WPIM-T1

LOCAL MANAGEMENT GUIDE

CABLETRON
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The Complete Networking Solution™

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NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment uses, generates, and can radiate radio frequency energy and if not installed in accordance with the operator's manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference in which case the user will be required to correct the interference at his own expense.

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CHAPTER 1

INTRODUCTION

Welcome to the Cabletron Systems *WPIM-T1 Local Management Guide*. This manual explains how to use Local Management to control and manage the Cabletron Systems WPIM-T1. Appendix A of this guide provides connector and pinout information for the WPIM-T1.

The WPIM-T1 resides in and provides connectivity/functionality to Cabletron Systems Wide Area Network (WAN) modules such as the BRIM-W6.

Before using this manual you must:

- Install the WPIM-T1 in a Wide Area Network module. Refer to the appropriate manual (i.e., the *BRIM-W6 User's Guide*) for installation and troubleshooting procedures.

- Setup and access Local Management. Refer to the appropriate MIM, standalone hub, or module User's Guide for instructions on setting up and accessing Local Management.

1.1 USING THIS MANUAL

Read through this manual completely to familiarize yourself with its content and to gain an understanding of the features and capabilities of the WPIM-T1. You should have a general working knowledge of the following data communications networks and their physical layer components before using the WPIM-T1.

- WAN
- Ethernet and IEEE 802.3
- Token Ring and 802.5

The following list briefly explains each chapter of the WPIM-T1 manual.

Chapter 1, **Introduction**, outlines the contents of this manual, describes WPIM-T1 features, lists specifications, and concludes with a list of related manuals.

Chapter 2, **Local Management**, describes how to use Local Management to setup the WPIM-T1.

Appendix A, **WAN Interface Cable Specifications**, provides Cabletron part numbers and connector information for WPIM-T1 interface cables.

Appendix B, **FCC Part 68-User's Information**, explains the FCC rules for the WPIM-T1.

Appendix C, **WAN Terms and Acronyms**, is a brief glossary of the terms used in this book.

1.2   GETTING HELP

If you need additional support related to the WPIM-T1, or if you have any questions, comments, or suggestions concerning this manual, contact Cabletron Systems Technical Support:

By phone .... (603) 332-9400
                                                Monday-Friday; 8am - 8pm Eastern Time
By CompuServe .... GO CTRON from any ! prompt
By Internet mail .... support@ctron.com
By FTP .... ctron.com (134.141.197.25)
    Login: *anonymous*, Password: *your email address*

1.3   WPIM-T1 FEATURES

The WPIM-T1 extends the functionality of your Wide Area Network module to allow remote connectivity using WAN services such as T-1, or Fractional T-1.

The WPIM-T1 provides a T-1 interface that includes a built-in Channel Service Unit/Digital Service Unit (CSU/DSU) for direct connection to a T-1 line. This WPIM supports both Full T-1 or Fractional T-1 using 56 or 64 Kbps timeslots.

WAN Protocols
As of this printing, the module in which the WPIM-T1 is installed supports the following WAN protocols (refer to the Release Notes included with the host MIM or standalone hub for a list of current protocols):

- Point to Point Protocol (LCP) and as defined by RFC 1661
- Point to Point Protocol (BNCP) and as defined by RFC 1638
- Point to Point Protocol LAN Extender (PPP/LEX)
- Frame Relay as defined by RFC 1490

MIB Support
Refer to the Release Notes included with the host MIM or standalone hub for a list of all MIBs supported by the WPIM-T1. For information about how to extract and compile individual MIBs, contact Cabletron Systems Technical Support (see **Getting Help**).

1.4   RELATED MANUALS

Refer to the manual included with the host Wide Area Network module (e.g., the *BRIM-W6 User's Guide*) to supplement the procedures and other technical data provided in this manual. Refer to the MIM, standalone hub or module User's Guides and/or Local Management Guides for Local Management setup information. This manual references procedures in these manuals, where appropriate, but does not repeat them.

1.5 **WPIM-T1 SPECIFICATIONS**

This section describes the environmental specifications and safety and approval requirements for the WPIM-T1. Cabletron Systems reserves the right to change these specifications at any time without notice.

Environmental Requirements

Operating Temperature: +5° to +40°C (41° to 104°F)

Non-operating Temperature: -30° to +90°C (-22° to 194°F)

Operating Humidity: 5% to 95% (non-condensing)

Safety
This unit meets the safety requirements of UL1950 (without D3 deviations), CSA C22.2 No. 950, and EN60950.

EMI
This unit meets the EMI requirements of FCC Part 15 Class A.

EMC
This unit meets the EMC requirements of EN50082-1 including:
IEC 801-2 (ESD), IEC 801-3 (Radiated Susceptibility),
and IEC 801-4 (EFT/B).

NEBS
This unit has been tested by Bellcore and found to comply with the following Bellcore standards:

TR-NWT-000063 Network Equipment Building System (NEBS) Generic Equipment Requirements.

GR-1089-CORE EMC and Electrical Safety Generic Criteria for Network Telecommunications Equipment.

TELECOM
The WPIM-T1 meets FCC Part 68 (see Appendix B).

CHAPTER 2

LOCAL MANAGEMENT

This Chapter explains how to configure the WPIM-T1 through Local Management. The **WAN Physical Configuration screen** and the **WAN Interface Configuration screen** appear as Local Management menu selections after you install the WPIM-T1 into a WAN module such as the BRIM-W6 and then install the BRIM into a MIM or standalone hub. Refer to the MIM or standalone hub technical documentation for instructions about how to set up and access Local Management.

This chapter contains the following sections.

Read Sections 2.1 and 2.2 to gain an understanding of the WPIM-T1 Local Management screens. Sections 2.3 through 2.6 provide examples for setting up the WPIM-T1 for full or fractional T-1 in a PPP (LEX or BNCP) environment, or for configuring the WPIM-T1 for Frame Relay.
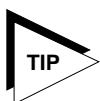
> **TIP**
>
> *Navigate through the WPIM Local Management Screens by using the following keyboard commands:*
>
> *SPACEBAR to toggle between selections in a field.*
>
> *ENTER (RETURN) to implement a selection.*
>
> *Arrow keys to move up, down or sideways within the screen.*

