NS300/301 cPCI T1/E1 Network Controller Technical Description

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1 General Information

Netaccess Series 7.5 NS300/301 boards use Primary Rate Interface (PRI) and are members of the Brooktrout family of Peripheral Component Interconnect (PCI)-based T1/E1 ISDN adapter boards. NS300/301 boards consist of the following models:

Models/Configurations

MODEL DESCRIPTION	# T1/E1 Ports	# HDLC Engines
NS300/301+cP32DH-4P-AB	4	32
NS300/301+cP32DH-8P-AB	8	32
NS300/301+cP256DH-4P-AB	4	256
NS300/301+cP256DH-8P-AB	8	256
NS300/301+cP544DH-8P-AB	8	544

Note: When a feature discussed in this manual applies to a specific board type, the board's model name is used (NS300/301+cP32DH-8P-AB, NS300/301+cP32DH-4P-AB, etc.). If the information applies to all board types, the general terms "NS300/301 T1/E1 Network Controller" or "NS300/301 board" are used.

NS300/301 boards support data and/or digital voice communications. They can be configured to provide four, or eight T1/E1 digital spans.

NS300/301 boards contain a PCI bus interface to communicate with a host processor and an H.110 bus interface. The H.110 or Computer Telephony bus (CT bus) provides a bidirectional multiplexed digital highway through the backpanel J4 connector. The board runs Instant ISDN Software™ that manages the board's operation and configuration, and handles communication with the host.

This Technical Description describes the NS300/301 board functions, interfaces, configuration, initialization and installation. It assumes you have experience using intelligent controller boards in a PCI bus environment and possess a working knowledge of T1/E1 network signaling. You should also have the following publications on hand when using a NS300/301 board:

- *Brooktrout Instant ISDN Software Release Notes*: describes the features and compatibility of each software release.
- *Brooktrout Instant ISDN Software SMI Reference*: defines the Simple Message Interface (SMI™) messages used to control and configure the board's operation.
- Appropriate *Brooktrout Programmer's Manual* for the driver or interface library used to communicate with the board.

- Specifications and reference manuals on the H.110 bus and switching architecture.

NS300/301 Board Configurations

NS300/301 boards (*Figure 1-1*) have the capability of being configured for different applications that may require additional components. Configuration options are based on the board product model purchased:

- NS300/301+cP32DH-4P-AB: 4 port base card with AB connectors, and a capacity for 32 HDLC channels (32 channels on the MPC860MH/DH processor).
- NS300/301+cP32DH-8P-AB: 8 port base card with AB connectors and a capacity for 32 HDLC channels (32 channels on the MPC860MH/DH processor).
- NS300/301+cP256DH-4P-AB: 4 port base card with AB connectors and a capacity for up to 256 data channels.
- NS300/301+cP256DH-8P-AB: 8 port base card with AB connectors and a capacity for up to 256 data channels.
- NS300/301+cP544DH-8P-AB: 8 port base card with AB connectors and a capacity for up to 544 data channels.

The T1/E1 ports on the transition module are software configurable; the Host application can either initialize the framer chips as T1 interfaces, or as E1 interfaces (configuration options are directed through the SMI L4L3mSET_HARDWARE control message). The Host application can configure each T1/E1 port differently on the same card, having some interfaces terminate T1 services and other spans terminate E1 services.

When configured for T1 interfaces, the span is compatible either as a DSX-1 or DS-1 (CSU-terminated) interface. Instant ISDN software provides configuration options for adjusting the DSX-1 line length or line dB build-out for each T1 interface.

The NS300/301 adapter board's default memory configuration is configurable for 32MB or 64MB. SDRAM is only accessible by the microprocessor. They also provide either 16MB or 32MB shared memory DRAM that can be accessed by either the MPC860P or any PCI Bus Master.

The NS300/301 board's standard configuration for the four span model is one 32-channel HDLC controller, which is internal to the MPC860MH/DH microprocessor. For models with more spans, the NS300/301 board is configured with additional HDLC controller devices that support up to 256 HDLC channels for the four span model or 256 HDLC channels for the eight span model. Additionally, each T1/E1 framer device has 2 HDLC channels built into its circuitry.

The NS300/301 board can also be configured with an H.110 CT bus interface, which provides interconnection for digital voice and/or data traffic between H.110 compatible devices in the same platform.

A 10/100BASE-T Ethernet interface is available for Local Area Network (LAN) connections. Located on the NS300/301 baseboard bracket, the ethernet interface provides full-duplex capability and interfaces to standard 802.3 10/100BASE-T media.

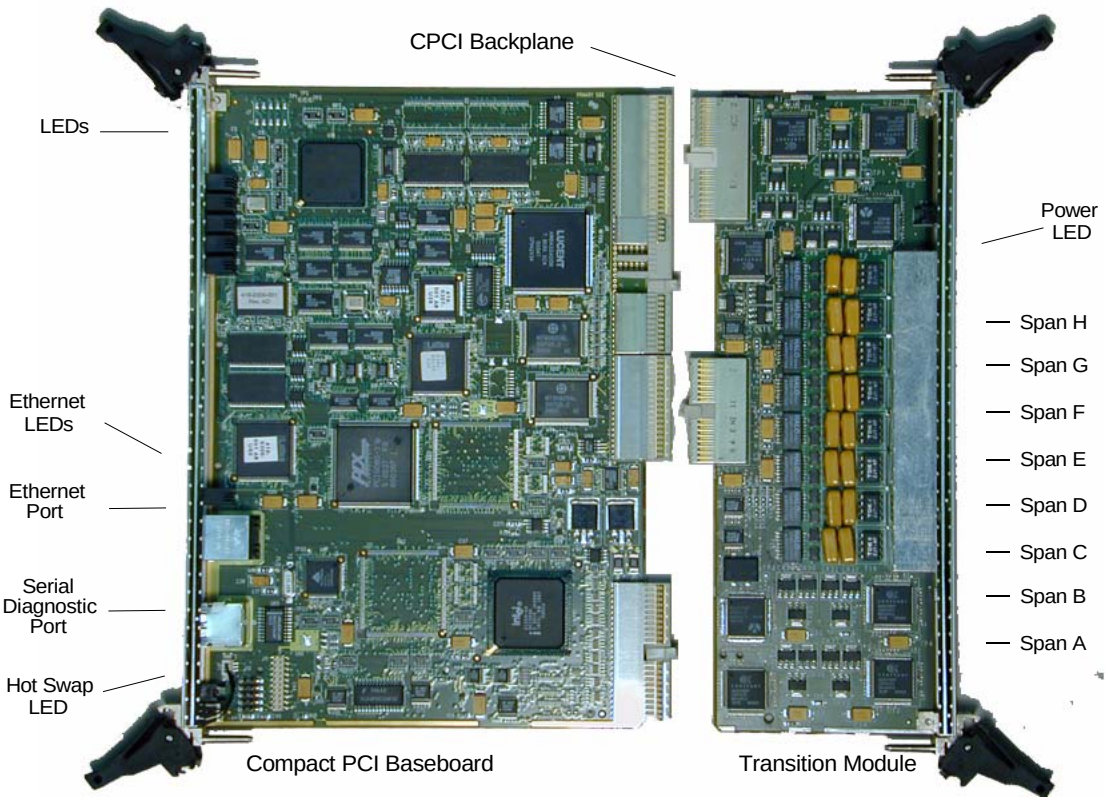


Figure 1-1. NS300/301 Compact PCI Board (with 8-span Transition Module)

Compatibility and Compliance

Table 1-1 lists some of the network devices and standards that NS300/301 boards have been tested against for compatibility and compliance.

Note: Brooktrout Technology continues to perform compatibility and compliance testing on NS300/301 boards. Contact Brooktrout Technology for complete, up-to-date compatibility and compliance lists.

Table 1-1. NS300/301 CompactPCI Board Compatibility and Compliance

Network Standards	FCC Part 68 IC CS-03 CTR4 TS-038 INS-NET-1500 (JATE Green Book) CTR12/13 NTR4 AT&T Technical Publications 54016, 54019A, 62411 and 62421

Table 1-1. NS300/301 CompactPCI Board Compatibility and Compliance

Bellcore Standards	National ISDN-2, ISDN-3
Compatible Switch Types	Lucent 5ESS Northern Telecom DMS-100
Safety	UL1950 3rd Edition CSA C22.2 No. 950-95, C-UL1950 3rd Edition EN 60950 TS-001 ETS 300 046
EMI	FCC Part 15, Class A ICES-003 Issue 2, Rev. 1, Class A EN55022, Class A EN55024 AS/NZS 3548 Class A

Specifications

Table 1-2 lists NS300/301 CompactPCI board specifications arranged by functional category; references in the table indicate where the functionality is discussed in this document

Table 1-2. NS300/301 CompactPCI Board Specifications

Category	Values			Refer To
General	Physical Dimensions for CPCI Baseboard (excluding front panel)	Height	233.35 mm (9.187")	
		Length	160 mm (6.299")	
		Width	2 mm (.079")	
	Physical Dimensions for Transition Module (excluding front panel)	Height	233.35 mm (9.187")	
		Length	80 mm (3.150")	
		Width	2 mm (.079")	
	Weight	Baseboard:	12.7 oz.	
		Transition Module:	9.2 oz.	
	Environment	Operating Temperature	0° C to 50° C (32° F to 122° F)	
		Storage Temperature	-40° C to 100° C (-40° F to 212° F)	
		Relative Humidity	20% to 80%, noncondensing (storage and operation)	
	Power Requirements	+5 Vdc, ±5%, @ 1.5 Amps Typical +3.3Vdc, ±5%, @ 0.6 Amps Typical +12Vdc, ±5%, - N/A		
	Interfaces	T1/E1 CompactPCI Bus H.110 Bus Diagnostic Port Ethernet 802.3	8-pin modular connectors (4 or 8) 5 V, 3.3V CompactPCI connector CompactPCI J4 connector on-board 8-pin connector requiring diagnostic cable (1) front panel 8-pin connector	*Chapter 3*

