

**T2015 TOKEN-RING
NETWORK ADAPTER
INSTALLATION GUIDE**

CABLETRON
SYSTEMS Inc.
The Complete Networking Solution™

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CHAPTER 1

INTRODUCTION

This manual provides installation and reference information for the network adapters. The network adapters connect your PC to an IEEE 802.5, Token-Ring network using shielded twisted pair cable of types 1, 2, 6, 8, and 9, or unshielded voice-grade IBM type 3 twisted pair cable. The adapters incorporate Cabletron Systems' LANVIEW® LEDs. These diagnostic LEDs indicate network activity, wire fault/attachment, and ring speed.

1.1 USING THIS MANUAL

This manual is organized so that you can follow sequential chapters as you install an adapter. Read Chapter 1 first to familiarize yourself with your adapter model's capabilities. Then:

- Copy the software diskettes supplied with the adapter.
- Configure and install the adapters as outlined in Chapter 2.
- Connect the adapter to the network as outlined in Chapter 3.
- Install the network drivers required for your application as outlined in the **Network Software Installation Guide**. Diagnostics for troubleshooting are supplied on the Cabletron software diskette(s), and are described in the Network Software Installation Manual.

Chapter 1, **Introduction**, discusses the capabilities of the adapters.

Chapter 2, **Installation**, provides instructions for installing the adapters in your computer.

Chapter 3, **Making Network Connections**, provides instructions and requirements for connecting your adapters to the network.

1.2 THE ADAPTER FEATURES

The following sections outline the features of the adapters.

1.2.1 Connectivity

The Cabletron Systems adapters connect your computer to an IEEE 802.5 Token-Ring network. The various adapter models incorporate both an unshielded (RJ-45 UTP) twisted pair port, and a DB-9 shielded twisted pair port. All port types provide access for SNMP network management such as Cabletron's SPECTRUM®, Remote LANVIEW®/Windows, or any SNMP-compliant management software.

1.2.2 RJ-45 Unshielded Twisted Pair Port

The adapter's unshielded twisted pair port employs the RJ-45 eight-pin industry standard connector. The adapters do not require a media filter for attachment of a UTP lobe link. An unshielded twisted pair lobe cable can be connected directly to this port. The other end of this lobe cable must be connected to an IEEE 802.5 compliant Token-Ring device such as one of Cabletron's TRMIM Token-Ring Media Interface Modules.

1.2.3 DB-9 Shielded Twisted Pair Port

The adapter's shielded twisted pair port incorporates the industry standard DB-9 connector. A shielded pair lobe cable can be connected to the DB-9 port. The other end of the lobe cable must be connected to an IEEE 802.5 compliant Token-Ring device such as one of Cabletron's TRMIM Token-Ring Media Interface Modules.

1.2.4 LANVIEW LEDs

Cabletron Systems' adapters incorporate Cabletron Systems' LANVIEW Status Monitoring and Diagnostic System. The LANVIEW LEDs help you diagnose problems, such as failure to establish a twisted pair link between the adapter and a device at the far end of the link. Individual LEDs advise you when the adapter is sending and receiving data packets, when wire faults occur in the lobe link, and the operating speed of histogen-Ring. A more detailed description of the functions of the individual LEDs appears in Chapter 2, **Installation**.

1.2.5 Software

Software drivers, related software, and diagnostics are supplied by Cabletron Systems on floppy diskettes shipped with the adapter. The drivers support a variety of network platforms. For network software installation instructions, refer to the Network Software Installation Guide that accompanies the software.

The diagnostic program provided with the adapter is user-friendly and menu-driven and does not require detailed instructions. With the diagnostic program you can check the adapter's operation at various levels, through a series of tests. The diagnostic program detects where problems might be located in the operation of the adapter, or determines if a problem exists in the communication between the adapter and the computer.

1.2.6 Statistics

Statistics can be gathered from the adapter either from your computer, or from another workstation utilizing Cabletron Systems' SPECTRUM, Remote LANVIEW / Windows, Remote LANVIEW for SunNet Manager®, or other SNMP-compliant network management software. Through this software, you can gather statistics on the adapter's activity on the network. For further information on Local Statistics, refer to the **Network Software Installation Guide**.