2.1 THE WAN PHYSICAL CONFIGURATION SCREEN

To access the WAN Physical Configuration screen from the Feature Selection screen, use the arrow keys to highlight the WAN Configuration option, then press ENTER. The screen shown in Figure 2-1 appears.

```
<host name> Local Management                       Flash Image Version: xx.xx.xx

                        WAN PHYSICAL CONFIGURATION


      WPIM 1                    WPIM 2

Type:       T1            Type:       SY
BRIM #:     1             BRIM #:     1
Mode:       [Primary]     Mode:       [Secondary]
Active:     Yes           Active:     No
Interfaces: 002-025       Interfaces: 026


       WPIM 1 Line Configuration              WPIM 1 Timeslot Configuration

T1 Timeslot View:        [Active]      01-08  000 000 000 000 000 000 000 000
T1 Line Coding:          [B8ZS]
T1 Frame Type:           [ESF]
T1 Tx Clock Source:      [Loop-Timing]  09-16 000 000 000 000 000 000 000 000
T1 Line Buildout:        [0 db]
T1 Network Loopback:     [None]
                                        17-24 000 000 000 000 000 000 000 000



      SAVE        [WPIM 1]       WAN INT CONFIG        RETURN
```

                                                                    148201

Figure 2-1. WAN Physical Configuration Screen

2.1.1 WAN Physical Configuration Screen Fields

The following sections describe WAN Physical Configuration screen fields and instructions for setting them. The WAN Physical Configuration screen lets you configure the WPIM or "Physical Interface."

Cabletron offers a variety of WPIMs. The following Physical Configuration screen examples show the WPIM-T1 and the WPIM-SY. Select the WPIM you wish to configure by using the arrow keys to highlight the WPIM command field at the bottom of the screen. Use the SPACEBAR to select the appropriate WPIM, then press ENTER. The WAN Configuration screen automatically displays unique configuration fields for each WPIM as shown in Figure 2-1.

The WAN Physical Configuration screen displays the following information for each WPIM:

WPIM *1-4*
Displays configuration information for as many as four WPIMs.
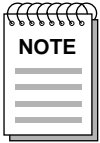
NOTE	*Each BRIM-W6 supports two WPIMs. Some of Cabletron's products (e.g., the NBR-620 or the EMM-E6) will support two BRIM-W6 modules providing connectivity for as many as four WPIMs. **Only one WPIM per BRIM-W6 can be active**.*

Type
Displays the WPIM type.

BRIM #
Displays the BRIM slot in which the WPIM resides.

Mode
Displays the WPIM mode. Toggles between Primary and Secondary. In a device such as the BRIM-W6 where two WPIMs are utilized but only one can be active at a given time, the second WPIM installed or recognized defaults to Secondary.

Active
Displays the status of the WPIM, Yes or No.

Interfaces
Displays the interfaces available to each WPIM.

2.1.2   WPIM-T1 Configuration Fields

The configuration fields displayed on the Physical Configuration screen shown in Figure 2-1 vary depending on the type of WPIM. The examples in this Local Management Guide cover the WPIM-T1. Each Cabletron WPIM has a Local Management Guide that provides specific configuration guidelines and examples.
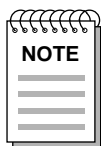
⟨⟨⟨⟨⟨⟨⟨⟩ **NOTE**	*The service provider (i.e., AT&T, Sprint, MCI, NYNEX, etc.) determines the settings for the following fields. Consult the service provider for the correct settings.*

T1 Timeslot View
Displays the status of the Timeslot Configuration Table. The selections for this field toggle between Active and New. The Active setting displays current Timeslot Configuration table settings. The default setting is **Active**. The New setting allows you to change Timeslot Configuration table settings. The default setting for the Timeslot Configuration table is all Timeslots not assigned (**000**).

T1 Line Coding
Displays the line coding for the physical T-1 line. The selections toggle between B8ZS and AMI. The default setting for this field is **B8ZS**.

T1 Frame Type
Displays the T-1 Frame type. The selections toggle between ESF and D4. The default setting for this field is **ESF**.

T1 Tx Clock Source
Displays the T-1 Transmit Clock Source. The selections for this field toggle between Loop-Timing (Extracted Line Data) and Local-Timing (Internal Clock). The default setting for this field is **Loop-Timing**.

T1 Line Buildout
Displays the line coding for the physical T-1 line. Set this to 0 dB unless the service provider recommends another setting. The default setting for this field is **0 dB**. The selections for this setting toggle between the following levels.

- 0 dB
- -7.5 dB
- -15 dB
- 133-266 Ft
- 267-399 Ft
- 400-533 Ft
- 534-655 Ft

T1 Network Loopback

Network Loopback is a testing procedure that segments the line and allows the user to isolate faults. The selections for this field toggle between None and Line-Loop. In Line-Loop all 24 channels are looped back to the T-1 line.The WPIM-T1 must be in Loop-Timing mode to use this option. The default setting is **None**.

2.1.3   The WPIM Timeslot Configuration Table

The WPIM Timeslot Configuration table allows you to configure the way in which the Cabletron WAN module uses the T-1 line. The configuration table consists of 24 Timeslots. You must assign each Timeslot an **Interface** number (for example, 002 for an active Interface number or 000 if the Timeslot is not used). When you lease an entire T-1 line, you can use all 24 Timeslots (the full T-1 bandwidth). If you lease only a fraction of the T-1, the service provider tells you which Timeslots to use.

You can utilize Timeslots any way you choose. The WPIM-T1 supports Time Division Multiplexing (TDM) allowing channelization of circuits (Timeslots) within the public network. For example, if your BRIM-W6 has access to a full T-1 (24 Timeslots), and you want to communicate with two other sites, your configuration might look like Figure 2-2.
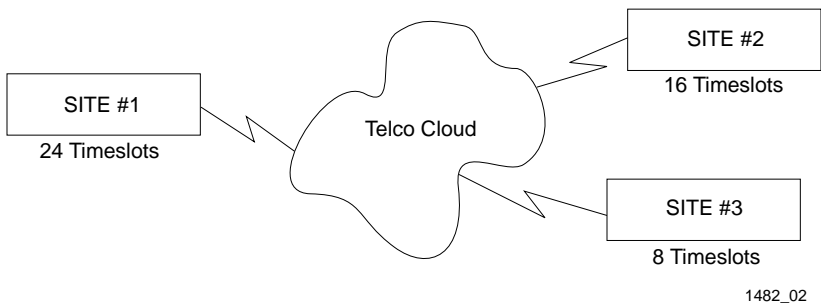
Figure 2-2. Sample Timeslot Configuration

Figure 2-3 shows a sample configuration for three sites. Of the 24 Timeslots, Site #1 uses 16 to communicate with Site #2 and the remaining 8 to communicate with Site #3. This configuration varies tremendously depending on how the service provider maps out the T-1 Timeslots. Your service provider will tell you which Timeslots are active.

