Priority Override is activated.

The terminal performing the override must have a priority level equal to or higher than the terminal being overridden. To activate Priority Override, the user of a 500/2500 terminal dials the Override Flexible Feature Code, while the user of a M1000 series or Meridian digital terminal presses the Override key (OVR). Priority Override can also be activated using the Enhanced Override Flexible Feature Code or the Enhanced Override key (EOVR).

Forced Camp-on is partially supported on ISDN BRI terminals, as explained below:

- Forced Camp-on to an ISDN BRI terminal is not possible, because Forced Camp-on requires Warning Tone Allowed Class of Service (ISDN BRI terminals are defaulted to WTD COS);
- Forced Camp on from an ISDN BRI terminal is not possible because feature keys and FFC are not supported for ISDN BRI;
- a BRI terminal transferred to a non-BRI terminal may have forced camp-on applied to it, if no COS restrictions apply; however, the ISDN BRI terminal display is not updated.

Intercept Computer Interface

This feature allows the Meridian 1 to use an intercept (attendant assistance service) computer for storing and retrieving call messages. Calls to an absent tenant's DN using this feature are routed to a designated Intercept Position (ICP) DN. A terminal at the ICP displays a message stating why the tenant at the DN is absent. The person at the ICP can then store the caller's message for the tenant's DN and activate the message waiting LED at the tenant's telephone. The tenant at the DN retrieves the stored caller messages by calling the ICP, where the messages are displayed on the terminal (or optionally printed).

The feature can be activated or deactivated by the following:

- Flexible Feature Code (FFC) dialed from the tenant's telephone. This code specifies the reason for the tenant's absence and can be extended with a date and time as extra information. The FFC decodes into a text message;
- Pressing the Call Forward All Calls (CFW AC) key on an SL-1 telephone (deactivation);

- From the ICP terminal;
- Automatically when a TN is disabled or enabled by a maintenance overlay program.

The Intercept Computer Interface is partially supported on ISDN BRI terminals, as explained below:

- an ISDN BRI terminal cannot access the ICP feature, since FFCs are not supported for ISDN BRI; also, the ICP feature cannot be activated on an ISDN BRI terminal from the intercept computer or via a maintenance overlay program, since the ICP feature is activated on a terminal basis;
- an ISDN BRI terminal cannot act as an intercept position, or be allowed to be a default DN for intercept transfer; only Message Center ACD DNs and attendant DNs are allowed to be intercept positions;
- a call originating from an ISDN BRI terminal and terminating on a non-ISDN BRI terminal with ICP active is intercepted according to the ICP configuration; the ISDN BRI terminal display cannot be updated after the call redirection.

Intercept Computer enhancements

Call Forward interaction control.

When an intercept transfer is activated from a customer's or tenant's extension, it may be configured that only external calls be forwarded to the external intercept DN (ECDN), while internal calls are forwarded to an answering machine, or the internal intercept DN (ICDN). Note that this capability applies only if the extension's flexible call forward no answer DN (FDN) is not configured as an intercept position.

This feature is partially supported on ISDN BRI terminals, as explained below:

- since an ISDN BRI terminal cannot access the ICP feature, it cannot support this ICP enhancement;
- a call originating from an ISDN BRI terminal that is considered as an internal calling party, and terminating on a non-ISDN BRI having the ICP feature active, is diverted to the intercept DN for internal calls.

Multifrequency Compelled Signaling features

R2 and MFC signaling on DID and TIE trunks

This feature allows line and register signaling on DID and TIE trunks, using an MF sender and receiver card. Each forward signal sent to the Central Office is acknowledged by a backward signal. This feature also allows the Meridian 1 to request Calling Number Identification (CNI) information, to be shown on the originating terminal's display.

The register signaling part of this feature is supported for ISDN BRI. The CNI display is not supported.

Multifrequency Signaling for Socotel (MFE)

Multifrequency Signaling for Socotel (MFE) is similar to R2 Multifrequency Compelled (MFC) Signaling, but is not compelled in the same way. Instead of each signal being answered by another signal of some meaning, each signal is answered by a control frequency which indicates to the other end of the call that the signal has been received and its transmission can cease. In this way, signals may originate at either end of the call.

