TRNIC™ Series Hardware Guide

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410 First Avenue
Needham, MA 02494-2722
781-449-4100
www.brooktrout.com

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See *Chapter 5, Contacting Technical Support*.

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Preface

About this Manual

This manual describes the TRNIC+I24T and the TRNIC+P24T telephony network interface cards that connect digital resource boards (such as TR114 boards) to T1 telephone service. It contains the following sections.

Chapter 1 - Presents information on the basic features of the TRNIC network interface cards.

Chapter 2 - Explains how to configure and install the TRNIC+I24T network interface card.

Chapter 3 - Explains how to configure and install the TRNIC+P24T network interface card.

Chapter 4 - Describes the LEDs that are used on the TRNIC cards and explains how to test and troubleshoot the TRNIC cards.

Chapter 5 - Lists the ways you can contact Brooktrout technical support and describes information you should furnish when requesting help.

Appendix A - Provides information on North American regulations with which the TRNICs are in compliance.

Appendix B - Discusses use of two or more network interface cards on a single MVIP cable.

Appendix C - Describes the configuration of the T1 network connection.

Related Documents

TR114 ISA Digital Hardware Guide

Manual Conventions

This manual uses the following conventions:

- *Italics* denote file names, directory names, and program names within the general text.
- The **Courier** font in bold indicates a command sequence entered by the user at the system prompt, for example:

  cd /usr/sys/bfax/app.src

  The Courier font not bolded indicates system output, for example:

  ```
  c:>Files installed.
  ```

- When used by itself, the term ‘TRNIC’ refers to either the TRNIC+I24T or the TRNIC+P24T.
- Throughout this guide, in all instructions describing how to set switches, DOWN means pushed toward the board’s surface, and UP means pushed away from the board’s surface.

Chapter 1
Introducing the TRNIC

The TRNIC telephony interface cards provide a connection for TR114 digital boards to a single robbed-bit T1 span (24 channels).

The TRNIC operates in transparent mode. This means the TRNIC transfers unaltered T1 data and signaling information to and from TR114 digital boards. The TR114 digital boards perform all of the call control tasks.

Models

The TRNIC is available in the following models:

TRNIC+I24T	ISA bus model with an interface to the PEB or MVIP bus.
TRNIC+P24T	PCI bus model with an interface to the MVIP bus.

Features

The TRNIC Series boards have the following features:

- Provide one T1 (robbed-bit) telephone interface for 24 fax or voice channels.
- Require no software drivers, no address setting, and no interrupt setting.
- Connect to the MVIP bus or PEB bus (I24T only).
- Has FCC Part 68 and Part 15 Class A approval and Canadian DOC approval.

System Requirements

- A computer with either an 8-bit ISA slot for the TRNIC+I24T or a 32-bit PCI slot for the TRNIC+P24T.
- A Channel Service Unit (CSU) if the distance between the T1 circuit and the TRNIC exceeds 500 feet.

  Many sites recommend the T-SERV-II® CSU from ADC Kentrox (**www.kentrox.com** or 1-800-733-5511).
- T1 telephone service.
- One or more TR114 digital boards with MVIP or PEB bus (TRNIC+I24T only) connectors or other resource boards that conform to PEB or MVIP specifications. For each TRNIC, only 24 T1 channels are available to the boards.

Power Requirements

Each TRNIC model has the following typical power requirements:

Model	**5V dc**	**Power**
TRNIC+I24T	350 mA	1.75W
TRNIC+P24T	185 mA	0.925W

Contents of the Box

TRNIC+I24T Models

The following list includes all of the parts that ship with your TRNIC+I24T network interface card. Please check the contents of your package to make sure it contains these parts.

- One TRNIC+I24T
- One 6' T1 twisted cable terminated with RJ-45 modular jacks (see *Appendix C, Configuration of the T1 Network Connection*)
- One DB-15 to RJ-45 adapter to connect the T1 network cable to the TRNIC+I24T

- One MVIP cable for MVIP operation; one PEB cable for PEB operation
- One *TRNIC Series Hardware Guide* (this guide)
- One *TRNIC+I24T Quick Reference Card*

Go to Chapter 2 to configure and install the TRNIC+I24T.

TRNIC+P24T Models

The following list includes all of the parts that ship with your TRNIC+P24T network interface card. Please check the contents of your package to make sure it contains these parts.

- One TRNIC+P24T
- One 6' T1 twisted cable terminated with RJ-45 modular jacks (see *Appendix C, Configuration of the T1 Network Connection*)
- One MVIP cable
- One *TRNIC Series Hardware Guide* (this guide)
- One *TRNIC+P24T Quick Reference Card*

Go to Chapter 3 to configure and install the TRNIC+P24T.

Chapter 2
Configuring and Installing the TRNIC+I24T

This chapter explains how to:

- Change the TRNIC+I24T configuration switches as needed.
- Install the TRNIC+I24T in an ISA slot in the computer.
- Connect the MVIP or PEB cable.
- Connect the TRNIC+I24T to T1 telephone service.

Identifying the Switches and Connectors

Figure 2-1 shows the location of the switches and connectors on the TRNIC+I24T.

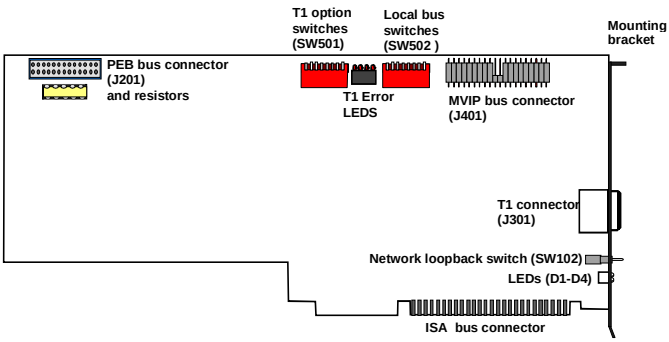


Figure 2-1. Layout of the TRNIC+I24T

Default Configuration

The TRNIC+I24T is shipped configured for a PEB environment and with the following default settings for its T1 options and local bus parameters.

Default T1 Options (SW501):

- T1 clock master **T1 network**
- Framing Mode **SF**
- Line Coding **B8ZS**
- Cable length **0 to 132 ft.**

Default Local Bus Parameters (SW502):

- Bus type **PEB**
- MVIP stream select **N/A**
- MVIP clock master **N/A**
- MVIP sync source ctrl **N/A**
- MVIP termination **N/A**

When PEB is the bus type, the MVIP settings are ignored.