Table 1-2. NS300/301 CompactPCI Board Specifications (Continued)

Category	Values			Refer To
T1 Interface	Electrical Interface	DSX-1		*Chapter 1*
	Number Per Board	Four or Eight		*Chapter 3*
	Input Stream	Frequency	DSX-1 1.544 MHz ± 50 Hz DS1 (CSU) 1.544 MHz ± 75 Hz	
		Impedance	100 ohms ± 10 ohms	
		Framing Time	5 ms max. (SF) 10 ms max. (ESF) 15 ms max. (SLC-96)	
	Output Stream	Drive Capability	DSX-1 0 - 655 ft of ABAM DS1 (CSU) 0 - 6000 ft of ABAM	
		Impedance	100 ohms ± 10 ohms	
	Frame Formats (software selectable)	SF (Super Frame (D4)) ESF (Extended Super Frame) SLC-96 (as defined in Bellcore TR-TSY-000008) T1DM (as defined in Bellcore TR-TSY-000278)		*Chapter 4*
	Line Coding (software selectable)	AMI (Alternate Mark Inversion) B8ZS (Bipolar 8 Zero Substitution) unframed		*Chapter 4*
	Signaling Types (software selectable)	Robbed Bit (Switched 56) Common Channel Signaling (ISDN) X.25 Frame Relay		*Chapter 4*
	Timing Reference	Software-selectable from:	internal oscillator Incoming T1 span(s) H.110 bus master clock H.110 bus secondary clock	*Chapter 4*
	Pulse Amplitude	DSX-1 2.4 V to 3.6 V		
	Receive Attenuation	DSX-1 <10 db		
	Max. Successive Zeros	15 (using AMI line coding)		
	Maximum Jitter	Conforms to AT&T Technical Publication 62411		

Table 1-2. NS300/301 CompactPCI Board Specifications (Continued)

Category	Values			Refer To
E1 Interface	Electrical Interface	E1 (as defined in ITU-T G.703)		*Chapter 1*
	Number Per Board	Four or Eight		*Chapter 3*
	Input Stream	Frequency	2.048 MHz ± 50 ppm	
		Impedance	120 ohms ± 10 ohms	
	Output Stream	Drive Capability	1000 feet (as defined in ITU-T G.703)	
		Impedance	120 ohms ± 10 ohms	
	Frame Formats (software selectable)	CRC-4 Multiframing with SI=FEBE Basic framing with no CRC-4, Si=1 CRC-4 with TS16 CAS with FEBE Basic framing with TS16 CAS SS7 (ANSI T1.111, ITU Q.703)		*Chapter 4*
	Signaling Types (software selectable)	Channel Associated Signaling (CAS) Formatting Common Channel Signaling Formatting X.25 Frame Relay		
	Line Coding (software selectable)	HDB3 (High Density Bipolar 3) AMI (Alternate Mark Inversion)		*Chapter 4*
	Timing Reference	Software-selectable from:	internal oscillator Incoming E1 span(s) H.110 bus master clock H.110 bus secondary clock	*Chapter 4*
	Pulse Amplitude	+3/-3 V (± 10%) TP +2.37/-2.37 (± 10%) Coax		
	Receive Attenuation	0-6 db at 1.024 MHz		
	Max. Successive Zeros	HDB3 Code		
	Maximum Jitter	Conforms to ITU-T G.703		

Table 1-2. NS300/301 CompactPCI Board Specifications (Continued)

Category	Values		Refer To
CompactPCI Bus Interface	Interface	Version 2.1 compliant. Supports both Master and Slave modes	
	Configuration	Software configured	*Chapter 4*
	Addressing	Byte, Word, Longword	
	Data Transfers	8, 16, 32-bit Slave cycles are non-burst mode only, Master cycles are burstable	
	Interrupts	Bidirectional, INTA	
	Memory	Accessible by CompactPCI Master(s) VO: 16MB 2 x (4MB x 16) 256: 16MB 2 x (4MB x 16) 544: 32MB 4 x (4MB x 16)	
H.110 Interface	Capacity	256 full-duplex channels, non-blocking	*Chapter 2*
	Standard Switching	Incoming and outgoing H.110 bus under host control	*Chapter 3*
	Serial Lines	32 bidirectional data streams at 262 MBps, containing 128 channels of 64 Kbps each	
Board Component	Microprocessor (Motorola PowerQUICC)	MPC860P at 40 MHz (External), 80 MHz (Internal)	*Chapter 2*
	Memory	VO: 32MB 2 x (8MB x 16) 256: 32MB 2 x (8MB x 16) 544: 64MB 4 x (8MB x 16)	
	HDLC Controller	32-channel standard for voice-only models 256-channel models	
	Switching Matrix (TSI)	Two Mitel (90820) switches capable of switching 16 full-duplex data streams	

2
Functional Overview

This section introduces the NS300/301 board's major components and provides an overview of the board's operation.

Major Components

Figure 2-1 shows a simplified block diagram of the NS300/301 board's major functional components. These components are described briefly below:

- *T1/E1 Interface:* Contains a Line Interface Unit (LIU) within a T1/E1 framer (supported on the transition module) that inserts framing and supervision signals into the T1/E1 data stream. Up to eight T1/E1 interfaces are supported on a NS300/301 board. T1 interfaces can be either DSX-1 or DS1 (CSU) compatible.
- *Time Slot Interchanger (TSI):* Switches individual timeslots between the T1/E1 interfaces, HDLC controllers, and the H.110 bus. Switching actions are directed by SMI control messages from the host.
- *H.110 Bus Interface:* The H.110 Bus supports up to 32 x 128 half-duplex channels to carry voice/data traffic between circuit boards within the host system.
- *HDLC Controller:* Provides High-Level Data Link Control (HDLC) formatting on full-duplex channels via Direct Memory Access (DMA). All CPCI controllers have 32 data channels, plus an additional 2 data channels for each T1/E1 interface. The 4-port and 8-port DV models are populated with an additional 256 data channels.
- *Local Bus:* Carries control data between the board's major components.
- *Secondary PCI bus:* This on-board PCI bus is used by the MPC860 (via the PCI Bus Interface), the two optional 256 channel HDLC controllers, and the Host PCI Bus Bridge. These devices can master the bus and quickly move data to and from the Shared Memory or the system host.
- *PCI To PCI Bridge:* Acts as a bridge between the CompactPCI Bus and the board's Secondary PCI bus. Passes instructions from the host computer to the board and reports board information to the host in the form of SMI messages.
- *Shared Memory:* Contains a series of control and data buffers used to pass SMI messages and data between the host driver and the board. The shared memory also temporarily stores the Instant ISDN Software download image until moved to Local Bus Memory by the PowerQUICC processor when the board is taken out of Reset.
- *Microprocessor (PowerQUICC)*: Runs Instant ISDN software and responds to SMI messages from the host. The microprocessor can also perform call control functions, such as acknowledging a call, without instructions from the host.

- *Diagnostic Port*: Provides access to diagnostic utilities for examining the status and configuration of the board. The diagnostic port is an 8-pin connector located on the NS300/301 baseboard frontpanel bracket. With guidance from Brooktrout Customer Support, this port can provide additional debug functionality.
- *Ethernet Port:* Provides a 10/100BASE-T Ethernet interface for Local Area Network (LAN) connections. The Ethernet interface provides full-duplex capability and interfaces to standard 802.3 10/100BASE-T media. The Ethernet interface is located on the NS300/301 baseboard frontpanel bracket.

NS300/301 boards run Instant ISDN Software which performs the configuration, management, call control and packet processing functions for the board. Instant ISDN Software interfaces with various software device drivers that pass SMI messages between the host and the board. Contact Brooktrout Sales for a list of device drivers currently available (contact information inside front cover).

SMI messages consist of a series of C language structures and are divided into several categories. Call Control messages control call setup, clearing and event reporting. Management messages are used to configure NS300/301 board parameters and coordinate the data packet processing performed on the board.

Refer to the *Instant ISDN Software SMI Reference Manual* for complete information on SMI Messaging Syntax and usage.