1.2.7 Related Manuals

- Remote LANVIEW / Windows Station Software User's Manual
- SPECTRUM documentation
- Network Software Installation Guide P/N 9030705

CHAPTER 2

INSTALLATION

2.1 ADAPTER MODELS

The T2015 and T3015 Series network adapters are used for the specific computer bus architectures listed below:

- T2015 Series - IBM Personal Computer AT, IBM Personal System/2 Model 30, or a compatible with an AT style bus.
- T3015 Series - IBM Personal System/2 or compatibles with a Micro Channel[®] style bus.

2.2 PREPARING THE ADAPTERS

This chapter shows you how to prepare a Cabletron Systems Token-Ring network adapter and install it in your computer. The clock configuration for both the T2015 and T3015 is set through a jumper. The I/O address for the T2015 is set through a dual DIP switch, and the I/O address of the T3015 is set by configuring the Adapter Description File for your microchannel-compatible computer. All other parameters for both adapters are set through software. The preparation and installation procedure for any of the adapters consists of:

- Unpacking the adapter and software, and making a backup copy of the software.
- Configuring and installing the adapter, and running diagnostics if necessary.
- Making network connections, and installing network drivers for your operating system.

2.2.1 Unpacking the Adapter

The network adapter and its software are shipped separately. The complete installation package should contain one conductive pouch with the adapter and this manual. The software is shipped in a shrink-wrapped package containing the software, a license agreement, and a **Network Software Installation Guide**.

Carefully remove the conductive pouch from the box. Leave the adapter in the conductive pouch until you are ready to install it. Open the shrink-wrapped software package when you are ready to install the software. Be sure to read the license agreement.



The adapter is sensitive to static discharges. Hold it by the corners. Avoid contact with the PC bus edge connector or any of the components, except the jumpers. Failure to observe all static precautions can result in damage to the adapter.

2.2.2 Copying the Software

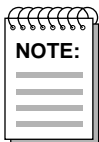
Before you begin the installation, it is important that you make a backup copy of the Cabletron software supplied with the adapter. Use the disk copy routine for your PC to make a duplicate copy of the Cabletron software diskettes. Store the original software in a safe place, and use the copies for the actual installation procedure.

2.3 PREPARING THE T2015 ADAPTER

Before you install the T2015 Token-Ring adapter in your computer, you will have to set the adapter's I/O base address, and possibly the adapter's Clock Source.

The I/O base address is set through a pair of dip switches. If your T2015 adapter is being installed in a computer that requires a synchronous clock source for its adapter boards, you will also need to change the clock source jumper.

Setting this jumper is described in Section 2.3.2. The jumper's default setting is correct for most computers. Refer to Figure 2-1 for the jumper and switch locations.



*If your adapter is installed in a computer with incompatibilities in the bus architecture, such as an IBM PS/2 Model 30-286, you may need to change the bus compatibility switch in the driver software command line. Setting this switch is described in the **Network Software Installation Guide**.*

2.3.1 Setting the I/O Base Address

Before the T2015 adapter can be used, the I/O base address must be set using a pair of two-position dip switches accessible through the card's bracket. The switches are located just below the ports on the bracket (see Figure 2-2).

The card's other parameters are set during the installation of network software. This configuration is discussed in the Network Software Installation Manual.

The I/O base address is a hexadecimal field that distinguishes the T2015 adapter from other adapters that may be in the PC. The adapter must be set to one of four base addresses - 0A20, 0A80, 1A20, or 1A80.



The adapter is sensitive to static discharges. Hold the adapter by its corners. Avoid contact with the PC bus edge connector or any of the components, except the jumpers. Failure to observe all static precautions may result in damage to the adapter.