Changing the Configuration Settings

If the default settings match the actual installation environment, you can install the TRNIC+I24T in your system as is. Otherwise, you need to change the appropriate switches before installing it in the computer.

Changing T1 Options

Use the switches of SW501 to configure the T1 options for the TRNIC+I24T. Switches 7 and 8 are not used and do not affect TRNIC+I24T operation. See Figure 2-1 for the location of SW501. Figure 2-2 shows SW501 with the switches set to the default.

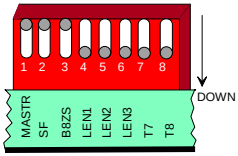


Figure 2-2. SW501 with Default Settings

Note: DOWN means pushed toward the board's surface, and UP means pushed away from the board's surface.

To change the T1 clock master, framing mode, and line coding options for the TRNIC, set the switches as shown in Table 2-1. Setting in **bold** are the defaults.

Table 2-1. T1 Options

Switch	Meaning	Setting	Mode
1	T1 clock master (MASTR)	**Up** Down	**T1** TRNIC
2	Framing mode (SF)	**Up** Down	**SF** ESF
3	Line coding (B8ZS)	**Up** Down	**B8ZS** AMI

The modes are

- ***T1 clock master***

  T1 – The T1 generates and transmits the clocking signals to the TRNIC. For PEB operation, always use this mode.

  TRNIC – The TRNIC generates and transmits the clocking signals to the T1.

- ***Framing mode***

  SF (Super Frame**) –** A transmission structure that divides the data into twelve, 193-bit blocks or frames.

  ESF (Extended Super Frame**) –** A transmission structure that divides the data into twenty-four, 8,000 bps blocks or frames.

- ***Line coding***

  B8ZS (Binary 8 Zero Substitution**) –** A T1 line-coding format that inserts two violations of the bipolar line encoding technique instead of inserting a 1 for every seven consecutive 0s.

  AMI (Alternate Mark Inversion) – A T1 line coding format that represents binary 1s (marks) as signals of equal amplitude, but that alternately inverts the polarity of each successive mark. It represents binary 0s as signals of zero amplitude.

Setting the T1 Cable Length

Switches 4, 5, and 6 of SW501 set the length of the cable that connects the TRNIC+I24T to the T1 network. If the length of your cable exceeds 132 feet, change the default setting to the setting that most closely corresponds to the actual length of your cable.

Note: Set the length as accurately as possible. An incorrect setting for the cable length affects signal quality and proper operation of the TRNIC+I24T.

To configure the length of the cable, set the switches as shown in Table 2-2. The default settings are shaded.

Table 2-2. Cable Length Settings

Cable length	4 (LEN1)	5 (LEN2)	6 (LEN3)
0 to 132 ft.	DOWN	DOWN	DOWN
133 to 266 ft.	UP	DOWN	DOWN
267 to 398 ft.	DOWN	UP	DOWN
399 to 532 ft.	UP	UP	DOWN
533 to 654 ft.	DOWN	DOWN	UP

You can change these switches while the TRNIC+I24T is powered on without causing the board or the system to malfunction. The TRNIC+I24T monitors these switches once every second and when it detects a change, it reconfigures its operation.

Changing Local Bus Parameters

Use the switches of SW502 to configure the local bus options of the TRNIC+I24T. Switch 8 is not used and does not affect TRNIC+I24T operation. See Figure 2-1 for the location of SW502. Figure 2-3 shows SW502 with the switches set to the default.

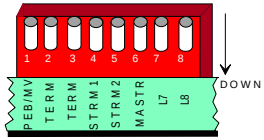


Figure 2-3. SW502 with Default Settings

If PEB is the local bus, the other switches are ignored because they are use for the MVIP bus.The switches, their possible settings, and the modes that they set are summarized in Table 2-3. Default settings are shown in **bold**.

Table 2-3. Local Bus Options Set with SW2

Switch	Meaning	Setting	Mode
1	Local bus type (PEB/MV)	**UP** DOWN	**PEB** MVIP
2, 3	MVIP Termination (TERM, TERM)	**UP, UP** DOWN, DOWN	**Unterminated** Terminated
4, 5	MVIP Stream Select (STRM1, STRM2)	**UP, UP** DOWN, UP UP, DOWN DOWN, DOWN	**6/7** 4/5 2/3 0/1
6	MVIP Clock master (MASTR)	**UP** DOWN	**TRNIC+I24T master** TRNIC+I24T slave
7	MVIP Clock sync functions:	Function depends on mode set for MVIP master clock (switch 6)	
7 *w/6 UP*	Sync source ctrl (L7)	**UP** DOWN	**TRNIC+I24T** Secondary NIC
7 *w/6 DOWN*	Framing sig. output (L7)	**UP** DOWN	**Disable output** Enable output

The modes are

- ***Local Bus Type (PEB/MV)***

  PEB – For connecting the TRNIC to boards via the PEB bus. The PEB bus is always clock master and the remaining local bus parameters have no effect. When you select PEB, always specify the T1 as T1 clock master.

  MVIP – For connecting the TRNIC to boards via the MVIP bus. Unless the default settings are sufficient, set the remaining local bus parameters.

- ***MVIP Termination (TERM, TERM)***

  Enables or disables MVIP clock termination. For details, see *MVIP Termination* on page 2-7.

- ***MVIP Stream Select (STRM1, STRM2)***

  Selects the MVIP data/signaling pair: 0/1, 2/3, 4/5, or 6/7. By convention, even numbered streams carry data, and odd numbered streams carry signaling.

- ***MVIP Clock Master (MASTR)***

  Leave at the default setting if the TRNIC is the only NIC on the MVIP bus. See *Appendix B, Using Two or More NICs on the MVIP Bus*, for information on setting this switch when you have more than one NIC on the MVIP bus.

- ***MVIP Synchronization Mode (L7)***

  Leave at the default setting if the TRNIC is the only NIC on the MVIP bus. See *Appendix B, Using Two or More NICs on the MVIP Bus*, for information on setting this switch when you have more than one NIC on the MVIP bus.

Be sure that the local bus parameters in the *digital.cfg* file match the bus type actually used on the TRNIC+I24T and its associated boards.

LAN fax users: Typically, for software setup, you set parameters in the *digital.cfg* file or through a board setup procedure. See the documentation supplied with your software.