R2 MFC Signaling operates by answering each forward signal from the originating end, with a backward signal from the terminating end. Each signal must be interpreted using the appropriate table. Unlike R2 MFC Signaling, backward and forward signals use the same frequency combinations. The need for the concept of an incoming or outgoing sender/receiver is replaced by an MFE sender/receiver, which can act in both directions during any single call.

Pulsed signals, which are used in R2 MFC Signaling to indicate a message being initiated from the CO which normally replies, are no longer necessary with the new MFE card.

The sequence of messages sent to and received from the CO is transparent to the ISDN BRI terminal.

Networking features

International ISDN PRI interworking

The interworking between ISDN BRI and International ISDN PRI Central Office Connectivity allows voice calls to always be completed to and from ISDN BRI terminals; however, some restrictions may apply to data calls.

Advice of Charge for NUMERIS connectivity

This feature provides the total cost for a call made from a Meridian 1 switch to the ISDN access designed for France (NUMERIS). The Meridian 1 to NUMERIS PSTN connectivity is implemented using ISDN packages PRI2 and IPRI.

This feature is supported for ISDN BRI terminals as the Periodic Pulse Metering feature is supported.

Advice of Charge for AXE-10 Australia and Japan D70 connectivity

The Advice of Charge (AOC) at End of Call for AXE-10 Australia and Japan D70 feature supports charge information being sent from an AXE-10 (Australian) or D70 (Japanese) Central Office to the PBX, over an ISDN BRI connection. The information is sent for outgoing calls from the PBX.

Information is received and displayed when the call is taken down. It is displayed on the caller's telephone display as supported by the Charge Display at End of Call feature. This feature appends the charge information to existing information on the display and retains the information displayed for 10 seconds. Charge Display applies to display-equipped Meridian Modular terminals, M2317, and M3000 sets only. The information is also printed as part of the Call Detail Recording (CDR) record.

Australia introduces PBX control of the AOC facility, meaning that the information must be requested for each outgoing call as opposed to expecting it for every call once the feature has been configured. Japan does not support PBX control of the AOC facility.

Message Registration (MR) and Periodic Pulse Metering (PPM) are both packaged under software package 101. Prior to the introduction of this feature, the method used to differentiate which feature was equipped was to check if the International Supplementary Features software package was equipped. If it was, PPM was required. Since the Supplementary Features package is not available in Japan and AOC requires PPM software, a new method of differentiation has been introduced. This method uses a system wide flag to allow the customer to select between MR and PPM. This flag is set by a prompt in LD 17

The AOC feature does not support AOC being sent to ISDN BRI terminals. A meter can be assigned to a DSL. All chargeable calls made by an ISDN BRI terminal on this DSL are charged against the DSL's meter.

Advice of Charge EuroISDN connectivity

This feature provides Integrated Services Digital Network (ISDN) Primary and Basic Rate Interfaces to Central Offices/Public Exchanges that comply to the European Telecom Standards Institute (ETSI) specification ETS 300 102 for the Layer 3. The interfaces provided by this feature also comply with the country-specific Application Documents for Austria, Denmark, Finland, Germany, Holland, Ireland, Italy, Norway, Portugal, Sweden, and Switzerland. Other countries must comply with ETS 300 102 to be supported.

The supplementary services Calling Line Identification Presentation, Calling Line Identification Restriction, Connected Line Identification Presentation and Connected Line Identification Restriction are provided for the above countries where Application Documents are available. In addition, Advice of Charge for EuroISDN is supported in some of these countries. For more information about Advice of Charge for EuroISDN, see the feature description contained in this document.

The EuroISDN feature also provides interworking with other ISDN or non-ISDN interfaces including Meridian Customer Defined Network (MCDN), QSIG, Digital Private Network Signaling System 1 (DPNSS1), R2 Multifrequency Compelled Signaling (R2 MFC), 2 Mbit Digital Trunk Interface (DTI2), and analog trunk interfaces. This feature also provides interworking between NET3 S0 (ETSI compliant BRI sets) and DPNSS2/DASS2 (Digital Access Signaling System 2) links.

Meridian 1 to New Zealand NEAX-61 ISDN PRI Connectivity

This feature provides an ISDN Primary Rate Interface (PRI) between a Meridian 1 (SL-1) and New Zealand NEAX-61. The design is based on the international 30B + D PRI configuration.

