TR1034 PCI T1/ E1 Board

for LAN Fax Applications

Hardware Manual

Software Versions 2.1.x and 3.0.x
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Brooktrout Technology®

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TR1034 PCI T1/E1 Board: Document Number 934-034-80, version A, issued July 2003 for Bfv software release 2.1.x and 3.0.x.

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For Brooktrout Technical Support, see *Contacting Technical Support* on page xvi.

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Contents

List of Tables

Table **Page**

Preface

This manual explains how to configure, test, and troubleshoot two types of TR1034 Digital Peripheral Component Interconnect (PCI) boards:

- T1
- E1

Before using this book, install your TR1034 board and connect your phone service following the instructions in the hardware installation guide included with the board.

The Preface contains the following sections:

- About this Guide
- Introducing the TR1034 Fax Board
- Contacting Technical Support

About this Guide

This hardware guide explains how to configure and test the Brooktrout TR1034 universal PCI fax boards with either T1 Robbed Bit or ISDN PRI telephone service.

Chapter Topics

This guide contains the following chapters:

Chapter 1	This chapter explains how to configure the TR1034 T1/E1 boards for your LAN Fax software based on Bfv version 2.x and how to change the parameters that are set in software.
Chapter 2	This chapter explains how to configure the TR1034 T1/E1 boards for your LAN Fax software based on Bfv version 3.0.x and how to change the parameters that are set in software.
Chapter 3	This chapter explains how to test your TR1034 installation using Brooktrout's configuration and diagnostic software.
Appendix A	This hardware appendix describes the physical features of the TR1034 T1/E1 PCI boards and recommends personal safety precautions when handling them. It describes pinouts and LED activity for PRI boards, and provides information for regulatory and standards compliance.
Appendix B	This appendix provides information about call progress error codes, result error codes, and ISDN cause codes.
Appendix C	This appendix describes ISDN telephone service options. It provides order and connection information about ISDN services.
Glossary	The glossary defines the terms used in this manual.

Typographical Conventions

This manual uses the typographical conventions shown in the following table.

Convention	Type of Information
Italic typeface	File, path, directory or program name
`Bold monospace` typeface	Code or syntax entered by user
`Plain monospace` typeface	System output of code or syntax
Sans serif typeface	Keys or buttons to press, screen names

The Caution icon is used to indicate an action that could cause harm to the hardware or software.

Related Documents

- The hardware installation guide that came with your board.
- TR1034 Firmware Installation and Release Notes
- The software development kit manuals

Documentation Feedback

Brooktrout is committed to continuously improving the completeness and usability of our product documentation. All suggestions, comments, or corrections are welcome. Send your feedback to *techpubs@brooktrout.com*. Include the following information in your correspondence:

- Document number, located on the title page
- Release date, located on the title page
- Your telephone number if you would like us to contact you personally
- A brief description of your findings and the relevant location in the document

Your comments help us provide the highest quality documentation possible.

Introducing the TR1034 Fax Board

The Brooktrout Technology TR1034™ offers enterprise customers a line of 33.6Kbps intelligent fax boards with high performance fax capabilities for a variety of computer-based fax applications, such as network fax, fax broadcast, unified messaging, and business process automation.

There are two types of TR1034 PCI boards:

- TR1034 T1 boards for the United States, Canada and Japan:
- TR1034 E1 boards for Europe (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland):

The following table summarizes the TR1034 PCI boards, their number and type of channels, and their availability. Each model can use the same type and number of telephone lines as interfaces on the board.

Table 1. TR1034 Models

Board Type	# Channels
TR1034+P8H-T1	8
TR1034+P16H-T1	16
TR1034+P24H-T1	24
TR1034+P8H-E1	8
TR1034+P10H-E1	10
TR1034+P16H-E1	16
TR1034+P20H-E1	20
TR1034+P30H-E1	30

This document includes information on configuring and testing your TR1034 board, establishing telephone network connections, and troubleshooting any issues that might arise.

For comprehensive information about features of the TR1034 PCI series boards, see Appendix A, *Hardware* on page 97.

System Requirements

The following section describes:

- Hardware Requirements
- Operating Requirements
- Cable Requirements
- ISDN Requirements

Hardware Requirements

This section lists the required hardware for use with TR1034 boards in your system.

- One 32- or 64-bit PCI slot (3.3v or 5v)
- A hardware interrupt (assigned by system BIOS)
- A block of consecutive I/O ports (assigned by system BIOS)
  - 12 addresses for two-channel boards
  - 20 addresses for four-channel boards

Operating Requirements

This section summarizes the requirements for effective operation of TR1034 boards in your system.

Temperature

0° - 50° C (32° - 122° F)

Humidity

10% - 95% (non-condensing)

Power

Make sure the host computer can supply the following power requirements:

- Base card: 3A at 5VDC = 15W

Required Cables

Brooktrout supplies telephone cables with the TR1034 board. If you make cables for your TR1034, see *Telephone Jack PinOut* on page 103 for cabling information.

Telephony Requirements

Regardless of the type of phone service required by the model of Brooktrout board(s) that you have (T1 or E1 ISDN, T1 robbed-bit), when ordering phone service you should tell your telco representative to view the board(s) as a "PABX", and they need to run a trunk or trunks from their central office or PABX to the Brooktrout "PABX".

Aside from informing your telco person that the Brooktrout board(s) you're using need(s) trunk lines, you also need to specify the exact type of service given the model of board you have.

For information about ISDN, see Appendix C, *ISDN Telephone Service Options* on page 137.

Contacting Technical Support

Brooktrout provides technical support for customers who have purchased their TR1034 board directly from Brooktrout Technology, Inc. If you purchased your TR1034 board from a reseller, contact that reseller for technical support.

Getting Technical Support

If you contact Brooktrout Technical Support, please be prepared to work with the support personnel. You may be asked to do several things, such as taking down your server.

Please have the following information ready:

- The model of the TR1034 board in question
- Test results obtained from running diagnostic software

Use one of the following methods to contact Brooktrout Technical Support.

Web site

Go to the support section of the website (www.brooktrout.com) and click on the Contacting Support link.

Or enter the following location in your browser window:

http://www.brooktrout.com/contacts/technical_support.cfm

Returning a Defective TR1034 Board

If you suspect that your TR1034 board is malfunctioning, contact Brooktrout Technology or the reseller from whom you purchased the board.

Typically, Brooktrout Technical Support or your reseller requests that you run diagnostics on the TR1034 board to determine whether it has a hardware defect. If it does, you need to return the board for repair to Brooktrout Technology, Inc. or to the reseller from whom you purchased it.

In the event of equipment malfunction, Brooktrout Technology, Inc. or an authorized agent should perform all repairs. The user is responsible for reporting the need for service to Brooktrout or to one of its authorized agents.

When returning a product on Return Merchandise Authorization (RMA) to Brooktrout Technology, Inc., ship it in the original packaging or in an antistatic bag within a guarded box so that the board is not damaged in the shipping process. Write the RMA number on the shipping container and send the container to the following address:

Brooktrout Technology, Inc.
18 Keewaydin Drive
Salem, New Hampshire 03079
USA

1 Configuring Your TR1034 Board using Brooktrout Software Version 2.1.x

This chapter explains how to configure the TR1034 boards, and how to change the parameters that are set in the Software Development Kit (SDK) version 2.1.x based software.

Before configuring your board, install your TR1034 and connect your phone service to it following the instructions in the hardware installation guide included with the board.

This chapter includes the following activities for setting up Brooktrout firmware, software, and configuration files:

- Setting up Brooktrout Firmware, Software, and Configuration Files
- Loading the Driver and Initializing the TR1034
- Updating Firmware Files
- Configuring Your LAN Fax Software
- Configuring T1 Robbed Bit Systems
- Configuring ISDN T1 Systems
- Configuring ISDN E1 Systems
- BSMI Service
- Ensuring that the Board is Working

Setting up Brooktrout Firmware, Software, and Configuration Files

See your LAN Fax application user manual for instructions on installing and configuring your LAN Fax software. The LAN Fax software provides a Brooktrout driver and firmware. After you have set up your LAN Fax software to support the TR1034, you can begin sending and receiving faxes using that software.

Defining the TR1034 SDK Version Supplied With Your LAN Fax Application

You need to know which version of the TR1034 SDK supports your LAN Fax application because

- When you configure your board software, there are different configuration files and parameters for the different versions.
- If you need product support, Brooktrout Tech Support needs to know which version of the TR1034 SDK your LAN Fax application uses to support your TR1034.
- If you need to use a diagnostic tool, different versions of the tool support different SDK versions.

Check for that information using the following procedure:

1. On the computer system where the TR1034 board(s) are installed, do a file search for a file named *boston.sys*.

   To do a file search in Windows, go to Start→ Search For Files or Folders, enter the name of the file, and click Search.

   Boston.sys is the driver file that the application provides to support the TR1034 platform.
2. When the *boston.sys* file is located, move your mouse cursor over the name and right-click your mouse.

   Some selections appear.
3. Choose Properties.

4. When the Properties window opens, left-click the Version tab, and see what version is reported.
   - If your version says “4.5.x”, then your application is using TR1034 SDK 2.1.x.
   - If your version says “4.6.x”, then your application is using TR1034 SDK 3.0.x.

If your search displays more than one *boston.sys* driver file loaded on your system, check with the support group or documentation of your LAN Fax application to find out which *boston.sys* file their application uses to communicate with your TR1034 board(s).

Process Overview

Use the following general steps to configure your board:

1. Installing the driver (page 5)
2. Starting the driver (page 5)
3. Downloading firmware (page 8)
4. Configuring your LAN Fax SW (page 9 and following)
5. Check on BSMI service: (page 31)

   When you have SDK 2.1.x and you use ISDN, you might need to install BSMI service. Normally the application will install and start this service, but if not, see *Starting BSMI* on page 34.

Loading the Driver and Initializing the TR1034

Installing the Driver

When you install your LAN Fax software, the Brooktrout driver should be automatically installed.

Starting the Driver

The Brooktrout *Boston* driver will start when you start up your computer.

To manually start the driver, from a command (DOS prompt) window, type:

```
net start boston
```

To manually stop or shut down the driver, from a command (DOS prompt) window, type:

```
net stop boston
```

Updating Firmware Files

When you install your LAN Fax software, Brooktrout drivers and firmware are installed. Normally you don't have to update these files.

The following table lists the firmware and flash update files. Whether you are a T1 or E1 user, the file names and uses are the same.

Filename	Definition
cp1000.bin	Control processor (PPC) firmware for all platforms
bootdsp.hex	DSP boot loader
dsp1000_5_ v34.hex	TR1034 DSP firmware for V.34 fax
flashupd.bin	Boot ROM flash update firmware

Boot ROM Flash Updates

The flash firmware is firmware that remains on the board even after powering down the system. It contains major board characteristics and settings.

Your LAN Fax software typically provides the latest boot ROM flash firmware along with the firmware files listed on page 6.

If you need to download the flash firmware to bring the flash version on your board to the same level as your LAN Fax software, you can do a one-time flash download as part of the installation process. To download the flash, use the following procedure:

1. If it is not already set, set the switch on each PCI board to a value in the range of 2 through F. Each board must have a unique value (the board's module ID number).
2. Search your computer for the following files:
   - *firm.exe*
   - *flashupd.bin*

   If you don't find these files, call Brooktrout Technical Support.

   Make sure *flashupd.bin* is in the same directory as *firm.exe*. Do not begin this process with the application running.
3. Use the *firm* program to perform a flash update (do not interrupt the update process). Enter the following:

   ```
   net stop boston
   net start boston
   firm -m <module> -t 2 flashupd.bin
   ```

   For PCI boards, <*module*> is the board module number as set by the rotary switch.

This process takes less than a minute to complete. Do not interrupt the update process or the board might not reboot. In this case, failure to comply renders the board unusable and requires a factory RMA to fix the board. Brooktrout will not issue an advance replacement RMA.

Downloading the Firmware

Your LAN Fax software downloads the firmware each time you boot the machine or restart the device driver. To download the firmware, if necessary, use the following procedure:

1. Search for the script *firmload.bat* on your system.
2. Verify that DSP firmware with postfix V.34 is used.
3. Run the firmload script by entering the following at a command line:

   `firmload -c 30 <firmware directory>`
   where <*firmware directory*> identifies the location of the firmware files on your system.

It should take about 20 seconds for the TR1000 firmware to download and for the board to begin operating. Proper operation is indicated by the board status LED alternating off for two seconds and green for two seconds.

If you use the TR1034 with LAN Fax server applications, refer to the documentation accompanying the application software. In most cases, the firmware is already included with the software you received from the LAN Fax software vendor and no further installation is required.

Configuring Your LAN Fax Software

Your software vendor supplies default configuration files. Use them to configure your LAN Fax software. Review the following sections to identify possible changes you might need to make:

- *Configuring T1 Robbed Bit Systems* on page 10
- *Configuring ISDN T1 Systems* on page 16
- *Configuring ISDN E1 Systems* on page 23

Each section provides configuration information for the following configuration files:

Call Control file
- *btna.cfg*

User configuration file
- *btcall.cfg*

Telephony file
- *teleph.cfg*

Use the default configuration files supplied by your software vendor. The sections below provide information about parameters that you might need to set and samples of the configuration sections of these files. Except for the listed parameters, the default values should work for your system.

See *Defining the TR1034 SDK Version Supplied With Your LAN Fax Application* on page 2 to understand which version of the Brooktrout API your LAN Fax software is based on.

Configuring T1 Robbed Bit Systems

The following sections provide configuration details for a T1 Robbed Bit system.

Configuring Call Control Parameters for T1 Robbed Bit Systems

No call control parameters need to be set. T1 Robbed Bit systems do not use a *btna.cfg* file.

Configuring User Configuration Parameters for T1 Robbed Bit Systems

You will probably need to set values in the *btcall.cfg file* for the following parameters:

debug

If this keyword is present, API debug mode will be enabled after the first channel is reset by the software *if debug mode is not already enabled by the application.* An optional filename might be specified to set up a debug function to send output to the specified file if a debug function was not already set by the application.

Value Type: string

Default: disabled, stdout

did_digits

Specifies the number of DID digits to capture. If the software detects less than the specified number of DID digits, the board terminates the call and returns a "Reorder Tone" (fast busy) to the network.

The maximum number is 63.

Value Type: decimal

Default: 4

Value Type: decimal

Default: 0

teleph

Defines the name of the telephony configuration file that contains telephony hardware configuration information and static telephony connection information.

If the file specified by the *teleph* keyword is present, then the file specified by the *digital* keyword will not be used. If not, then the software also checks for the *digital* keyword file.

Value Type: character string

Default: *teleph.cfg*

Example 1. User configuration section for T1 Robbed Bit

```
did_digits 4
country_code 0010
ced_timeout 6000
nrings 1
teleph C:\boston\ecc.api\server\teleph.cfg
debug \temp\btlog.txt
```

Configuring Telephony Parameters for T1 Robbed Bit Systems

You will probably need to set a value for the following parameters in the *teleph.cfg* file:

ds1_line_type

Specifies a framing type.

Valid Values

2 = Extended SuperFrame DS1 (T1) (Default for T1).

3 = AT&T D4 format Ds1 (T1). (also known as SuperFrame)

0x02 (Extended SuperFrame DS1) is the default.

line_coding

Specifies the line coding scheme on the line.

2 = B8ZS

5 = AMI

Default = B8ZS

line_encoding

Specifies A-law/μ-law line encoding.

Requires a firmware reload to change.

1 = μ-Law (USA) (default)

port_type

Hardware port type. This value follows “unit 1”. Enter one of the following (value is hex):

40 = T1

sig_prot

Specifies the T1 robbed-bit signaling protocol.

0 = E&M (AT&T PUB 43801) Wink.

1 = E&M (AT&T PUB 43801)

Default = Immediate (E&M Wink).

signal_mode

Specifies signal modes.

2 =Robbed Bit.

t1_line_build_out — Defines the T1 framer waveform configuration.

Values for T1:
0 = 0_133 (Default)
1 = 133_266
2 = 266_399
3 = 399_533
4 = 533_655

Example 2. Telephony configuration section for T1 Robbed Bit

```
# Sample TELEPH.CFG file for RBS-T1 line (teleph_hp02h_t1.cfg)



# ********** Module 0 **********

# Module 0 represents the default settings for all modules in the system
# unless a module section is defined for a specific board.
# Valid settings are 2 through F.
# Each board in a system must have a unique number.

module 0

unit 0 20 line_encoding=1 bus_speed=8 bus_clock=0 h110_master_drive=0
      h110_master_ref=0 h110_master_ref_fallbk=10

unit 1 40 line_encoding=1 signal_mode=2 sig_prot=0 ds1_line_type=2
      clock_config=1 line_loopback=1 fac_data_link=1 t1_line_build_out=0
      line_coding=2
```

Example 2. Telephony configuration section for T1 Robbed Bit (Continued)

```
# Connections for Telephony Unit 1
connect 7 0  2 0 0 F 0 0  0
connect 7 0  3 0 0 F 0 0  1
connect 7 0  4 0 0 F 0 0  2
connect 7 0  5 0 0 F 0 0  3
connect 7 0  6 0 0 F 0 0  4
connect 7 0  7 0 0 F 0 0  5
connect 7 0  8 0 0 F 0 0  6
connect 7 0  9 0 0 F 0 0  7
connect 7 0 10 0 0 F 0 0  8
connect 7 0 11 0 0 F 0 0  9
connect 7 0 12 0 0 F 0 0 10
connect 7 0 13 0 0 F 0 0 11
connect 7 0 14 0 0 F 0 0 12
connect 7 0 15 0 0 F 0 0 13
connect 7 0 16 0 0 F 0 0 14
connect 7 0 17 0 0 F 0 0 15
connect 7 0 18 0 0 F 0 0 16
connect 7 0 19 0 0 F 0 0 17
connect 7 0 20 0 0 F 0 0 18
connect 7 0 21 0 0 F 0 0 19
connect 7 0 22 0 0 F 0 0 20
connect 7 0 23 0 0 F 0 0 21
connect 7 0 24 0 0 F 0 0 22
connect 7 0 25 0 0 F 0 0 23
```

Configuring ISDN T1 Systems

The following sections provide configuration details for an ISDN T1 system.

Configuring Call Control Parameters for ISDN T1 Systems

You might need to set values in the *btna.cfg* file (could be named *btna.t1*). This file configures the board telephony interface to work with ISDN service. See Example 3 on page 17 for configuration values.

call_type

Outbound call type.

99 = First attempt call type is 3.1k Audio. If this fails with a cause value greater than 34, retry with type speech. This is a worldwide option.

0 = Speech

1 = 3.1 kHz audio (aLaw-outside US)

Default = 99

switch_type

Central Office/PABX switch type. Use only with PRI.