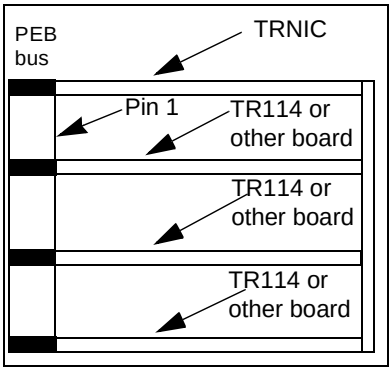
Setting Termination for the Local Bus

Termination requirements of the PEB and MVIP bus protocols affect installation as described in *PEB Termination* and *MVIP Termination*.

PEB Termination

The PEB protocol requires termination at both ends of the PEB cable. The PEB termination resistor bank is built into the TRNIC+I24T and should not be removed. You must install the TRNIC+I24T at one end of the PEB cable and a terminated board (for example, a TR114) at the other end of the cable. On a TR114 board, the PEB termination resistor bank is installed beneath the PEB bus. Make sure you remove the PEB termination resistor bank on all other boards connected in the middle of the PEB bus.

For example, Figure 2-4 shows the PEB bus with four connections. The TRNIC itself and the board (such as a TR114) at the opposite end of the cable from the TRNIC are terminated.



PEB Connection	PEB Termination Resistors
1st Connection - TRNIC	Installed
2nd Connection	Not Installed
3rd Connection	Not Installed
4th Connection	Installed

Figure 2-4. Termination on the PEB Bus

MVIP Termination

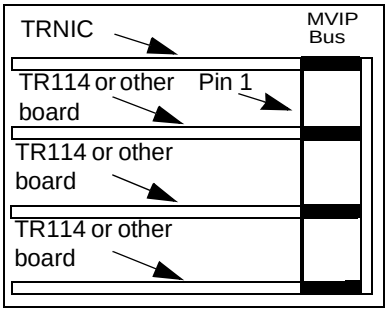
The clock on the MVIP bus requires termination. Switches 2 and 3 of SW502 enable or disable this termination on the TRNIC+I24T. (See *Changing Local Bus Parameters* on page 2-5).

MVIP clock termination requirements depend on the number of connections on the MVIP bus. Follow these guidelines:

- Install the TRNIC+I24T at one end of the cable.
- For systems with 5 or fewer MVIP bus connections, terminate the resource board (such as a TR114) at the end of the cable opposite the TRNIC+I24T. Make all other boards on the cable unterminated including the TRNIC+I24T.

- For systems with more than 5 MVIP bus connections, terminate both ends of the MVIP cable – the TRNIC+I24T *and* the resource board at the opposite end of the cable. Make all other boards on the cable unterminated.

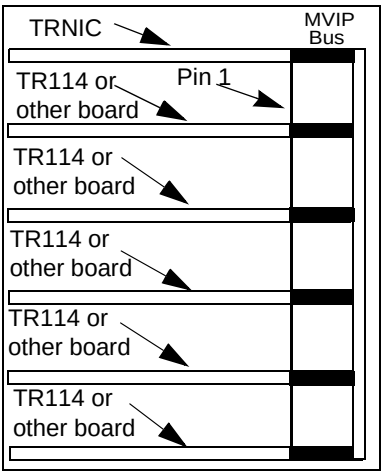
Figure 2-5 shows the MVIP bus with four connections. Only the last board is terminated.



MVIP Connection	MVIP Termination
1st Connection - TRNIC	Not terminated
2nd Connection	Not terminated
3rd Connection	Not terminated
4th Connection	Terminated

Figure 2-5. Termination With 4 MVIP Connections

Figure 2-6 shows the MVIP bus with six connections. Both the TRNIC and the last board are terminated.



MVIP Connection	MVIP Termination
1st Connection - TRNIC	Terminated
2nd Connection	Not terminated
3rd Connection	Not terminated
4th Connection	Not terminated
5th Connection	Not terminated
6th Connection	Terminated

Figure 2-6. Termination With 6 MVIP Connections

Installing the TRNIC+I24T

Once the TRNIC+I24T is configured with the correct cable length and operation parameters (we recommend that you keep a record of these values), install it in any 8-bit slot in a computer with an ISA or EISA expansion bus as follows:

1. Power off the computer.
2. Remove the computer's cover. If the system has a board hold-down bar, remove it as well.
3. Locate an unused expansion slot and remove the bracket for it.
4. Holding the TRNIC+I24T at each top corner, insert the board firmly into the ISA or EISA slot.
5. Screw the TRNIC+I24T's mounting bracket securely to the computer's frame.
6. Turn on the computer.

After you install the TRNIC in the computer, attach either the PEB bus or the MVIP bus to the board to carry the digital signals to and from the resource boards. Do not attach both buses to the TRNIC.

Attaching the PEB Bus to the TRNIC

The PEB bus is a twenty-six pin ribbon cable with connectors that attach to connectors on the boards. On the TRNIC, J201, shown in Figure 2-7, is the connector. See Figure 2-1 for the location of J201.

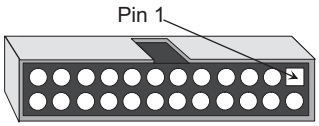


Figure 2-7. Pin Configuration of the PEB Connector

The cable's PEB connector is keyed. Do not connect the PEB cable to the TRNIC+I24T unless pin 1 on the cable's connector is correctly aligned with the board's connector.

For more detailed information on the PEB cable, see Chapter 4 in the *TR114 ISA Digital Hardware Guide.*

Attaching the MVIP Bus to the TRNIC

The MVIP bus is a forty-pin ribbon cable with connectors that attach to connectors on the boards. On the TRNIC, J401, shown in Figure 2-8, is the connector. See Figure 2-1 for the location of J401.

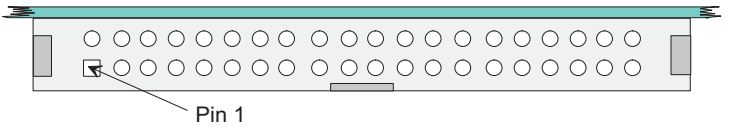


Figure 2-8. Pin Configuration of the MVIP Connector

The cable's MVIP connector is keyed. Do not connect the MVIP cable to the TRNIC+I24T unless pin 1 on the cable's connector is correctly aligned with the board's connector.

For more detailed information on the MVIP cable, see Chapter 4 in the *TR114 ISA Digital Hardware Guide*.

Connecting the TRNIC+I24T to T1 Service

J301, a 15-pin D-sub DSX-1 connector on the TRNIC+I24T, provides the connection to the T1 network. See Figure 2-9.