The NEAX-61 interface will support calls from ISDN BRI sets within the MCDN. These will be able to call out to and receive calls from the Public Switched Telephone Network (PSTN), also called the ISDN public network. Operation will be as though the call was a tandem trunk call.

Although ISDN BRI trunks to the NEAX-61 are not supported, any ISDN BRI trunks supported to other interfaces will be able to tandem to the PSTN transparently. Feature operation will appear to the user as though the call was from a normal PRI network trunk to the PSTN.

Network Wide Listed Directory Numbers

This feature enables LDNs to be recognized network wide when Network Attendant Service (NAS) is used. The same LDNs must be configured in multiple nodes. Network LDN is defined on a customer basis.

This feature is supported over ISDN BRI trunk DSLs.

Night Service improvements

All calls remain queued for night service

This feature allows all calls that are queued for an attendant when night service is entered, to remain queued in order to be presented to the night DN. This feature is supported for ISDN BRI-originated calls; however, the displays on the ISDN BRI terminals are not updated to reflect the call modification.

Automatic timed reminder recalls to the night DN

This feature allows any recall that times out during night service, to be presented or queued to the night DN. This applies to slow answer recall, call waiting and camp-on calls extended by an attendant, and camp-on calls extended by a terminal.

This capability applies to external call only, since there is no internal recall to a night DN unless done by NAS routing.

This feature is partially supported for ISDN BRI. If an external call has been extended an attendant to an ISDN BRI terminal, and the slow answer recall timer or the call waiting recall timer expires before the call is answered, the call is presented or queued to a local or remote night DN. The ISDN BRI terminal is disconnected in the case of the slow answer recall, and the call waiting canceled in the case of the call waiting. The camp-on recall timer does not apply, because Camp-on is not supported for ISDN BRI.

If a call originating from an ISDN BRI terminal has been extended or camped on by the attendant to a non-ISDN BRI terminal, the call is timed for slow answer recall, call waiting recall, or camp-on recall. If the timer expires, the call is dropped if not controlled by NAS routing. The call is also dropped if it is controlled by NAS routing and the night DN is at a remote node. If the call is controlled by NAS routing and the night DN is at the local node, the call is presented or queued to the night DN. When the recall timer expires, the terminating party is disconnected, or the call waiting or camp-on is canceled.

A non-ISDN BRI terminal cannot extend a camp-on to an ISDN BRI terminal, since Camp-on is not supported for ISDN BRI.

Periodic Pulse Metering

This feature, based on the Message Registration feature, allows meters to be assigned to terminals, attendant consoles, trunk routes, and customers. This permits Meridian 1 customers to maintain accurate records of Central Office and DOD calls, for billing or administrative purposes. The Call Detail Recording (CDR) feature has been enhanced to record the PPM metering information.

This feature has been adapted for ISDN BRI application as follows. Since meters cannot be assigned to ISDN BRI terminals, because there is no standard protocol to update an ISDN BRI terminal's meter, meters have been assigned to Digital Subscriber Loops (DSLs) instead. All charges due to ISDN BRI terminals located on the same DSL are accumulated on the assigned meter. The contents of this meter may be read or changed from any authorized non-ISDN BRI station.

The metering of conventional trunks is supported transparently. The metering of ISDN BRI trunks is not supported.

Meter recalls to the attendant and background terminal messaging uses the originating ISDN BRI CLID.

Meter charge transfers associated with the activation of Hunt or Call Forward No Answer from an ISDN BRI terminal are not supported; the calling party is charged for the entire call.

Recorded Announcement for Calls Diverted to External Trunks

Recorded Announcement for Calls Diverted to External Trunks (RANX) provides an optional recorded announcement when the call is being forwarded to external Public Exchange/Central Office (over DTI, DTI2, PRI2, PRI, or analog trunks) or over ISDN BRI trunks connected to AXE-10 or EuroISDN routes. The announcement notifies the calling party that call forwarding is taking place and the call may take longer than usual to set up. The delay depends on the required signaling to reach the destination party.

Radio Paging

This feature allows call paging through the use of a Flexible Feature Code. The paged party, who is notified of a call page by the buzzing of a special device, can later access the paging party by dialing another FFC. There are three methods of paging a call:

- pre-selection, whereby the paging is performed right away;
- post-selection, whereby a FFC is used in cases where the desired party is busy or does not answer;
- forwarding to a paging equipment.