Default: 0 -AT&T #4 ESS

Value	Description
0	AT&T #4 ESS (Default)(recommended US)
1	AT&T #5 ESS
2	Northern Telecom DMS-100
3	Northern DMS-250
4	Ericsson MD-110 (North America)
5	Ericsson MD-110 (International)
6	Siemens (North America)
7	Japan
8	Other

Example 3. Call control configuration information for ISDN T1 (USA only)

```
[board 0 port 0]
# T1 = 1, E1 = 2
line_length 0
switch_type 0
variant_type 0
call_type 99
net_spfc 0x00
[end
```

Configuring User Configuration Parameters for ISDN T1 Systems

You might need to set values for the following parameters in the *btcall.cfg* file:

debug

If this keyword is present, API debug mode will be enabled after the first channel is reset by the software *if debug mode is not already enabled by the application.* An optional filename might be specified to set up a debug function to send output to the specified file if a debug function was not already set by the application.

Value Type: string

Default: disabled, stdout

debug_control e b

Turns on ISDN tracing in addition to the API debug logging (debug keyword in the user defined configuration file). This parameter only takes effect when the `debug` keyword in *btcall.cfg* takes effect (when the application has not already turned on Brooktrout API debugging). The ISDN debug information will be added to the API debug log file. Use this parameter only to test the installation.

This parameter should never be used, unless explicitly directed to do so by Technical Support.

did_digits

Specifies the number of DID digits to capture. If the software detects less than the specified number of DID digits, the board terminates the call and returns a "Reorder Tone" (fast busy) to the network.

The maximum number is 63. This parameter is applicable for the ISDN Called Party Number.

Value Type: decimal

Default: 4

teleph

Defines the name of the telephony configuration file that contains telephony hardware configuration information and static telephony connection information.

If the file specified by the *teleph* keyword is present, then the file specified by the *digital* keyword will not be used. If not, then the software also checks for the *digital* keyword file.

Value Type: character string

Default: *teleph.cfg*

Example 4. User configuration section for ISDN T1

```
did_digits 4
country_code 0010
ced_timeout 6000
nrings 1
teleph C:\boston\ecc.api\server\teleph.cfg
debug \temp\btlog.txt
debug_control e b
```

Configuring Telephony Parameters for ISDN T1 Systems

You will probably need to set a value for the following parameters in the *teleph.cfg* file:

Note: On the TR1034 platform, ISDN B channels are mapped dynamically to fax channels within the application.

Make sure that the Connect lines in teleph.cfg have been commented out or are not there.

ds1_line_type

Specifies a framing type.

Valid Values

2 = Extended SuperFrame DS1 (T1) (Default for T1).

3 = AT&T D4 format Ds1 (T1). (also known as SuperFrame)

0x02 (Extended SuperFrame DS1) is the default.

line_coding

Specifies the line coding scheme on the line.

2 = B8ZS

5 = AMI

Default = B8ZS

line_encoding

Specifies A-law/μ-law line encoding.

Requires a firmware reload to change.

1 = μ-Law (USA) (default)

port_type

Hardware port type (this is the value just after "unit 1"), one of the following (value is hex):

40 = T1

sig_prot

Specifies the T1 robbed-bit signaling protocol.

255 = No in-band signaling

signal_mode

Specifies signal modes.

4 = Message oriented (T1 or E1) (Default for T1)

t1_line_build_out — Defines the T1 framer waveform configuration.

Values for T1:
0 = 0_133 (Default)
1 = 133_266
2 = 266_399
3 = 399_533
4 = 533_655

Example 5. Telephony configuration section for ISDN T1

```
# Sample TELEPH.CFG for PRI-T1 line (teleph_hp02h_t1_isdn.cfg)



# ********** Module 0 **********

# Module 0 represents the default settings for all modules in the system
# unless a module section is defined for a specific board.
# Valid settings are 2 through F.
# Each board in a system must have a unique number.

module 0

unit 0 20 line_encoding=1 bus_speed=8 bus_clock=0 h110_master_drive=0
      h110_master_ref=0 h110_master_ref_fallbk=10

unit 1 40 line_encoding=1 signal_mode=4 sig_prot=255 ds1_line_type=2
      clock_config=1 line_loopback=1 fac_data_link=1 t1_line_build_out=0
      line_coding=2
```

Example 5. Telephony configuration section for ISDN T1 (Continued)

```
# Connections for Telephony Unit 1
# connect 7 0  2 0 0 F 0 0  0
# connect 7 0  3 0 0 F 0 0  1
# connect 7 0  4 0 0 F 0 0  2
# connect 7 0  5 0 0 F 0 0  3
# connect 7 0  6 0 0 F 0 0  4
# connect 7 0  7 0 0 F 0 0  5
# connect 7 0  8 0 0 F 0 0  6
# connect 7 0  9 0 0 F 0 0  7
# connect 7 0 10 0 0 F 0 0  8
# connect 7 0 11 0 0 F 0 0  9
# connect 7 0 12 0 0 F 0 0 10
# connect 7 0 13 0 0 F 0 0 11
# connect 7 0 14 0 0 F 0 0 12
# connect 7 0 15 0 0 F 0 0 13
# connect 7 0 16 0 0 F 0 0 14
# connect 7 0 17 0 0 F 0 0 15
# connect 7 0 18 0 0 F 0 0 16
# connect 7 0 19 0 0 F 0 0 17
# connect 7 0 20 0 0 F 0 0 18
# connect 7 0 21 0 0 F 0 0 19
# connect 7 0 22 0 0 F 0 0 20
# connect 7 0 23 0 0 F 0 0 21
# connect 7 0 24 0 0 F 0 0 22
```

Configuring ISDN E1 Systems

The following sections provide configuration details for an ISDN E1 system.

Configuring Call Control Parameters for ISDN E1 Systems

The *btna.cfg* file (sometimes named *btna.E1*) configures the board telephony interface to work with the ISDN service. You might need to set values for the following parameters:

aoc

Advice of charge

1 = enable

0 = disable

Default = 0

call_type

Defines the outbound bearer capability.

99 = First attempt call type is 3.1k Audio. If this fails with a cause value greater than 34, retry with type speech. This is a worldwide option.

16 = Voice call (aLaw-outside US) (E1 voice-only applications)

17 = 3.1 kHz audio (aLaw-outside US)

Default = 99

framing

Defines framing options.

Default: 0x00 Multiframing with CRC4.

Line	Type	Framing	Meaning
E1	0x00	CRC4	ON (Si=FEBE); Multiframing
E1	0x02	No CRC	Basic framing

network
Specifies the method for
1 = network emulation
0 = user emulation 0 (user) (Default)

overlap_recv
Overlap receive. Allows for receiving overlap calls.
0 = disable
1 = enable

switch_type
PBX switch type.
Default: 8
8 Other (European default)

variant_type
PBX variant type.
Default: 6
6 PRI only Euro-ISDN

Example 6. Call control configuration section for ISDN E1

```
[board 0 port 0]
switch_type 8
variant_type 6
call_type 99
[end]
```

Configuring User Configuration Parameters for ISDN E1 Systems

You will probably need to set values for the following parameters in the *btcall.cfg* file:

debug

If this keyword is present, API debug mode will be enabled after the first channel is reset by the software *if debug mode is not already enabled by the application.* An optional filename might be specified to set up a debug function to send output to the specified file if a debug function was not already set by the application.

Value Type: string

Default: disabled, stdout

debug_control e b

Turns on ISDN tracing in addition to the API debug logging (debug keyword in the user defined configuration file). This parameter only takes effect when the `debug` keyword in *btcall.cfg* takes effect (when the application has not already turned on Brooktrout API debugging). The ISDN debug information will be added to the API debug log file. Use this parameter only to test the installation.

This parameter should never be used, unless explicitly directed to do so by Technical Support.

did_digits

Specifies the number of DID digits to capture. If the software detects less than the specified number of DID digits, the board terminates the call. Set the `did_digits` parameter to the total number of digits that you expect to receive; this setting works in all circumstances.

DID behavior also depends on the value of the configuration file variable *did_variable*.

Value Type: decimal

Default: 4

When sending digits using the en-block method, the application passes the whole number in a single group. Most installations receive DID digits in this way.

If you receive DID digits en-block, set the `did_digits` parameter to the expected number of digits and the `did_variable` parameter to 0. Setting `did_digits` to a value less than the expected number of DID digits causes only the trailing digits to be passed. For example, if the network sends 1234567 as the called party number and `did_digits` is set to 3, the board returns 567 to the application. Setting `did_digits` to a value greater than the number of digits you receive causes the TR1034 board to reject the call.

did_variable

Sets the requirements for DID call detection based on the line parameter value *did_digits* and the interdigit time limit.

0 = The board detects a DID call only when it receives the number of decimal digits specified by *did_digits*.

1 = The board terminates the digits and detects a DID call when it receives the number of decimal digits specified by *did_digit* or when the interdigit time limit expires. If *did_digits* is 0, the maximum value for *did_digits* increases to 127 digits, and termination occurs based only on the time-out.

Value Type: decimal

Default: 0

When sending digits using the overlap receiving method, the application passes the DID digits grouped into separate messages. Overlap receiving is found in the following circumstances:

- The public network in some countries, notably Germany, Austria, and Italy, allows a user-defined variable number of sub-address DID digits.
- When the supplemental service is DID and the data link is point-to-point.
- When the caller is dialing using overlap sending.

If you receive DID digits in overlap receiving mode and the number of digits you might receive are variable, set the `did_digits` parameter to the maximum you expect to receive and set the `did_variable` parameter to 1. When the `did_variable` parameter is set to 1, the board operates with a 5-second interdigit time-out.

teleph

Defines the name of the telephony configuration file that contains telephony hardware configuration information and static telephony connection information.

If the file specified by the *teleph* keyword is present, then the file specified by the *digital* keyword will not be used. If not, then the software also checks for the *digital* keyword file.

Value Type: character string

Default: *teleph.cfg*

Example 7. User configuration file configuration section for ISDN E1

```
did_digits 3
did_variable 0
country_code 0010
ced_timeout 6000
nrings 1
teleph C:\boston\ecc.api\server\teleph.cfg
debug \temp\btlog.txt
debug_control e b
```

Configuring Telephony Parameters for ISDN E1 Systems

You will probably need to set a value for the following parameters in the *teleph.cfg* file:

clock_config

Defines the transmit clock source.

1 = Loop timing: T1/E1 controller is slave to the network (Default).

2 = Local timing: local T1/E1 controller is master.

If you set the value of clock_config to 1, set `h110_master_ref` to 0 and change the value of the network parameter in the *btna.cfg* file (set to 0).

If you set the value of clock_config to 2, set `h110_master_ref` to 128 and change the value of the network parameter in the *btna.cfg* file (set to 1).

ds1_line_type Defines the DS1 line type.

4 = Multiframing with Si=FEBE (E1)

(Default for E1).

5 = Basic framing with no CRC4, Si=1

(E1).

line_coding Specifies the line coding scheme on the line.

3 =HDB3

line_encoding Specifies A-law/μ-law line encoding.

Requires a firmware reload to change.

0 = A-Law (Europe) (Default for E1)

module number Module identification numbers range from 2 through F. Use span 0 because there is only one span per board.

port_type Hardware port type, one of the following (value is hex):

80 = E1

signal_mode Specifies signal modes.

4 = Message oriented (T1 or E1)

(default for E1).

t1_line_build_out T1 framer waveform configuration.

Values for E1:

0 = 75_OHM

1 = 120_OHM (Default)

unit number Hardware port unit number, starting from 0. Unit 0 stands for the H.100 bus and unit 1 for the only PRI port on the TR1034.

Note: On the TR1034 platform, in ISDN, B channels are mapped dynamically to fax channels within application. The "Connect" lines in *teleph.cfg* must be commented out.

Example 8. Telephony file configuration section for ISDN E1

```
# Sample TELEPH.CFG for PRI-E1 line (teleph_hp02h_e1_isdn.cfg)


# ********** Module 0 **********

# Module 0 represents the default settings for all modules in the system
# unless a module section is defined for a specific board.
# Valid settings are 2 through F.
# Each board in a system must have a unique number.

module 0

unit 0 20 line_encoding=0 bus_speed=8 bus_clock=0 h110_master_drive=0
      h110_master_ref=0 h110_master_ref_fallbk=10

unit 1 80 line_encoding=0 signal_mode=4 sig_prot=255 ds1_line_type=4
      clock_config=1 t1_line_build_out=1 line_coding=3
```

Example 8. Telephony file configuration section for ISDN E1 (Continued)

```
# Connections for Telephony Unit 1
# connect 7 0  2 0 0 F 0 0  0
# connect 7 0  3 0 0 F 0 0  1
# connect 7 0  4 0 0 F 0 0  2
# connect 7 0  5 0 0 F 0 0  3
# connect 7 0  6 0 0 F 0 0  4
# connect 7 0  7 0 0 F 0 0  5
# connect 7 0  8 0 0 F 0 0  6
# connect 7 0  9 0 0 F 0 0  7
# connect 7 0 10 0 0 F 0 0  8
# connect 7 0 11 0 0 F 0 0  9
# connect 7 0 12 0 0 F 0 0 10
# connect 7 0 13 0 0 F 0 0 11
# connect 7 0 14 0 0 F 0 0 12
# connect 7 0 15 0 0 F 0 0 13
# connect 7 0 16 0 0 F 0 0 14
# connect 7 0 17 0 0 F 0 0 15
# connect 7 0 18 0 0 F 0 0 16
# connect 7 0 19 0 0 F 0 0 17
# connect 7 0 20 0 0 F 0 0 18
# connect 7 0 21 0 0 F 0 0 19
# connect 7 0 22 0 0 F 0 0 20
# connect 7 0 23 0 0 F 0 0 21
# connect 7 0 24 0 0 F 0 0 22
# connect 7 0 25 0 0 F 0 0 23
# connect 7 0 26 0 0 F 0 0 24
# connect 7 0 27 0 0 F 0 0 25
# connect 7 0 28 0 0 F 0 0 26
# connect 7 0 29 0 0 F 0 0 27
# connect 7 0 30 0 0 F 0 0 28
# connect 7 0 31 0 0 F 0 0 29
```

BSMI Service

Use the BSMI Service when you use an ISDN/ECCAPI connection and your software uses the Brooktrout SDK version 2.1.x.

Note: BSMI service is not valid if your system uses robbed bit signaling in the USA.

Setting Up the BSMI Service

To setup the BSMI Service, follow this sequence of tasks:

1. Install the BSMI Service.
2. Start the BSMI Service manually or automatically.
3. Check port status.
4. Remove the BSMI Service (optional).

Note: Before you start the BSMI Service, ensure that your:

- TR1034 board is installed.
- BOSTON driver is installed and started.
- Firmware is downloaded to the board.

The BSMI Service must be running at all times when you are using ISDN signaling.

Each time you restart the BSMI service, you need to download the firmware. See *Downloading the Firmware* on page 8 for instructions.

Installing the BSMI Service

The BSMI service should already have been installed by your LAN Fax application. However, if you need to install the service, do the following:

1. Open a Command Prompt window. Go to the BSMI server directory:

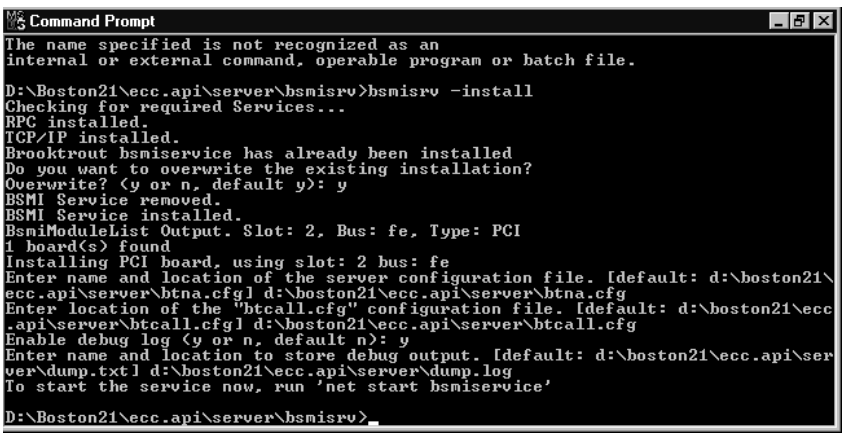
   `cd \boston\ecc.api\server\bsmisrv`

All file and directory locations in this section could be changed by your LAN Fax software provider. If you cannot find the files in the locations below, consult your LAN Fax software documentation for the location of the service.

2. Enter the following command to install the BSMI server:

   `bsmisrv -install`

   The following screen displays the process for defining file locations and installation parameters.



3. Enter the directory path and file name of the server configuration file:

   `c:\boston\ecc.api\server\btna.cfg`

4. Enter the directory path of the *btcall.cfg* configuration file:

   ```
   c:\boston\ecc.api\server\btcall.cfg
   ```

Note: Parameters in the btcall.cfg that are set to filenames need to contain absolute paths to the filename. For example, when using the *teleph.cfg* parameter, enter:

```
teleph c:\boston\ecc.api\server\teleph.cfg
```

5. Answer Y or N to enable debugging and the creation of a log file or not.

   If you answer Y, enter the path for the location of the new log file.

   The log file is generally called dump.txt and provides information about the ISDN line status.

Starting BSMI

The BSMI service is located under the ecc.api/server directory.

Start the service under Services or as a console application by entering the following at a console window:

```
net start bsmisrv
```

In debug mode, enter the following at the command prompt from the directory where *bsmisrv.exe* is located:

```
bsmisrv -d 2
```

Make sure your *btna.cfg* and *teleph.cfg/btcall.cfg* files are configured correctly before starting the bsmiservice.

For results, check the log file.

If the log file results were not successful, the problem could be one of the following:

- Default configuration files which are wrong for E1
- LEDs wrong (for example, both LEDs are off)
- The application could not find the configuration files

Ensuring that the Board is Working

Brooktrout strongly recommends that you test your TR1034 board after you install it. There are two ways the board can be tested:

- If you are installing Brooktrout software and writing your own application, successfully running the sample application verifies your board is working correctly.

  Refer to the installation instructions and the release notes that came with your Brooktrout API for more information on installing the Brooktrout software and firmware.
- If you plan to install software from another vendor, first run the Brooktrout *Faxdiag* program to test the board installation – instructions for running this program are explained in Chapter 3, *"Testing"*, on page 71.

Configuring Your TR1034 Board using Brooktrout Software Version 3.0.x

This chapter explains how to configure the TR1034 boards and how to change the parameters that are set in the Software Development Kit (SDK) version 3.0.x based software.

Before configuring your board, install your TR1034 and connect your phone service to it following the instructions in the hardware installation guide included with the board.