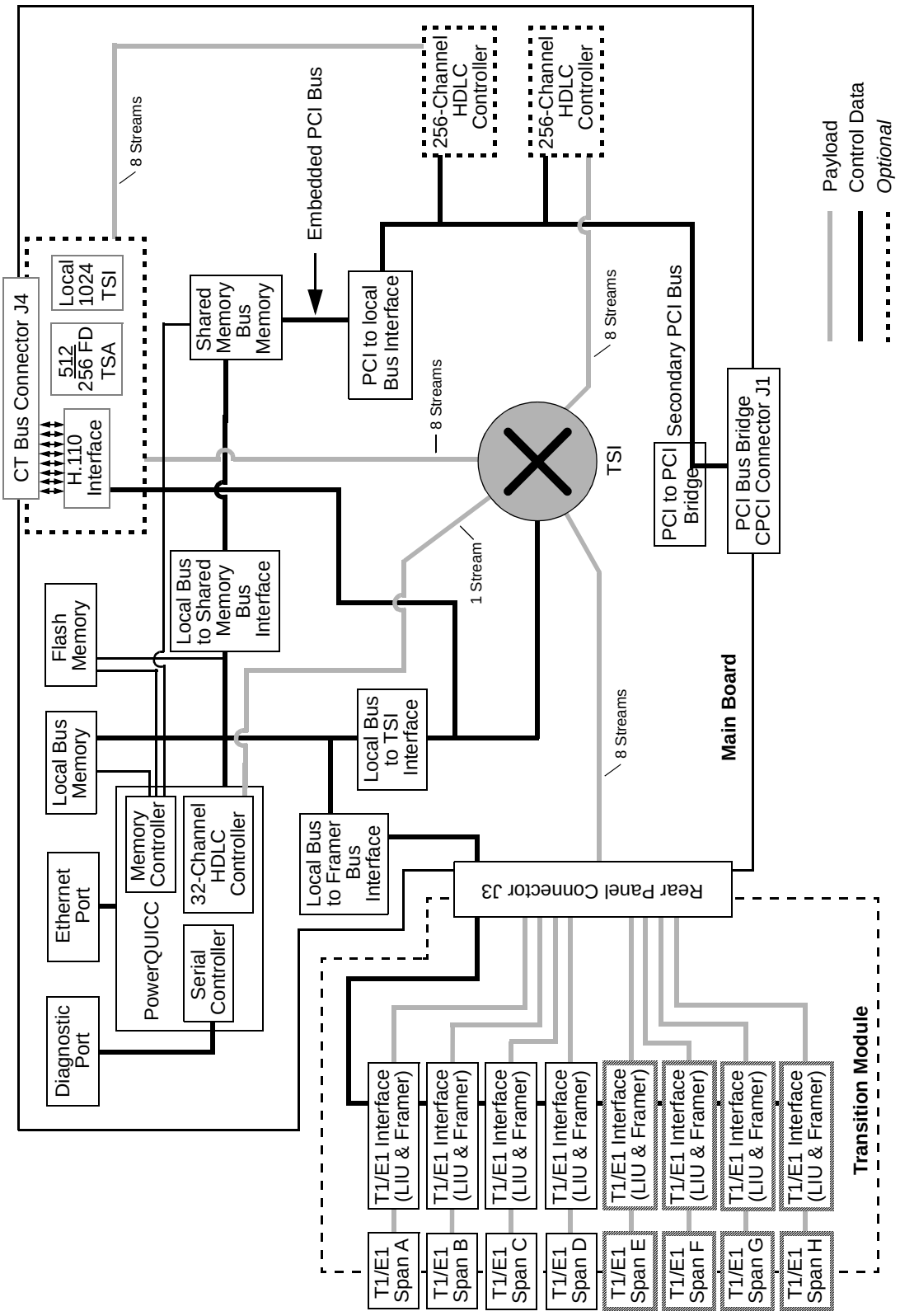


Figure 2-1. Functional Block Diagram of an NS300/301 Board

Operational Flow

When viewed as part of an overall system, the purpose of an NS300/301 board is to provide flexible, integrated network access. The goal of this access is to move *payload* between the host system and a network. Access to public or private networks and movement of payload is controlled by the system's host processor and can be configured to suit a wide range of services.

Note: The term "payload" refers to any type of voice, data, video, or similar traffic carried by an NS300/301 board.

Functionally, NS300/301 boards can be divided into the following areas:

- Control interface
- Data interface
- Network interface
- H.110 bus interface
- Switching matrix
- Diagnostic interface
- Ethernet Interface

Control Interface

The NS300/301 board and host device driver communicate via the *control interfac*e. Control messages are passed to onboard shared memory via the CompactPCI bus, through the PCI bus bridge, and onto the secondary PCI bus located on the board. Residing on this secondary PCI bus, is the PLX PCI to embedded bus bridge. Device driver software resident on the host generates an interrupt for each SMI message passed to the adapter. When this interrupt is received, the PowerQUICC interprets the SMI message and performs accordingly.

Data Interface

The *data interface* is used for high-speed data transfer to and from a public or private network. The mechanism for transferring this payload from the host to the NS300/301 board is similar to that used by the control interface; payload is passed to/from the board via the CompactPCI bus interface and is interrupt-driven. Unlike the control interface, the microprocessor makes no attempt to interpret this data; the payload resides in buffers located in a memory pool situated on the host PCI bus, or the adapter's "Shared Memory". HDLC controllers located on the board's secondary PCI bus are mapped to these buffers. The HDLC controllers have serial stream interfaces that may be mapped to an external interface (either the T1/E1 network interface or streams on the H.110 bus) through the on-board *switching matrix*.

The device driver creates data buffer pools as logical entities, and maintains a data passing interface through the SMI for each unique data stream. Although most applications maintain only one data interface per T1/E1 channel, Instant ISDN software supports configurations of up to 256 logical data interfaces per board. Payload can be sent in transparent mode (raw T1/E1 stream), or packetized in HDLC frames. Packetizing is performed by the individual HDLC controllers, and Instant ISDN software can be configured to perform higher layer link protocols (LAP-D, LAP-B, LAP-F, etc.) on each data interface. All protocols are software configurable, using the SMI L4L3mENABLE_PROTOCOL control message.

Network Interface

The T1/E1 *network interface* provides access to public or private networks. The physical characteristics of this interface are described in *Chapter 3*. Other characteristics of this interface are software configurable by the host via the SMI control interface, including:

- Framing, line coding, clock source and pre-equalization/line build out
- Interface Access type (T1/E1)
- Signaling Type (ISDN common channel, Non-Facilities Associated Signaling, T1 robbed bit, etc.)
- Call types and special features (voice calls, data calls, call-by-call selection, Variabill, B-channel negotiation, etc.)
- X.25 protocol processing (over an established B-channel)
- Ethernet/802.3

H.110 Bus Interface

NS300/301 boards offer a high-speed *H.110 bus interface* supporting direct connection with other similarly equipped devices in the same platform. All NS300/301 boards have 32 HDLC channels internal to the processor. An additional 128, 256, and 512 are available as options.

The H.110 bus interface provides interconnection for digital voice and/or data traffic between individual circuit boards in the same platform. NS300/301 boards support bus connections that conform to the H.110 standard. For more information on the H.110 switching model, refer to the Enterprise Computer Telephony Forum (ECTF) H.110 Revision 0.3 Hardware Compatibility Specification: CT Bus available by calling ECTF at 415-578-6852, email at ectf@ectf.org, or connecting to the website (http://www.ectf.org).

If a board is populated with a second Conexant HDLC controller, its highways map only to the H.110 bus. As such, channels on a second Conexant HDLC controller cannot be mapped to the first Conexant HDLC controller, the MPC860 HDLC controller or any T1/E1 framer interface. Also, subrate switching is not available on the second HDLC device (if populated).

Note: NS300/301 adapter boards configured with more than 256 HDLC channels require updated device drivers and IISDN firmware. If your device driver software is not listed, please contact Brooktrout Customer Support for information.

Switching Matrix

NS300/301 boards incorporate an on-board *switching matrix* allowing voice or data to be switched among the data interface, network interfaces, and H.110 bus interface. The switching matrix consists of the *Timeslot Interchanger (TSI)*, and is under host control via the SMI L4L3mSET_TSI control message.

The switching matrix is critical to the board's operation. For example, to process calls, a switched connection must first be established between the T1/E1 interface and an HDLC controller. The switching matrix also maps individual incoming and outgoing H.110 data streams to either the HDLC controller, T1/E1 interface, or Ethernet port. At power-up, all interface connections/links between the T1/E1 interface, H.110 bus,

and HDLC controller are disabled, by default. Refer to the *Instant ISDN Software SMI Reference Manual* for more information on the L4L3mSET_TSI timeslot switching commands.

Ethernet Interface

NS300/301 boards contain a 10/100BASE-T Ethernet interface located on the NS300/301 baseboard front panel bracket. The Ethernet adapter provides full-duplex capability, incorporates Manchester encoding/decoding, and provides active circuitry for interfacing to standard 802.3 10/100BASE-T media. The Ethernet 802.3 protocol is implemented by the MPC860 (PowerQUICC).

Diagnostic Interface

NS300/301 boards contain a serial diagnostic port that provides access to the *diagnostic interface*. By connecting a diagnostic cable (provided in Developer's Kit) to the 8-pin modular connector located on the frontpanel bracket of the NS300/301 baseboard, the user can access a diagnostic menu containing application debugging and troubleshooting tools. Refer to *Chapter 6* for more information on board diagnostics.

Supported Drivers

Brooktrout Technology provides device drivers for the following operating systems that support the NS300/301 CompactPCI T1/E1 Network controller:

- Windows NT 4.0
- Windows 2000/XP
- Linux
- Solaris
- UnixWare
- VxWorks
- QNX/Neutrino

3 Interfaces

This section describes the following NS300/301 CompactPCI board physical interfaces:

- Bus interfaces
  - PCI bus bridge CPCI connector (J1)
  - H.110 CT bus (J4)
  - Rear panel (Transition Module) connector (J3)
- T1/E1 network interfaces
- Diagnostic port
- Ethernet port

Figure 3-1 shows the location of these interfaces.