01-08	005	005	005	005	005	005	005	005
09-16	005	005	005	005	005	005	005	005
17-24	000	000	000	000	000	000	000	000

SITE #2

01-08	005	005	005	005	005	005	005	005
09-16	005	005	005	005	005	005	005	005
17-24	006	006	006	006	006	006	006	006

SITE #1

01-08	006	006	006	006	006	006	006	006
09-16	000	000	000	000	000	000	000	000
17-24	000	000	000	000	000	000	000	000

SITE #3

1482_03
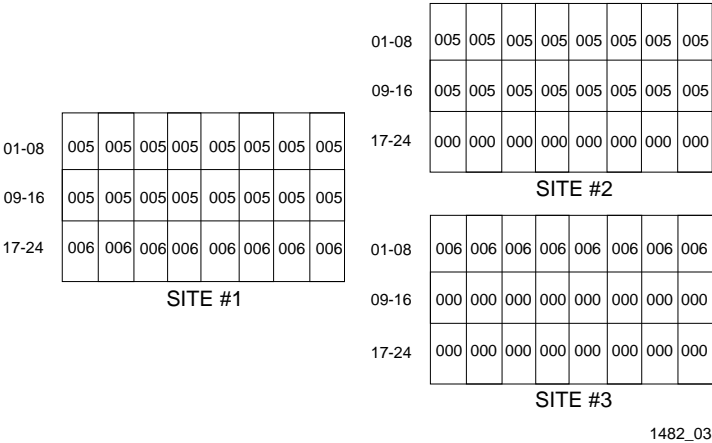
Figure 2-3. Sample Configuration

Site #1 is using the full T-1, so all the Timeslots must have an Interface assignment. Site #2 and Site #3 only use a fraction of the T-1, but the total quantity of Timeslots must match those of Site #1. Unused Timeslots receive an Interface number of 000.

NOTE
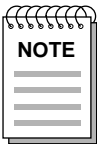
The Interface numbers of Site #1, Site #2 and Site #3 do not have to match. Only the **quantity** *of Timeslots must match (the service provider assigns the Timeslots).*

2.2   THE WAN INTERFACE CONFIGURATION SCREEN

This section describes the features of the WAN Interface Configuration
screen. Access the screen by using the arrow keys to highlight the **WAN
Int Config** option at the bottom of the Physical Configuration screen, then
press ENTER. The WAN Interface Configuration screen shown in
Figure 2-4 appears.

```
<host name> Local Management                    Flash Image Version: xx.xx.xx

                        WAN INTERFACE CONFIGURATION



                          PT#  IF#  LID  STATE   PT#  IF#  LID  STATE
  Interface Number:  [002]      001  001  Enet   UP    017
  Data Compression:  [NO]       002                    018
  Max Xmit Unit:     [0]        003                    019
  Line Coding:       [NONE]     004                    020
  Active Protocol:   [NONE]     005                    021
                                006                    022
                                007                    023
                                008                    024
                                009                    025
                                010                    026
                                011                    027
                                012                    028
                                013                    029
                                014                    030
                                015                    031
                                016                    032


  SAVE       RETURN
```

148204

Figure 2-4. WAN Interface Configuration Screen

2.2.1   WAN Interface Configuration Screen Fields

This section describes the WAN Interface Configuration screen fields.

Interface Number
Displays the active Interface Numbers. Use this field to configure the
Interface Numbers you assigned to the Timeslots on the WAN Physical
Configuration screen.

Data Compression
Displays the status of Data Compression. This field displays YES or NO.
The default setting is **NO**.

Max Xmit Unit
User-configured field that displays the maximum packet size that can be
transmitted on the selected interface. The default settings for this field are
8191 for PPP and **4095** for Frame Relay.

Line Coding
Displays the Line Coding for timeslots associated with this interface. This
field displays JBZS, INV-HDLC, or None. The default setting for this
field is **None**.

Active Protocol
Displays the active OSI Layer protocol. This field toggles between None,
FR (Frame Relay), or PPP (Point-to-Point). The default setting is **None**.

If you select **PPP**, the following field appears:

> **PPP Type:**   This field toggles between BNCP or LEX.

If you select **FR**, the following field appears:

> **FR LMP:**   This field displays NO LMI, Q.933-A or
> T1.617-D. Set this field to **T1.617-D**. The NO
> LMI setting is for specialized applications in
> which no Frame Relay Link Management is
> available or required.

If **NO LMI** is selected, the following fields are displayed:

> **DLCI Address:**   This field can be set to values from 0-1023. The
> values 0-15 and 1008-1022 are reserved DLCI
> addresses.

> **Circuit State:**   Toggles between Active, Inactive and Invalid.

PT#

Displays the application ports (bridge ports) available from the host platform to the WAN. If the active protocol is PPP, Local Management assigns only one application port per interface number (IF#). If the active protocol is Frame Relay, Local Management assigns the available WAN bridge ports from the host platform, one per DLCI.

You can assign WAN application ports to the 24 interfaces for the PPP configuration that suits your needs. In a Frame Relay configuration, you can assign all WAN application ports to one interface. In this example, the remaining 23 interfaces would not have WAN application ports available.

The quantity of application ports for a Frame Relay network is determined by the quantity of DLCIs (Data Link Connection Identifiers) assigned to that Interface. This is determined either manually or by the LMP (Link Management Protocol).

IF#

Displays the Interface that is associated with the application port.

LID

Displays the Link Identifier. If the active protocol is Frame Relay, the Data Link Connection Identifier is displayed. If the active protocol for this interface is PPP, then PPP appears in this field.

STATE

Displays the status of the application port. If the active protocol is Frame Relay, this field displays the status as Active, Inactive, or Disabled (for no LMI). If the active protocol is PPP, this field displays UP (for active) or DOWN (for inactive).

2.3   FULL T-1 CONFIGURATION USING PPP

This section provides step-by-step instructions for configuring the
WPIM-T1 to use a full T-1 circuit in a PPP environment. This simplified
example assumes the setup shown in Figure 2-5 using a MicroMMAC
hub with a BRIM-W6 containing a WPIM-T1 at Site #1. Configurations
may vary depending on the hub.

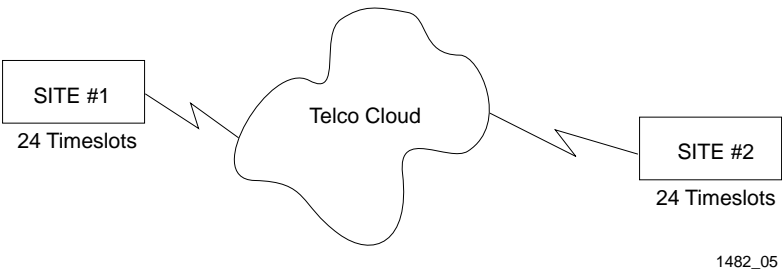
Figure 2-5. Full T-1 Configuration

The line configuration information shown in Table 2-1 must be supplied
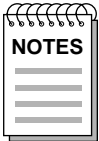by the service provider.