This chapter includes the following activities:

- Setting up Brooktrout Firmware, Software, and Configuration Files
- Loading the Driver and Initializing the TR1034
- Updating Firmware Files
- Configuring Your LAN Fax Software
- Configuring T1 Robbed Bit Systems
- Configuring ISDN T1 Systems
- Configuring ISDN E1 Systems
- Ensuring that the Board is Working

Setting up Brooktrout Firmware, Software, and Configuration Files

See your LAN Fax application user manual for instructions on installing and configuring your LAN Fax software. The LAN Fax software provides a Brooktrout driver and firmware. After you have set up your LAN Fax software to support the TR1034, you can begin sending and receiving faxes using that software.

Defining the TR1034 SDK Version Supplied With Your LAN Fax Application

You need to know which version of the TR1034 (SDK) supports your LAN Fax application because

- When you configure your board software, there are different configuration files and parameters for the different versions.
- If you need product support, Brooktrout Tech Support needs to know which version of the TR1034 SDK your LAN-fax application uses to support your TR1034.
- If you need to use a diagnostic tool, different versions of the tool support different SDK versions.

Check for that information using the following procedure:

1. On the computer system where the TR1034 board(s) are installed, do a file search for a file named *boston.sys*.

   To do a file search in Windows, go to Start→ Search For Files or Folders, enter the name of the file, and click Search.

   Boston.sys is the driver file that the application provides to support the TR1034 platform.
2. When the *boston.sys* file is located, move your mouse cursor over the name and right-click your mouse.

   Some selections appear.
3. Choose Properties.

4. When the Properties window opens, left-click the Version tab, and see what version is reported.
   - If your version says “4.5.x”, then your application is using TR1034 SDK 2.1.x.
   - If your version says “4.6.x”, then your application is using TR1034 SDK 3.0.x.

If your search displays more than one *boston.sys* driver file loaded on your system, check with the support group or documentation of your LAN-fax application to find out which *boston.sys* file their application uses to communicate with your TR1034 board(s).

Process Overview

Use the following general steps to configure your board:

1. Installing the driver (page 41)
2. Starting the driver (page 41)
3. Downloading firmware (page 44)
4. Configuring your LAN Fax SW (page 45 and following)

Loading the Driver and Initializing the TR1034

Installing the Driver

When you install your LAN Fax software, the Brooktrout driver should be automatically installed.

Starting the Driver

The Brooktrout *Boston* driver starts when you start up your computer.

To manually start the driver, from a command (DOS prompt) window, type:

```
net start boston
```

To manually stop or shut down the driver, from a command (DOS prompt) window, type:

```
net stop boston
```

Updating Firmware Files

When you install your LAN Fax software, Brooktrout drivers and firmware are installed. Normally you don't have to update these files.

The following table lists the firmware and flash update files. Whether you are a T1 or E1 user, the file names and uses are the same.

Filename	Definition
cp.bin	Control processor (PPC) firmware for all platforms
bootdsp.hex	DSP boot loader
dsp1000_v34.hex	TR1034 DSP firmware for V.34 fax
flashupd.bin	Boot ROM flash update firmware

Boot ROM Flash Updates

The flash firmware is firmware that remains on the board even after powering down the system. It contains major board characteristics and settings.

Your LAN Fax software typically provides the latest boot ROM flash firmware along with the firmware files listed on page 42.

If you need to download the flash firmware to bring the flash version on your board to the same level as your LAN Fax software, you can do a one-time flash download as part of the installation process. To download the flash, use the following procedure:

1. If it is not already set, set the switch on each PCI board to a value in the range of 2 through F. Each board must have a unique value (the board's module ID number).
2. Search your computer for the following files:
   - *firm.exe*
   - *flashupd.bin*

   If you don't find these files, call Brooktrout Technical Support.

   Make sure *flashupd.bin* is in the same directory as *firm.exe*. Do not begin this process with the application running.
3. Use the *firm* program to perform a flash update (do not interrupt the update process). Enter the following:

   ```
   net stop boston
   net start boston
   firm -m <module> -t 2 flashupd.bin
   ```

   For PCI boards, <*module*> is the board module number as set by the rotary switch.

This process takes less than a minute to complete. Do not interrupt the update process or the board might not reboot. In this case, failure to comply renders the board unusable and requires a factory RMA to fix the board. Brooktrout will not issue an advance replacement RMA.

Downloading the Firmware

Your LAN Fax software downloads the firmware each time you boot the machine or restart the device driver. To download the firmware, if necessary, use the following procedure:

1. Search for the script *firmload.bat* on your system.
2. Verify that DSP firmware with postfix V.34 is used.
3. Run the firmload script by entering the following at a command line:

   `firmload -c 30 <firmware directory>`
   where <*firmware directory*> identifies the location of the firmware files on your system.

It should take about 20 seconds for the TR1000 firmware to download and for the board to begin operating. Proper operation is indicated by the board status LED alternating off for two seconds and green for two seconds.

If you use the TR1034 with LAN Fax server applications, refer to the documentation accompanying the application software. In most cases, the firmware is already included with the software you received from the LAN Fax software vendor and no further installation is required.

Configuring Your LAN Fax Software

Your software vendor supplies default configuration files. Use them to configure your LAN Fax software. Review the following sections to identify possible changes you might need to make:

- *Configuring T1 Robbed Bit Systems* on page 46
- *Configuring ISDN T1 Systems* on page 53
- *Configuring ISDN E1 Systems* on page 60

Each section provides configuration information for the following configuration files:

Call Control file
- *ecc.cfg*

User configuration file
- *btcall.cfg*

Telephony file
- *teleph.cfg*

Use the default configuration files supplied by your software vendor. The sections below provide information about parameters that you might need to set and samples of the configuration sections of these files. Except for the listed parameters, the default values should work for your system.

See *Defining the TR1034 SDK Version Supplied With Your LAN Fax Application* on page 38 to understand which version of the Brooktrout API your LAN Fax software is based on.

Configuring T1 Robbed Bit Systems

The following sections provide configuration details for a T1 Robbed Bit system.

Configuring Call Control Parameters for T1 Robbed Bit Systems

You might need to set values in the *ecc.cfg* file for the following parameters in the *ecc.cfg* file.

ecc_signalling_mode

Specifies the ECC operation mode

Values:

0 = robbed-bit (Default)

Using the default is safe, although it might not be necessary since the *ecc.cfg* file might not be used for Robbed Bit T1.

module number

Module identification numbers range from 2 through F. Use span 0 because there is only one span per board.

Example 1. Call Control Configuration Information

```
# Sample of T1-RB version of ECC.CFG file
#
# module numbers start with 2
# span numbers start with 0
#
# configured for T1 RB
#

ecc_signalling_mode 0

[module 2 span 0]
[end]
```

Configuring User Configuration Parameters for T1 Robbed Bit Systems

You will probably need to set values in the *btcall.cfg* file for the following parameters:

debug

If this keyword is present, API debug mode will be enabled after the first channel is reset by the software *if debug mode is not already enabled by the application.* An optional filename might be specified to set up a debug function to send output to the specified file if a debug function was not already set by the application.

Value Type: string

Default: disabled, stdout

did_digits

Specifies the number of DID digits to capture. If the software detects less than the specified number of DID digits, the board terminates the call and returns a "Reorder Tone" (fast busy) to the network.

The maximum number is 63.

Value Type: decimal

Default: 4

teleph

Defines the name of the telephony configuration file that contains telephony hardware configuration information and static telephony connection information.

If the file specified by the *teleph* keyword is present, then the file specified by the *digital* keyword will not be used. If not, then the software also checks for the *digital* keyword file.

Value Type: character string

Default: *teleph.cfg*

Example 2. User configuration section for T1 Robbed Bit

```
did_digits 4
country_code 0010
ced_timeout 6000
nrings 1
teleph C:\boston\ecc.api\server\teleph.cfg
debug \temp\btlog.txt
```

Configuring Telephony Parameters for T1 Robbed Bit Systems

You might need to set a value in the *teleph.cfg* file for the following parameters:

ds1_line_type

Specifies a framing type.

Valid Values

2 = Extended SuperFrame DS1 (T1) (Default for T1).

3 = AT&T D4 format Ds1 (T1). (also known as SuperFrame)

0x02 (Extended SuperFrame DS1) is the default.

line_coding

Specifies the line coding scheme on the line.

2 = B8ZS

5 = AMI

Default = B8ZS

line_encoding

Specifies A-law/μ-law line encoding.

Requires a firmware reload to change.

1 =μ-Law (USA) (default)

port_type

Hardware port type (this is the value after "unit 1"), one of the following (value is hex):

40 or 100 = T1

sig_prot

Specifies the T1 robbed-bit signaling protocol.

0 = E&M (AT&T PUB 43801) Wink.

1 = E&M (AT&T PUB 43801)

Immediate (E&M Wink).

signal_mode

Specifies signal modes.

2 =Robbed Bit.

t1_line_build_out — Defines the T1 framer waveform configuration.

Values for T1:

0 = 0_133 (Default)

1 = 133_266

2 = 266_399

3 = 399_533

4 = 533_655

Example 3. Telephony configuration section for T1 Robbed Bit

```
# Sample TELEPH.CFG file for RBS-T1 line (teleph_hp02h_t1.cfg)


# ********** Module 0 **********

# Module 0 represents the default settings for all modules in the system
# unless a module section is defined for a specific board.
# Valid settings are 2 through F.
# Each board in a system must have a unique number.

module 0

unit 0 20 line_encoding=1 bus_speed=8 bus_clock=0 h110_master_drive=0
      h110_master_ref=0 h110_master_ref_fallbk=10

unit 1 40 line_encoding=1 signal_mode=2 sig_prot=0 ds1_line_type=2
      clock_config=1 line_loopback=1 fac_data_link=1 t1_line_build_out=0
      line_coding=2
```

Example 3. Telephony configuration section for T1 Robbed Bit (Continued)

```
# Connections for Telephony Unit 1
connect 7 0  2 0 0 F 0 0  0
connect 7 0  3 0 0 F 0 0  1
connect 7 0  4 0 0 F 0 0  2
connect 7 0  5 0 0 F 0 0  3
connect 7 0  6 0 0 F 0 0  4
connect 7 0  7 0 0 F 0 0  5
connect 7 0  8 0 0 F 0 0  6
connect 7 0  9 0 0 F 0 0  7
connect 7 0 10 0 0 F 0 0  8
connect 7 0 11 0 0 F 0 0  9
connect 7 0 12 0 0 F 0 0 10
connect 7 0 13 0 0 F 0 0 11
connect 7 0 14 0 0 F 0 0 12
connect 7 0 15 0 0 F 0 0 13
connect 7 0 16 0 0 F 0 0 14
connect 7 0 17 0 0 F 0 0 15
connect 7 0 18 0 0 F 0 0 16
connect 7 0 19 0 0 F 0 0 17
connect 7 0 20 0 0 F 0 0 18
connect 7 0 21 0 0 F 0 0 19
connect 7 0 22 0 0 F 0 0 20
connect 7 0 23 0 0 F 0 0 21
connect 7 0 24 0 0 F 0 0 22
connect 7 0 25 0 0 F 0 0 23
```

Configuring ISDN T1 Systems

The following sections provide configuration details for an ISDN T1 system.

Configuring Call Control Parameters for ISDN T1 Systems

You will need to set values in the *ecc.cfg* file for the following parameters:

ecc_signalling_mode

Specifies the ECC operation mode by choosing this option:

1 = ISDN

module number

Module identification numbers range from 2 through F. Use span 0 because there is only one span per board.

call_type

Outbound call type.

99 = First attempt call type is 3.1k Audio. If this fails with a cause value greater than 34, retry with type speech. This is a worldwide option.

0 = Speech

1 = 3.1 kHz audio (aLaw-outside US)

Default = 99

switch_type

Central Office/PABX switch type. Use only with PRI.

Default: 0 -AT&T #4 ESS

Value	Description
0	AT&T #4 ESS (Default)(recommended US)
1	AT&T #5 ESS
2	Northern Telecom DMS-100
3	Northern DMS-250
4	Ericsson MD-110 (North America)
5	Ericsson MD-110 (International)
6	Siemens (North America)
7	Japan
8	Other

Example 4. Call control configuration section for ISDN T1

```
#
# module numbers start with 2
# span numbers start with 0
#
# configured for T1 PRI
#

ecc_signalling_mode 1

[module 2 span 0]
switch_type 0
variant_type 0
call_type 99
[end]
```

Note: If you have a custom setup for switch_type and variant_type (for example YESS/At&T), your setup might have different values. Refer to your LAN Fax documentation for specific details.

Configuring User Configuration Parameters for ISDN T1 Systems

You might need to set values for the following parameters in the *btcall.cfg* file:

debug

If this keyword is present, API debug mode will be enabled after the first channel is reset by the software *if debug mode is not already enabled by the application.* An optional filename might be specified to set up a debug function to send output to the specified file if a debug function was not already set by the application.

Value Type: string

Default: disabled, stdout

debug_control e b

Turns on ISDN tracing in addition to the API debug logging (debug keyword in the user defined configuration file). This parameter only takes effect when the `debug` keyword in *btcall.cfg* takes effect (when the application has not already turned on Brooktrout API debugging). The ISDN debug information will be added to the API debug log file also, when the API debug feature is turned on by the application. Use this parameter only to test the installation.

This parameter should never be used, unless explicitly directed to do so by Technical Support.

did_digits

Number of DID digits to capture. If the software detects less than the specified number of DID digits, the board terminates the call and returns a "Reorder Tone" (fast busy) to the network.

The maximum number is 63. This parameter is applicable for the ISDN Called Party Number.

Value Type: decimal

Default: 4

teleph

Defines the name of the telephony configuration file that contains telephony hardware configuration information and static telephony connection information.

If the file specified by the *teleph* keyword is present, then the file specified by the *digital* keyword will not be used. If not, then the software also checks for the *digital* keyword file.

Value Type: character string

Default: *teleph.cfg*

Example 5. User configuration section for ISDN T1

```
did_digits 4
country_code 0010
ced_timeout 6000
nrings 1
teleph C:\boston\ecc.api\server\teleph.cfg
debug \temp\btlog.txt
debug_control e b
```

Configuring Telephony Parameters for ISDN T1 Systems

On the TR1034, ISDN B channels can be mapped to the fax channels by the application, or (more commonly) using connect lines in this configuration file.

You will probably need to set a value for the following parameters in the *teleph.cfg* file:

ds1_line_type

Specifies a framing type.

Valid Values

2 = Extended SuperFrame DS1 (T1) (Default for T1).

3 = AT&T D4 format Ds1 (T1). (also known as SuperFrame)

0x02 (Extended SuperFrame DS1) is the default.

line_coding

Specifies the line coding scheme on the line.

2 = B8ZS

5 = AMI

Default = B8ZS

line_encoding

Specifies A-law/μ-law line encoding.

Requires a firmware reload to change.

1 = μ-Law (USA) (default)

port_type

Hardware port type (this is the value just after "unit 1"), enter the following (value is hex):

40 or 100 = T1

sig_prot

Specifies the signaling protocol.

255 = no inboard signaling

signal_mode

Specifies signal modes.

4 = message oriented (T1 or E1)

t1_line_build_out — T1 framer waveform configuration.

Values for T1:

0 = 0_133 (Default)

1 = 133_266

2 = 266_399

3 = 399_533

4 = 533_655

Example 6. Telephony configuration section for ISDN T1

```
# Sample TELEPH.CFG for PRI-T1 line (teleph_hp02h_t1_isdn.cfg)



# ********** Module 0 **********

# Module 0 represents the default settings for all modules in the system
# unless a module section is defined for a specific board.
# Valid settings are 2 through F.
# Each board in a system must have a unique number.

module 0

unit 0 20 line_encoding=1 bus_speed=8 bus_clock=0 h110_master_drive=0
      h110_master_ref=0 h110_master_ref_fallbk=10

unit 1 40 line_encoding=1 signal_mode=4 sig_prot=255 ds1_line_type=2
      clock_config=1 line_loopback=1 fac_data_link=1 t1_line_build_out=0
      line_coding=2
```

Example 6. Telephony configuration section for ISDN T1 (Continued)

```
# Connections for Telephony Unit 1
connect 7 0  2 0 0 F 0 0  0
connect 7 0  3 0 0 F 0 0  1
connect 7 0  4 0 0 F 0 0  2
connect 7 0  5 0 0 F 0 0  3
connect 7 0  6 0 0 F 0 0  4
connect 7 0  7 0 0 F 0 0  5
connect 7 0  8 0 0 F 0 0  6
connect 7 0  9 0 0 F 0 0  7
connect 7 0 10 0 0 F 0 0  8
connect 7 0 11 0 0 F 0 0  9
connect 7 0 12 0 0 F 0 0 10
connect 7 0 13 0 0 F 0 0 11
connect 7 0 14 0 0 F 0 0 12
connect 7 0 15 0 0 F 0 0 13
connect 7 0 16 0 0 F 0 0 14
connect 7 0 17 0 0 F 0 0 15
connect 7 0 18 0 0 F 0 0 16
connect 7 0 19 0 0 F 0 0 17
connect 7 0 20 0 0 F 0 0 18
connect 7 0 21 0 0 F 0 0 19
connect 7 0 22 0 0 F 0 0 20
connect 7 0 23 0 0 F 0 0 21
connect 7 0 24 0 0 F 0 0 22
```

Configuring ISDN E1 Systems

The following sections provide configuration details for an ISDN E1 system.

Configuring Call Control Parameters for ISDN E1 Systems

You will probably need to set a value for the following parameter in the *ecc.cfg* file:

ecc_signalling_mode	ECC operation mode 1 = ISDN
network	Specifies control of the network Valid Values 1 = network master 0 = slave Default: 0
call_type	Outbound call type. 99 = First attempt call type is 3.1k Audio. If this fails with a cause value greater than 34, retry with type speech. This is a worldwide option. 16 = Voice call (aLaw-outside US) (E1 voice-only applications) 17 = 3.1 kHz audio (aLaw-outside US) Default = 99
switch_type	PBX switch type. Use only with PRI. 8 = other (European Option)
variant_type	PBX variant type. 6 = PRI only Euro-ISDN
[end]	End of module/span parameters N/A

Example 7. Call control configuration section for ISDN E1

```
#
# module numbers start with 2
# span numbers start with 0
#
# configured for E1 PRI
#

ecc_signalling_mode 1

[module 2 span 0]
switch_type 8
variant_type 6
call_type 99
[end]
```

Configuring User Configuration Parameters for ISDN E1 Systems

You will probably need to set a value for the following parameters in the *btcall.cfg* file:

debug

If this keyword is present, API debug mode will be enabled after the first channel is reset by the software *if debug mode is not already enabled by the application*. An optional filename might be specified to set up a debug function to send output to the specified file if a debug function was not already set by the application.