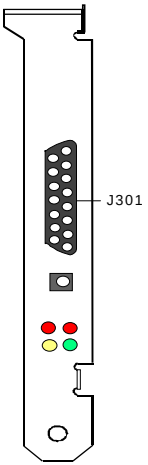


Figure 2-9. Location of J301 on the Mounting Bracket

To connect the TRNIC+I24T board to the T1 service, follow these steps:

1. Insert one end of the T1 network cable into the J301 connector plug that came with the TRNIC+I24T. See *Appendix D* for pinouts of the cable connectors.

2. Insert the J301 connector plug into J301 on the TRNIC+I24T.
3. Insert the RJ-45 T1 plug, located at the other end of the T1 cable, into the T1 jack on the wall or the CSU (see *Using a Channel Service Unit (CSU)*).

The TRNIC+I24T is now connected to T1 telephone service.

Using a Channel Service Unit (CSU)

If the distance between the originating T1 circuit (ask your telephone representative for this information) is less than 500 feet from the TRNIC+I24T, you do not need to connect J301 to a CSU. If the distance from the TRNIC+I24T to the T1 circuit exceeds 500 feet, you must connect J301 to a CSU and the CSU to the T1 circuit.

CSUs perform these functions:

- Amplify the T1 signal so both ends of the connection detect the signal correctly.

  You may need to configure the CSU to boost or attenuate the signal until both ends can detect the signal correctly.

- Provide constant circuit to the telephone company when a power down occurs on your computer.

  Since the T1 line continues to receive signal during a power down (though the T1 line cannot communicate without the PC), providing constant current prevents the telephone company from receiving a T1 line failure alarm. You must provide battery backup to your CSU.

- Provide access to bantam jacks for diagnostic testing and problem solving.

- Provide a loop-back mechanism to the telephone company to test and ensure that signals on the T1 line to the CSU are good.

  Telephone companies use this feature when they install a new T1 line or diagnose line problems.

- Provide other performance monitoring features and LED error warning.

Chapter 3
Configuring and Installing the TRNIC+P24T

This chapter explains how to:

- Change the TRNIC+P24T configuration switches as needed.
- Install the TRNIC+P24T in a PCI slot in the computer.
- Connect the MVIP cable.
- Connect the TRNIC+P24T to T1 telephone service.

Identifying the Switches and Connectors

Figure 3-1 shows the locations of the switches and connectors on the TRNIC+P24T.

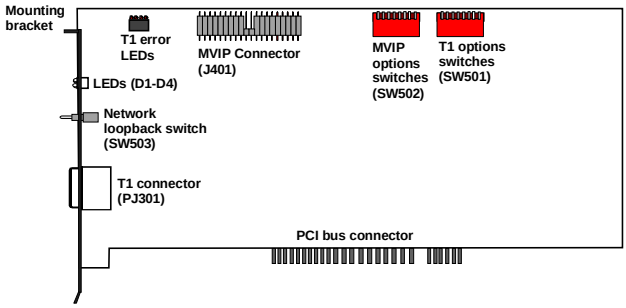


Figure 3-1. Layout of the TRNIC+P24T

Default Configuration

The TRNIC+P24T is shipped with the following default settings for its T1 and MVIP options.

Default T1 options (SW501):

- T1 clock master **T1 network**
- Framing **SF**
- Coding **B8ZS**
- Cable length **0 to 132 ft.**

Default MVIP Options (SW502)

- MVIP stream select **6/7**
- MVIP clock master **TRNIC**
- MVIP sync source ctrl **TRNIC**
- MVIP termination **Unterminated**

Changing the Configuration Settings

If the default settings match the actual installation environment, you can install the TRNIC+P24T in your system as is. Otherwise, you need to change the appropriate switches before installing it in the computer.

Changing T1 Options

Use the switches of SW501 configure the T1 options for the TRNIC+P24T. Switches 7 and 8 are not used and do not affect TRNIC+P24T operation. See Figure 3-1 for the location of SW501. Figure 3-2 shows SW501 with the switches set to the default.

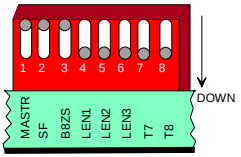


Figure 3-2. T1 Switches (SW501)

Note: DOWN means pushed toward the board's surface; UP means pushed away from the board's surface.

To change the T1 clock master, framing mode, and line coding options, set the switches as shown in Table 3-1. Setting in **bold** are the defaults.

Table 3-1. T1 Options

Switch	Meaning	Setting	Mode
1	T1 clock master (MASTR)	**Up** Down	**T1** TRNIC
2	Framing mode (SF)	**Up** Down	**SF** ESF
3	Line coding (B8ZS)	**Up** Down	**B8ZS** AMI

The modes are

- ***T1 clock master***

  T1 – The T1 generates and transmits the clocking signals to the TRNIC.

  TRNIC – The TRNIC generates and transmits the clocking signals to the T1.

- ***Framing mode***

  SF (Super Frame**) –** A transmission structure that divides the data into twelve, 193-bit blocks or frames.

  ESF (Extended Super Frame) **–** A transmission structure that divides the data into twenty-four, 8,000 bps blocks or frames.

- ***Line coding***

  B8ZS (Binary 8 Zero Substitution**) –** A T1 line-coding format that inserts two violations of the bipolar line encoding technique instead of inserting a 1 for every seven consecutive 0s.

  AMI (Alternate Mark Inversion) – A T1 line coding format that represents binary 1s (marks) as signals of equal amplitude, but that alternately inverts the polarity of each successive mark. It represents binary 0s as signals of zero amplitude.

Setting the T1 Cable Length

Switches 4, 5, and 6 of SW501 set the length of the cable that connects the TRNIC+P24T to the T1 network. If the length of your cable exceeds 132 feet, change the default setting to the setting that most closely corresponds to the actual length of your cable.

Note: Set the length as accurately as possible. An incorrect setting for the cable length affects signal quality and proper operation of the TRNIC+P24T.

To configure the length of the cable, set the switches as shown in Table 3-2. The default settings are shaded.

Table 3-2. Cable Length Settings

Cable length	4 (LEN1)	5 (LEN2)	6 (LEN3)
0 to 132 ft.	DOWN	DOWN	DOWN
133 to 266 ft.	UP	DOWN	DOWN
267 to 398 ft.	DOWN	UP	DOWN
399 to 532 ft.	UP	UP	DOWN
533 to 654 ft.	DOWN	DOWN	UP

You can change these switches while the TRNIC+P24T is powered on without causing the board or the system to malfunction. The TRNIC+P24T monitors these switches once every second, and when it detects a change, it reconfigures its operation.