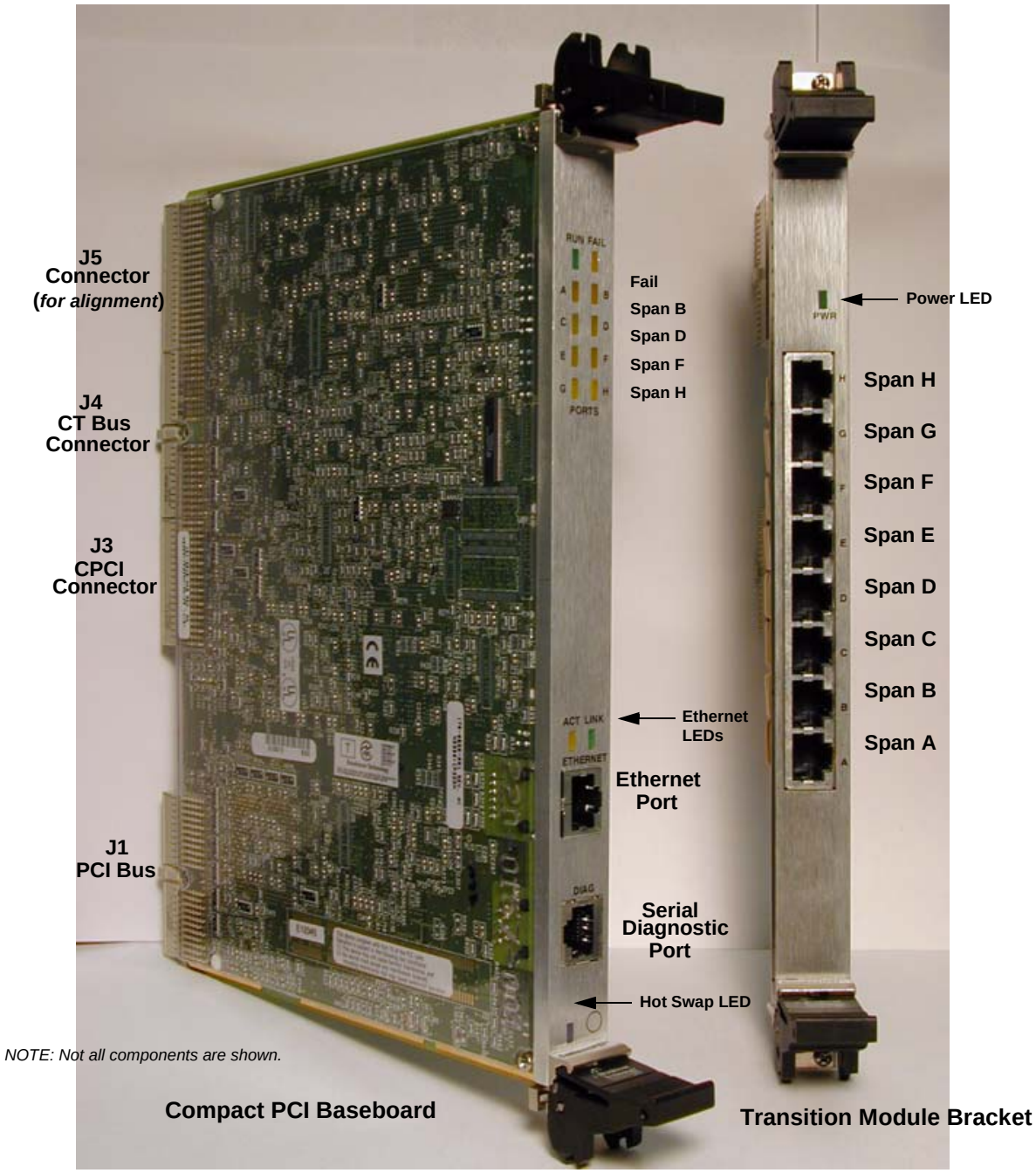


Figure 3-1. Connector Locations (8-spans)

Bus Interfaces

PCI Bus Bridge CPCI Connector

NS300/301 Compact PCI adapter boards can be inserted into any standard CompactPCI slot in a CompactPCI chassis. The NS300/301 adapter board conforms to the PICMG 2.0 Rev. 2.1 CompactPCI Specification, dated 2 September 1997 by the PCI Industrial Computers Manufacturers Group (PICMG). Pin assignments for the CompactPCI connector are listed in *Table 3-1*.

Table 3-1. PCI Bus Bridge J1 Pin Assignments

25	5V	REQ64#	ENUM#	3.3V	5V	GND
24	AD[1]	5V	V(I/O)	AD[0]	ACK64#	GND
23	3.3V	AD[4]	AD[3]	5V	AD[2]	GND
22	AD[7]	GND	3.3V	AD[6]	AD[5]	GND
21	3.3V	AD[9]	AD[8]	M66EN	C/BE[0]#	GND
20	AD[12]	GND	V(I/O)	AD[11]	AD[10]	GND
19	3.3V	AD[15]	AD[14]	GND	AD[13]	GND
18	SERR#	GND	3.3V	PAR	C/BE[1]#	GND
17	3.3V	SDONE	SBO#	GND	PERR#	GND
16	DEVSEL#	GND	V(I/O)	STOP#	LOCK#	GND
15	3.3V	FRAME#	IRDY#	GND	TRDY#	GND
12-14	KEY AREA					
11	AD[18]	AD[17]	AD[16]	GND	C/BE[2]#	GND
10	AD[21]	GND	3.3V	AD[20]	AD[19]	GND
9	C/BE[3]#	IDSEL	AD[23]	GND	AD[22]	GND
8	AD[26]	GND	V(I/O)	AD[25]	AD[24]	GND
7	AD[30]	AD[29]	AD[28]	GND	AD[27]	GND
6	REQ#	GND	3.3V	CLK	AD[31]	GND
5	BRSVP1A5	BRSVP1B5	RST#	GND	GNT#	GND
4	BRSVP1A4	GND	V(I/O)	INTP	INTS	GND
3	INTA#	INTB#	INTC#	5V	INTD#	GND
2	TCK	5V	TMS	TDO	TDI	GND
1	5V	-12V	TRST#	+12V	5V	GND
Pin	**A**	**B**	**C**	**D**	**E**	**F**

NS300/301 adapter boards contain a non-transparent Intel PCI bridge chip that enables customers to have access to the Hot Swap Control and Status Register (HS_CSR).

The new bridge chip is now a non-transparent bridge, thus disallowing host BIOS access to devices on the secondary PCI bus on the NS300/301 adapter. On the previous generation of the NS300/301 board (the PRI-CPCI board), the transparent bridge allowed host BIOS access. Also, I/O and shared memory base address register (BAR) location offsets differ between the two chips.

	412 Card	NS300 Card	NS301 Card
PLX Runtime Register BAR	0x10	0x18	0x18
Shared Memory BAR	0x18	0x1C	0x1C

Note: The manner in which the shared memory range is determined differs on the previous generation board.

With the previous generation board, the shared memory is found as a 32 bit bitmask range at the 0x00 offset in the PLX runtime registers. With the NS300/301 card, the shared memory is found as a 32 bit bitmask range at the 0xB4 offset from the PCI configuration space in the Intel device specific configuration registers. In both cases, since the register is a bitmask range, the actual length is calculated by negating the register contents and adding one

Note: In some Operating Systems, a longword byteswap may be required. Consult your operating system documentation.

PCI vendor and device IDs are as follows:

	412 Card	NS300 Card	NS301 Card
Main Vendor ID	0x10B5	0x1011	0x8086
Main Device ID	0x9080	0x0046	0xB555
Subsystem Vendor ID	0x11CE	0x11CE	0x11CE
Subsystem Device ID	0x0101	0x0102	0x0102

Note: The Intel 21554 is a commonly used PCI to PCI bridge. Some operating systems and drivers may improperly claim the NS300/301 board, thus preventing the Netaccess Series 7.5 driver from reserving the resource. The developer needs to be aware of operating system patches and errata that address PCI configuration space issues. In cases where Brooktrout has noted this problem, driver documentation, errata, or electronic updates will provide details.

H.110 CT Bus

All NS300/301 boards have 32 HDLC channels internal to the processor. An additional 128, 256, and 512 are available as options.

If a board is populated with a second Conexant HDLC controller, its highways map only to the H.110 bus. As such, channels on a second Conexant HDLC controller cannot be mapped to the first Conexant HDLC controller, the MPC860 HDLC controller or any T1/E1 framer interface. Also, subrate switching is not available on the second HDLC device (if populated).

Note: NS300/301 adapter boards configured with more than 256 HDLC channels require updated device drivers and IISDN firmware. If your device driver software is not listed, please contact Brooktrout Customer Support for information.

The H.110 CT bus consists of 4096 timeslots (32 serial channels, each carries 128 timeslots in a 125 µsec frame). The NS300/301 adapter card can only switch 512 timeslots to/from the H.110 CT bus to board local devices or the network spans. The H.110 CT bus interface uses the CPCI J4 connector for board-to-board data transfers. Signal names and pin assignments for the H.110 connector are listed in *Table 3-2*.