Table 2-1. Telco Configuration Information

Configuration Information Required by User	Configuration Information Supplied by Service Provider
Line Coding	B8ZS or AMI
Frame Type	ESF or D4
Clock Source	Loop Timing or Local Timing

2.3.1   WPIM-T1 Physical Configuration

Begin the WPIM-T1 configuration by accessing the WAN Physical Configuration screen through Local Management (Figure 2-1). Access the WAN Physical Configuration screen from the Feature Selection screen that first appears when you enter Local Management. Use the arrow keys to highlight the **WAN Configuration** option, then press ENTER. The screen shown in Figure 2-1 appears. Proceed with the following steps:

1.   Use the arrow keys to highlight the **[WPIM]** field at the bottom of the screen. Press the SPACEBAR to select the WPIM being configured, then press ENTER.

2.   Use the arrow keys to highlight **Timeslot View**. Press the SPACEBAR to select **New**, then press ENTER. The cursor moves to Timeslot #1 of the Timeslot Configuration Table.

3.   Insert an interface number (see NOTE below) into every Timeslot. Type the number, press ENTER, then use the arrow keys to highlight the next Timeslot field. Exit this field by using the arrow keys. The cursor automatically moves to the **T1 Line Coding** field.

NOTES

The value assigned to the Timeslots is the interface being used for WAN communication. The available interface range is displayed on the WAN Physical Configuration screen (see Figure 2-1). You may insert any of the available interface numbers into the Timeslots.

In the example shown in Figure 2-1, the interface range for the MicroMMAC with a WPIM-T1 in slot one of the BRIM-W6 is 2-25. Although any of these values may be used, Cabletron Systems recommends using the first available interface number (in this example interface #2).

The following four steps are based on information supplied by the service provider. Consult the service provider for the correct settings.

4. Use the arrow keys to highlight **T1 Line Coding**. Press the
    SPACEBAR to select **B8ZS** or **AMI**, then press ENTER.

5. Use the arrow keys to highlight **T1 Frame Type**. Press the
    SPACEBAR to select **ESF** or **D4**, then press ENTER.

6. Use the arrow keys to highlight **T1 TX Clock Source**. Press the
    SPACEBAR to select **Local** (no clock source provided by telephone
    company) or **Loop** (clock source provided by telephone company),
    then press ENTER.

> ⚠️ **CAUTION**
>
> *If you are using a Local clock source, set only one end of the*
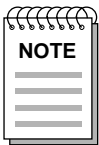> *circuit for Local, the other end must be set for Loop.*

7. Use the arrow keys to highlight **T1 Line Buildout** (LBO). Press the
    SPACEBAR to select **0 dB** unless the service provider recommends
    another setting, then press ENTER.

8. Use the arrow keys to highlight **T1 Network Loopback.** Press the
    SPACEBAR to select **None**, then press ENTER.

9. Use the arrow keys to highlight the **SAVE** command, then press
    ENTER. The message "Save Done!" appears and Local Management
    saves the changes to memory.

10. Access the WAN Interface Configuration screen by using the arrow
    keys to highlight the **WAN Int Config** option, then press ENTER.

2.3.2   WPIM-T1 Interface Configuration

This screen is accessed through the WAN Physical Configuration screen.
Refer to Figure 2-4 and proceed with the following steps to configure the
WAN Interface through Local Management.

1. Set the WAN connection Interface Number by typing the same
    number into the **Interface Number** field that was input into the
    Timeslots in the WAN Physical Configuration screen, then press
    ENTER (see NOTE on page 2-11).

2. Unless the user sets the Max Xmit Unit, the WPIM-T1 automatically sets the **Max Xmit Unit** to **8191** (default) after the active protocol (PPP) is selected.

3. If the T1 Line Coding is **B8ZS** on the previous screen:

    a. Use the arrow keys to highlight **Line Coding**. Press the SPACEBAR to select **None**, then press ENTER.

    b. Use the arrow keys to highlight **Active Protocol**. Press the SPACEBAR to select **PPP**, then press ENTER.

    c. Use the arrow keys to highlight **PPP Type**. Press the SPACEBAR to select **BNCP**, then press ENTER.

4. If the T1 Line Coding is **AMI** on the previous screen:

    a. Use the arrow keys to highlight **Line Coding**. Press the SPACEBAR to select **INV-HDLC**, then press ENTER.

    b. Use the arrow keys to highlight **Active Protocol**. Press the SPACEBAR to select **PPP**, then press ENTER.

    c. Use the arrow keys to highlight **PPP Type**. Press the SPACEBAR to select **BNCP**, then press ENTER.

5. Use the arrow keys to highlight the **SAVE** command, then press ENTER. The message "Save Done!" appears and Local Management saves the changes to memory.

NOTE	*Upon saving this screen, the interface just configured is assigned to an application port (PT#) in the table on the right hand side of the screen.*

The WAN configuration is complete. It takes up to 60 seconds for the WAN Interface to come out of standby and for communications to begin.

2.4   FRACTIONAL T-1 CONFIGURATION USING PPP

This section provides step-by-step instructions for configuring the
WPIM-T1 to use a fractional T-1 circuit in a PPP environment. This
example assumes the setup shown in figure 2-6 using two MicroMMAC
hubs each with a BRIM-W6 containing a WPIM-T1. Configurations may
vary depending on the hub. In a fractional T-1 setup, only a portion of the
24 Timeslots or DS-0's are used.
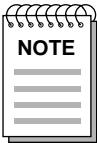
> **NOTE**
>
> *The terms DS-0 (Digital Signal, level 0) and Timeslot are
> used synonymously in this guide to represent a standard
> 64,000 bit/second channel.*

SITE #2
with BRIM-W6

16 Timeslots

SITE #1
with BRIM-W6

16 Timeslots

Telco Cloud

1482_06
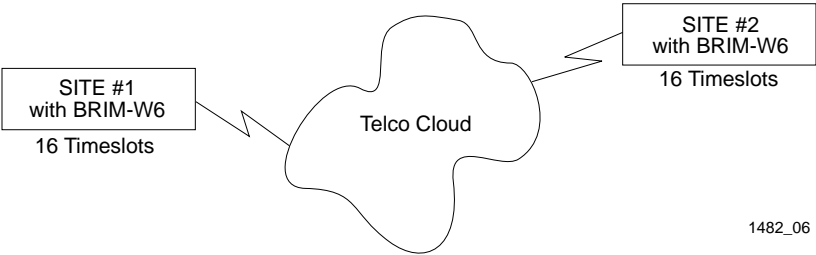
Figure 2-6. Fractional T-1 Configuration

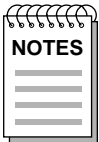The line configuration information shown in Table 2-2 must be supplied
by the service provider.