Changing MVIP Options

Use the switches of SW502 to configure the MVIP options of the TRNIC+P24T. Switches 7 and 8 are unused and do not affect TRNIC+P24T operation. See Figure 3-1 for the location of SW502. Figure 3-3 shows SW502 with the switches set to the default.

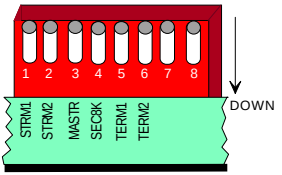


Figure 3-3. MVIP Option Switches (SW502)

To configure the MVIP options, set switches 1 through 6 as shown in Table 3-3. Default settings are shown in **bold**.

Table 3-3. Valid MVIP Options Set with SW502

Switch	Meaning	Setting	Mode
1, 2	MVIP Stream Select (STRM1, STRM2)	**UP, UP** DOWN, UP UP, DOWN DOWN, DOWN	**6/7** 4/5 2/3 0/1
3	MVIP Clock master (MASTR)	**UP** DOWN	**TRNIC master** TRNIC slave
4	Clock sync functions:	Function depends on mode set for MVIP master clock (switch 3)	
4 *w/3 UP*	Sync source ctrl (SEC8K)	**UP** DOWN	**TRNIC** Secondary net card
4 *w/3 DOWN*	Framing sig. output (SEC8K)	**UP** DOWN	**Disable output** Enable output
5, 6	Termination (TERM1, TERM2)	**UP, UP** DOWN, DOWN	**Unterminated** Terminated

The modes are

- ***MVIP Stream Select (STRM1, STRM2)***

  Selects the MVIP data/signaling pair: 0/1, 2/3, 4/5, or 6/7. By convention, even numbered streams carry data, and odd numbered streams carry signaling.

- ***MVIP Clock Master (MASTR)***

  Leave at the default setting if the TRNIC is the only NIC on the MVIP bus. See *Appendix B, Using Two or More NICs on the MVIP Bus*, for information on setting this switch when you have more than one NIC on the MVIP bus.

- ***MVIP Clock Synchronization Functions (SEC8K)***

  Leave at the default setting if the TRNIC is the only NIC on the MVIP bus. See *Appendix B, Using Two or More NICs on the MVIP Bus*, for information on setting this switch when you have more than one NIC on the MVIP bus.

- ***MVIP Termination (TERM1, TERM2)***

  Enables or disables MVIP clock termination. For details, see *MVIP Termination* on page 3-6.

Be sure that the MVIP parameters in the *digital.cfg* file match those actually used on the TRNIC+P24T and its associated boards.

LAN fax users: Typically, for software setup, you set parameters in the *digital.cfg* file or through a board setup procedure. See the documentation supplied with your software.

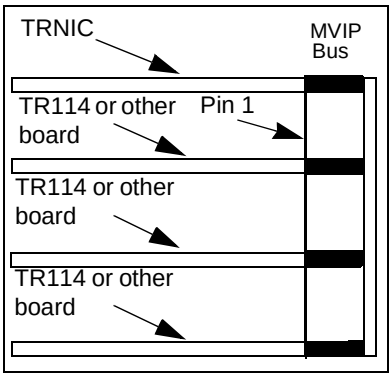
MVIP Termination

The clock on the MVIP bus requires termination. Switches 5 and 6 of SW502 together enable or disable this termination on the TRNIC+P24T (see *Changing MVIP Options* on page 3-4).

MVIP clock termination requirements depend on the number of connections on the MVIP bus. Follow these guidelines:

- Install the TRNIC+P24T at one end of the cable.
- For systems with 5 or fewer MVIP bus connections, terminate the resource board (such as a TR114) at the end of the cable opposite the TRNIC+P24T. Make all other boards on the cable unterminated including the TRNIC+P24T.
- For systems with more than 5 MVIP bus connections, terminate both ends of the MVIP cable – the TRNIC+P24T *and* the resource board at the opposite end of the cable. Make all other boards on the cable unterminated.

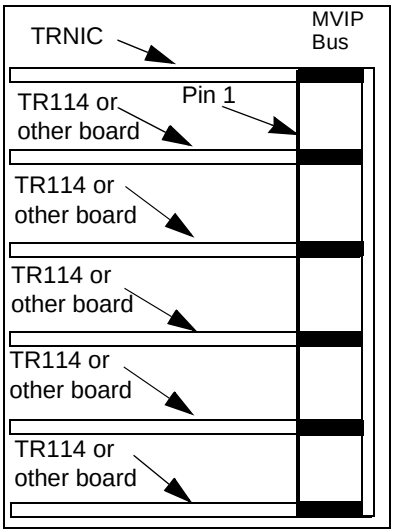
Figure 3-4 shows the MVIP bus with four connections. Only the last board is terminated.



MVIP Connection	MVIP Termination
1st Connection - TRNIC	Not terminated
2nd Connection	Not terminated
3rd Connection	Not terminated
4th Connection	Terminated

Figure 3-4. Termination With 4 MVIP Connections

Figure 3-5 shows the MVIP bus with six connections. Both the TRNIC and the last board are terminated.



MVIP Connection	MVIP Termination
1st Connection - TRNIC	Terminated
2nd Connection	Not terminated
3rd Connection	Not terminated
4th Connection	Not terminated
5th Connection	Not terminated
6th Connection	Terminated

Figure 3-5. Termination With 6 MVIP Connections

Installing the TRNIC+P24T

Once the TRNIC+P24T is configured with the correct cable length and operation parameters (we recommend that you keep a record of these values), install it in any 32-bit slot in a computer with a PCI expansion bus as follows:

1. Power off the computer.
2. Remove the computer's cover. If the system has a board hold-down bar, remove it as well.
3. Locate an unused expansion slot and remove the bracket for it.
4. Holding the TRNIC+P24T at each top corner, insert the board firmly into the PCI slot.
5. Screw the TRNIC+P24T's mounting bracket securely to the computer's frame.
6. Turn on the computer.

After you install the TRNIC in the computer, attach the MVIP bus to the board to carry the digital signals to and from the resource boards.

Attaching the MVIP Bus to the TRNIC

The MVIP bus is a forty-pin ribbon cable with connectors that attach to connectors on the boards. On the TRNIC, J401, shown in Figure 3-6, is the connector. See Figure 3-1 for the location of J401.

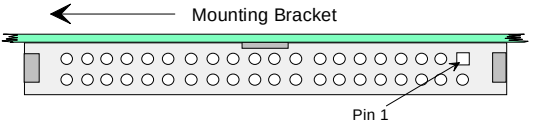


Figure 3-6. Pin Configuration of the MVIP Connector

Do not connect the MVIP cable to the TRNIC+P24T unless pin 1 on the cable's connector is correctly aligned with the board's connector.