Note: Shaded areas in *Table 3-2* represent unused signals

Table 3-2. H.110 CT Bus Connector J4 Pin Assignments

25	SGA4	SGA3	SGA2	SGA1	SGA0	FG
24	GA4	GA3	GA2	GA1	GA0	FG
23	12V	/CT_Reset	/CT_EN	-12V	CT_MC	FG
22	PFS0#	RSVD	RSVD	RSVD	RSVD	FG
21	-SELVbat	PFS1#	RSVD	RSVD	-SELVbatRtn	FG
20	NP	NP	NP	NP	NP	NP
19	NP	NP	NP	NP	NP	NP
18	VRG	NP	NP	NP	VRGRtn	NP
17	NP	NP	NP	NP	NP	NP
16	NP	NP	NP	NP	NP	NP
15	-Vbat	NP	NP	NP	-VbatRtn	NP
12-14	KEY AREA					
11	CT_D29	CT_D30	CT_D31	V(I/O)	/CT FRAME_A	GND
10	CT_D27	3.3V	CT_D28	5V	/CT FRAME_B	GND
9	CT_D24	CT_D25	CT_D26	GND	/FR_COMP	GND
8	CT_D21	CT_D22	CT_D23	5V	CT_C8_A	GND
7	CT_D19	5V	CT_D20	GND	CT_C8_B	GND
6	CT_D16	CT_D17	CT_D18	GND	CT_NETREF_1	GND
5	CT_D13	CT_D14	CT_D15	3.3V	CT_NETREF_2	GND
4	CT_D11	5V	CT_D12	3.3V	SCLK	GND
3	CT_D8	CT_D9	CT_D10	GND	SCLKx2	GND
2	CT_D4	CT_D5	CT_ D6	CT_D7	GND	GND
1	CT_D0	3.3V	CT_D1	CT_D2	CT_D3	GND
Pin	**A**	**B**	**C**	**D**	**E**	**F**

The H.110 CT bus interface on the NS300/301 adapter can act as a CT Bus clock master, or as a slave. As a CT Bus master or slave, the NS300/301 adapter implements all clock fallback mechanism requirements per the ECTF H.110 Revision 1.0 specification. Refer to *Chapter 4* for more information on clocking sources.

CompactPCI Connector

CompactPCI Connector J3 is used for through-the-backplane Rear I/O Panel Connections, providing connectivity to a maximum of eight T1/E1 interfaces on the rear panel I/O transition board. The electrical interface includes 8 full-duplex TDM highways, and a Slave microprocessor interface. Current pin assignments for the CompactPCI Connector J3 are listed in *Table 3-3*.

Table 3-3. CompactPCI Connector J3 Pin Assignments

19	TDM_IN7	TDM_OUT7	TDM_OUT8	TDM_IN8	TDM_CLK	GND
18	TDM_OUT5	TDM_IN5	TDM_IN6	TDM_OUT6	FRM8_E1T1	GND
17	TDM_IN3	TDM_OUT3	TDM_OUT4	TDM_IN4	TDM_SYNC	GND
16	TDM_OUT1	TDM_IN1	TDM_IN2	TDM_OUT2	FRM7_E1T1	GND
15	FRM3_E1T1	FRM4_E1T1	FRM5_E1T1	FRM6_E1T1	FRM2_E1T1	GND
14	RCVD_LCLK14	GND	GND	FRM1_E1T1	GND	GND
13	GND	3.3V	SPARE	GND	GND	GND
12	SPARE	3.3V	SPARE	SPARE	3.3V	GND
11	SPARE	SPARE	5V	SPARE	3.3V	GND
10	IO_D5	IO_D6	IO_D7	5V	FRM58_RST	GND
9	IO_D0	IO_D1	IO_D2	IO_D3	IO_D4	GND
8	5V	5V	5V	/FRM7_CS	5V	GND
7	/FRM4_CS	/FRM_DTACK	/FRM6_CS	/FRM2_CS	/FRM8_CS	GND
6	RCVD_LCLK58	/FRM5_CS	/FRM1_CS	FRM_RW	/FRM3_CS	GND
5	FRMS_ALE	/FRM6_IRQ	/FRM_DS	/FRM8_IRQ	FRM14_RST	GND
4	/FRM5_IRQ	5V	/FRM7_IRQ	GND	ONESEC_IRQ	GND
3	FRMS_A8	/FRM1_IRQ	/FRM2_IRQ	/FRM3_IRQ	/FRM4_IRQ	GND
2	FRMS_A4	FRMS_A5	FRMS_A6	FRMS_A7	GND	GND
1	FRMS_A0	5V	FRMS_A1	FRMS_A2	FRMS_A3	GND
Pin	**A**	**B**	**C**	**D**	**E**	**F**

Network Interfaces

NS300/301 CPCI boards provide up to eight T1/E1 interfaces via one modular connector unit on the transition module's rear bracket. *Table 3-4* lists the pin assignments for the individual 8-pin T1/E1 connectors.

Table 3-4. T1/E1 Span Pin Assignments

T1/E1 Pin	Signal Name
1	Receive Ring
2	Receive Tip
3	no connection
4	Transmit Ring

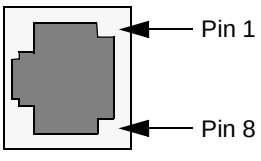


Table 3-4. T1/E1 Span Pin Assignments

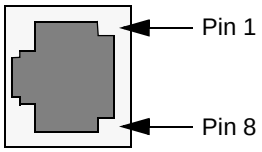
T1/E1 Pin	Signal Name
5	Transmit Tip
6	no connection
7	no connection
8	no connection

Serial Diagnostic Port

The serial diagnostic port is an 8-pin modular connector on the board's frontpanel bracket. *Table 3-5* lists the pin assignments for this port. Refer to *Chapter 6* for more information on connecting a terminal and accessing the diagnostic utilities.

Table 3-5. Diagnostic Port Pin Assignments

Pin	Signal Name
1	no connection
2	no connection
3	no connection
4	GND
5	RXD
6	TXD
7	no connection
8	no connection

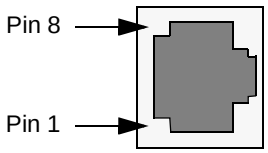


10/100 BASE-T Ethernet Port

The Ethernet port is an 8-pin RJ45 connector on the baseboard frontpanel bracket. *Table 3-6* lists the pin assignments for this port. Refer to *Chapter 6* for information on the ethernet LEDs.

Table 3-6. Ethernet Port Pin Assignments

Pin	Signal Name
1	TX Positive
2	TX Negative
3	RX Positive
4	no connection
5	no connection
6	RX Negative
7	no connection
8	no connection



4
Configuration

NS300/301 CompactPCI boards are plug-and-play capable and are configured and enabled by the Host application software. This section describes the configuration registers and software applications that enable NS300/301 boards to work within a CompactPCI bus environment. The configuration settings fall into two categories:

- *PCI Configuration and Shared Runtime registers* control board/microprocessor shared memory parameters, and control reset/interrupts.
- *Instant ISDN Software* configures the NS300/301 *board* signaling and clocking characteristics

PCI Configuration Registers

Table 4-1 lists the PCI Configuration registers used to control board/microprocessor functions and the shared memory parameters. The registers within this range are used to identify the device, to control its PCI functions, and to sense its PCI status. *Table 4-2* lists the NS300/301 board's Shared Runtime registers. For more information on the PCI configuration registers, refer to *PCI System Architecture*, third edition, dated July 1995.

Note: Most of these registers are written by system PNP firmware at machine boot time. Device driver writers will not normally access these registers.

Table 4-1. PCI Configuration Registers

On-Board (Offset from F1000000h)	31 23 15 7 0				PCI CFG Register Address
00h	Device ID		Vendor ID		00h
04h	Status		Command		04h
08h	Class Code			Revision ID	08h
0Ch	BIST	Header Type	Latency Timer	Cache Line Size	0Ch
10h	PCI Base Address for Memory Mapped Runtime Registers				10h
14h	PCI Base Address for I/O Mapped Runtime Registers				14h
18h	PCI Base Address for Memory Mapped Runtime Registers				18h
1Ch	PCI Base Address for On-board Shared Memory				1Ch

Table 4-1. PCI Configuration Registers

On-Board (Offset from F1000000h)	31 23 15 7 0				PCI CFG Register Address
20h					20h
24h					24h
28h	Reserved				28h
2Ch	Reserved				2Ch
30h	PCI Base Address for Local Expansion ROM				30h
34h	Reserved				34h
38h	Reserved				38h
3Ch	Max_Lat	Min_Gnt	Interrupt Pin	Interrupt Line	3Ch

Table 4-2. Memory Map Runtime Registers

On-Board (Offset from F1000000h)	31 23 15 7 0		PCI CFG Register Address
C0h	*Mailbox Register 0*		40h
C4h	*Mailbox Register 1*		44h
C8h	*Mailbox Register 2*		48h
CCh	*Mailbox Register 3*		4Ch
D0h	*Reserved*		50h
D4h	*Reserved*		54h
D8h	*Reserved*		58h
DCh	*Reserved*		5Ch
E0h	PCI to Local Doorbell Register		60h
E4h	Local to PCI Doorbell Register		64h
E8h	Interrupt Control/Status		68h
ECh	EEPROM Control, PCI Command Codes, User I/O Control, Init Control		6Ch
F0h	Device ID	Vendor ID	70h

Note: Italic fields in *Table 4-2* are not used by SMI/IISDN

Command Register

The Command register is located at address 04h in the PCI configuration space and takes the form

15 Reserved 10	9	8	7	6	5	4	3	2	1	0

The Command register provides basic control over the NS300/301 board's ability to respond to and/or perform PCI bus accesses. It's a 16-bit register, but only bits 0-9 are currently defined. Bits 10-15 are reserved for future use. Bits 1 and 2 are typically the only bits the driver must set. *Table 4-3* describes the bit assignments.