Value Type: string

Default: disabled, stdout

debug_control e b

Turns on ISDN tracing in addition to the API debug logging (debug keyword in the user defined configuration file). This parameter only takes effect when the `debug` keyword in *btcall.cfg* takes effect (when the application has not already turned on Brooktrout API debugging). The ISDN debug information will be added to the API debug log file, when the API debug feature is turned on by the application. Use this parameter only to test the installation.

This parameter should never be used, unless explicitly directed to do so by Technical Support.

did_digits

Specifies the number of DID digits to capture. If the software detects less than the specified number of DID digits, the board terminates the call. Set the `did_digits` parameter to the total number of digits that you expect to receive; this setting works in all circumstances.

DID behavior also depends on the value of the configuration file variable *did_variable*.

Value Type: decimal

Default: 4

When sending digits using the en-block method, the application passes the whole number in a single group. Most installations receive DID digits in this way.

If you receive DID digits en-block, set the `did_digits` parameter to the expected number of digits and the `did_variable` parameter to 0. Setting `did_digits` to a value less than the expected number of DID digits causes only the trailing digits to be passed. For example, if the network sends 1234567 as the called party number and `did_digits` is set to 3, the board returns 567 to the application. Setting `did_digits` to a value greater than the number of digits you receive causes the TR1034 board to reject the call.

did_variable

Sets the requirements for DID call detection based on the line parameter value *did_digits* and the interdigit time limit.

0 = The board detects a DID call only when it receives the number of decimal digits specified by *did_digits*.

1 = The board terminates the digits and detects a DID call when it receives the number of decimal digits specified by *did_digit* or when the interdigit time limit expires. If *did_digits* is 0, the maximum value for *did_digits* increases to 127 digits, and termination occurs based only on the time-out.

Value Type: decimal

Default: 0

When sending digits using the overlap receiving method, the application passes the DID digits grouped into separate messages. Overlap receiving is found in the following circumstances:

- The public network in some countries, notably Germany, Austria, and Italy, allows a user-defined variable number of sub-address DID digits.
- When the supplemental service is DID and the data link is point-to-point.
- When the caller is dialing using overlap sending.

If you receive DID digits in overlap receiving mode and the number of digits you might receive are variable, set the `did_digits` parameter to the maximum you expect to receive and

set the `did_variable` parameter to 1. When the `did_variable` parameter is set to 1, the board operates with a 5-second interdigit time-out.

teleph

Defines the name of the telephony configuration file that contains telephony hardware configuration information and static telephony connection information. You must specify the full pathname of the file.

If the file specified by the *teleph* keyword is present, then the file specified by the *digital* keyword will not be used. If not, then the software also checks for the *digital* keyword file.

Value Type: character string

Default: *teleph.cfg*

Example 8. User configuration file configuration section for ISDN E1

```
did_digits 3
did_variable 0
country_code 0010
ced_timeout 6000
nrings 1
teleph C:\boston\ecc.api\server\teleph.cfg
debug \temp\btlog.txt
debug_control e b
```

Configuring Telephony Parameters for ISDN E1 Systems

The general format of the file is:

```
module mod_num
unit unit_num port_type [name=value name=value
...]
unit unit_num port_type [name=value name=value
...]
...
[
connect conn_mode src_port_class src_unit src_
stream
src_slot dest_port_class ...
connect conn_mode src_port_class src_unit src_
stream
src_slot dest_port_class ...
...
]
```

You will probably need to set a value for the following parameters in the *teleph.cfg* file:

clock_config

Defines the transmit clock source.

1 = Loop timing: T1/E1 controller is slave to the network (Default).

2 = Local timing: local T1/E1 controller is master.

	If you set the value of clock_config to 1, set `h110_master_ref` to 0 and change the value of the network parameter in *ecc.cfg* file (set to 0). If you set the value of clock_config to 2, set `h110_master_ref` to 128 and change the value of the network parameter in *ecc.cfg* file (set to 1).
ds1_line_type	Defines the DS1 line type. 4 = Multiframing with Si=FEBE (E1) (Default for E1). 5 = Basic framing with no CRC4, Si=1 (E1).
h110_master_ref	For a master, the clock reference source. 0 = Span A (Default), the first T1/E1 interface is the Master clock reference source 128 = Source clock from Internal Oscillator To have the TR1034 board act as a network end, set this parameter, change the clock config value to 2 and the network value (in the *ecc.cfg* file) to 1. Use this configuration only for test purposes.
line_coding	Specifies the line coding scheme on the line. 3 =HDB3
line_encoding	Specifies A-law/μ-law line encoding. Requires a firmware reload to change. 0 = A-Law (Europe) (Default for E1)
module number	Module identification numbers range from 2 through F. Use span 0 because there is only one span per board.
port_type	Hardware port type, one of the following (value is hex): 80 = PRI E1 200 = PRI E1
signal_mode	Specifies signal modes.

4 = Message oriented (T1 or E1)

t1_line_build_out — T1 framer waveform configuration.

Values for E1:

0 = 75_OHM

1 = 120_OHM (Default)

unit number — Hardware port unit number, starting from 0. Unit 0 stands for the H.100 bus and Unit 1 for the one PRI port on the TR1034.

Note: On the TR1034, ISDN B channels can be mapped to the fax channels by the application, or (more commonly) using connect lines in this configuration file.

Example 9. Telephony file configuration section for E1 PRI

```
# Sample TELEPH.CFG for PRI-E1 line (teleph_hp02h_e1_isdn.cfg)



# ********** Module 0 **********

# Module 0 represents the default settings for all modules in the system
# unless a module section is defined for a specific board.
# Valid settings are 2 through F.
# Each board in a system must have a unique number.

module 0

unit 0 20 line_encoding=0 bus_speed=8 bus_clock=0 h110_master_drive=0
      h110_master_ref=0 h110_master_ref_fallbk=10

unit 1 80 line_encoding=0 signal_mode=4 sig_prot=255 ds1_line_type=4
      clock_config=1 t1_line_build_out=1
      line_coding=3
```

Example 9. Telephony file configuration section for E1 PRI

```
# Connections for Telephony Unit 1
connect 7 0  2 0 0 F 0 0  0
connect 7 0  3 0 0 F 0 0  1
connect 7 0  4 0 0 F 0 0  2
connect 7 0  5 0 0 F 0 0  3
connect 7 0  6 0 0 F 0 0  4
connect 7 0  7 0 0 F 0 0  5
connect 7 0  8 0 0 F 0 0  6
connect 7 0  9 0 0 F 0 0  7
connect 7 0 10 0 0 F 0 0  8
connect 7 0 11 0 0 F 0 0  9
connect 7 0 12 0 0 F 0 0 10
connect 7 0 13 0 0 F 0 0 11
connect 7 0 14 0 0 F 0 0 12
connect 7 0 15 0 0 F 0 0 13
connect 7 0 16 0 0 F 0 0 14
connect 7 0 17 0 0 F 0 0 15
connect 7 0 18 0 0 F 0 0 16
connect 7 0 19 0 0 F 0 0 17
connect 7 0 20 0 0 F 0 0 18
connect 7 0 21 0 0 F 0 0 19
connect 7 0 22 0 0 F 0 0 20
connect 7 0 23 0 0 F 0 0 21
connect 7 0 24 0 0 F 0 0 22
connect 7 0 25 0 0 F 0 0 23
connect 7 0 26 0 0 F 0 0 24
connect 7 0 27 0 0 F 0 0 25
connect 7 0 28 0 0 F 0 0 26
connect 7 0 29 0 0 F 0 0 27
connect 7 0 30 0 0 F 0 0 28
connect 7 0 31 0 0 F 0 0 29
```

Ensuring that the Board is Working

Brooktrout strongly recommends that you test your TR1034 board after you install it. There are two ways the board can be tested:

- If you are installing Brooktrout software and writing your own application, successfully running the sample application verifies your board is working correctly.

  Refer to the installation instructions and the release notes that came with your Brooktrout API for more information on installing the Brooktrout software and firmware.
- If you plan to install software from another vendor, first run the Brooktrout *testnt* program to test the board installation – this is explained in Chapter 3, *"Testing"*, on page 71.

3 Testing

This chapter explains how to test your TR1034 installation using Brooktrout's configuration and diagnostic software. If you did not receive a diskette or CD with the test software, you can download a copy of the test program from the Brooktrout web site. For information about downloading the test program or other software, see *Installing the Application* on page 74.

If you have already installed your LAN Fax application, you might want to try to use the LAN Fax application to test your board(s). If things work, then you will not need to proceed with this test application. If you have not installed your LAN Fax application, then using this test application first should be an efficient and easy approach to testing.

Use the windows-based test program to test up to 30 channels simultaneously on one or more Brooktrout boards in a Windows NT or Windows 2000 server.

- About the Hardware Test Application
- Installing the Application
- Starting up the Test Program
- Configuring the Test Software
- Running the Test Software

About the Hardware Test Application

The TR1034 is an intelligent one span/port v.34 capable fax board that supports LAN Fax applications. It works with T1 Robbed-bit, T1 ISDN, and E1 ISDN digital telephony lines. Applications written to use this board are created using the Brooktrout Bfv API (and the Enhanced Call Control API if ISDN functionality is required). This API code is either linked directly into the application itself (static linking) or available to be loaded dynamically via DLLs which would need to be included with the application installation.

The hardware test links the API code, so no DLLs are required. In addition, it supplies a driver to communicate between the Bfv API function call being made in the application and the firmware on the board. The most recent firmware is also available in the test software package to be downloaded to the board before running the test.

Brooktrout has provided two versions of this tool for different API/driver versions:

SDK version	Driver Version	API Version	Tool Version
2.1.1	4.5.6	4.5.3	2.0-45
3.0.1/3.0.3	4.6.5	4.6.3	2.0-46

If you have not installed a LAN Fax software application: Use version 2.0-46 of the test product that installs the driver into Windows and provides all necessary files.

If you have an installed LAN Fax software application created using Bfv, do the following to determine the driver version: Search your computer for the *boston.sys* file. Right click on the filename and select Properties. Select the Version tab and check the version number. If the driver version is 4.6.5, use version 2.0-46 of the test product. If the driver version is 4.5.6, use version 2.0-45 of the test product.

If you don't know which driver version your application is based on, run the test tool to see if the software is compatible. If your LAN Fax software driver is not compatible, the tool tells

you to run the other version of the program. Start with one based on 2.0-46, as it is more likely that your application is based on that version.

Installing the Application

This section describes how to access, install, and configure product files. It has the following section:

- Checking the Installed Files
- Operating Notes
- About Using This Software

You might have received the Brooktrout Hardware Test files on a CD that came with your board. If you did not get the files on a CD, you can download a self-extracting zip file from the web by doing the following:

1. Go to the Brooktrout website (*www.brooktrout.com*).
2. Select Support.
3. Select TR1034.
4. Select Download.
5. Click Hardware Diagnostic Test for Windows.
6. Select FaxDiag_TR1034.exe to download the file.
7. Save the file to an empty directory.
8. Double click the file to extract the test files to the current directory.

Checking the Installed Files

After extracting the hardware test tool, the following files are present:

Files for Version 2.0-46

boston.sys	Boston driver v4.6.5 (right click to view properties in File Manager)
bt_cparm.cfg	Country configuration file. Do not change this file.
btcall.cfg	User configuration file. Change this file if you need to define a different number of called digits.
FaxDiag.exe	The test program
install.exe	Use this program to uninstall the driver if the hardware test tool installed it (See *results.txt* file to see if the driver was installed if you don't remember seeing it on the display.)
Msg.txt	File providing text messages displayed by the test program
test.ips	One page test fax file in Brooktrout packet format
test_bootdsp.hex test_cp.bin test_dsp1000_ v34.hex	Standard firmware files, prefixed with word “test_”. The files are the same ones used by an actual installation.
	Additional files that might be created:
Results.txt	General troubleshooting log for the test application
logXX.txt	Troubleshooting log for each channel (also called the api debug logs)
ecclog.txt	Enhanced Call Control layer troubleshooting log
dh.log	Dump history troubleshooting log
log_driver.txt	Driver troubleshooting log
log_isdn.txt	ISDN only layers 2 and 3 trace troubleshooting log
teleph.cfg	Telephony configuration file (make changes to this file using a text editor only under the direction of Brooktrout Support.)

ecc.cfg	ECC configuration file (make changes to this file using a text editor only under the direction of Brooktrout Support.)

Files for Version 2.0-45

bt_cparm.cfg	Country configuration file. Do not change this file.
btcall.cfg	User configuration file. Change this file if you need to define a different number of called digits.
FaxDiag.exe	The test program
Msg.txt	File providing text messages displayed by the test program
test_bootdsp.hex test_cp.bin test_dsp1000_ v34.hex	Standard firmware files, prefixed with word "test_". The files are the same ones used by an actual installation.
test.ips	One page test fax file in Brooktrout packet format
	Additional files that may be created:
Results.txt	General troubleshooting log for the test application
logXX.txt	Troubleshooting log for each channel (also called the api debug logs)
ecclog.txt	Enhanced Call Control layer troubleshooting log
dh.log	Dump history troubleshooting log
log_driver.txt	Driver troubleshooting log
log_isdn.txt	ISDN only layers 2 and 3 trace troubleshooting log
teleph.cfg	Telephony configuration file (make changes to this file using a text editor only under the direction of Brooktrout Support.)
btna.cfg	This ECC configuration file is named and located as specified in the Windows Registry for the ECC component of your current LAN Fax application (edit this file only when troubleshooting with Technical Support). **Note:** *btna.cfg* will only be created if you select ISDN call control.

In the case of 2.0-45, there is a Windows service component called BSMIService that must be previously installed in your system if you want to do ISDN call control. Check with your LAN Fax application vendor if you do not find this component.

Operating Notes

You might need to modify the following keyword entries in the *btcall.cfg* user configuration file in certain setups as outlined below. Make these changes before starting up the test application.

did_digits

Specifies the number of DID digits to capture. Should be set to the total number of digits that you ever expect to receive - this works in all circumstances.

The parameter is applicable for T1 DNIS and the ISDN called party number.

DID behavior also depends on the value of the did_variable keyword.

This parameter might be needed for E1 PRI installations.

did_variable

Sets the requirements for DID call detection based on the line parameter value did_digits and the interdigit time limit.

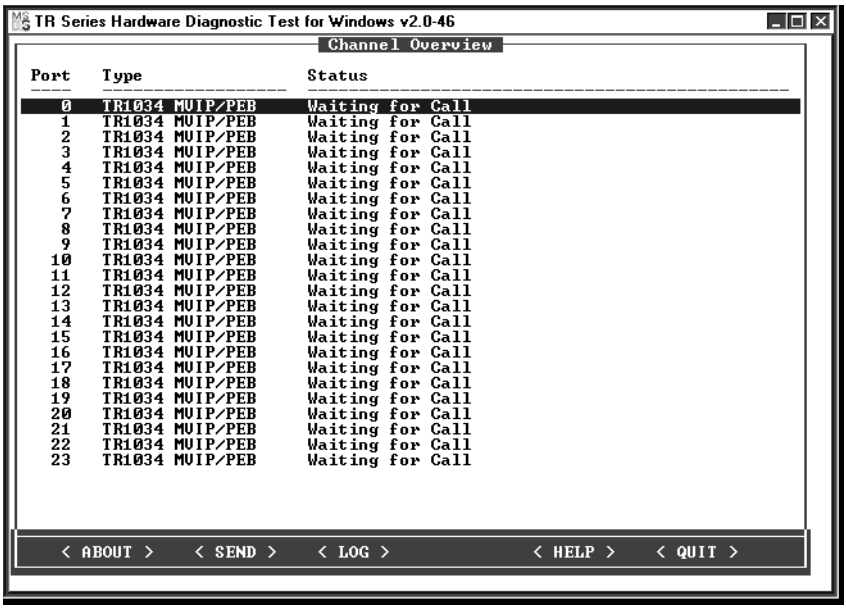
0 = the board detects a DID call only when it receives the number of decimal digits specified by did_digits. This setting is always used in case of en-block receiving, which means that the whole number is passed in a single group. The call is terminated if the specified number of DID digits is not detected, which means that you have set did_digits too high.

1= the board terminated the digits and detects a DID call when it receives the number of decimal digits specified by did_digits or when the interdigit time limit expires. If did_digits is 0, the maximum value for did_digits increases to 127 digits, and termination occurs based only on the time-out. Needed when you expect to receive a variable number of digits. You must make sure that you set did_digits high enough.

About Using This Software

Using the Main Window

After installing and starting the hardware test product, the following screen provides access to most product functions. It lists all ports on the board you selected and provides port status.



Using the Buttons on the Screens

For the buttons listed on the bottom of any window, a single mouse click activates the button.

About — The ABOUT button provides information including the version number of the driver and describes how to contact Brooktrout Technical Support.

Send — The SEND button lets you send a fax again.

Cancel

The CANCEL button or the Esc key brings you back to the Channel Overview screen.

Help

The HELP button gives further information about what you can do in the Status History screen.

Log

The LOG button creates a log file that records the send/receiving activities for each channel used. If you have problems sending and receiving faxes, click the LOG button before using the channel. Logs are created for each fax sent or received until the LOG button is clicked again. Look for the logs as *logxx.txt* files in the current directory. To disable the LOG command, click LOG again and following the instructions on the screen.

Quit

The QUIT button closes the test utility. See *Stopping the Test Program* on page 95 for more details about closing the program.

Mouse Properties for Windows 2000 Systems

For Windows 2000 systems only, you might have to change the mouse properties.To change mouse properties, do the following:

1. Position the mouse arrow on the blue line at the top of the test window.
2. Right click.
3. When the window appears, uncheck QuickEdit Mode and Insert Mode.
4. Click Okay.

Plug and Play Drivers for Windows 2000

For Windows 2000 systems only: Future releases of the Boston driver might be plug and play (PnP) compatible. After the PNP driver gets installed as part of your LAN Fax application installation, it starts up automatically and should be compatible with this program without any modifications.

Starting up the Test Program

Use the following procedure to start up the test program.

1. Open a DOS command prompt window.

   Although you can run the hardware test tool by double-clicking it in File Manager, if you get errors, the DOS window that opens when you start the program this way might close before you can see those errors.

2. Go to the directory that supports your software version (using the 'cd' command).

   Go to the *\FaxDiag46* directory first to start version 2.0-46 of the tool, unless you already know you have a 4.5 driver version installed. If you have a 4.5 driver installed, go to the *\FaxDiag45* directory to start version 2.0-45.

3. To start the hardware tool, enter the following command in the DOS window:

   `FaxDiag`

For 2.0-46

If you are starting version 2.0-46 of the tool and no driver is installed, a driver will be installed.

If the driver is started already, it will try to stop it and start it.