Table 2-2. Telco Configuration Information

Configuration Information Required by User	Information Supplied by Service Provider
Line Coding	B8ZS or AMI
Frame Type	ESF or D4
Clock Source	Loop Timing or Local Timing
DS-0's (Timeslots)	Timeslots being used for each end of the circuit

2.4.1   WPIM-T1 Physical Configuration

Begin the WPIM-T1 physical configuration by accessing the **WAN Physical Configuration** screen through Local Management (Figure 2-1). Proceed with the following steps:

1. Use the arrow keys to highlight the **[WPIM]** field at the bottom of the screen. Press the SPACEBAR to select the WPIM being configured, then press ENTER.

2. Use the arrow keys to highlight **Timeslot View**. Press the SPACEBAR until **NEW** appears, then press ENTER. The cursor moves to Timeslot #1 of the Timeslot Configuration Table.

3. Insert an interface number (see NOTE below) into every Timeslot being used (in the example shown in Figure 2-6, 16 Timeslots are being used, the rest have zeros in them). Type the number, press ENTER, then use the arrow keys to highlight the next Timeslot field. Exit this field by using the arrow keys.The cursor automatically moves to the **T1 Line Coding** field.

NOTES

The value assigned to the Timeslots is the interface being used for WAN communication. The available interface range is displayed on the WAN Physical Configuration screen (see Figure 2-1). You may insert any of the available interface numbers into the Timeslots.

In the example shown in Figure 2-1, the interface range for the MicroMMAC with a WPIM-T1 in slot one of the BRIM-W6 is 2-25. Although any of these values may be used, Cabletron Systems recommends using the first available interface number (in this example interface #2).

The following four steps are based on information supplied by the service provider. Consult the service provider for the correct settings.

4. Use the arrow keys to highlight **T1 Line Coding**. Use the SPACEBAR to select **B8ZS** or **AMI**, then press ENTER.

5. Use the arrow keys to highlight **T1 Frame Type**. Use the SPACEBAR to select **ESF** or **D4**, then press ENTER.

6. Use the arrow keys to highlight **T1 Tx Clock Source**. Use the SPACEBAR to select **Local** (no clock source provided by telephone company) or **Loop** (clock source provided by telephone company), then press ENTER.

⚠️ **CAUTION**
If you are using a Local clock source, set only one end of the circuit for Local, the other end must be set for Loop.
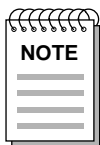
7. Use the arrow keys to highlight **T1 Line Buildout** (LBO). Press the SPACEBAR to select **0 dB** unless the service provider recommends another setting, then press ENTER.

8. Use the arrow keys to highlight **T1 Network Loopback**. Press the SPACEBAR to select **None**, then press ENTER.

9. Use the arrow keys to highlight the **SAVE** command, then press ENTER. The message "Save Done!" appears and Local Management saves the changes to memory.

10. Access the WAN Interface Configuration screen by using the arrow keys to highlight the **WAN Int Config** option, then press ENTER.

2.4.2   WPIM-T1 Interface Configuration

This screen is accessed through the WAN Physical Configuration screen. Proceed with the following steps to configure the WAN Interface through Local Management.

1. Set the WAN connection Interface Number by typing the same number into the **Interface Number** field that was input into the Timeslots in the WAN Physical Configuration screen, then press ENTER (see NOTE on page 2-15).

2. Unless the user sets the Max Xmit Unit, the WPIM-T1 automatically sets the **Max Xmit Unit** to **8191** (default) after the active protocol (PPP) is selected.

3. If the T1 Line Coding is **B8ZS** on the previous screen:

    a. Use the arrow keys to highlight **Line Coding**. Press the SPACEBAR to select **NONE**, then press ENTER.

    b. Use the arrow keys to highlight **Active Protocol**. Press the SPACEBAR to select **PPP**, then press ENTER.

    c. Use the arrow keys to highlight **PPP Type**. Press the SPACEBAR to select **BNCP**, then press ENTER.

4. If the T1 Line Coding is **AMI** on the previous screen:

    a. Use the arrow keys to highlight **Line Coding**. Press the SPACEBAR to select **INV-HDLC**, then press ENTER.

    b. Use the arrow keys to highlight **Active Protocol**. Press the SPACEBAR to select **PPP**, then press ENTER.

    c. Use the arrow keys to highlight **PPP Type**. Press the SPACEBAR to select **BNCP**, then press ENTER.

5. Use the arrow keys to highlight the **SAVE** command, then press ENTER. The message "Save Done!" appears and Local Management saves the changes to memory.

> **NOTE**
>
> *Upon saving this screen, the interface just configured is assigned to an application port (PT#) in the table on the right hand side of the screen.*

The WAN configuration is complete. It takes up to 60 seconds for the WAN Interface to come out of standby and for communications to begin.

2.5 FRAME RELAY CONFIGURATION

This section provides step-by-step instructions for configuring the
WPIM-T1 to use a T-1 circuit in a Frame Relay environment. This
example assumes the setup shown in Figure 2-7 using two MicroMMAC
hubs each with a BRIM-W6 containing a WPIM-T1. Configurations may
vary depending on the hub.
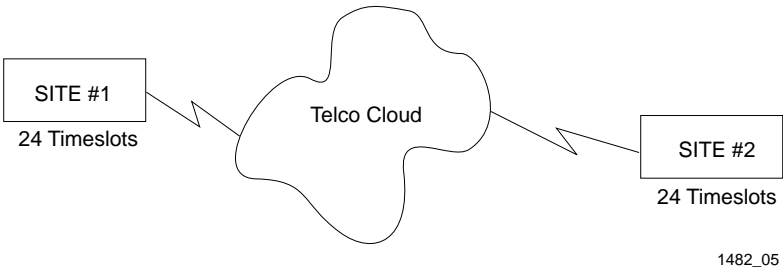
Figure 2-7. Frame Relay Configuration

The following information must be supplied to or by the service provider.

- LMP type: **ANSI T1.617 Annex D**

The line configuration information shown in Table 2-3 must be supplied
by the service provider.

Table 2-3. Telco Configuration Information

Configuration Information Required by Customer	Information Supplied by Service Provider
Line Coding	B8ZS or AMI
Frame Type	ESF or D4
Clock Source	Loop Timing or Local Timing
DS-0's (Timeslots)	Timeslots being used for each end of the circuit

2.5.1   WPIM-T1 Physical Configuration

Begin the WPIM-T1 physical configuration by accessing the **WAN Physical Configuration** screen through Local Management (Figure 2-1). Proceed with the following steps:

1. Use the arrow keys to highlight the **[WPIM]** field at the bottom of the screen. Press the SPACEBAR to select the WPIM being configured, then press ENTER.