Paging cannot be done from an ISDN BRI terminal, since FFCs are not supported for ISDN BRI. Paging to an ISDN BRI terminal is supported for the pre-selection and post-selection methods; it is not supported for the forwarding method.

Radio Paging Product Improvements

Attendant Recall over Network

This product improvement enables Radio Paging (RPA) to recall the attendant who originated the Radio Paging call only; the attendant may be located anywhere within an ISDN Meridian Customer Defined Network (MCDN) configured with Network Attendant Services (NAS).

Digit Display to Same Attendant

This improvement enables the attendant's display to be updated with paged name to display paged name instead of answering name on the paging party when answered, and to make network Radio Paging show the same display information as in the standalone operation.

Since ISDN BRI sets do not support FFCs, they cannot be used to access or answer RPA calls if the ISDN BRI sets are local on the paging node. For network situations, ISDN BRI sets can access and answer remote RPA calls. This is possible because the RPAX/RPAN FFCs are dialed as DSC/TSC steering codes.

Attendant Recall over Network is supported over ISDN BRI trunks within an ISDN Meridian Customer Defined Network (MCDN) configured with Network Attendant Services (NAS).

Special dialtone after dialed numbers

This feature allows special dial tones to be provided after certain dialed digits.

This feature is generally supported for digits dialed from ISDN BRI terminals. For each TERMINALUP and INFO message, the software determines if tones are required; however, if enblock dialing is used, it cannot be confirmed whether or not some of the messages contain only one digit, or several digits. If they contain several digits, some tones may be skipped.

Station Activity Record

Station activity records are generated for sets with class of service Call Detail Monitoring Allowed (CDMA) for all incoming and outgoing calls if Call Detail Recording (CDR) is allowed for the customer. Their format is identical to regular CDR records, but they have a new type identifier (D). Other CDR records are not affected by this new functionality.

Station activity records are supported on ISDN BRI sets with a class of service Call Detail Monitoring Allowed (CDMA), for external calls.

List of terms

The following is a list of terms and abbreviations used throughout this manual.

ACD

Automatic Call Distribution

AML

Applications Module Link

ANSI

American National Standards Institute

AST

Associate Set

APPL

Application

AWG

American Wire Gauge

B1CT

B-channel 1 Call Type

B2CT

B-channel 2 Call Type

Backup

64 kbps channel carrying D channel packet data

BC

Bearer Capability

B_D-channel

64 kbps B-channel carrying D channel packet data

BRA

Basic Rate Access

BRSC

Basic Rate Signaling Concentrator

ISDN BRI

ISDN Basic Rate Interface

ISDN BRIL

ISDN Basic Rate Interface Line

ISDN BRIP

ISDN Basic Rate Interface Packet

ISDN BRIT

ISDN Basic Rate Interface Trunk

CC

Clock Controller

CCITT

International Telegraph and Telephone Consultative Committee

CFNA

Call Forward No Answer

CFTA

Call Forward by Call Type Allowed

CFTD

Call Forward by Call Type Denied

CH	PRI Channel Number
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
CLS	Class of Service
CO	Central Office (local exchange)
COT	Local exchange Trunk
CPU	Central Processing Unit
CTD	Conditionally Toll Denied
CTYP	Card Type
CUN	Conditionally Unrestricted
CUST	Customer Number
DCH	D-Channel
DES	DSL Designator

DFDN

Default Directory Number

DID

Direct Inward Dial

DN

Directory Number

DSL

Digital Subscriber Loop

DTE

Data Terminal equipment

DTI

1.5 Mbps Digital Trunk Interface

DTI2

2.0 Mbps Digital Trunk Interface

EFD

Flexible External Call CFNA Directory Number

EHT

Hunt External Call Directory Number

ENET

Enhanced Network

ESN

Electronic Switching Network

ETSI

European Telecommunications Standards Institutes

FBA

Call Forward Busy Allowed

FBD	Call Forward Busy Denied
FDN	Flexible CFNA Directory Number
FEAT	Class of Service Features
FNA	Call Forward No Answer Allowed
FND	Call Forward No Answer Denied
FR1	Fully Restricted Class 1
FR2	Fully Restricted Class 2
FRE	Fully Restricted
HBTA	Hunting By Call Type Allowed
HBTD	Hunting By Call Type Denied
HDLC	High Level Data Link Control
HTA	Hunt Allowed
HTD	Hunt Denied