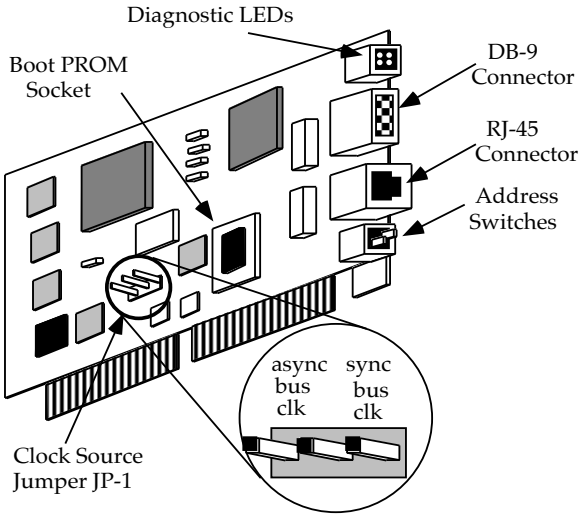


Figure 2-1. T2015 Token-Ring Adapter

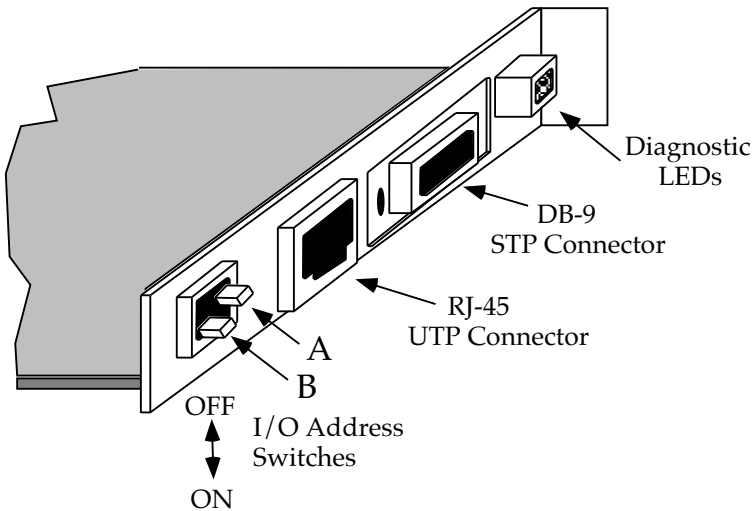


Figure 2-2. T2015 Bracket and I/O Address Switches

To set the I/O address, follow this procedure:

- Remove the T2015 adapter from its protective bag. Hold the adapter so the bracket is facing you and the LEDs are at the top.
- Select the I/O base address for the adapter using the following settings. Refer to Figure 2-2 on page 2-4, and Table 2-1 below.

Table 2-1. I/O Address Switch Settings

Switch A	Switch B	I/O Address	Boot Address
On	On	0A20	D0000
Off	On	0A80	C0000
On	Off	1A20	E0000
Off	Off	1A80	PROM disabled

The I/O base address can be reset after the adapter has been installed. However, the new I/O base address must be entered into your network driver's configuration. Note that only two base addresses, 0A20 and 1A20, can be used if you are running IBM's PC LAN Program or other NetBIOS-based applications. Refer to the **Network Software Installation Guide** for more information.

If an incompatibility exists in the clock source, and you need to set the adapter for the synchronous clock source mode, proceed to Section 2.3.2 which follows. If you are installing the adapter in any other AT-compatible machine, proceed to Section 2.4 to begin installation procedures.

2.3.2 Setting the Clock Source Jumper

You will need to set the Clock Source Jumper (JP1) if your PC requires the adapter to be synchronous with the system bus clock. In most computers, the adapter will use its own clock source, meaning that the adapter is running in the asynchronous mode. If the adapter uses the system's clock source, it will be running in the synchronous mode.

JP1 is used to select which source clock will be used, the adapter's or the system's. For most AT-compatibles, you will not have to change this jumper.