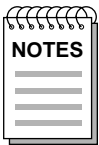2. Use the arrow keys to highlight **Timeslot View**. Press the SPACEBAR to select **New**, then press ENTER. The cursor moves to Timeslot #1 of the Timeslot Configuration Table.

3. Insert an interface number (see NOTE below) into every Timeslot being used. Type the number, press ENTER, then use the arrow keys to highlight the next Timeslot field. Exit this field by using the arrow keys. The cursor automatically moves to the **T1 Line Coding** field.

> **NOTES**
>
> *The value assigned to the Timeslots is the interface being used for WAN communication. The available interface range is displayed on the WAN Physical Configuration screen (see Figure 2-1). You may insert any of the available interface numbers into the Timeslots.*
>
> *In the example shown in Figure 2-1, the interface range for the MicroMMAC with a WPIM-T1 in slot one of the BRIM-W6 is 2-25. Although any of these values may be used, Cabletron Systems recommends using the first available interface number (in this example interface #2).*
>
> *The following four steps are based on information supplied by the service provider. Consult the service provider for the correct settings.*

4. Use the arrow keys to highlight **T1 Line Coding**. Press the SPACEBAR to select **B8ZS** or **AMI**, then press ENTER.

5. Use the arrow keys to highlight **T1 Frame Type**. Press the
    SPACEBAR to select **ESF** or **D4**, then press ENTER.

6. Use the arrow keys to highlight **T1 Tx Clock Source**. Press the
    SPACEBAR to select **Local** (no clock source provided by telephone
    company) or **Loop** (clock source provided by telephone company),
    then press ENTER.

>   *If you are using a Local clock source, set only one end of the*
>   *circuit for Local, the other end must be set for Loop.*

7. Use the arrow keys to highlight **T1 Line Buildout** (LBO). Press the
    SPACEBAR to select to **0 dB** unless the service provider recommends
    another setting, then press ENTER.

8. Use the arrow keys to highlight the **SAVE** command, then press
    ENTER. The message "Save Done!" appears and Local Management
    saves the changes to memory.

9. Access the WAN Interface Configuration screen by using the arrow
    keys to highlight the **WAN Int Config** option, then press ENTER.

2.5.2   WPIM-T1 Interface Configuration

This screen is accessed through the WAN Physical Configuration screen.
Proceed with the following steps to configure the WAN Interface through
Local Management.

1. Set the Interface Number that is being used for the WAN connection
    by typing the same number into the **Interface Number** field that was
    input into the Timeslots in the WAN Physical Configuration screen,
    then press ENTER (see NOTE on page 2-19).

2. Use the arrow keys to highlight **Line Coding**. Press the SPACEBAR
    to select **None**, then press ENTER.

3. Use the arrow keys to highlight **Active Protocol**. Press the
    SPACEBAR to select **FR**, then press ENTER.

4. Use the arrow keys to highlight **FR LMP**. Press the SPACEBAR to select **T1.617-D**, then press ENTER.

5. Use the arrow keys to highlight **SAVE**, then press ENTER. The message "Save Done!" appears and Local Management saves the changes to memory.
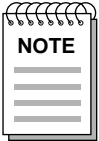
NOTE	*Upon saving this screen, the interface just configured is assigned to an application port (PT#) in the table on the right hand side of the screen once the device starts communicating with the service provider's switch.*

The WAN configuration is complete. Communications between the WPIM-T1 and the service provider's switch takes approximately 1 to 2 minutes to begin. A status of **Inactive** appears until both ends of the PVC (Permanent Virtual Circuit) are configured. Once both end devices have negotiated link management with the switches, the status field reads **Active**.

2.6   LEX CONFIGURATION

This section provides step-by-step instructions for configuring the WPIM-T1 to operate in a LEX environment. LEX (LAN Extender) is a Cisco Systems protocol that allows a core router to communicate to a remote site using PPP.

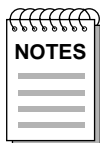The line configuration information shown in Table 2-4 must be supplied by the service provider.

Table 2-4. Telco Configuration Information

Configuration Information Required by User	Configuration Information Supplied by Service Provider
Line Coding	B8ZS or AMI
Frame Type	ESF or D4
Clock Source	Loop Timing or Local Timing

2.6.1   WPIM-T1 Physical Configuration

Begin the WPIM-T1 configuration by accessing the WAN Configuration screen through Local Management (Figure 2-1). Access the WAN Physical Configuration screen from the Feature Selection screen that first appears when you enter Local Management. Use the arrow keys to highlight the **WAN Configuration** option, then press ENTER. The screen shown in Figure 2-1 appears. Proceed with the following steps:

1. Use the arrow keys to highlight the **[WPIM]** field at the bottom of the screen. Press the SPACEBAR to select the WPIM being configured, then press ENTER.

2. Use the arrow keys to highlight **Timeslot View**. Press the SPACEBAR to select **New**, then press ENTER. The cursor moves to Timeslot #1 of the Timeslot Configuration Table.

3. Insert an interface number (see NOTE below) into every Timeslot being used. Type the number, press ENTER, then use the arrow keys to highlight the next Timeslot field. Exit this field by using the arrow keys. The cursor automatically moves to the **T1 Line Coding** field.

> **NOTES**
>
> *The value assigned to the Timeslots is the interface being used for WAN communication. The available interface range is displayed on the WAN Physical Configuration screen (see Figure 2-1). You may insert any of the available interface numbers into the Timeslots.*
>
> *In the example shown in Figure 2-1, the interface range for the MicroMMAC with a WPIM-T1 in slot one of the BRIM-W6 is 2-25. Although any of these values may be used, Cabletron Systems recommends using the first available interface number (in this example interface #2).*
>
> *The following four steps are based on information supplied by the service provider. Consult the service provider for the correct settings.*

4. Use the arrow keys to highlight **T1 Line Coding**. Press the SPACEBAR to select **B8ZS** or **AMI**, then press ENTER.

5. Use the arrow keys to highlight **T1 Frame Type**. Press the SPACEBAR to select **ESF** or **D4**, then press ENTER.

6. Use the arrow keys to highlight **T1 Tx Clock Source**. Press the SPACEBAR to select **Local** (no clock source provided by telephone company) or **Loop** (clock source provided by telephone company), then press ENTER.