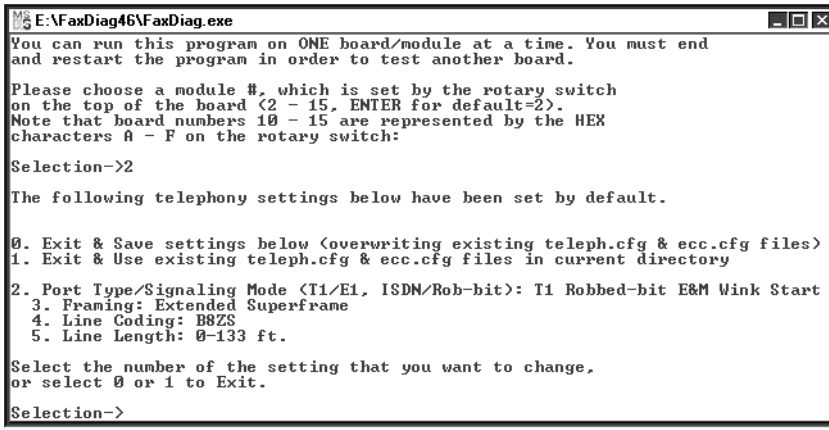
If the driver is stopped, it will try to start it.

For 2.0-45

If you started up version 2.0-45, no driver will be installed. If you already have a compatible driver, the system is ready to test. If you do not have a compatible driver, the program requests that you run version 2.0-46.

The tool also stops BSMIService if it is already running.

The system prompts you to enter a module number or to change software parameters.

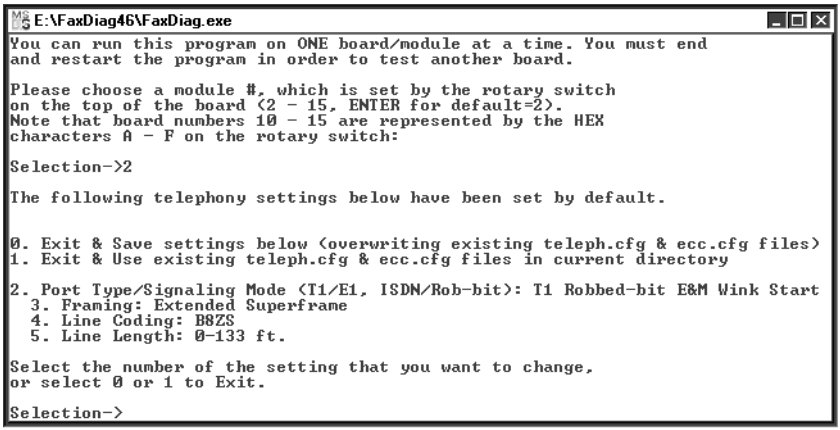


4. Enter a module (board) number to test the board or possibly to change parameters for that board.

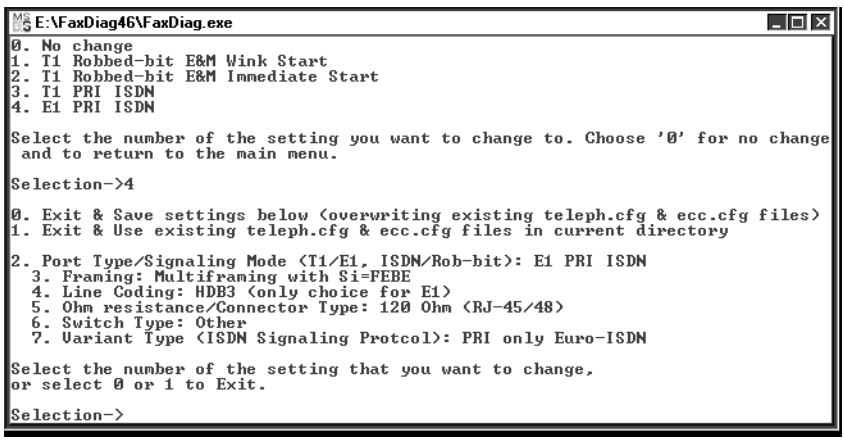
   You can only test one board at a time. You must restart the application for each board you want to test. After selecting the board, you can change telephony parameters. See *Configuring the Test Software* on page 82.

Configuring the Test Software

This window appears if you need to configure T1 telephony parameters (default):



This window appears if you need to configure E1 telephony parameters (choose 2 and select E1 PRI):



- Choose '0' the first time you run the tool or any time you want to create new configuration files based on your menu selections. See the next section for configuration values.

  OR

  Choose 1 to use settings from configuration files that were created on a previous run of this tool.

  Do not use your own versions of such files (from, for example, an existing LAN Fax application) without advice from Technical Support.

Defining Parameters

Before you select 0 to select parameters, use the DOS-based menu to define parameters. You must know the settings of your line in advance if you expect this program to work. Verify your parameter values with your Telco provider.

Signaling Mode

Select 2 to specify port type and signaling mode. Choose from the following options:

0. No Change
1. T1 Robbed Bit E&M Wink Start
2. T1 Robbed Bit E&M Immediate Start
3. T1 PRI ISDN
4. E1 PRI ISDN

Framing

Select 3 to specify framing.

For T1, choose from the following options:

0. No change
1. Extended SuperFrame
2. SuperFrame (D4)

For E1, choose from the following options:

0. No change
3. CRC4 Multiframing with Si=FEBE
4. Basic framing with no CRC, Si=1

Line Coding

Select 4 to specify line coding.

For E1, there is only one option displayed on the main screen.

4. Line Coding: HDB3 (only choice for E1)

For T1, choose from the following options:

0. No change
1. B8ZS
3. AMI (Basic - No suppression)

Line Length/ Connector Type

For T1 configurations only: select 5 to specify line length in feet. Choose from the following options:

0. No change
1. 0-133
2. 133-266
3. 266-399
4. 399-533
5. 533 - 655

For E1 configurations, select 5 to specify connector type. Choose from the following options:

0. No change
6. 75 Ohm (coaxial)
7. 120 Ohm (RJ-45/48)

After selecting and defining parameters, the software writes the following files to the current directory:

- *teleph.cfg*
- *ecc.cfg* (for version 2.0-46)
- *btna.cfg* (for version 2.0-45, this file is only created if you made an ISDN selection.)

For Version 2.0-45 with ISDN call control only, if backup copies of the BTNA and user configuration files do not exist, the software attempts to create backup copies (by adding .bak to existing file names). To locate these files, the software checks the BSMIService Windows Registry entries for the path/names of these files.

The newly created *btna.cfg* file and the "updated" *btcall.cfg* files are copied over the files that were just backed up.

After creating or updating files, the software tries to start BSMIService. If this attempt fails, contact your LAN Fax vendor for assistance in verifying your BSMI service installation.

The *btcall.cfg* teleph keyword line will be updated with the full path of the *teleph.cfg* file so that the BSMI Service can find the *teleph.cfg* file.

If you are using version 2.0-46 with ISDN call control, the test tool waits for up to 5 minutes while the bearer channels come into service. Then the user interface of the tool appears. If this wait happens, check to make sure your ISDN line is working. The LED next to the span/port must be solid green.

Running the Test Software

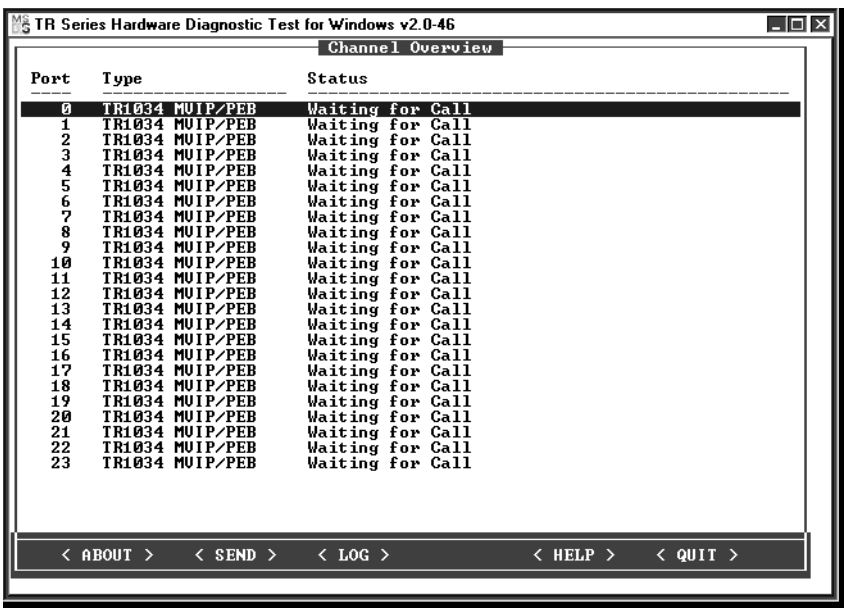
Use this software to do the following:

- Viewing the Status of Available Channels From the Main Window
- Sending a Fax
- Viewing Line Status
- Receiving a Fax
- Creating Log Files
- Stopping the Test Program

Viewing the Status of Available Channels From the Main Window

The Channel Overview screen lists each channel and its status. For button and mouse information for this and other screens, see *Operating Notes* on page 77. Based on your definition of port type and signaling mode, the screen displays the following number of ports:

Port Type	Number of Ports
T1 Robbed Bit	24
T1 ISDN	23
E1 ISDN	30



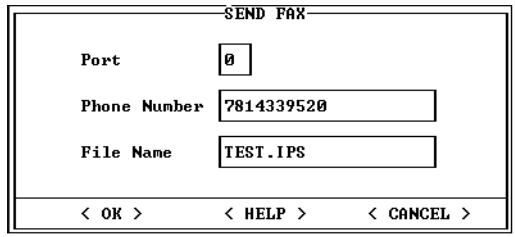
Note: If you have EI ISDN, there is not enough display space for 30 channels. Channels numbered 27-29 (zero-based) share a common line:

```
27-29    TR1034 H.100   Waiting for Call
```

Sending a Fax

Use the following procedure to send a fax.

1. Select SEND to send the fax.
   The software displays a box requesting information about where to send a fax.



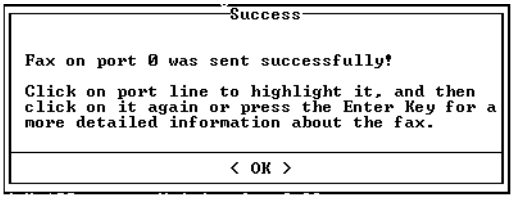
2. Enter a port (channel) number.
3. Use the Tab key to move to the next field.
4. Enter the phone number of a local fax machine.
   Use one of the following values to wait before dialing the number if you need to have the channel wait for a dial tone. Use these values only for T1 Robbed Bit systems.

Value	Definition
w	Wait for dial tone
, (comma)	1 second pause
; (semicolon)	5 second pause

To send and receive a fax through different ports on your board, dial any phone number mapped to the T1/E1 line connected to your board. In this configuration, the TR1034 acts as both the sending and receiving sides of a fax transmission so that no actual fax machine is involved.

The Status messages of the port in question change, and these messages report the progress of the Send activity.

If the fax goes through correctly, the following message appears telling you so.



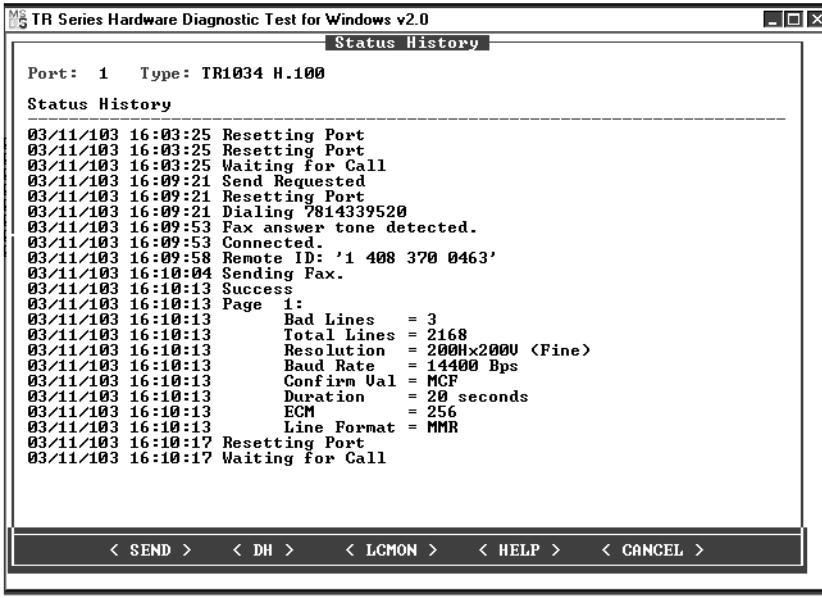
5. Select OK to remove the window.

Viewing Line Status

Use the following procedure to get more information about port activity:

1. Highlight the port number you want to examine further.
2. Select that line again or press Enter to display the Status History screen.

   The following screen appears:



3. Select Cancel to return to the Channel Overview screen.

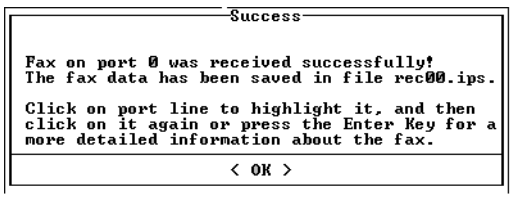
Receiving a Fax

To see if your system can receive a fax from an external system, do the following:

1. From a local fax machine, dial the phone number corresponding to the port.

   Once the call is detected, the port picks up and starts to receive the fax automatically.

   After the fax is received, it is saved in a file and a message is displayed.



2. To allow the port to be available for the next call, select OK.
3. To display details about the port, highlight the line that lists the port number.
4. Select that line again or press Enter to display the Status History screen.
5. To send the fax back out to a local fax machine, select SEND and enter the name of the file that was received (in this example it would be *rec00.ips*).

Creating Log Files

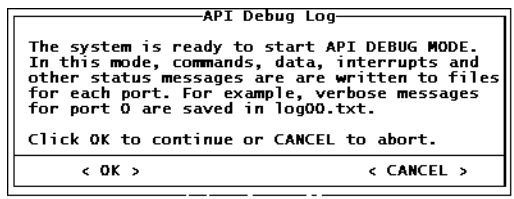
The LOG button creates a log file that records the send/receiving activities for each channel used. If you have problems sending and receiving faxes, click the LOG button before using the channel. Logs are created for each fax sent or received until the LOG button is clicked again. Look for the logs as *logxx.txt* files in your fax center directory. To disable the LOG command, click LOG again and follow the screen prompts.

Starting up Log Mode

To create log files that include all commands, data, interrupts and messages, do the following:

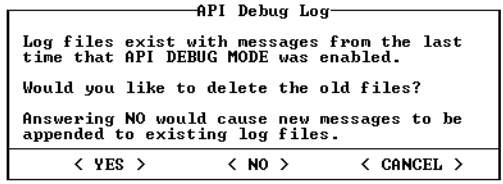
1. From the Channel Overview screen, click the Log option.

   The first time you turn on a log in a session, the following message appears:



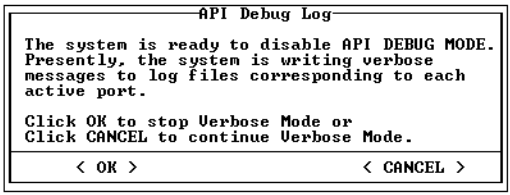
2. Click OK to start the Debug Mode and create log files for each port.

   If there are previous log files, the following message appears:



Stopping Log Mode

Once your system is creating log files, to turn off the log mode, click the Log option again. The following message appears:

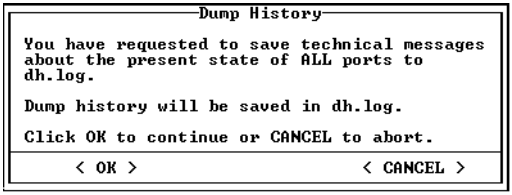


Click OK to stop logging information.

Using the Dump History Mode

The DH button is for capturing the dump history. Use this option only when requested by Brooktrout Technical Support.

1. When you select the DH (Dump History) option, the following message appears:



2. Select OK to create a dump history log.
3. Stop the logging action by selecting the DH option again.

Using the LCMON Mode

Use the LCMON button to disable or enable loop current monitoring (for T1, it enables or disables answer supervision or signaling). Only use the LCMON button if requested by Brooktrout Technical Support.

Stopping the Test Program

Stopping Version 2.0-45

To shut down the test program for version 2.0-45 of the software, do the following:

- Select Quit to stop the program.

  If using ISDN Call control, the software restores the files that were backed up earlier directly over the ones used by the tool, restoring your Brooktrout installation completely. At no time are any Windows Registry settings ever changed by this tool for your BSMIService installation.

Stopping Version 2.0-46

To shut down the test program for version 2.0-46 of the software, do the following:

1. Select Quit to stop the program.

   If you plan to re-use the test tool, then you are finished.
2. If you will not be using this tool again, you should remove the driver if the install procedure installed a driver in the test program folder.

   See the *results.txt* file to see if the driver was installed. If no driver was installed, then you are finished.
3. Before removing the driver, stop the driver first by entering the following at any command prompt:

   ```
   net stop boston
   ```
4. To remove the driver, enter the following command from the FaxDiag46 directory:

   ```
   install -r
   ```

Hardware

This hardware appendix describes the physical features of the TR1034 series of boards. It describes various telephone services appropriate for boards, and provides information for regulatory and standards compliance.

It has the following sections:

- TR1034 Models
- TR1034 Features
- Telephone Jack PinOut
- Monitoring LED Activity
- North American Standards Compliance

TR1034 Models

The following table summarizes the TR1034 PCI boards, their number and type of channels, and their availability. Each model can use the same type and number of telephone lines as interfaces on the board.

Table 1. TR1034 Models

Board Type	# Channels
TR1034+P8H-T1	8
TR1034+P16H-T1	16
TR1034+P24H-T1	24
TR1034+P8H-E1	8
TR1034+P10H-E1	10
TR1034+P16H-E1	16
TR1034+P20H-E1	20
TR1034+P30H-E1	30

TR1034 Features

The TR1034 is built upon the same TRxStream platform as the TR1000 and shares its highly scalable carrier-grade design. However, it is permanently configured to meet the unique needs of the fax service provider market, providing up to 30 channels of robust, high-performance V.34 fax in a single PCI slot.

Note: Do not combine the TR1034 in the same chassis with a TR114 board. This combination might not work with your LAN Fax application.

Combining the TR1034 With Other Boards

- Can combine the TR1034 in the same chassis with other TRxStream boards
- If you have multiple TR1034 in same chassis, do not connect them using the H.100 bus.