HUNT

Hunt Directory Number

I/O

Input/Output

IE

Information Element

IPE

Intelligent Peripheral Equipment

ISDN BRI

Integrated Services Digital Network Basic Rate Interface

ISDN

Integrated Services Digital Network

ISM

Incremental Software Management

IVD

Integrated Voice and Data

LAPB

Link Access Procedure, Balanced

LAPD

Link Access Procedure on the D-channel

LDN

Listed Directory Number

LOOP

Loop Number

LTEI

Logical Terminal Identifier (LTID) and Terminal End-point Identifier (TEI) Pair

LTG	Logical Terminal Group
LTID	Logical Terminal Identifier
LTN	Logical Terminal Number
MCAL	Maximum Number of Calls on a DSL at one time
MCDN	Meridian Customer Defined Networking
MCU	Micro Controller Unit
MDF	Main Distribution Frame
MHz	MegaHertz (Millions of cycles per second)
MISP	Multi-Purpose ISDN Signaling Processor
MODE	Network Terminal Mode
MPH	Meridian 1 Packet Handler
MPU	Main Processor Unit
MRA	Message Registration Allowed

MRD

Message Registration Denied

MSC

Maintenance Signaling Channel

MSDL

Multi-Purpose Serial Data Link

MTEI

Maximum Number of Terminal End-point Identifiers

MTSP

Maximum Number of TSPs Defined for a DSL

MUX

Multiplexed

MWA

Message Waiting Allowed

MWD

Message Waiting Denied

NCOS

Network Class of Service

NT

Network Termination

NT1

Network Termination 1 is a device that provides a conversion from a U to an S/T interface

NTAS

NT1 Adaptive Sampling

NTFS

NT1 Fixed Sampling

OSI	Open System Interconnect
OPX	Off Premise Extension
PBX	Private Branch Exchange
PE	Peripheral Equipment
PGPN	Protocol Group Number
PH	Packet Handler
PIC	Polyolefin Insulated Cable
PRA	Primary Rate Access
PRES	Presents/Restricts Calling Party Number Display
PRI	1.5 Mbps Primary Rate Interface
PRI2	2.0 Mbps Primary Rate Interface
PRID	Protocol ID
PSDL	Peripheral Software Downloading

PSDN

Packet Switched Data Network

PSTN

Public Switched Telephone Network

PULP

Paper-Pulp Insulated cable

RDI

Restricted DID

ROM

Read Only Memory

SAPI

Service Access Point Identifier

SDI

Serial Data Interface

SFA

Second Level Call Forward No Answer Allowed

SFD

Second Level Call Forward No Answer Denied

SILC

S/T Interface Line Card

SPID

Service Profile Identifier

SRE

Semi-Restricted

SSD

Scan and Signal Distributor

TCM	Time Compression Multiplexing
TA	Terminal Adapter used to adapt non-ISDN BRI terminals to ISDN BRI line interface
TE	Terminal Equipment
TEI	Terminal End-point Identifier
TGAR	Trunk Group Access Restriction
TID	Terminal Identifier
TLD	Toll Denied
TS	Time Slot
TSP	Terminal Service Profile
UDI	Unrestricted DID
UILC	U Interface Line Card
UNR	Unrestricted
USID	User Service Identifier

XLST

Pretranslation Group

X.121

CCITT recommendation for a numbering plan

X.2

CCITT recommendation for X.25 optional user facilities

X.25

CCITT recommendation for a connection-oriented Layer protocol

Meridian 1
ISDN Basic Rate Interface
Product Description

© 1992,1999 Nortel Networks Corporation

All rights reserved

Information is subject to change without notice. Nortel Networks Corporation reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant. This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC rules, and the radio interference regulations of Industry Canada. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

SL-1 and Meridian 1 are trademarks of Nortel Networks Corporation.

Publication number: 553-3901-100

Document release: Standard 6.0

Date: June 1999

Printed in the United States of America



How the world shares ideas.