Table 4-3. Command Register Bit Assignments

Bit	Function
0	I/O Space. A value of 1 allows the device to respond to I/O space accesses. A value of 0 disables the device from responding to I/O space accesses.
1	Memory Space. A value of 1 allows the device to respond to memory space accesses. A value of 0 disables the device from responding to memory space accesses.
2	Master Enable. A value of 1 allows the device to behave as a bus master. A value of 0 disables the device from generating bus master accesses.
3	Special Cycle. This bit is not supported.
4	Memory Write/Invalidate Enable. (Refer to the PCI Base Address Register for Direct Master, Table 33, (PCI 28h)(LOC A8h) bit #9.)
5	VGA Palette Snoop. This bit is not supported.
6	Parity Error Response. A value of 1 indicates that parity checking is enabled. A value of 0 indicates that a parity error is ignored and operation continues.
7	Wait Cycle Control. Controls whether or not the device does address/data stepping. A value of 1 indicates that the device always does stepping. A 0 value indicates the device never does stepping. This value is hardwired to 0.
8	SERR# Enable. A value of 1 enables the SERR# driver. A value of 0 disables the driver.
9	Fast Back-to-Back Enable. Indicates what type of fast back-to-back transfers a Master can perform on the bus. A value of 1 indicates that fast back-to-back transfers can occur to any agent on the bus. A value of 0 indicates fast back-to-back transfers can only occur to the same agent as the previous cycle.
15:10	Reserved

PCI to Local Doorbell Register

The PCI to Local Doorbell Register is located at address 60h in the PCI Runtime register space.

7	6	5	4	3	2	1	0

Writing to this register will generate an interrupt to the NS300/301 microprocessor.

Bit 0 identifies host to board control event interrupts. Bit 1 identifies host to board data event interrupts.

Local to PCI Doorbell Register

The Local to PCI Doorbell Register is located at address 64h in the PCI Runtime register space.

7	6	5	4	3	2	1	0

Read and write back the contents of this register to clear board to host interrupts. The NS300/301 board uses INTA.

Bit 0 identifies board to host control event interrupts. Bit 1 identifies board to host data event interrupts.

Interrupt Control/Status Register

The Interrupt Control/Status Register is located at address 68h in the PCI Runtime register space.

Bit 9 of this register must be set to enable board to host interrupts.

User I/O Control

The User I/O Control register is located at byte address 6E in the PCI Runtime register space and provides reset/unhalt byte control of the NS300/301 microprocessor.

A value of 1 causes the USERO output to go high, putting the NS300/301 microprocessor in Reset. A value of 0 causes the output to go low, taking the NS300/301 microprocessor out of Reset.

Software Configurable Parameters

NS300/301 board signaling and clocking characteristics are controlled using Instant ISDN SMI Management messages; these characteristics include:

- Framing formats

- Line coding
- Clock source
- T1 Pre-equalization/line build out

The available settings for these characteristics are described briefly in the subsections that follow. Refer to the *Instant ISDN Software SMI Reference* for complete information on controlling these parameters (specifically the section on L4L3mSET_HARDWARE messaging).

Framing Formats

T1 Formats

The NS300/301 board supports the following T1 framing formats:

- Super Frame (SF)
- Extended Super Frame (ESF)
- SLC-96 (as defined in Bellcore TR-TSY-000008)
- T1DM (as defined in Bellcore TR-TSY-000278)

Framing formats are assigned separately to each T1 interface on the NS300/301 board.

E1 Formats

The NS300/301 board supports the following E1 framing formats:

- CRC-4 Multiframing with the Si bit set for Far End Block Error (FEBE) checking, the default format used
- Basic framing without CRC-4 and the Si bit set to 1
- CRC-4 with TS16 Channel Associated Signaling (CAS) with FEBE
- Basic framing with TS16 CAS
- SS7 (ANSI T1.111, ITU Q.703)

Framing formats are assigned separately to each E1 interface on the NS300/301 board.

Line Coding

T1 Line Coding

The NS300/301 board supports the following software selectable line coding types:

- Bipolar 8 Zero Substitution (B8ZS), the default coding used
- Alternate Mark Inversion (AMI)
- Bipolar 7 Zero Substitution (B7ZS)

Line coding types are assigned separately to each T1 interface on the NS300/301 board.

E1 Line Coding

The NS300/301 board supports the following software selectable line coding types:

- High Density Bipolar 3 (HDB3)
- Alternate Mark Inversion (AMI)

Line coding types are assigned separately to each E1 interface on the board.

Clock Source

T1/E1 transmissions and H.110 bus signals require a clocking source to synchronize the signal data. Clocking for the NS300/301 board is software selectable and can be derived from the following sources:

- Internal oscillator on the NS300/301 board
- Incoming T1/E1 span (from any interface)
- CT bus primary master clock signal
- CT bus secondary master clock signal

The timing options you assign apply to all network and data interfaces on the board. In the default mode, the NS300/301 board derives clocking from the first incoming T1/E1 Span A.

T1 Pre-equalization/Line Build Out

Pre-equalization or Line Build Out settings are software selectable and must be assigned separately to each T1 interface on the NS300/301 board. The type of setting depends on whether the T1 connector is providing a DSX-1 or DS1 (CSU) electrical interface.

The table below shows the software configurable settings for both types of network interfaces provided by the NS300/301 adapter board.

DSX-1	DS1 (CSU)
0-133 ft.	0.0 db
133-266 ft.	-7.5 db
399-533 ft.	-15.0 db
533-655 ft.	-22.5 db

For a DSX-1 interface, set the pre-equalization based on the distance between the board and the cross-connect point in multiples of 133 feet. For a DS1 interface, set the LBO to compensate for the decibel (db) line loss. Contact your T1 service provider to determine the necessary settings.

5
Installation & Removal

This section provides installation and removal instructions for the NS300/301 board.

Board Installation

Observe antistatic precautions whenever handling the NS300/301 board to avoid damaging sensitive components. Wear a ground strap connected to a grounded equipment frame whenever handling the board; always transport the board in an antistatic bag.

Hot Swap Chassis

1. Place the NS300/301 baseboard and associated Transition Module on an antistatic mat.
2. Remove the cover from the host system chassis; refer to the documentation supplied with the host system for instructions.
3. Select an available CompactPCI slot pair (front and rear slots). If necessary, remove any bracket(s) that cover the chassis openings for these slots.
4. Holding the NS300/301 Transition Module by the bracket and board edges, gently insert the board into the card guides. Make sure the board is seated securely.
5. Connect the T1/E1 span(s) to the 8-pin modular connection(s) on the NS300/301 Transition Module.
6. Secure the Transition Module into the chassis by locking it in with the ejector handles.
7. Holding the NS300/301 Main board by the bracket and ejector handles, gently insert the board into the card guides. Make sure the board is seated securely.
8. Secure the board to the chassis by locking it in with the ejector handles.

Note: Observe that the blue hot swap LED is illuminated until the ejector handles are latched.

9. Replace the host system chassis cover.
10. Observe the front panel of the NS300/301 Main board; the yellow Network Interface Status LEDs (labeled PORTS A – H) display a circulating pattern, and the blue Hot Swap LED is extinguished. In addition, observe that the green PWR LED on the Transition Module is illuminated.
11. When the Instant ISDN Software has been downloaded into the board, the green RUN LED is illuminated (and remains illuminated), and the yellow Network Interface Status LEDs for those ports receiving a proper signal remain extinguished.

Refer to *Chapter 6* for more information on NS300/301 board status indicators. If the board fails to initialize, check your host system power connections and then contact Brooktrout Customer Support (contact information in *Appendix A*).

Non-Hot Swap Chassis

1. Verify that the host system power has been removed or otherwise turned off.
2. Place the NS300/301 Main board and associated Transition Module on an antistatic mat.
3. Remove the cover from the target host system chassis; refer to the documentation supplied with the host system for instructions.
4. Select an available CompactPCI slot pair (front and rear slots). If necessary, remove any bracket(s) that cover the chassis openings for these slots.
5. Holding the NS300/301 Transition Module by the bracket and board edges, gently insert the board into the card guides. Make sure the board is seated securely.
6. Connect the T1/E1 span(s) to the 8-pin modular connection(s) on the NS300/301 Transition Module.
7. Secure the Transition Module into the chassis by locking it in with ejector handles.
8. Holding the NS300/301 Main board by the bracket and ejector handles, gently insert the board into the card guides. Make sure the board is seated securely.
9. Secure the board to the chassis by locking it in with the ejector handles.
10. Replace the host system chassis cover.
11. Turn the host's power ON.
12. Observe the front panel of the NS300/301 Main board; the yellow Network Interface Status LEDs (labeled PORTS A – H) display a clockwise circulating pattern, and the blue Hot Swap LED is extinguished. In addition, observe that the green PWR LED on the Transition Module is illuminated.
13. When the Instant ISDN Software has been downloaded into the board, the green RUN LED is illuminated (and remains illuminated), and the yellow Network Interface Status LEDs for those ports receiving a proper signal remain extinguished.