Specifications

Power and Environmental

- Base card power requirements: 3A at 5VDC = 15W
- Operating temperature: 0°C–50°C
- Humidity: 10%–95% non-condensing

Operating systems supported

- Windows NT 4 server (SP 4, 5 or 6a)
- Windows 2000
- Sun Solaris Intel 2.6, 2.7 (7)
- Sun Solaris SPARC 2.6, 7 (2.7), 8
- Unixware 2.1.3, 7.0.1, 7.1.0
- Linux Redhat 6.0, 6.1, 6.2, 7.0 (uniprocessor only)

PCI Platforms

- Control CPU
  PowerPC 8240@200MHz
- 6 DSPs:
  TI 320C549@100MHz

- Voice channels: Up to 30
- Fax channels: Up to 30 (V.34)
- Telephony Bus:
  - ECTF H.100; TDM capacity: 4,096 time slots
  - 1 RJ48C T1/E1 connector
- Physical: One full-size PCI slot

Fax Features

- Maximum speed: 33.6 Kbps
- Emulates Group-3 fax device, uses ITU T.30 protocol
- V.34 (33.6 Kbps), V.17, V.29, V.ter, V.21 & V.33 modulation with auto fallback
- Error correction mode (ECM) is supported
- Compression schemes (done "on the fly")
  - MH (T.4 1-dimensional)
  - MR (T.4 2-dimensional)
  - MMR (T.6) [Is only available with ECM]
- Superfine resolutions: 300x300,200x400,400x400
- Supported file types:
  - TIFF –F
  - ASCII
  - PCX/DCX
  - Infopacket
- ASCII conversion on the fly
- Headers and footers supported
- Line error detection/correction
- Font download
- Polling

Intelligent Call Progress

- Detects dial tone
  - Optional with Brooktrout boards

- On-board algorithms detect variety of phone line conditions
  - Busy signals (regular and reorder)
  - Human answered
  - Fax tone
  - Special Information Tone (SIT)
  - 3-beep warning sound
  - Disconnected, out of service, circuits busy, etc.
  - Detection of international signals
  - Up to 3 (8) proprietary tones can be detected

ISDN

- All additional features/services inherent in ISDN can be implemented
- Providing called party number, setting calling party number
- ISDN disconnect cause can be returned to the user

Call Control Capabilities

- All On-board: no separate interface card needed
- Common Channel Signaling (CCS)
  - E1 EuroISDN
  - T1 North American ISDN
- Channel Associated Signaling (CAS)
  - T1 Robbed Bit signaling – Transparent Mode E&M
  - CAS R2 signaling (requires extra implementation making use of BSMI API)
- Interface board connected to H.100 bus
  - Whatever protocol
    For example, SS7 via Brooktrout Netaccess board

Interfaces

- Full T1/E1 and “fractional” T1/E1 supported

- Works with telco-supplied T1/E1 lines, or T1/E1 lines from a PBX
- Various frame modes, line codings, signal protocols supported
- Inbound routing supported via DNIS, ANI, DTMF, MF or CPN routing

Voice Capabilities

- Digitizing/Compression
  - G.711 u-law or A-law
  - OKI ADPCM 24/32Kbps (6/8k sample rates)
  - 11kHz 8/16 bit linear PCM (.WAV)
  - 8kHz 16 bit linear PCM (.WAV)
- Speech play and record
  - Automatic Level control record
  - Dynamic Range Compression
  - Silence Compressed Record
  - Noise Suppression
  - Voice Playback controls
  - Volume and Pitch Corrected Speed
  - Robust DTMF detection during voice playback
  - Voice Activated Record – with silence suppression (Initial Silence Suppression)

Tone detection

- Incoming digits detected automatically
- DTMF and MF
- Application can even implement this when using ISDN in the first place for the called party number
- Outgoing, board can dial DTMF

Telephone Jack PinOut

PRI Pinout

On all TR1034 PRI models, the 8-pin RJ-45 jack accesses all TR1034 channels.

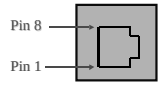
The pinout is as follows:

PRI Network Interface card Port

◆ The PRI port PIN Assignments (TE)

Pin 1 = Receive Ring
pin 2 = Receive Tip
Pin 4 = Transmit Ring
Pin 5 = Transmit Tip

Cross over cable needed to swap receive and transmit pins (to swap from TE to NT)



Monitoring LED Activity

LED activity can be useful in diagnosing difficulties with the board. This section describes the significance of LED activity for the TR1034.

Mounting Brackets

A status LED for the T1/E1 line is located below the T1/E1 connector (Figure 1).

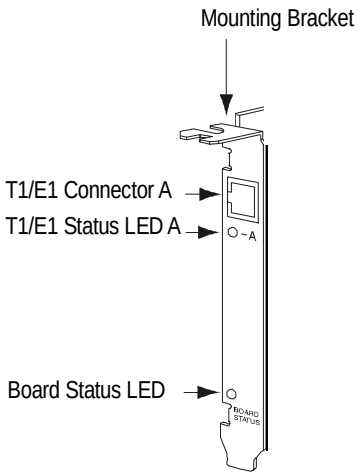


Figure 1. TR1034 LED Location

Interpreting T1/E1 LED Signals

The following table shows the possible states for the LEDs.

T1/E1 LED	Indicates
Off	Board is not yet configured by software.
Red	Layer 1 is down because of one of the following problems: The line is disconnected. Service not turned up. Mismatch in physical attributes.
Green	Layer 1 is functioning (framing, line coding, clocking are good).
Orange	The board's telephony port is attempting to synchronize with the phone line.
Red/Orange	Synchronization not quite achieved between the board and the line. Make sure telco is master over the line, and the board is set as slave.

Interpreting Board Status LED Signals

An additional LED (Board Status, see Figure 1) is provided to indicate the overall status of the TR1034 board:

Board Status LED	Indicates
Off	The server is off, is not getting enough power, or the wrong module is set.
Slowly flashing orange	The board powered up and passed internal tests, no firmware downloaded yet.
Steady, or rapidly flashing, red	The board powered up, but failed tests; or, "hung" during fax process. Run dump history to capture debug output. Afterwards, we recommend a "cold boot" to clear the system.
Flashing quickly between orange and green	The board is downloading firmware.
Slowly flashing green	The firmware is downloaded; the board is in service.

Note: On TR1034, there are no LEDs specifically associated with channels.

North American Standards Compliance

Note to developers and system integrators: The following compliance information must be provided to your customer and the end user as part of your system documentation.

The Federal Communications Commission (FCC) in the United States and Industry Canada (IC) in Canada regulate all electronic devices that connect to the telephone system and/or generate radio frequency signals. The TRxStream board is such a device and must comply with the regulations specified below.

Telephony Regulations

FCC Notices for Registered Component Devices

This equipment is registered with the FCC under Part 68 as a component device for use with a host computer. In order for the FCC registration of this product to be retained, all other products used in conjunction with this product must also be FCC Part 68 registered for use with these hosts. If any of these components are not registered, then you are required to obtain FCC Part 68 registration of the assembled equipment prior to connection to the telephone network. Part 68 registration requires that you maintain this approval and as such are responsible for the following:

Any component added to your equipment, whether it bears component registration or not, will require a Part 68 compliance evaluation. You may need to test and make a modification filing to the FCC before that new component can be used.

Any modification/update made by a manufacturer to any registered component within your equipment, will require a Part 68 compliance evaluation. You may need to test and make a modification filing to the FCC before that modified component can be used.

If you continue to produce this component you are required to comply with the FCC's Continuing Compliance requirements.

Therefore, it is recommended that only FCC Part 68 registered devices bearing the 'CN' or 'CE' equipment code as part of the FCC registration number, be used. To determine if your particular components are appropriately approved, look for the FCC registration number on all components and ensure that the equipment code '-CN-' or '-CE-' is part of that number. Refer to the FCC Registration number on this product as an example.

If at any time the ownership of this component device is transferred to someone else (whether independently or as part of a system), supply this manual to the new owner.

FCC Rules Regarding Fax Branding

The Telephone Consumer Protection Act of 1991 makes it unlawful for any person to use a computer or other electronic device to send any message via a telephone fax machine unless such message clearly contains, in a margin at the top or bottom of each transmitted page or on the first page of the transmission, the date and time it is sent; an identification of the business, other entity, or individual sending the message; and the telephone number of the sending machine, business, entity, or individual.

Users: To program this information into your fax machine, follow the procedure described in your user manual.

Developers: You must include facilities in your application to enable the user to enter the required information. Use the API's BfvFaxHeader function with the TRxStream to place this information on each transmitted page as required. You must also include, in your user manual, instructions for entering this information into your system.

FCC Regulations For Connecting to a T1 Phone Line (Part 68)

The Federal Communications Commission (FCC) has established rules that permit a TRxStream board to be directly connected to the telephone network:

- Standardized jacks are used for connections.
- This equipment may not be used on coin service provided by the telephone company. Connection to party lines is subject to state tariffs. (Contact your state public utility commission or corporation commission for information.)

A malfunctioning circuit can harm the telephone network.

Disconnect a malfunctioning TRxStream from the telephone network until you determine the cause of the malfunction and repair it. If a malfunctioning TRxStream remains connected, the telephone company may temporarily disconnect service.

The TRxStream board is approved as a DSX-1 device. 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).

The CSU has been designed to prevent harm to the T1 network. If the telephone company finds that the equipment is exceeding tolerable parameters, the telephone company can temporarily disconnect service, although they will attempt to give you advance notice if possible.

If the telephone company alters their equipment in a manner that will affect use of this device, they must give you advance warning so as to give you the opportunity for uninterrupted service. You will be advised of your right to file a complaint with the FCC.

Under the FCC rules, no customer is authorized to repair this equipment. This restriction applies regardless of whether the equipment is in or out of warranty.

Before connecting the TRxStream to telephone service, you must give a representative of the local telephone company the following information:

- The telephone numbers (Port ID) to which the TRxStream is connected.
- SOC: 6.0P
- FIC: 04DU9-BN 1.544Mbps SF
  04DU9-DN 1.544Mbps SF+B8ZS
  04DU9-1KN 1.544Mbps ESF
  04DU9-1SN 1.544Mbps ESF+B8ZS
- The type of wall jack required: USOC-RJ-48C
- The FCC Registration number: Labeled on back of board
- FCC registration of the protection device (CSU)

IC Equipment Attachment Limitations (CS-03)

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. Industry Canada 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. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications 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. Users should not attempt to make installation connections themselves, but should contact the appropriate electric inspection authority or electrician, as appropriate.

The Industry Canada certification number is found on the back of the board.

Electromagnetic Emissions

This product was tested for emissions in a computer meeting the limits of FCC Part 15, Class A. In order to ensure that it continues to meet the Class A emissions limits it should be installed in a host computer or other enclosure which also meets the Class A limits and bears an FCC Part 15 registration number, a FCC logo and/or a CE marking.

FCC Emissions Information

All computing devices utilizing clock frequencies in excess of 10 kHz must be tested for compliance with RF emission limits set by the FCC.

Changes or modifications to this unit not expressly approved by Brooktrout Technology, Inc. could void the user's authority to operate the equipment.

Pursuant to Part 15 of the FCC Rules, this equipment has been tested and found to comply with the limits for a Class A digital device. These limits 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, it may cause interference harmful 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 or her own expense.

IC Emissions Notice

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la class A est conforme à la norme NMB-003 du Canada.

Safety

The TRxStream is recognized by ETL; the component recognition number is on the back of the board. The TRxStream has been tested and complies with UL Standard 1950, Third Edition and with CSA Standard C22.2 No.950-95, *Safety of Information Technology Equipment, Including Electrical Business Equipment*.

This product must be mounted in the final assembly so that it is isolated from exposure to any hazardous voltages (voltages greater than 42.4V peak or 60Vdc) within the assembly. Adequate separation and restraint of cables and cords must be provided.

To maintain the safety certification of the system, ensure that the power drawn from the power supply does not exceed its capacity. Please refer to the power usage table on the hardware installation card applicable to your board for information on the voltages and currents required for proper operation.

Error Codes

This appendix provides information about call progress error codes, result error codes, reset error codes, and ISDN cause codes.

It includes the following sections:

- Call Progress Error Codes
- Result Error Codes
- Reset Error Codes
- ISDN Cause Codes

Call Progress Error Codes

Final Call Progress Codes

Since the software returns the value of Final Call Progress at the end of phase A when no fax information transfer has taken place, any issues are telephony and not fax related. These would be logged in cases such as failure to dial out from behind a PBX, invalid numbers, or no connection/open circuit cables.

Value	Call	Progress Type Description
301	FCP_BUSY1	Normal busy; remote end busy (off-hook).
302	FCP_BUSY2	Normal busy; remote end busy (off-hook). Used instead of BUSY1 in certain countries.
303	FCP_ROBUSY	Reorder or fast busy; indicates that telephone company trunk lines are busy; on PBXs, indicates no available outside lines.
304	FCP_RECALL	Recall dial tone detected; signal generated when calling another party while already connected to one or more parties (for example, conference calling, call waiting).
305	FCP_CONFIRM	Confirmation tone; automated equipment acknowledges successful completion of caller requested feature (for example, call forwarding). This is not G2 confirmation tone (CFR2).
306	FCP_PULSE	This result is reserved and should never occur.
316	FCP_HUMAN	Answer (probable human) detected; does not match any other expected call progress signal patterns.
317	FCP_ANSWER	Remote end answered call; can occur immediately after a break in the ring-back cycle; like `HUMAN`, does not match any other call progress signal patterns, but is marked by silence.
318	FCP_DIALTON	Dial tone detected; usually indicates the dialing sequence did not break dial tone.
324	FCP_SILENCE	In `VOICE` mode, after dialing, no signal detected during the silence timeout. In `ANSWER` mode, no fax CNG tone detected after answering a call.

Value	Call	Progress Type Description
325	FCP_RNGNOANS	Indicates the remote end was ringing but did not answer. In fax mode, this result occurs after the ced_timeout (default: 40 secs) has expired and the line continues to ring (You can adjust the value of these time-out parameters in the *btcall.cfg* configuration file).
326	FCP_G2DETCT	Group 2 fax machine detected; remote machine is capable of sending and receiving G2 facsimiles only.
327	FCP_SITINTC	Intercept tone detected; remote end originating failure; invalid telephone number or class of service restriction. With the ISDN TR1034, this can also indicate a datalink mis-match (ptp or pmp).
328	FCP_QUIET	After dialing the number, no energy detected on the line for the wait_for_ced time-out period; possible dead line.
329	FCP_SITVACODE	Vacant tone detected; remote originating failure; invalid telephone number.
330	FCP_SITREORD	Reorder tone detected; end office (PBX) or carrier originating failure.
331	FCP_SITNOCIR	No circuit detected; end office or carrier originating failure, possible dead line.
332	FCP_CNGDETCT	CNG fax calling tone detected.
339	FCP_ANSWER_TONE_ DETECT	Fax machine detected; usually a fax CED tone, but also fax V.21 signals when the remote machine does not send a CED tone before it sends the fax protocol information.
340	FCP_UNKNOWN	An error occurred due to an unknown cause.
348	FCP_ISDN_CALL_ PROGRESS	By enabling call progress on an ISDN D channel, one of the following values is in the second byte of the FIFO buffer: 4: CALL_PROCEEDING: Call is proceeding normally. 5: CALL_ALERTING: Ringback detected; remote end is ringing 6: CALL_CONNECTED: Call is connected 7: CALL_DISCONNECTED: Call was disconnected
349	FCP_ISDN_CALL_ COLLISION	Indicates that a call collision occurred on the ISDN line.

Result Error Codes

Fax Hang-up Codes

The fax hang-up codes are first divided into whether the fax was being originated, or answering. They are further grouped into which of the T.30 phases the hang up occurred. The codes and a brief description of that code are listed below.

From the hang-up code, it is possible to identify during which phase the hang up occurred, whether the board was originating or answering, and obtain a description.

The *Response Received?* and *Command Received*? sections are called from a variety of locations within the T.30 protocol, and you also need to determine where the *Response Received?* or *Command Received?* was called.

Value	Hang-up code	Description
Call Placement Phase A Codes		
0	HNG_NORMAL_XMIT	Normal and proper end of connection.
1	HNG_RNG_DET	Ring detected without a successful handshake.
2	HNG_ABORT	Call Aborted
3	HNG_NO_LOOP_CURRENT	No loop current or A/B signaling bits.
4	HNG_ISDN_DISCONNECT	ISDN disconnection.
11	HNG_T1_TIMEOUT	No answer, T.30 T1 time-out.
Transmit Phase B Codes (A-1)		
20	HNG_XMITB_TIMEOUT	Unspecified transmit Phase B error.
21	HNG_XMITB_NORM	Remote cannot receive or send.
22	HNG_XMITB_MISC	COMREC error, Phase B transmit.
23	HNG_XMITB_COMREC_VCNR	COMREC invalid command received.
24	HNG_XMITB_SE	RSPREC error
25	HNG_XMITB_DCS_FTC	DCS send three times without response.

Value	Hang-up code	Description
26	HNG_XMITB_DIS_FTC	DIS/DTC received three times; DCS not recognized.
27	HNG_XMITB_TRAINFAIL	Failure to train.
28	HNG_XMITB_RSPREC_VCNR	RSPREC invalid response received.
29	HNG_XMITB_COMREC_DCN	DCN received in COMREC.
30	HNG_XMITB_RSPREC_DCN	DCN received in RSPREC.
33	HNG_PHASEB_INCOMPAT_FMT	Incompatible fax formats, for example, a page width mismatch.
34	HNG_XMITB_INVAL_DMACNT	Invalid DMA count specified for transmitter.
35	HNG_XMITB_FTM_NOECM	Binary File Transfer specified, but ECM not enabled on transmitter.
36	HNG_XMITB_INCMP_FTM	Binary File Transfer mode specified, but not supported by receiver.
37	HNG_XMITB_INCMP_EFF	Remote does not support EFF page options required by host.
38	HNG_XMITB_NOEFF	Remote does not support EFF page coding.
Transmit Phase D Codes		
40	HNG_XMITD_RR_NORES	No response to RR after three tries.
41	HNG_XMITD_CTC_NORES	No response to CTC, or response was not CTR.
42	HNG_XMITD_T5TO_RR	T5 time out since receiving first RNR.
43	HNG_XMITD_NOCONT_NSTMSG	Do not continue with next message after receiving ERR.
44	HNG_XMITD_ERRRES_EOREOP	ERR response to EOR-EOP or EOR-PRI-EOP.
45	HNG_XMITD_RTN_DCN	Transmitted DCN after receiving RTN.
46	HNG_XMITD_PPR_EOR	EOR-MPS, EOR-EOM, EOR-NULL, EOR-PRI-MPS, or EOR-PRI-EOM sent after fourth PPR received.
51	HNG_XMITD_SE	RSPREC error.
52	HNG_XMITD_MPS_FTC	No response to MPS, repeated three times.
53	HNG_XMITD_MPS_VCNR	Invalid response to MPS.
54	HNG_XMITD_EOP_FTC	No response to EOP repeated three times.