For more detailed information on how to connect the MVIP cable to the TRNIC+P24T and to the TR114 boards, see Chapter 4 in the *TR114 ISA Digital Hardware Guide.*

Connecting the TRNIC+P24T to T1 Service

PJ301, an RJ-45 telephone jack on the TRNIC, provides the connection to the T1 network. See Figure 3-7.

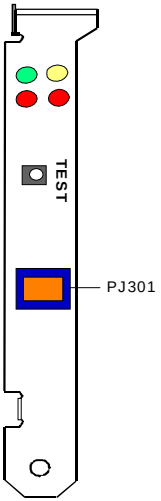


Figure 3-7. Location of PJ301 on the TRNIC+P24T Mounting Bracket

To connect the TRNIC+P24T board to the T1 service, follow these steps:

1. Insert one end of the T1 cable into PJ301, the TRNIC+P24T RJ-45 telephone jack. See *Appendix D* for pinouts of the cable connectors.

2. Insert the RJ-45 T1 plug, located at the other end of the T1 cable, into the T1 jack on the wall or the CSU (see *Using a Channel Service Unit (CSU)*).

The TRNIC+P24T is now connected to T1 telephone service.

Using a Channel Service Unit (CSU)

If the distance between the originating T1 circuit (ask your telephone representative for this information) is less than 500 feet from the TRNIC+I24T, you do not need to connect J301 to a CSU. If the distance from the TRNIC+I24T to the T1 circuit exceeds 500 feet, you must connect J301 to a CSU and the CSU to the T1 circuit.

CSUs perform these functions:

- Amplify the T1 signal so both ends of the connection detect the signal correctly.

  You may need to configure the CSU to boost or attenuate the signal until both ends can detect the signal correctly.

- Provide constant circuit to the telephone company when a power down occurs on your computer.

  Since the T1 line continues to receive signal during a power down (though the T1 line cannot communicate without the PC), providing constant current prevents the telephone company from receiving a T1 line failure alarm. You must provide battery backup to your CSU.

- Provide access to bantam jacks for diagnostic testing and problem solving.

- Provide a loop-back mechanism to the telephone company to test and ensure that signals on the T1 line to the CSU are good.

  Telephone companies use this feature when they install a new T1 line or diagnose line problems.

- Provide other performance monitoring features and LED error warning.

Chapter 4
Interpreting LED Activity and Troubleshooting

The TRNIC should now be properly configured and installed in your computer. T1 telephone service should be installed, and the TRNIC card should be connected to your T1 telephone line.

This chapter describes how to:

- Verify that the TRNIC is operating error-free.
- Locate the T1 service and transmission LEDs.
- Interpret LED activity on the TRNIC and the CSU.
- Enable and disable network loopback mode.

Error-Free Operation

When the TRNIC is operating in normal mode under error-free conditions, the green LED (D4) on the TRNIC's mounting bracket illuminates continuously.

When the TRNIC is operating in network loopback mode under error-free conditions, D4 and D1 illuminate continuously. See Figure 4-1 for the location of D1 and D4.

If your TRNIC does not operate properly, reread the configuration and installation instructions and make sure that you have installed the TRNIC and the T1 cable correctly. If the TRNIC is installed properly but does not operate properly, see the following sections for a possible cause.

T1 Service LEDs

The T1 service LEDs project through the board's mounting bracket below J301 (+I24T) and above PJ301 (+P24T), the T1 network connector. D1 and D2 are red, D3 is yellow, and D4 is green. These LEDs indicate the status of the T1 service. Figure 4-1 shows the location of D1, D2, D3, and D4 on the TRNIC mounting brackets.

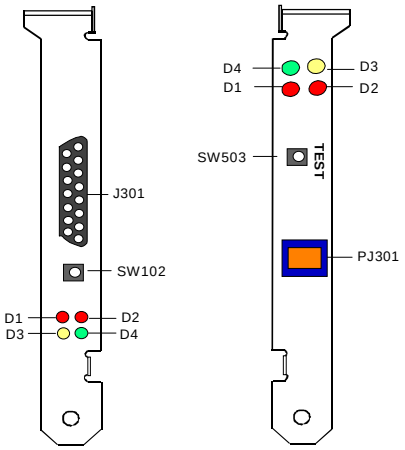


Figure 4-1. Location of T1 Service LEDs

Table 4-1. T1 Service LED Activity

LED	Color	Indicates
D1	Red	TRNIC in network loopback mode.
D2	Red	Loss of T1 network signal.
D3	Yellow	TRNIC failing to synchronize on incoming T1 signal, and sending yellow alarm.
D4	Green	TRNIC receiving error-free T1.

If there are problems, you will encounter one of the conditions described in the following table.

Condition	Description	Solution
Yellow LED (D3) and red LED (D2) are lit.	The board cannot detect a valid T1 signal.	1. Ensure that the cable between the TRNIC and the T1circuit is the correct type and is connected. For information on the correct type of cable to use, see *T1 Cables* on page C-2 . 2. Ensure that the cable pinouts are correct between the TRNIC and the T1 circuit. See *Pinouts of the T1 Connectors* on page C-1. The tip transmit pin on the T1 should be mapped to the tip receive pin on the TRNIC and the ring transmit pin should be mapped to the ring receive pin. 3. Ensure that your T1 service is up and running correctly. 4. Ensure that the TRNIC board is not in loop-back mode.
Red LED (D2) is lit	Loss of signal from the T1 network	1. Check the TRNIC's cabling and connection to the CSU or T1 wall jack. 2. Check the configuration of the CSU
Flashing Green LED		Check to see if the clocking parameters match what your T1 provider is set up to provide.

Condition	Description	Solution
Yellow LED (D3) is lit.	The board cannot synchronize on the T1 signal it is receiving. Possible causes are: • Loss of T1 signal. • T1 signal has an invalid framing pattern. • T1 signal contains severe errors. • T1 signal contains Blue Alarm (all 1s) pattern. • AMI/B8ZS, SF/ESF setup parameters of the T1 service do not match what the TRNIC is set up to receive.	1. Check for proper network clock configuration in the T1 signal from the Central Office or from the PBX. 2. Check the switch settings for cable length to be sure it matches the actual length
Green LED lit but data is not received or sent to the T1 service.	A clocking conflict between the board and the T1 service, caused by both sides generating and sending T1 clock signals, may prevent the board from synchronizing. When the TRNIC fails to synchronize, it will not receive or send data to the T1 network properly.	1. Check Switch 1 of SW501 for the T1 clock master configuration. Unless the TRNIC is connected to a PBX, configure the TRNIC so that the T1 is the clock master 2. Check the PBX or Telco to ensure that the T1 line is up and running. 3. Check that the T1signaling protocol matches the settings of the T1 signaling switches

T1 Transmission LEDs

The T1 transmission LEDs are located between the MVIP connector and the mounting bracket. See Figure 4-2.