Refer to *Chapter 6* for more information on NS300/301 board status indicators.

If the board fails to initialize, check your host system power connections and then contact Brooktrout Customer Support (contact information in *Appendix A*).

Note: If Pin C23 is not grounded, the NS300/301 network adapter will not work in the chassis.

Board Removal

Observe antistatic precautions whenever handling the NS300/301 board to avoid damaging sensitive components. Wear a ground strap connected to a grounded equipment frame whenever handling the board; always transport the board in an antistatic bag.

Hot Swap Chassis

1. Remove the host system chassis cover, refer to the documentation supplied with the host system for instructions.
2. Unlatch the ejector handles on the NS300/301 main board.
3. Observe the front panel of the NS300/301 Main board; the blue Hot Swap LED is illuminated, and the yellow Network Interface Status LEDs (labeled PORTS A – H) display a clockwise circulating pattern.
4. Holding the NS300/301 Main Board by the bracket and the ejector handles, gently remove the board from the card guides.
5. Place the NS300/301 Main Board on an antistatic mat.
6. Observe that the green PWR LED on the Transition Module is extinguished.
7. Disconnect the T1/E1 span(s) from the 8-pin modular connection(s) on the NS300/301 Transition Module.
8. Remove the Transition Module from the chassis by unlatching the ejector handles.
9. Holding the NS300/301 Transition Module by the bracket and ejector handles, gently remove the board from the card guides.
10. Place the NS300/301 Transition Module on an antistatic mat.
11. Place both the Transition Module and Main Board in an antistatic bag while they remain out of the host system chassis.
12. Replace the host system chassis cover.

Non-Hot Swap Chassis

1. Verify that the host system power has been removed or otherwise turned off.
2. Remove the host system chassis cover; refer to the documentation supplied with the host system for instructions.
3. Observe the front panel of the NS300/301 Main board; the green RUN LED, the yellow Network Interface Status LEDs (labeled PORTS A – H), and the blue Hot Swap LED are all extinguished. In addition, observe that the green PWR LED on the Transition Module is extinguished.
4. Unlatch the ejector handles on the NS300/301 Main Board.
5. Holding the NS300/301 Main Board by the bracket and ejector handles, gently remove the board from the card guides.
6. Place the NS300/301 Main Board on an antistatic mat.
7. Disconnect the T1/E1 span(s) from the 8-pin modular connection(s) on the NS300/301 Transition Module.

8. Remove the Transition Module from the chassis by unlatching the ejector handles.
9. Holding the NS300/301 Transition Module by the bracket and ejector handles, gently remove the board from the card guides.
10. Place the NS300/301 Transition Module on an antistatic mat.
11. Place both the Transition Module and the Main Board in an antistatic bag while they remain out of the host system chassis.
12. Replace the host system chassis cover.
13. Return power to the host if necessary.

Hot-Swap Support

NS300/301 adapter boards are fully hot-swap compliant. NS300/301 adapter boards conform to the PICMG 2.0 Rev. 2.1 CompactPCI Specification and the Hot Swap Specification PICMG 2.1 Rev. 1.0 by the PCI Industrial Computers Manufacturers Group (PICMG).

Note: NS300/301 adapter boards that are hot swapped (extracted) from the system chassis must be replaced with an adapter that has the same size shared memory.

Host Control of LEDs

The NS300/301 flash code has the ability to blink all of the port LEDs on and off at the same time for user defined use (such as an error indication). The driver enables the blinking LED pattern by accessing a register in the bridge's CSR (Control and Status Registers), located within a 4k region with a base address as specified in the bridge's Base Address Register 0 (offset 0x10). The driver requests the LED pattern by writing a defined value (0xDEADDEAD) to the CSR's Scratchpad 1 Register (offset 0xAC). Once the flash code completes initialization and is in the clockwise LED rotation, the code periodically checks to see if the host driver has requested the LED pattern. If the defined value is present in the Scratchpad 1 Register, the flash will execute code to blink all port LEDs on and off at the same time. All other values in the scratchpad register are invalid and cause a return to the normal LED mode.

Note: While this feature is enabled, the shared memory resize feature is disabled.

6
Power-Up & Diagnostics

This section briefly describes the NS300/301 board's power-up process and identifies the diagnostic tools available to verify board operation.

Power-Up & Initialization

When power is applied to the PCI bus, the adapter microprocessor boots from flash upon PCI reset removal, and programs the PCI bridge, and enumerates the secondary PCI bus.

The host application then downloads the diagnostic image, and the adapter microprocessor is reset, and starts executing the diagnostic image.

To bring the NS300/301 board to its operational state, follow the instructions in the *Netaccess Series Release 7.5 Driver Programmer's Manual*. The Driver Programmer's Manual details the Host API and contains sample code fragments that illustrate how to initialize the board and download Instant ISDN software.

The NS300/301 board reports to the host whether the download succeeded or failed. If the download was successful, the board is in its operational state with all data channels disabled, and is ready to respond to SMI messages from the host.

Note: A warm reboot using ALT-CTL-DEL or a CPCI chassis reset button does not guarantee reset of the Brooktrout CPCI board. It has been discovered that some chassis vendors have not tied the PCI reset signal (/PCI_RST) to the ALT-CTL-DEL event and/or the reset button on the chassis. However, setting the PCI configuration space reset bit (aka User0) will bring the board into reset, regardless of the chassis.

When power is successfully supplied to a board, the microprocessor executes a boot program that is stored in a non-volatile flash memory. The boot program configures the PCI-PCI bridge. Upon successful configuration, the span LEDs will blink in a circular, clockwise pattern. If there is a configuration failure, the fail LED will blink.

Status Indicators

NS300/301 boards contain up to fourteen (14) LEDs (8-span model) that can be viewed through the front panels of the CompactPCI Baseboard and Transition Module. *Table 6-1* and *Table 6-2* lists the name, color, and meaning of each LED.

Table 6-1. Baseboard LED Descriptions

Name	Color	LED is...	Indicating...
RUN	Green	OFF	(PowerQUICC in Reset) or not running
		ON	Normal microprocessor activity
FAIL	Yellow	OFF	Normal operation
		ON	Board failure
Span A	Yellow	OFF	Normal operation
		ON	Carrier failure (LOS) on Span A
Span B	Yellow	OFF	Normal operation
		ON	Carrier failure (LOS) on Span B
Span C	Yellow	OFF	Normal operation
		ON	Carrier failure (LOS) on Span C
Span D	Yellow	OFF	Normal operation
		ON	Carrier failure (LOS) on Span D
Span E	Yellow	OFF	Normal operation
		ON	Carrier failure (LOS) on Span E
Span F	Yellow	OFF	Normal operation
		ON	Carrier failure (LOS) on Span F
Span G	Yellow	OFF	Normal operation
		ON	Carrier failure (LOS) on Span G
Span H	Yellow	OFF	Normal operation
		ON	Carrier failure (LOS) on Span H

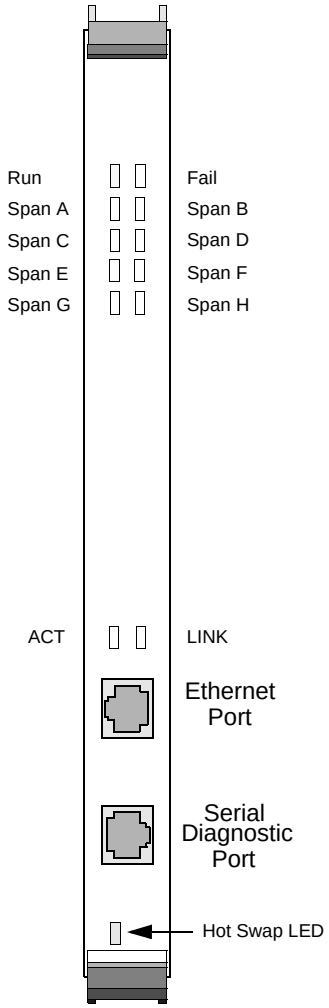


Table 6-1. Baseboard LED Descriptions

Name	Color	LED is...	Indicating...
LINK	Green	OFF	Ethernet Link Integrity Failed
		ON	Ethernet Link Integrity Passed
ACT	Yellow	OFF	No Receive Activity on Ethernet port
		ON	Receive Activity Detected
Hot Swap LED	Blue	OFF	(See Note)
		ON	

Table 6-2. Transition Module LED Descriptions

Name	Color	LED is...	Indicating...
PWR	Green	OFF	No power is present on the Transition Module
		ON	Transition Module is powered up

Board Reset

A device driver accessing the NS300/301 card must now delay after resetting the card (changing the reset bit, User0 (PLX PCI register 0x6E, lsb) to one) for at least 25 microseconds. With the NS300/301 card, setting User0 causes the hardware to execute bootstrap code that is located in a flash EEPROM device. The delay allows the bootstrap code to complete. Failure to delay may cause an incomplete bootstrap, which is essential for successful configuration of the non-transparent bridge and the secondary PCI bus (on the card) devices. An incomplete bootstrap may cause the primary PCI bus (on the host) to function improperly or not at all.