Value	Hang-up code	Description
55	HNG_XMITD_EOP_VCNR	Invalid response to EOP.
56	HNG_XMITD_EOM_FTC	No response to EOM, repeated three times.
57	HNG_XMITD_EOM_VCNR	Invalid response to EOM.
60	HNG_XMITD_RSPREC_DCN	DCN received in RSPREC.
61	HNG_XMITD_PPSNULL_NORES	No response received after third try for PPS-NULL.
62	HNG_XMITD_PPSMPS_NORES	No response received after third try for PPS-MPS.
63	HNG_XMITD_PPSEOP_NORES	No response received after third try for PPS-EOP.
64	HNG_XMITD_PPSEOM_NORES	No response received after third try for PPS-EOM.
65	HNG_XMITD_EORNULL_NORES	No response received after third try for EOR-NULL.
66	HNG_XMITD_EORMPS_NORES	No response received after third try for EOR-MPS.
67	HNG_XMITD_EOREOP_NORES	No response received after third try for EOR-EOP.
68	HNG_XMITD_EOREOM_NORES	No response received after third try for EOR-EOM.
Receive Phase B Codes		
70	HNG_RCVB_TIMEOUT	Unspecified receive Phase B error.
71	HNG_RCVB_SE	RSPREC error.
72	HNG_RCVB_MISC	COMREC error.
73	HNG_T2_PNOTREC T.30	T2 timeout, expected page not received.
74	HNG_RCVB_T1_TIMEOUT	T.30 T1 timeout after EOM received.
75	HNG_NORMAL_RCV	DCN received in COMREC. While this value is considered by the board to be a successful fax receive result, if it occurs in conjunction with BT_STATUS_ERROR_HANGUP, it still indicates that an error has occurred.
76	HNG_RCVB_RSPREC_DCN	DCN received in RSPREC.
77	HNG_T2_TIMEOUT T.30	T2 timeout, expected page received.

Value	Hang-up code	Description
78	HNG_RCVB_INVAL_DMACNT	Invalid DMA count specified for receiver.
79	HNG_RCVB_FTM_NOECM	Binary File Transfer specified, but ECM not supported by receiver.
Receive Phase D Codes		
101	HNG_RCVD_SE_VCNR	SPREC invalid response received.
102	HNG_RCVD_COMREC_VCNR	COMREC invalid response received.
103	HNG_RCVD_T3TO_NORESP	T3 timeout; no local response for remote voice interrupt.
104	HNG_RCVD_T2TO	T2 timeout; no command received after responding RNR.
105	HNG_RCVD_DCN_COMREC	DCN received for command received.
106	HNG_RCVD_COMREC_ERR	Command receive error.
107	HNG_RCVD_BLKCT_ERR	Receive block count error in ECM mode.
108	HNG_RCVD_PGCT_ERR	Receive page count error in ECM mode.
Miscellaneous Codes		
240	HNG_INTERRUPT_ACK	No interrupt acknowledges, timeout.
241	HNG_COMM_FAULT	Loop current still present while playing reorder tone after timeout.
242	HNG_T30_HOLDUP	T.30 holdup timeout.
243	HNG_HOLDUP_DCN	DCN received from host in receive holdup section for FAX PAD mode.
244	HNG_HOLDUP_DCN_NON_FPAD	DCN received from host in receive holdup section for non-FAX PAD mode.

Reset Error Codes

Here are some additional error codes that might occur during the reset of the TR1034. If you add the bit values below, you get a unique number. This unique number is returned by the reset function, and you then can turn this unique number into its components.

For example the reset error 1b breaks down to the following error codes:

0x00000010L

AND

0x00000008L

AND

0x00000002L

AND

0x00000001L

The following table identifies reset status condition bit values, as returned in the reset_status field when resetting a channel.

Bit Value	Related Function	Explanation
0x00000001L	#define RST_RSTDONE_TIMEOUT	Timeout occurred waiting for reset done interrupt (fatal). If a board has a major problem (such as nearing a DEAD board state), you might get an error code value of 1.
0x00000002L	#define RST_MAGIC_BAD	The board has a bad magic number (fatal).
0x00000004L	#define RST_RSTDONE_ NOMODEM	The reset occurred, but the channel reported that it has no modem.
0x00000008L	#define RST_USR_CONFIG_ UNREADABLE	The user configuration file (*btcall.cfg*) could not be opened/ read.

Bit Value	Related Function	Explanation
0x00000010L	#define RST_USR_CONFIG_ BADFORMAT	The user configuration file (*btcall.cfg*) is not in the correct format.
0x00000020L	#define RST_CPARM_UNREADABLE	The country parameter file (*bt_ cparm.cfg)* Finish list so all files are defined) could not be opened/read, possible bad format.
0x00000040L	#define RST_COUNTRY_ NOTFOUND	The country specified in the user configuration file could not be found.
0x00000080L	#define RST_FIRM_UNREADABLE	The firmware file specified in the user configuration file could not be opened/read (fatal).
0x00000100L	#define RST_FIRM_DLOAD_ERR	An error occurred during firmware download (fatal).
0x00000200L	#define RST_FONT_UNREADABLE	A font file specified in the user configuration file could not be opened/read.
0x00000400L	#define RST_FONT_DLOAD_ERR	An error occurred during font download (fatal).
0x00000800L	#define RST_DAA_BAD	The DAA bytes are not valid.
0x00001000L	#define RST_DID_BATT_MISSING	A DID channel does not have a battery connected.
0x00002000L	#define RST_HW_VERSION_BAD	The hardware version that the channel reported is not valid.
0x00004000L	#define RST_DIG_CONFIG_ UNREADABLE	The digital/ISDN configuration file specified in the user configuration file could not be opened/read.
0x00008000L	#define RST_DIG_CONFIG_ BADFORMAT	The digital/ISDN configuration file specified in the user configuration file is not in the correct format (fatal).
0x00010000L	#define RST_DIG_HW_ERR	A hardware error occurred during digital/ISDN configuration (fatal).
0x00020000L	#define RST_MEM_ALLOC_ERR	A memory allocation error occurred.

Bit Value	Related Function	Explanation
0x00040000L	#define RST_ALERT	An alert occurred (fatal).
0x00080000L	#define RST_INT_ERR_OVRN	An error interrupt or interrupt overrun occurred (fatal).
0x00100000L	#define RST_DRIVER_ERR	The driver reported an error during reset or initialization (fatal).
0x00200000L	#define RST_DIG_PARAM_ERR	Incorrect configuration parameters were specified, as reported by firmware, during digital/ISDN configuration (fatal). If *teleph.cfg* does not have properly defined values, you might get error code values of 200000 (two hundred thousand) or 40000000 (forty million).
0x00400000L	#define RST_DIAG_ERR	Channel reported a diagnostic error of some kind.
0x00800000L	#define RST_MAX_TIMEOUT	Maximum timeout exceeded (fatal).
0x01000000L	#define RST_DIG_ERR_OTHER	Other digital/ISDN configuration error (fatal).
0x02000000L	#define RST_RETAIN_ERR	Error due to channel state retention attempt. (fatal).
0x08000000L	#define RST_PACKET_SEND_RCV	Other packet send/receive error (fatal).
0x10000000L	#define RST_PACKET_CONTENT_ERR	Packet content error (parse/form) (fatal).
0x20000000L	#define RST_UNCLASSIFIED_ERR	Other unclassified error (fatal).
0x40000000L	#define RST_FIRM_DETECTED_ERR	Firmware detected an error. If *teleph.cfg* does not have properly defined values, you might get error code values of 200000 (two hundred thousand) or 40000000 (forty million).
0x80000000L	#define RST_FONT_DOWNLOADED	A font file specified was already downloaded.

ISDN Cause Codes

When the ISDN network or remote user disconnects a call for any reason, the cause (IE) might be reported by any ISDN aware application.

The cause IE consists of three significant octets:

- Cause codes are not specific. They are guidelines and are implementation-dependent. Certain PTTs and PABX manufacturers use a smaller sub-set of cause codes, covering a wide range of possible problems.
  A single general location octet which indicates where the disconnection message was generated.
- Cause Value Octet
  The actual cause value octet which provides a detailed description.
- Diagnostic Octet
  A diagnostic octet which might be added providing further information.

Cause codes are not specific. They are guidelines and are implementation-dependent. Certain PTTs and PABX manufacturers use a smaller sub-set of cause codes, covering a wide range of possible problems.

Example 1. Disconnect Cause IE: 80 90

```
Disconnect cause IE: 80 90
```

Decode the message using the following table:

The general location is	0x80	Remote User
The cause value is	0x90	Normal Clearing
No diagnostic octet		

This message shows the remote user disconnecting (hanging up) normally.

Location Octet

Table 2. General Location

Hex	Value	Description
80	0	Remote User
81	1	Private Network Serving Local User
82	2	Public Network Serving Local User
83	3	Transit Network
84	4	Public Network Serving Remote User
85	5	Remote Private Network
87	7	International Network
8A	10	Network Beyond Internetworking Point

Cause Value Octet

The Cause Codes are grouped by class number.

- Class 000 - Normal Events, see Table 3 on page 125
- Class 010 - Network Congestion, see Table 4 on page 127
- Class 011 - Service or Option Not Available, see Table 5 on page 128
- Class 100 - Service or Option Not Implemented, see Table 6 on page 128
- Class 101 - Invalid Message, see Table 7 on page 129
- Class 110 - Protocol Error, see Table 8 on page 131
- Class 111 - Interworking, see Table 9 on page 132
- Values specific to Brooktrout returned by the Brooktrout API as cause codes (not ISDN cause code values), see Table 10 on page 132.

Table 3. Class 000 - Normal Events

Hex	Value	Description	Meaning
81	1	Unallocated number	Indicates that the requested destination, although valid, cannot be reached.
82	2	No route to specified network	Sending equipment (sending the cause) is requested to route call through an unrecognized transit network.
83	3	No route to destination	Called user cannot be reached because the network does not serve the destination.
86	6	Channel unacceptable	The last identified channel is not acceptable to the sending entity.
87	7	Call awarded	Incoming call is connected to a channel already established fro similar calls (for example: packet-mode X.25 virtual calls).
90	16	Normal clearing	Call is cleared by one of the users involved.
91	17	User busy	Called user cannot accept another call although compatibility is established.
92	18	No user responding	When a user does not respond to call establishment messages with either an alerting or connect indication within the allowed time.
93	19	User altering, no answer	User provided an alerting indication but has not provided a connect indication within the allowed time.
95	21	Call rejected	Equipment sending the cause does not want to accept this call although the equipment is busy or incompatible.
96	22	Number changed	Indicates called party number is not assigned.
9A	26	Nonselected user clearing	User not awarded the incoming call.

Table 3. Class 000 - Normal Events (Continued)

Hex	Value	Description	Meaning
9B	27	Destination out of order	Destination interface is not functioning correctly. The cause has special significance with the ISDN board. This message usually indicated a failure to establish layer 2. Other symptoms include a failure to fax to any number, and a failure to answer any calls. Typically caused by either physical cable problems or an incorrect datalink protocol. Change the datalink protocol, using *briconf*. If the error message still persists, check the cable connection. Use the onboard protocol analyzer to determine the exact nature of the problem.
9C	28	Invalid number format	Called party number is invalid, or incomplete.
9D	29	Facility rejected	Network cannot provide the facility requested.
9E	30	Response to STATus ENQuiry	The reason for generating the STATUS message was the prior receipt of a STATUS ENQUIRY message.
9F	31	Normal unspecified	Used to report normal events only when no other cause in the normal class applies.

Table 4. Class 010 - Network Congestion

Hex	Value	Description	Meaning
A2	34	No channel available	An appropriate channel is not currently available to handle the call.
A3	35	Call queued (AT&T)	Network is not functioning. Immediate redial is unlikely to succeed.
A6	38	Network out of order	Network is not functioning. Immediate redial is unlikely to succeed.
A9	41	Temporary failure	Network is not functioning. Immediate redial is unlikely to succeed.
AA	42	Switching equipment congestion	Switching equipment generating this cause is experiencing a period of high traffic. AB 42 user information is discarded. The network can not deliver access information to the remote user as requested. For example: a user-to-user information low-layer compatibility sub-address as indicated in the diagnostic The particular type of discarded access information is optionally included in the diagnostic.
AC	44	Requested channel not available	The channel indicated by the requesting entity cannot be provided by the other side of the interface.
AF	47	Resources unavailable or unspecified	A resource unavailable event only when no other cause in the resource unavailable class applies.

Table 5. Class 011 - Service or Option Not Available

Hex	Value	Description	Meaning
B1	49	Quality of service unavailable	Throughput or transit delay cannot be supported. The Quality of Service (as defined in Recommendation X.213) cannot be provided.
B2	50	Requested facility not subscribed	Requested supplementary service not provided by the network because the user has not completed the necessary administrative arrangements with its supporting networks.
B4	52	Outgoing calls barred (AT&T)	No outgoing calls are allowed.
B6	54	Incoming calls barred	No incoming calls are allowed.
B9	57	Bearer capability not authorized	User is trying to make unauthorized use of equipment providing a bearer capability.
BA	58	Bearer capability not presently available	User has requested a bearer capability that is implemented by the equipment generating the cause, but is not available at this time.
BF	63	Service or option not available or unspecified	A service or option not available event only when no other cause in the service or option not available class applies.

Table 6. Class 100 - Service or Option Not Implemented

Hex	Value	Description	Meaning
C1	65	Bearer capability not implemented	Equipment sending this cause does not support the requested bearer capability.
C2	66	Channel type not implemented	Equipment sending this cause does not support the requested channel type.

Table 6. Class 100 - Service or Option Not Implemented

Hex	Value	Description	Meaning
C5	69	Requested facility not implemented	Equipment sending this cause does not support the requested supplementary service.
C6	70	Only restricted digital available	Request for an unrestricted bearer service, but the equipment sending this cause only supports the restricted version.
CF	79	Service not implemented or unspecified	The service or option not implemented event only when no other cause in the service or option not implemented class applies.

Table 7. Class 101 - Invalid Message

Hex	Value	Description	Meaning
D1	81	Invalid call reference value	A message with a call reference that is not currently in use on the user network interface, received by the equipment sending the cause.
D2	82	Channel does not exist	Equipment sending this cause received a request to use a channel not activated on the interface for a call.
D3	83	Suspended call exists, call identity does not	A call resume attempted with a call identity that differs from that in use for any currently suspended call.
D4	84	Call identity in use	Network received a call suspended request. The request contained a call identity (including the null call identity) that is already in use for a suspended call within the domain of interfaces over which this call can be resumed.

Table 7. Class 101 - Invalid Message

Hex	Value	Description	Meaning
D5	85	Invalid digit value for number	Network received a call resume request. The request contained a call identity information element that does not indicate any suspended call within the domain of interfaces over which the call can be resumed.
D6	86	Call having the requested call identity is cleared	The network has received a call resume request. This request contained a call identity information element that once indicated a suspended call; the suspended call was cleared while suspended (either by network timeout, or by a remote user).
D8	88	Incompatible destination	Equipment sending this cause received a request to establish a call that has low layer compatibility, high layer compatibility attributes (for example, data rate) that cannot be handled.
DB	91	Transit network does not exist	Transit network does not exist.
DF	95	Invalid message unspecified	Invalid message event only when no other cause in the invalid message call applies.

Table 8. Class 110 - Protocol Error

Hex	Value	Description	Meaning
E0	96	Mandatory information element is missing	Equipment sending this cause received a messages that is missing an information element that must be present in the message before that message can be processed. The particular Information Element is identified in the diagnostic octet. For example, 81 E0 04 means that the bearer capability is not included by the PABX (Private Network) in the SETUP message. 0x04 is the Bearer Capability Information Element Identifier as specified int the standards.
E1	97	Message type non-existent or not implemented	Equipment sending this cause received a message with a message type it does not recognize: Undefined message Defined but not implemented by the equipment sending the cause
E2	98	Message not compatible with call state or message type non-existent or not implemented	Equipment sending this cause received a message that it considers non-permissible while in the call state; or a STATUS message received indicating an incompatible call state.
E3	99	Information element non-existent or not implemented	Equipment sending this cause received a message that includes information elements not recognized because the information element identifier is not defined, or is defined but not implemented by the equipment sending the cause. However, the information element is not required to be present in the message to enable the equipment sending the cause to process the messages. When this cause is presented by the board, the particular Information Element is identified in the diagnostic octet. For example 81 E0 04, would mean that the bearer capability had not been included by the PABX (Private Network) in the SETUP message. 0x04 is the Bearer Capability Information Element Identifier as specified in the standards.

Table 8. Class 110 - Protocol Error

Hex	Value	Description	Meaning
E4	100	Invalid information element contents	Equipment sending this cause received an information element that it has implemented. However, the sending equipment was not able to implement the code because one or more of the fields were incorrectly coded.
E5	101	Message not compatible with call state	The received message is incompatible with the call state.
E6	102	Recovery on timer expiry	A timer expired and an associated Q.931 error handling procedure is initiated.
EF	111	Protocol error, unspecified	An error event only when no cause in the protocol error class applies

Table 9. Class 111 - Internetworking

Hex	Value	Description	Meaning
FF	127	Interworking unspecified	Interworking with the network that does not provide cause codes for its actions. Therefore, the precise cause for a message being sent is unknown.

Table 10. Brooktrout Specific Error Codes

Hex	Value	Description	Meaning
3E9	1001	Timeout error	Alerting message detected, but a timeout occurred before a connect message was detected.
3EA	1002	Timeout error	Setup acknowledge message detected, but a timeout occurred before a connect message was detected.
3EB	1003	Timeout error	Progress message detected, but a timeout occurred before a connect message was detected.
3EC	1004	Channel problem	Layer 2/D-channel went down

Table 10. Brooktrout Specific Error Codes

Hex	Value	Description	Meaning
3ED	1005	Unexpected termination	Wait for Complete was terminated unexpectedly.
3EE	1006	Disconnect error	Disconnect message occurred after the connect message check *res_line_status*
3EF	1007	Timeout error	Outgoing call attempted, but timeout occurred with no response from the network.

Diagnostic Octet

Table 11. Diagnostic Byte

Hex	Value	Description
02	2	Transit network identity or network specific facility Information Element Identifier
16	22	New destination number
1D	29	Facility identification
2B	43	Discarded Information Element Identifier
2F	47	Information Element Identifier
39	57	Attributes of bearer capability
3A	58	Attributes of bearer capability
41	65	Attributes of bearer capability
42	66	Channel type
58	88	Incompatible parameter
5F	95	Message type
60	96	Information Element Identifier
61	97	Message type
62	98	Message type
63	99	Information Element Identifier
64	100	Information Element Identifier
65	101	Message type
66	102	Timer number

For protocol errors, where the cause octet indicates a class of 110 - protocol error, the diagnostic octet might indicate the particular message or information element identifier. For example, 81 E0 04 means that the bearer capability is not included by the PABX (Private Network) in the SETUP message. 0x04 is the Bearer Capability Information Element Identifier as specified in the standards.