To set the jumper, place shunts as shown in Figure 2-3, below:

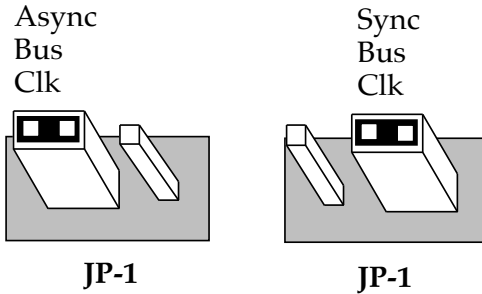


Figure 2-3. Clock Source Jumper, JP-1

When you have completed setting the Clock Source Jumper, you are now ready to install the T2015 into your computer.

2.4 INSTALLING THE T2015 ADAPTER

A T2015 adapter can occupy any 16-bit expansion slot or an XT type slot, but in an 8-bit slot, performance will be degraded. Follow these steps to install the T2015 adapter in your computer:

- Turn off the power to the PC and peripherals and disconnect all power cords and cables.

- Follow the instructions in your computer user manual, and using static discharge precautions, remove the cover from the computer.
- Select the slot in which the adapter will be installed. Carefully remove the adapter from its protective pouch, and visually inspect it.
- Remove the backplate from the selected slot by removing the screw holding the backplate in place, and slide the backplate out of the slot.

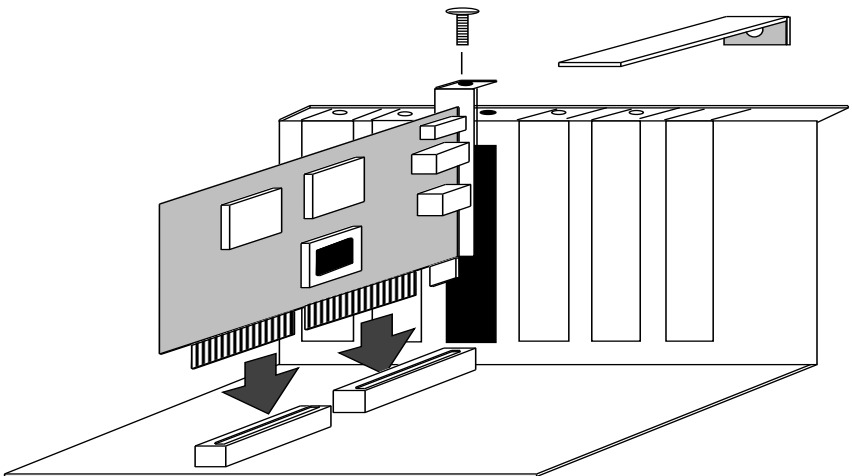


Figure 2-4. Installing the T2015 Adapter

Carefully insert the adapter into the expansion slot as shown in Figure 2-4. Orient the adapter so the PC edge bus connector is pointed down and the ports face out the back of the PC. Align the adapter so the PC bus edge connector is lined up with the expansion slot, and firmly press the adapter into the slot.

Reinsert the screw removed in disassembly and replace the PC cover. Reattach the power and peripheral cables and turn on the power for the PC and the peripherals.

If you are not going to install a Boot PROM at this time, proceed to Section 2.6, LANVIEW LEDs, for an explanation of the functions of these diagnostic LEDs.

2.5 INSTALLING A BOOT PROM

The adapter incorporates a socket for an optional Boot PROM. The Boot PROM plugs into the empty 32-pin socket shown in Figure 2-5. By installing a Boot PROM, you can use the adapter to boot up your PC, without a hard drive, onto a network running, for example, the Novell® NetWare network operating system. The Boot PROM address is linked to the I/O address as shown in Table 2-1 on page 2-5. Software installation instructions are included with the Boot PROM.

2.5.1 Boot PROM and Socket Alignment



*Observe all precautions when handling the Boot PROM.
Static discharges may damage the Boot PROM.*

To install a Boot PROM, remove the Boot PROM from its packaging. Insert the Boot PROM into the PROM socket so that the notched corner on the PROM is aligned with the notch on the socket as shown in Figure 2-5. Note the dimple in the top center of the PROM.