If a driver is a polling driver, there must be a delay after clearing User0; this is true for both previous generation cards and NS300/301 cards. After download, User0 is set to zero, which causes the MPC860 CPU to begin executing the downloaded code (from shared memory). After starting, IISDN replicates itself in local memory and switches code execution from shared memory to local memory. This delay allows IISDN to perform the switchover without giving the host the opportunity to start reading and writing to shared memory. If this happens during the switchover, there can be contention between the MPC860 and the host for shared memory arbitration, causing all sorts of problems. The delay prevents this bus contention. The minimum required duration of the delay may change depending upon the firmware version used, thus a suggested value is 500 microseconds.

The NS300/301 card is designed with flash memory that executes initialization code at power up and on card reset. The initialization code configures onboard PCI devices, and takes ~20ms to complete on a power up condition, and ~10ms on a card reset condition.

Note: These timings are based on 7.0.0 flash code; future revisions may have shorter or longer timing periods.

Once initialization is complete, the port LEDs will cycle on and off in a clockwise pattern. Drivers should not attempt to download code during the initialization period, as the onboard PCI bridge devices may be in a partially initialized state, and transactions to the board may fail, possibly resulting in a system crash.

Instant ISDN Runtime Diagnostics

After the NS300/301 board is downloaded, it offers a set of diagnostic utilities that can be accessed via the serial diagnostic port. To communicate with the serial diagnostic port, connect an asynchronous terminal configured for 9600 baud, 8 bits with no parity and 1 stop bit. The diagnostic cable may be used when running diagnostics. A Virtual TTY interface is also available via SMI.

The diagnostic utility options are listed in a brief menu; to display the menu, press **?**. One menu option allows you to trace Link Layer 0, 1 or 2 activity on a T1/E1 interface and produces a display similar to most protocol analyzers. Further information about the utilities of the diagnostics port is available in the SMI Programmer's Manual.

Appendix A
Brooktrout Customer Support

Customer First

Brooktrout is committed to delivering complete customer satisfaction. We endeavor to make all of our products reliable, easy to install and easy to use. If you need additional technical assistance after reading the *Technical Description* and *Programmer's Manual*, Brooktrout provides access to a wide range of service and support offerings.

Before You Call

When contacting Brooktrout Customer Support, please call from a location where you can operate your system, including the ability to remove or look at the hardware components of the Brooktrout card.

Contacting Brooktrout Customer Support

Purchase of a Brooktrout Developer's Kit entitles you to 12-months of unlimited technical support during standard business hours. Our Technical Assistance Center also offers a wide variety of additional fee-based support services, including Extended 24-hour Support Plans, Training Classes, Application Developer's Lab, On-Site Support, and more.

Brooktrout Customer Support can be reached via phone, fax, email and postal mail. Our support center is staffed Monday through Friday, 8:30am to 5:30pm, EST.

Please fill out and return the Warranty Registration Card supplied with your Brooktrout product. Your information will be entered into our Support Database for product tracking and will facilitate better customer support to your business center.

Mailing Address	Brooktrout Technology, Inc. 18 Keewaydin Drive Salem, NH 03079	
Support Phone	(781) 433-9600	8:30 am - 5:30 pm EST, Mon - Fri
	(781) 449-9009 (Fax)	24 hours

eMail	techsupport@brooktrout.com

Additional Brooktrout Support Services

Using an Internet connection, you can access our web page on the World Wide Web:

http://www.brooktrout.com

From our web page, you can access the latest technical and product information and the latest versions of our device drivers, FAQ files – you can even open a trouble ticket with a Brooktrout Support Engineer.

Appendix B
Agency Warnings and Notices

As required by FCC Rules and Regulations, the following information is provided for the guidance of the user.

FCC PART 15 NOTICES

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this 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 Brooktrout manuals, 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 his/her own expense.

Operation of this equipment is subject to the following conditions:

1. This equipment may not cause harmful interference,
2. the equipment must accept any interference received, including interference that may cause undesired operation, and
3. the use of shielded cables is required in order to ensure compliance with emission limits.

FCC PART 68 NOTICES (United States)

This equipment complies with Part 68 of the FCC Rules. On the surface of the circuit side of the printed circuit board of this equipment is a label that contains, among other information, the FCC Registration Number and Ringer Equivalence Number (REN), if applicable, for this equipment. If requested, this information must be provided to the telephone company.

This equipment uses up to eight (8) RJ-48 8-pin modular registered jacks. This equipment is designed to be connected to the telephone network or premise wiring using a compatible modular plug which is Part 68 compliant.

If this terminal equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of the service may be required. But if advance notice is not practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your rights to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operation or procedures that could affect the operation of your equipment. If this happens, the telephone company should provide advance notice in order for you to make the necessary modifications in order to maintain uninterrupted service.

If trouble is experienced with this equipment, please contact:

Warranty and Repair Service Center
Brooktrout Technology, Inc.
18 Keewaydin Drive
Salem, NH 03079
1-603-890-7298

for repair and (or) warranty information. If the trouble is causing harm to the telephone network, the telephone company may request that you remove the equipment from the network until the problem is resolved.

This equipment does not contain user repairable or serviceable components.

This equipment may not be used on the public coin service provided by the telephone company. Connection to Party Line Service is subject to state tariffs.

CSU Requirements

The NS300/301 may be configured to operate as a DSX-1 device using an external CSU. Federal regulations (FCC Part 68) prohibit connection of a DSX-1 device to the network without an FCC approved Channel Service Unit (CSU). Customers connecting this device to the network, shall upon request of the telephone company, inform the telephone company of the particular lines to which such connections are made and the FCC registration of the protection device (CSU).

Instructions for OEM/Final Equipment Assemblers

The mounting of the registered unit in the final assembly must be made so that the registered unit is isolated from exposure to any hazardous voltages within the assembly. Adequate separation and restraint of cables and cords must be provided.

The circuitry from the registered unit to the telephone line must be provided in wiring that carries no other circuitry unless specifically allowed by the rules (such as PC and PR leads). PC board traces carrying tip and ring leads shall have sufficient spacing to avoid surge breakdown.

If in the event this registered device is enclosed in an assembly, and not readily accessible, the registration label should be placed on the exterior of the cabinet for each type of registered device contained therein.

The final assembler shall provide in their consumer instructions all applicable paragraphs from this FCC Part 68 Notice.

Modular jacks or plugs shall be provided which comply with Part 68, Subpart F requirements for dimensions, tolerances and metallic plating.

Additional Labels for OEM/Final Equipment Assemblers

Brooktrout Technology will provide at no cost to you, additional FCC Part 68 registration labels for the NS300/301 should they be required to label your final equipment assembly in order to satisfy the above *Instructions for OEM/Final Equipment Assemblers.*

INDUSTRY CANADA (IC) NOTICE (Canada)

"NOTICE: The Industry Canada (IC) label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that non-compliance with the above conditions may prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telephone communications company cause to request the user to disconnect the equipment.

Users should ensure, for their own protection, that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

"CAUTION: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate."

"This Class (A) digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations."

"Cet appareil nume´rique de la classe (A) respecte toutes les exigences du Règlement sur le mate´riel brouilleur du Canada."

EUROPEAN UNION NOTICES

To ensure compliance with EN 60950: 1992, you must follow the requirements below when installing a NS300/301 board:

Power

- The host chassis must supply power to the board according to the power requirements listed in *Chapter 1*.
- The total power required by the host processor, NS300/301 board(s) and other boards in the host chassis must not exceed the power specifications stated in this technical manual.

Hazardous Voltage

- Typically, an NS300/301 board is not installed in a host chassis that contains boards which use or generate hazardous voltage (voltage that exceeds 42.4 Vac or 60 Vdc at peak condition). If you believe hazardous voltage is present in the host chassis, contact Brooktrout Customer Support for assistance when installing a NS300/301 board.

Interface Connections

- All NS300/301 board interfaces possess a SELV safety classification for connection to other devices.
- NS300/301 boards must not be used in conjunction with other equipment to switch messages, producing two-way live speech telephone calls, except where such use is explicitly permitted by the approval of the other equipment.

Creepage & Clearance Distances

- The NS300/301 board must be installed with appropriate clearance and creepage distances between the board and any device that uses or generates voltage (other than the CPCI bus connection). The table below identifies the minimum distances according to the voltage used or generated by the device:

Voltage Used/Generated	Clearance	Creepage
Up to 50 Vrms/Vdc	2.0 mm	2.4 mm (3.8 mm)
Between 50 and 125 Vrms/Vdc	2.6 mm	3.0 mm (4.8 mm)
Between 125 and 250 Vrms/Vdc	4.0 mm	5.0 mm (8.0 mm)
Between 250 and 300 Vrms/Vdc	4.0 mm	6.4 mm (10.0 mm)
Greater than 300 Vrms/Vdc	Obtain advice from a competent telecommunications safety engineer before installing the board	

Note: If the host chassis is subject to conductive pollution or dry nonconductive pollution which may become conductive due to condensation, use the creepage distances specified in parenthesis.

GERMAN NOTICE

The edge connector that is intended for connection to the host chassis is a Safety Extra Low Voltage (SELV) circuit. Rechnerschnittstelle: Der Kontaktleiste der die Verbindung zum herstellt entspricht den Safety Extra Low Voltage (SELV) Bestimmungen.

AUSTRALIAN NOTICE

This customer equipment is to be installed and maintained by service personnel as defined by AS/NZS 3260 Clause 1.2.14.3 (Service Personnel). Incorrect connection of connected equipment to the General Purpose Outlet could result in a hazardous situation.

Safety requirements are not fulfilled unless the equipment is connected to a wall socket outlet with protective earth contact.

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