> ⚠ **CAUTION**
>
> *If you are using a Local clock source, set only one end of the circuit for Local, the other end must be set for Loop.*

7. Use the arrow keys to highlight **T1 Line Buildout** (LBO). Press the SPACEBAR to select **0 db** unless the service provider recommends another setting, then press ENTER.

8. Use the arrow keys to highlight the **SAVE** command, then press ENTER. The message "Save Done!" appears and Local Management saves the changes to memory.

9. Access the WAN Interface Configuration screen by using the arrow keys to highlight the **WAN Int Config** option, then press ENTER.

2.6.2   WPIM-T1 Interface Configuration

This screen is accessed through the WAN Physical Configuration screen. Refer to Figure 2-4 and proceed with the following steps to configure the WAN Interface through Local Management.

1. Set the Interface Number that is being used for the WAN connection by typing the same number into the **Interface Number** field that was input into the Timeslots in the WAN Physical Configuration screen, then press ENTER. (see NOTE on page 2-22).

2. Unless the user sets the Max Xmit Unit, the WPIM-T1 automatically sets the **Max Xmit Unit** to **8191** (default) after the active protocol (PPP) is selected.

3. If the T1 Line Coding is **B8ZS** on the previous screen:

    a. Use the arrow keys to highlight **Line Coding**. Press the
        SPACEBAR to select **None**, then press ENTER.

    b. Use the arrow keys to highlight **Active Protocol**. Press the
        SPACEBAR to select **PPP**, then press ENTER.

    c. Use the arrow keys to highlight **PPP Type**. Press the SPACEBAR
        to select **LEX**, then press ENTER.

4. If the T1 Line Coding is **AMI** on the previous screen:

    a. Use the arrow keys to highlight **Line Coding**. Press the
        SPACEBAR to select **INV-HDLC**, then press ENTER.

    b. Use the arrow keys to highlight **Active Protocol**. Press the
        SPACEBAR to select **PPP**, then press ENTER.

    c. Use the arrow keys to highlight **PPP Type**. Press the SPACEBAR
        to select **LEX**, then press ENTER.

5. Use the arrow keys to highlight the **SAVE** command, then press
    ENTER. The message "Save Done!" appears and Local Management
    saves the changes to memory.

NOTE	*Upon saving this screen, the interface just configured is assigned to an application port (PT#) in the table on the right hand side of the screen.*

The WAN configuration is complete. It takes up to 60 seconds for the
WAN Interface to come out of standby and for communications to begin.

APPENDIX A

WAN INTERFACE CABLES SPECIFICATIONS

This appendix provides the Cabletron Systems part number and connector information for the WPIM-T1 Interface Cables.

Table A-1 lists Cabletron Systems part numbers for the interface cables for the WPIM-T1. A standard 20 foot cable is available or the customer may specify the length of cable when ordering.

Table A-1. Cabletron WPIM-T1 Cable Part Numbers

Interface Cable	Cabletron Part Number
T1 Line Interface Cable	9372094-20[1]
T1 Line Interface Cable	9372094-L[2]

1. Standard 20 foot T1 Line Interface Cable.
2. (L denotes length required in feet or meters). For example: 9372094-3 denotes a 3 foot cable; 9372094-3M denotes a 3 meter cable.

A.1 CABLE ASSEMBLIES AND PINOUTS

The following section provides connector information for the WPIM-T1 interface cable.

Table A-2. WPIM-T1 Connector Information

Cabletron interface cable part number	9372094-L
Description	T1 line interface cable
Connector 1	RJ48C
Connector 2	RJ48C

Table A-3. WPIM-T1 RJ48 Connector Pin Assignments

Pin	Signal
1	Receive Ring
2	Receive Tip
3	Not Used
4	Transmit Ring
5	Transmit Tip
6	Not Used
7	Shield Ground
8	Shield Ground

Table A-4. RJ48 DTE Pin Assignments

Pin	Signal
1	Receive Ring
2	Receive Tip
3	Not Used
4	Transmit Ring
5	Transmit Tip
6	Not Used
7	Shield Ground
8	Shield Ground

Table A-5. RJ48 Network Pin Assignments

Pin	Signal
1	Receive Ring
2	Receive Tip
3	Not Used
4	Transmit Ring
5	Transmit Tip
6	Not Used
7	Not Used
8	Not Used

APPENDIX B

FCC PART 68 - USER'S INFORMATION

The following instructions are to ensure compliance with the Federal Communications Commission (FCC) Rules, Part 68.

1. All direct connections to T1 lines must be made using standard plugs and jacks.

2. Before connecting your unit, you must inform the local telephone company of the following information:

Port ID	REN/SOC	FIC	USOC
WPIM-T1	6.0N	04DU9-BN 04DU9-DN 04DU9-1KN 04DU9-1SN 04DU9-1ZN	RJ48C

3. If the unit appears to be malfunctioning, it should be disconnected from the telephone lines until you learn if your equipment or the telephone line is the source of the trouble. If your equipment needs repair, it should not be reconnected until it is repaired.

4. 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 advance notice if possible.

5. 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.

6. 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.

7. The attached affidavit must be completed by the installer.

8. In the event of equipment malfunction, all repairs should be performed by our Company or an authorized agent. It is the responsibility of the users requiring service to report the need for service to our Company or to one of our authorized agents.

   Service can be obtained at Cabletron Systems Technical Support:

Address:	Cabletron Systems, Inc. 35 Industrial Way, Rochester, NH 03867-0505
Phone:	(603) 332-9400 Monday - Friday; 8am - 8pm Eastern Time
CompuServe:	GO CTRON from any ! prompt
Internet mail:	support@ctron.com

AFFIDAVIT FOR THE CONNECTION OF CUSTOMER EQUIPMENT TO 1.544 MBPS AND/OR SUBRATE DIGITAL SERVICES

For the work to be performed in the certified territory of

Telco's name:_____

State of:_____

Country of:_____

I, _____ , of _____
   (Name of Authorized Representative)   (Customer Name)

_____ , _____
     (Customer's Address)   (Telephone Number)

being duly sworn, state:

I have responsibility for the operation and maintenance of the terminal equipment to be connected to _____ 1.544 Mbps and/or _____ Subrate digital services. The terminal equipment to be connected complies with Part 68 of the Commission's rules except for the encoded analog content and billing protection specifications. With respect to encoded analog content and billing protection:

- I attest that all operations associated with the establishment, maintenance and adjustment of the digital CPE with respect to encoded analog content and encoded billing information continuously complies with Part 68 of the FCC's Rules and Regulations.

- The digital CPE does not transmit digital signals containing encoded analog or billing information which is intended to be decoded within the telecommunications network.

- The encoded analog and billing protection is factory set and is not under the control of the customer.