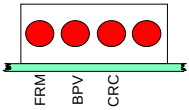


Figure 4-2. T1 Transmission LEDs

When lit, these LEDs indicate that T1 transmission errors are occurring and provide additional information about T1 network problems. The T1 transmission LEDs indicate the status of T1 transmission signaling as follows.

LED	Indicates	Solution
FRM	T1 framing error detected. Problems connecting to the T1 circuit are frequently due to incorrect T1 framing.	Cycle switch 2 (frame mode) of SW501 between its SF (UP) and ESF (DOWN) to detect and correct the framing error.
BPV	T1 bipolar violation detected. Bipolar violations are sometimes related to incorrect line coding.	Cycle switch 3 (line coding) of SW501 between B8ZS (UP) and AMI (DOWN) to detect and correct the bipolar violation. If the TRNIC is connected to a CSU, check the configuration of the CSU.
CRC	Discrepancy in cyclic redundancy check detected. Noise on the T1 line or an incorrectly configured cable length can cause repeated discrepancies in the CRC results.	Ensure that there is no noise on the T1 line. Configure the cable to the correct length (see *Setting the T1 Cable Length* on page 2-4 or on page 3-4).

CSU LEDs

If the TRNIC is attached to a CSU and the CSU's Bipolar Violation or Loss Of Signal lights illuminate, try changing the CSU's Line Build Out setting. The choices are usually 0dB, -7dB, -15 dB, and -22.5 dB. Always use 0dB between the CSU and the TRNIC.

Loopback Mode

SW102 (TRNIC+I24T) and SW503 (TRNIC+P24T) are toggle switches on the mounting bracket. These switches enable and disable network loopback mode. D1 illuminates when the TRNIC is in network loopback mode.

See Figure 4-1 for the locations of D1 and SW102 and SW503.

The telephone company uses network loopback mode to test individual channels in the T1 span. Turn network loopback mode on—toggle SW102 to the left or SW503 to the right—only at the telephone company's request.

Make sure loopback mode is off—toggle SW102 to the right or SW503 to the left—while the TRNIC is running under normal conditions.

Chapter 5
Contacting Technical Support

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 if its authorized agents.

This chapter explains how to get assistance from Brooktrout's Technical Support Department and how to return a defective TRNIC card.

Brooktrout Support

Brooktrout provides technical support for customers who have purchased their TRNIC product directly from Brooktrout Technology, Inc. If you purchased your TRNIC card from a reseller, please contact that reseller for technical support.

Before Contacting Brooktrout

Before contacting Brooktrout Technical Support, please have the following information at hand:

- The part number (PN) of the TRNIC. The part numbers always begins with the digits "802."
- Test results obtained from running *faxtest*, the diagnostic test program for use on TR114 boards.

Contacting Brooktrout

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

- Email: `techsupport@brooktrout.com`
- Telephone: 781-433-9600
- FTP Site: `ftp://ftp.brooktrout.com`
- Web Site: `http://www.brooktrout.com`

Returning a Defective TRNIC

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

Typically, Brooktrout Technical Support or your reseller will request you to run the diagnostics on the TRNIC board in question to determine whether or not 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.

If you purchased the TRNIC board directly from Brooktrout Technology, Inc., Brooktrout will issue a Return Material Authorization (RMA) number for it. When returning a product on RMA to Brooktrout Technology, Inc., you must supply the RMA number clearly on the shipping container and send the container to the following address:

Brooktrout Technology, Inc.
152 Second Avenue
Needham, MA 02494-2722

If your TRNIC board is out of warranty, you must get a Purchase Order Number before Brooktrout will issue you an RMA number.

Appendix A
North American Standards Compliance

Note to developers, system integrators, value added resellers, and distributors: 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 TRNIC 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 PC. 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 the telephone company requests that you supply the FCC Registration number and REN of the device you are connecting, please supply the FCC Registration numbers from all component and host devices that have a direct PSTN connection (i.e. have a REN stated on the label) and the highest REN.

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.

To ensure that the operation of the TRNIC is compliant with FCC and Industry Canada regulations use 0010 as the `country_code` in the file *btcall.cfg*. Use of any other value for the country code or modification of the *BT_CPARM.CFG* file may result in non-compliance of the board and make its connection to the public telephone network illegal.

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. On the TR114, use the API's **BfvFaxHeader** function 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 the TRNIC 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 TRNIC board from the telephone network until you determine the cause of the malfunction and repair it. If a malfunctioning TRNIC remains connected, the telephone company may temporarily disconnect service.

The CSU/DSU 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 TRNIC to telephone service, you must give a representative of the local telephone company the following information:

- The telephone numbers (Port ID) to which the TRNIC is connected.
- SOC: 6.0F
- 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

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 personal computer meeting the limits of FCC Part 15, Class B. 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 B 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 TRNIC is recognized by ETL; the component recognition number is on the back of the board. The TRNIC has been tested and complies with UL Standard 1950, Third Edition and with CSA Standard C22.2 No.950-95, Third Edition, *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 elsewhere in this manual for information on the voltages and currents required for proper operation.

Appendix B
Using Two or More NICs on the MVIP Bus

In rare cases, you may have to put two or more NICs on a single MVIP bus. Be aware that each resource board (such as TR114 boards) connected to that MVIP must be configured to transfer data on all channels through only one NIC.

This appendix describes some of the issues involved and how to configure the TRNIC so that it functions properly.

Setting MVIP Clock Master (MASTR)

The MASTR switch (switch 6 of SW502 on the TRNIC+I24T and switch 3 of SW502 on the TRNIC+P24T) controls whether the TRNIC being configured is the MVIP clock master. The clock master generates clocking signals to the MVIP bus. Only one TRNIC can be set to be the clock master.

MASTR	Result
UP	The TRNIC will generate the clocking signals to the MVIP bus.
DOWN	The TRNIC will not generate the clocking signals to the MVIP bus.

Setting MVIP Clock Synchronization

Switch 7 (L7) of SW502 on the TRNIC+I24T and switch 4 (SEC8K) of SW502 on the TRNIC+P24T is called the clock synchronization switch. It can have one of two functions depending on the setting of the MVIP clock master switch.