ISDN Telephone Service Options

This appendix describes telephone service options for T1 and E1 ISDN lines, and provides ordering and connecting information.

It includes the following sections:

- About ISDN Telephone Service
- Ordering ISDN Telephone Service
- Connecting to ISDN
- Troubleshooting ISDN Installations

About ISDN Telephone Service

The ISDN Primary Rate Interface (PRI) provides dial-up digital access to the worldwide telecommunications network. PRI supports single (point-to-point) ISDN terminal devices on an individual line.

PRI service provides end-to-end digital connectivity to support a wide range of telecommunication services. These services include voice and non-voice services.

PRI E1 provides 30 B (bearer) channels and one D (signaling) channel, often referred to as 30B+D. PRI T1 provides 23 B (bearer) channels and one D (signaling) channel, often referred to as 23B+D. The B channels carry circuit-switched voice or data at 64 kbit/s, and the D channel carries call control signaling at 16 kbit/s. The channels are connected to telephone service using an RJ-45 connector on the board.

PRI ISDN allows you to do inbound call routing. PRI E1 is primarily used in Europe and Japan. PRI T1 is primarily used in North America.

Ordering ISDN Telephone Service

Ask for the following when ordering ISDN service:

For E1

- Primary rate line, otherwise referred to as PRI, PRA, E1, S2m (G), T2 (F), ISDN30 (Nld), ISDN30e (UK).
- EuroISDN protocol, otherwise referred to as CTR-3,DSS1, Q.931, I.421 (limited ETSI), I.451(full ETSI), Net 8 (?), 6+,... (Net 5, Net 4, …). EuroISDN protocol does not include 1TR6, DASS2 or DPNSS.

  * Other protocols can be supported by connecting an interface board to the TR1034.
- Number of B-channels you require, if PBX or partial E1.
- Check physical interface 120 Ohm (usually) or 75 Ohm.
- Check if CRC-4 is enabled.
- The network side should be configured as an NT, and should provide the clock.
- Ensure reception of the *called party number* for inbound routing.
- Be aware of the method for inbound call distribution that is available to you. Methods of inbound call distribution include linear, circular and random. For linear and circular distribution, you can start from the lowest B channel or from the highest B channel. Brooktrout recommends Linear distribution, especially for a fractional TR1034 board.

Linear Calls are always placed on the same channel, and 'roll over' to other channels only when that one is busy. If a problem exists, linear distribution is recommended because it is easier to troubleshoot.

Cylical Calls are shared amongst the channels, by placing each new call on the next channel in the group.

- Do not request a specific HLC such as "telephony".

For T1: Similar to E1 with the following exceptions:

- No CRC-4
- No termination difference (always 120 ohm)

Connecting to ISDN

1. Compare your pin layouts on the board as described in the hardware installation guide to the network side to make sure they match. See the section on *PRI Pinout* on page 103 for more information.
2. Since you are working with a high speed ISDN line, make sure your cable is not too long.

   If you have problems with synchronization or getting ISDN Layer 2 up, first check the pin layouts and second, reduce the cable length.

Connecting to a PABX

The bulk of this section provides generic information suitable for all PABX installations. It acts as an installation framework and has paragraphs targeted to the reseller and PABX Engineer. These paragraphs provide Brooktrout ISDN TR034 detail and highlight information to be exchanged between the reseller and PABX Engineer.

Recommendations Before Installing

For the reseller

Ideally the following is required:

- Experience installing and configuring ISDN TR1034s
- Copy of this TR1034 PCI Hardware Manual
- Soft copy of the hardware diagnostic tool: *FaxDiag* (For information on this product, see Chapter 3, "*Testing*", on page 71)
- Access to a telephone near the Fax server
- On-site internet/FTP access
- Hand-held ISDN tester, such as an AuroraPlus Combi (www.trendcomms.com)
- Brooktrout contact information

For the PABX Engineer

Ideally the following:

- Experience configuring the PABX for different ISDN equipment, or the ability to contact someone with thorough knowledge of ISDN protocol for your PABX
- Portable ISDN tester

Installation

For the Reseller

Provide the following information to the PABX Engineer:

- Number of licensed TR1034 ISDN channels you require.

  If you use the Fractional TR1034, indicate that you require a partial ISDN line or a full ISDN line with linear call distribution.
- Whether or not the PABX needs to present a Called Party Number.

  If the ISDN TR1034 is to be used for inbound routing of faxes, then the PABX needs to present all or part of the number dialed by the fax sender, in order to identify the recipient.
- The quantity and range of DID (DDI) numbers you require.

  For example, you could tell the PABX Engineer that you require:
  - 1 PRI line
  - Linear call distribution
  - Ten DID numbers from 555100 to 555110

  The PABX needs to present a Called Party Number

  Before the PABX Engineer arrives to configure the PABX, you should ensure that the Engineer is experienced with ISDN installations, and brings an ISDN tester to the site.

  The PABX Engineer should check the ISDN requirements detailed in the next section, and confirm to you that the PABX is capable of matching each and every one of these requirements.

For the PABX Engineer

The Reseller provides you with certain information, including:

- Number of ISDN ports
- Call distribution (Linear/cyclical/random)
- Whether they require a Called Party Number to be presented
- Quantity and range of DID numbers

This section provides detailed information regarding the ISDN requirements of the Brooktrout ISDN TR1034. The information is presented in technical detail on a layer-by-layer basis. You should ensure the PABX is configured to meet these requirements.

General

- EuroISDN protocol stack, also known as DSS1 or ETSI 300 (*not* 1TR6 or DASS2). Primary Rate access.

  The PABX port should be a Network Termination (NT or master) since the TR1034 is Terminal Equipment (TE or slave).

Layer 1 – Physical Layer

- ITU I.431 Standard, RJ45 interface.
- Framing methods are different for T1 and E1 ISDN. Ask the PABX engineer what framing method is being supplied, then refer to the appropriate configuration chapter for *ds1_line_type* parameter options (Chapter 1, *"Configuring Your TR1034 Board using Brooktrout Software Version 2.1.x"*, on page 1 or Chapter 2, *Configuring Your TR1034 Board using Brooktrout Software Version 3.0.x*, on page 37).
- Brooktrout supports port termination at 120 Ohms (by default), however with the help of an additional cable adapter provided by Brooktrout, we also support port termination at 75 Ohms.

Layer 2 – Datalink Layer

- Q.921 Standard

  ISDN PRI uses only point-to-point data links.

Layer 3 – Network Layer

- Q.931 Standard
- For maximum flexibility, bearer capabilities of Speech and 3.1K Audio should be acceptable for both incoming and outgoing calls.
- The ISDN TR1034 can be configured to present a Calling Party Number.
- Most installations require the PABX to provide a Called Party Number. The reseller should have indicated to you if this is required. The Called Party Number does not need to be the full number dialed, merely enough trailing digits to uniquely identify a called user. Although the quantity of received digits is usually fixed, the ISDN TR1034 can accept a variable number of digits.

  The Called Party Number should be presented in one of the following ways:

En-Block	As a Called Party Number or a Redirecting Number Information Element within the initial SETUP message
Overlapped	As Called Party Number Information Elements, distributed within the initial SETUP message and subsequent INFO messages.

- The ISDN TR1034 has a number of ISDN protocol specific parameters that you can configure. These should generally be left at their defaults. In cases where you are experiencing problems during the installation, and you have a good understanding of the ISDN protocol used by your particular PABX, it might be useful for the reseller to show you this list of parameters, their range and their defaults. See the appropriate configuration chapter (Chapter 1, *"Configuring Your TR1034 Board using Brooktrout Software Version 2.1.x"*, on page 1 or Chapter 2, *Configuring Your TR1034 Board using Brooktrout Software Version 3.0.x*, on page 37) for ISDN parameter information.

You should now indicate to the reseller:

- If your PABX requires the ISDN TR1034 to present a Calling Party Number
- Exactly how many digits are present in the Called Party Number
- Indicate the framing method
- Any deviations from the requirements listed above
- Prior to connecting the ISDN TR1034, you should use your portable ISDN tester to demonstrate to the reseller that all ISDN channels can originate and receive calls. You should also demonstrate that when receiving calls, the Called Party Number is presented.

For The Reseller

The PABX Engineer should have demonstrated operation of the line. If not, you should test the line using your own ISDN tester.

The PABX Engineer should have indicated:

- If the PABX requires the ISDN TR1034 to present a Calling Party Number
- Exactly how many digits are present in the Called Party Number by the PABX
- What framing method was implemented
- Any deviations from the listed requirements

You can use this information to set the following parameters:

- parameters such as CPN, framing, etc. in the application and *teleph.cfg*
- *did_digits* and *did_variable* in *btcall.cfg* (*user.cfg*)

You should configure the board and test the installation using the diagnostics found on the Brooktrout website. Testing procedures are fully documented in Chapter 3, *Testing*, on page 71.

Troubleshooting ISDN Installations

Important Network Characteristics

ISDN Line characteristics

A single standard primary rate E1 line provides 30 channels called bearer (or B) channels that can be used simultaneously for both incoming and outgoing calls.A single standard primary rate T1 line provides 23 channels called bearer (or B) channels that can be used simultaneously for both incoming and outgoing calls. Call control for these channels is provided over a single, shared D channel. These channels are multiplexed together providing the 30B+D E1frame or 23B+D T1 frame.

Service indicator (Bearer Capability)

When placing a call, a TE presents certain characteristics of itself in order to request a certain bearer capability of the network and to allow a receiving device to establish if it is compatible with the sender before answering the call. Two important bearer capabilities are speech and 3.1k Audio. Speech specifies the lowest level of service, and is the bearer capability used by telephones. The bearer capability of 3.1k Audio is recommended by the appropriate standards for fax group 2/3. A bearer capability set to 3.1k Audio ensures a higher quality of line than guaranteed by speech. However, some public and private networks do not correctly handle 3.1k Audio bearer capabilities and might reject the call.

Receiving DID digits

There are two ways the NT can pass the DID digits to a TE, en-block and overlapped. In the vast majority of installations the DID number is passed en-block, where the whole number is passed in a single group. Some networks pass the DID digits overlapped, where the DID digits are received fragmented in separate messages.

Overlapped receiving is only found under the following circumstances:

- Countries where the public network can allow a user-defined variable number of subaddress DID digits, such as Germany, Austria and Italy.
- When the caller is dialing using overlapped sending.

General PABX

There are many parameters including the PABX make, model, version, configuration and country of installation that contribute to different configurations.

Framing

Framing methods differ from E1 to T1. For E1, generally use CRC4 multiframing, but in some countries it's possible to specify basic framing. For T1, generally use extended superframing.

ISDN Supplementary Services

Direct Inward Dialing

Direct Inward Dialing (DID) or Direct Dialing Inward (DDI) is recommended for larger LAN fax networks with ten or more workstations. It provides an unlimited range of numbers, usually purchased in blocks from the PTT.

In some countries, it is possible to specify how many of the trailing digits are sent as the Called Party Number to the TE when a call is placed.

DID enables automatic routing of facsimiles to distinct workstations or printers attached to the LAN fax network.

DID numbers consist of two parts: an access code that identifies the DID subscriber and an extension number that identifies the individual user. The length of the extension number usually depends on the size of the DID range and on subscriber requirements, but it is fixed for the subscription and registered in the public ISDN network.

The LAN fax network administrator must associate each of the workstations on the network with one of the telephone numbers in the assigned range of DID numbers.

For incoming calls, the telephone company includes the called party number in the SETUP message. The called party number might be the full DID number or the last one to five digits of the DID number. When the TR1034 channel answers a call, it captures the DID number and passes it to the LAN fax application on the host, which routes the fax to the workstation on the network associated with that number.

This service is intended for all other general purpose number provisioning, such as in PABX.

Advice of Charge (AOC)

It is possible to obtain the cost of a call as a supplemental service within ISDN. There are two forms of advice of charge: advice of charge during the call (AOC-D), and advice of charge at the end of the call (AOC-E).

Advice of charge - during

Billing information is provided by the network throughout the active phase of the call. The information is provided as subtotals, and a final total is presented at the end of the call.

Advice of charge - end

Billing information is only presented as a total at the end of the call. The billing information is delivered in two types: units and currency.

Units:

A unit value is returned, where each unit has a pre-defined value. This type of billing information has a simple structure with few options.

Currency:

The actual cost of the call is returned, including currency identifiers and multipliers. This type has a complex structure with many options, and can vary from country to country.

AOC-D is the most common form of AOC, because it is used in most PABX installations. Many PABX can also provide this AOC information to their EuroISDN ports. Unit is the most

common type, since it mirrors earlier analog billing methods, and has a simpler structure than currency. The structure of currency type varies from country to country.

Note: Although the board can interwork with all the varieties of AOC, if there is a choice available, we recommend AOC-D with unit type. This is because it is more widely available, premature disconnections result in a partial value, implementation does not vary widely, and it requires simple application support.

B Channel	One of the ISDN line's bearer channels. Operates at 64 kbit/s and carries voice, fax, data, or video.
Channel	One of the channels that transmits or receives fax or voice data over an ISDN line's B channel and call setup and call signaling over the ISDN line's D channel.
D Channel	The ISDN line channel that carries call control and call setup signaling (out-of-band signaling). Operates at 16 kbit/s and can carry packet-switched data.
DDI (DID)	Direct Dialing Inward (Direct Inward Dialing). A user network access method available on groups of ISDN lines. Assigns the group of ISDN lines a range of consecutive telephone numbers in blocks of 10, 100, 1,000, or 10,000 numbers.
Framing	The Brooktrout board supports two frame modes, SF and ESF:
* Super Frame (SF)	A T1 transmission structure that divides the data into twelve, 193-bit blocks, or frames. Also commonly referred to as "D4" framing.
* Extended Super Frame (ESF)	A T1 transmission structure that divides the data into 24 8,000 bps blocks, or frames.

Hunt Group

A logical access made up of multiple ISDN lines on which the telephone company can deliver incoming calls. To deliver a call, the telephone company searches the hunt group for a free B channel.

Immediate-Start

A DID service option where the telco waits a fixed amount of time after seizing the line before it sends the DID digits to the board. Then, when it detects or fails to detect the correct number of DID digits, the board responds the same as it does when configured for *wink-start* service.

ISDN

Integrated Services Digital Network. Provides dial-up digital access to worldwide telecommunications network over twisted-pair telephone lines.

ISPBX

Integrated Services Private Branch Exchange. An ISDN PBX.

Line Coding

AMI (Alternate Mark Inversion)

Alternate "1" bits have their polarity reversed (between + and -3 volts). Also, between two successive "1"s, the voltage briefly pauses at 0. Most often used if framing mode is SF/D4.

B8ZS (Binary 8 Zero Substitution)

Method of maintaining density of "1"s on the line by deliberately inserting "bipolar violations". Most often used if framing mode is ESF.

Network Termination Equipment

Termination devices that provide the interface connecting subscriber 4-wire equipment to telephone company 2-wire equipment. Installed on subscriber premises, defines the demarcation point between PSTN and subscriber equipment. Types are NT1 and NT2:

NT1

Network termination type 1. A 2-wire (PSTN)/4-wire (subscriber) interface. Installed at your site, it terminates the public ISDN network, supplies power to the ISDN line and your ISDN devices, and performs maintenance functions.

NT2

Network termination type 2. An intelligent device that performs higher-level functions, such as switching and concentration. Examples are an ISPBX, LAN, and a terminal controller.

Reference Points

Specifications defining the links that connect devices on an ISDN network and their communications protocols. ISDN standards define three user (subscriber) reference points, R, S, and T and two Central Office (CO) reference points, U, and V:

R

An analog interface linking a TE2 to a Terminal Adapter (TA). Tied to country-specific standards, it typically complies with an X series and V series of ITU-T recommendations.

S or S/T

A four-wire digital connection linking individual TE1s or TE2s to their NT1. It separates individual terminals from network-related communications functions.

While the S and T points are electrically identical, the S point links a TE1 or TE2 to an NT2, and the T point links them to an NT1.

U

Two-wire digital connection linking the NT1 to the Central Office. Also known as the "local loop."

V

The interface at the Central Office that links a line termination (LT) device with an exchange termination (ET) device.

Robbed-bit Signaling

In this type of signaling, the least significant bit of information in a T1 signal is "robbed" from the information stream and used to transmit framing and clocking information. This is sometimes called "in-band" signaling, or "A/B" signaling. Brooktrout supports two types of robbed-bit signaling; E&M and FXS/FXO.

E&M (Ear and Mouth)

Denotes the signaling path for the T1 signal. "E&M" means that the signaling bits (those bits that are "robbed" from the information stream and communicate not data, but framing and clocking information) do whatever the A-bit does. (In robbed-bit signaling, when the frame mode is Super Frame, you have A + B bits, when the frame mode is Extended Super Frame you have A, B, C + D bits.)

FXS & FXO

Foreign Exchange Office is the interface on a network or T1 node that "talks" to the PBX (or, Brooktrout board). Foreign Exchange Subscriber is the complementary interface at the other end of the FXO. This is a signaling method separate and distinct from E&M signaling; in this signal protocol, the signaling bits often do not follow what the A-bit does. If this method is chosen, the telco/PBX side should be set up as FXO, and the Brooktrout board set up as FXS. This is also commonly referred to as "T1 loop start" service.

TA

Terminal adapter. Protocol converter that enables old analog equipment (hardware and software) to communicate with the ISDN network.

Terminal Equipment

Any user device that connects to an ISDN line through an NT1. Types are TE1 and TE2:

TE1

Terminal equipment type 1. An ISDN telephone, computer, fax machine, or other equipment that you can connect to ISDN service without going through a terminal adapter (TA).

TE2

Terminal equipment type 2. An old, analog telephone, modem, fax machine, or other equipment that you used to connect to analog phone service. For ISDN, you connect it to ISDN service through a terminal adapter (TA).

User Network Access Method

Defines how the subscriber's equipment connects to the ISDN network and accesses ISDN services. Some methods are included in the basic service, while others are supplementary.

Which access method a subscriber selects depends on several factors: the number of PRI lines installed, the type of equipment connecting to ISDN service, and whether the installation includes an NT2 (for example, an ISPBX or LAN).

Wink-Start

A DDI service option where the board performs a "wink" after it detects seizure of the line; that is, it momentarily reverses the voltage polarity applied across the phone line (i.e., tip and ring), signaling the telco that it is ready to receive the last few digits of the dialed number.

Index

F

H

I

L

M

O

P

R

S

T

W