I attest that the operator(s) maintainer(s) of the digital CPE responsible for the establishment, maintenance and adjustment of the encoded analog content and billing information has (have) been trained to perform these functions by successfully completing one of the following: Check appropriate one(s).

    a. A training course provided by the manufacturer/grantee of the equipment used to encode analog signals; or

    b. A training course provided by the customer or authorized representative, using training materials and instructions provided by the manufacturer/grantee of the equipment used to encode analog signals; or

    c. An independent training course (e.g. trade school or technical institution) recognized by the manufacturer/grantee of the equipment used to encode analog signals; or

    d. In lieu of the proceeding training requirements, the operator(s) maintainer(s) is (are) under the control of a supervisor trained in accordance with _____above.

I agree to provide_____with proper documentation
                              (Telco's Name)

to demonstrate compliance with the information as provided in the proceeding paragraph, if so requested.

_____ (Signature)

_____ (Title)

_____ (Date)

Subscribed and sworn to me this _____ day of _____ , 19_____ .

_____
                    (Notary Public)

My commission expires: _____

APPENDIX C

WAN TERMS AND ACRONYMS

This appendix provides definitions for WAN terms and acronyms.

AMI Alternate Mark Inversion, line coding used with both E-1 and T-1. A digital 1 is encoded as a "mark" (pulse) and a 0 is encoded as a "space." The marks alternate polarity.

ANSI American National Standards Institute, the US member of the ISO.

Bearer (B) Channel A 64 Kbps channel used with BRI and PRI ISDN services.

Bipolar Violation The occurrence of two successive pulses of the same polarity in a bipolar signal.

B8ZS Binary 8-Zero Substitution, line coding utilized with ESF (Expanded Super Frame). Insures the ones density requirement for digital T-carrier facilities in the public network, while allowing 64 Kbps clear data per channel. This encoding method is not supported by some Telcos.

BRI Basic Rate Interface, minimum rate ISDN subscriber interface, provides 2 B + 1 D channels (two 64 Kbps "B" (Bearer) channels and one 16 Kbps "D" (Data) signaling channel for a total of 144 Kbps).

BRIM Cabletron Systems Bridge Router Interface Module. Expands the physical connectivity of a host device.

CRC Cyclic Redundancy Check, an algorithm or process used to identify corrupted packets in the transmission link.

CSU Channel Service Unit, a device that terminates the local loop/digital channel on a customer's (DSU) premises. The CSU connects to a DSX-1 interface on the CPE.

DCE	Data Communications Equipment, a device such as a modem that connects the communications circuit with the end device (see DTE).
Data (D) Channel	A 16 Kbps channel used with BRI and PRI services for signaling and control.
D4	D4 Framing, a popular framing format in T-1. Uses 12 T-1 Frames to identify both the channel and the signaling bit.
DLCI	Data Link Connection Identifier, a unique virtual circuit identifier used in Frame Relay. Identifies a given frame as being from a particular logical link. The DLCI has only local significance.
DSU	Digital Service Unit, converts RS-232 or other terminal interfaces to DSX-1 (T-1) interface.
DS-0	Digital Signal, level 0, a standard 64,000 bit/second channel. Synonymous with "Timeslot."
DTE	Data Terminal Equipment, equipment that originates and terminates data transmission such as a computer or printer (see DCE).
E-1	European digital signal level 1. Similar to T-1 but provides 32 channels (2.048 Mbps) instead of 24 channels (1.544 Mbps).
ESF	Extended Super Frame. A new T-1 framing standard (see D4 framing) that uses 24 T-1 frames, thus allowing individual identification of the channel and signaling bits.
Fractional T-1	Use of a portion (less than the full 24 channels) of a T-1 line.
Frame Relay	A network protocol that allows for many point-to-point virtual connections over a single access channel.
HDB3	High Density Bipolar 3, used with E-1, a bipolar coding method that does not allow more than 3 consecutive zeros.
HDLC	High-Level Data Link Control, layer 2 (link layer) full-duplex protocol derived from SDLC.
INV. HDLC	A form of zero suppression in which all zeros in the HDLC packet are changed to ones and all ones are changed to zeros.

ISDN   Integrated Services Digital Network. Allows point-to-point connections at 64 Kbps or 128 Kbps when necessary and disconnects the line when not in use. With this service the user only pays for the time connected.

JBZS   Jam Bit-Zero Suppression, a form of zero suppression that places a one in the seventh bit of a timeslot. Reduces the effective throughput to 56 Kbps.

LEX   LAN Extender, a Cisco Systems protocol used to internetwork a host-based router with a remote switch.

LMP   Link Management Protocol, used in Frame Relay. Allows the device to gather information about the DLCIs (Data Link Connection Identifiers) See T1.617-D, Q.933-A.

Local Timing   Timing for digital transmission circuit is internally generated by a source within the equipment. Usually used for short haul private lines. In this case one CSU must be set for Local (internal) timing and the CSU at the other end of the line must be set for Loop (recovered) timing to create a master-slave situation.

Loop Timing   Timing for digital transmission circuit is recovered from the received data, not generated internally by a source within the equipment. This is the typical situation when using public lines.

MIM   Media Interface Module, Cabletron Systems products designed to fit in a Multi Media Access Center (MMAC) hub.

MUX   Multiplexer, an electronic device that allows two or more signals to pass over one communications circuit.

PPP   Point-to-Point Protocol, provides a method for transmitting datagrams over serial point-to-point links.

PRI   Primary Rate Interface, an ISDN service providing 23 "B" (Bearer) channels of 64 Kbps and one 64 Kbps "D" (Data) channel for signaling and control.

PVC   Permanent Virtual Circuit, a virtual circuit that provides the equivalent of a dedicated private line service.

Q.933-A   Q.933 Annex A, an ITU link management protocol specification used in Frame Relay.

SDLC
Synchronous Data Link Control, layer 2 (link layer) protocol developed by IBM for SNA connectivity. Basis for HDLC.

SNA
Systems Network Architecture, data communication network architecture developed by IBM in the 1970's.

T-1
A Bell System term that refers to the physical carrier used to transmit a digital signal at 1.544 Mbps.

T1.617-D
T1.617 Annex D, an ANSI link management protocol specification used in Frame Relay.

TDM
Time Division Multiplexing, a technique in which separate data or voice signals are transmitted simultaneously over a single communications medium based on time interleaving.

Timeslot
A standard 64,000 bit/second channel. Synonymous with DS-0 (Digital Signal, level 0).

WAN
Wide Area Network, a network spanning a large geographic area.

WPIM
WAN Physical Interface Module, Cabletron Systems modules that provide connectivity/functionality for WAN modules such as the BRIM-W6.