If the TRNIC being configured is designated as MVIP clock master, *it* will be the NIC that synchronizes the MVIP clocks using a T1 framing signal. It can use its own (clock sync UP) or another NIC's (clock sync DOWN) T1 framing signal.

If the TRNIC is not the MVIP clock master, its T1 framing signal (the Sec. 8K signal) is output (clock sync DOWN) or is not output (clock sync UP) to the MVIP bus, which may or may not use it to synchronize the MVIP clocks. These switch states are shown in Table B-1.

Table B-1. MVIP Clock Synchronization

MVIP clock master switch	Clock sync switch	Result
UP	**UP**	Sets the TRNIC to use its own T1 framing signal to synchronize the MVIP clocks.
	DOWN	Sets the TRNIC to use the T1 framing signal from another network interface card to synchronize the MVIP clocks.
DOWN	**UP**	Prevents the TRNIC from outputting its T1 framing signal to the MVIP bus.
	DOWN	Sets the TRNIC to output its T1 framing signal to the MVIP bus.

Setting Stream Selection

If you have more than one T1 line transmitting to more than one NIC on a single MVIP, you may have to set different data/signal streams for the different T1 lines. You set the streams using switches 4 and 5 of SW502 on the TRNIC+I24T and switches 1 and 2 of SW502 on the TRNIC+P24T. Once you have selected the streams on the TRNIC, you must edit the *digital.cfg* file for the TR114 boards (or its equivalent for other resource boards) to ensure that the data/signal streams for the TR114s match the streams for the TRNIC through which the TR114 transfers data.

MVIP Clock Termination

Even if you have more than one NIC on the MVIP bus, the clock termination requirements are basically the same as when you have a single NIC on the bus. MVIP clock termination requirements depend on the number of connections on the MVIP bus. Follow these guidelines:

- Install the NIC designated as clock master at one end of the cable.
- For systems with 5 or fewer MVIP bus connections, terminate the resource board (such as a TR114) at the end of the cable opposite the NIC. Make all other boards on the cable unterminated including the clock master NIC and any other NICs.
- For systems with more than 5 MVIP bus connections, terminate both ends of the MVIP cable – the clock master NIC *and* the resource board at the opposite end of the cable. Make all other boards on the cable, including any other NICs, unterminated.

Appendix C
Configuration of the T1 Network Connection

This appendix documents:

- The pinouts of the DB-15 and RJ-45 T1 connectors.
- The kinds of cables typically used in T1 applications.

Pinouts of the T1 Connectors

J301 (TRNIC+I24T), a DB-15 connector, and PJ301 (TRNIC+P24T), an RJ-45 connector, provide the interface to the T1 network. (See Figure 4-1 on page 4-2 for the location of J301 and PJ301.)

Table C-1 defines and Figure C-1 shows the pins that provide the T1 data paths to and from the TRNIC.

Table C-1. Pin Configuration of the RJ-45 and DB-15 T1 Connectors

Tip & Ring	DB-15 Connector (TRNIC+I24T only)	RJ-45 Connector (TRNIC+P24T) or RJ-45 Adapter (TRNIC+I24T)
Transmit Tip	1	5
Receive Tip	3	2
Transmit Ring	9	4
Receive Ring	11	1

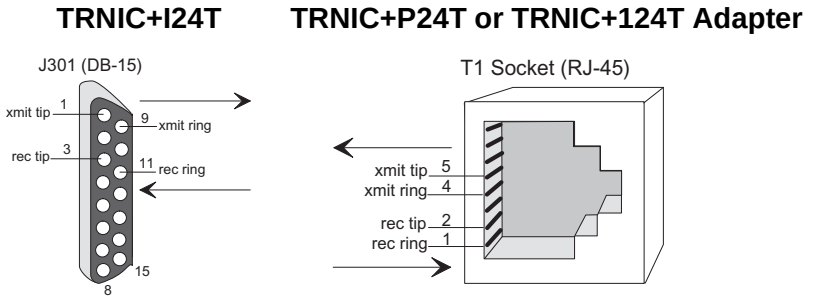


Figure C-1. T1 Pinouts

T1 Cables

At some point between the T1 connector on the TRNIC board and the T1 service connector (CSU, wall jack, or PBX), one and only one twist must occur in the wiring to connect the receive tip and ring pins on one connector to the corresponding transmit tip and ring pins on the opposite connector. All other connections must be straight through.

To use the correct cable, you need to know the pinout on the T1 side (CSU, wall jack, or PBX). Brooktrout supplies a 6-foot twisted cable (see *Twisted Cable*) but in some cases you may need to use a crossover cable (see *Crossover Cable*) or a straight-through cable (see *Straight-Through Cable*) to connect the transmit tip and ring pins on the TRNIC to the receive tip and ring pins on the T1 circuit.

Twisted Cable

The supplied T1 cable (order number: 340-018-02) provides the connection from the board to the T1 network with the proper twist. Figure C-2 shows the design of the twisted cable.

Figure C-2. Twisted Cable

Table C-2 shows the pinouts for the twisted cable.

Table C-2. Pinouts for the Twisted Cable

RJ-45 Pin on one end of cable	RJ-45 Pin on other end of cable
1	8
2	7
3	6
4	5
5	4
6	3
7	2
8	1

Crossover Cable

If you require a cross-over cable, you can order it from Brooktrout Technology Inc. (order number: 340-144-70). Figure C-3 shows the design of the crossover cable.

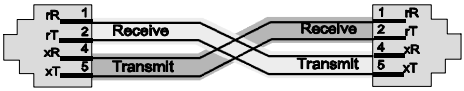


Figure C-3. Crossover Cable

Table C-3 shows the pinouts for the crossover cable.

Table C-3. Pinouts for the Crossover Cable

RJ-45 Pin on one end of cable	RJ-45 Pin on other end of cable
5	2
2	5
4	1
1	4

Straight-Through Cable

If you require a straight cable, you can order one from Brooktrout Technology Inc. (order number: 340-101-07). Figure C-4 shows the design of the straight-through cable.

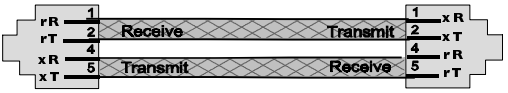


Figure C-4. Straight-through Cable

Table C-4 shows the pinouts of the straight cable.

Table C-4. Pinouts for the Straight Cable

RJ-45 Pin on one end of cable	RJ-45 Pin on other end of cable
5	5
2	2
4	4
1	1

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