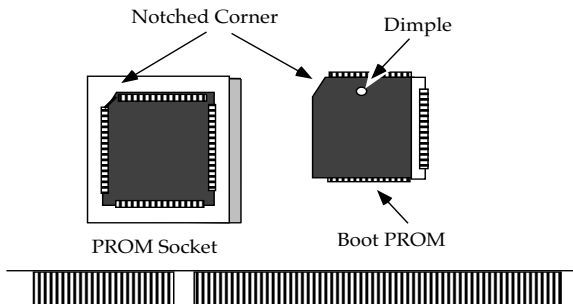


Figure 2-5. Installing a Boot PROM

2.6 LANVIEW LEDs

The Token-Ring adapters incorporate Cabletron's LANVIEW diagnostic LEDs. These LEDs help you diagnose problems, such as failure to establish a twisted pair link between the adapter and a device at the far end of the link. Individual LEDs advise you when the adapter is sending and receiving data packets, when wire faults occur in the lobe link, and Token-Ring operating speed.

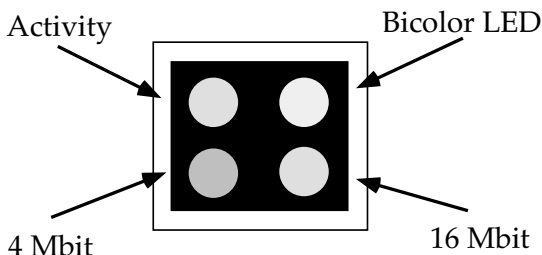


Figure 2-6. LANVIEW LEDs - T2015 and T3015 Adapters

- **Activity LED**
This yellow LED flashes to indicate that the adapter has detected minimum signal strength, is active on the Token-Ring, and is transmitting, and receiving data addressed to it.
- **4 Mbit LED**
This green LED indicates 4 megabit Token-Ring speed.
- **16 Mbit LED**
This yellow LED indicates 16 megabit Token-Ring speed.
- **Bicolor LED**
When off, this LED indicates that the adapter has not inserted Phantom into the Token-Ring.

When green, this LED indicates Phantom has been inserted into the Token-Ring, and there is no wire fault.

When red, this LED indicates Phantom has been inserted into the Token-Ring and there is a wire fault present.

2.7 PREPARING THE T3015 ADAPTER

This section contains instructions for preparing and installing your T3015 network adapter into your Micro-Channel compatible computer.

2.7.1 Setting the Clock Source Jumper

The Clock Source Jumper (JP1) adjusts the adapter's clock cycle to match the PS/2 model that the adapter is to be installed in. Placing a shunt over pins 1 and 2 set the clock source for PS/2 Model 50 compatibility. Placing the shunt over pins 2 and 3 adjust the clock source for compatibility with PS/2 Models 70 and 80.

To set the jumper, locate JP-1 as shown in Figure 2-7, below:

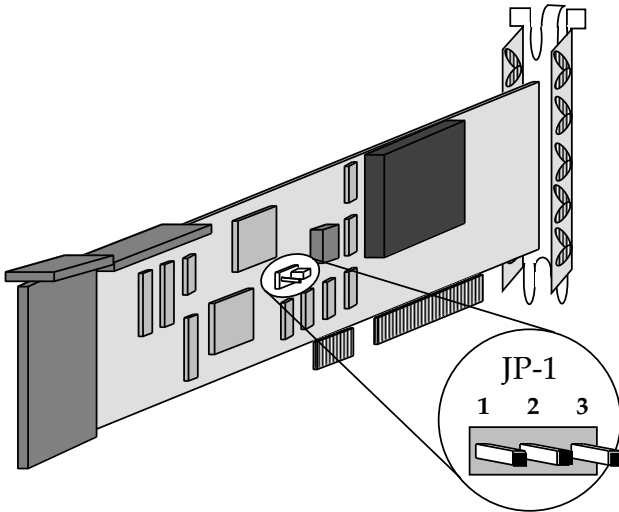


Figure 2-7. T3015 Clock Source Jumper JP-1

Place the shunts over the pins as required for your type of computer. See Figure 2-8, below.

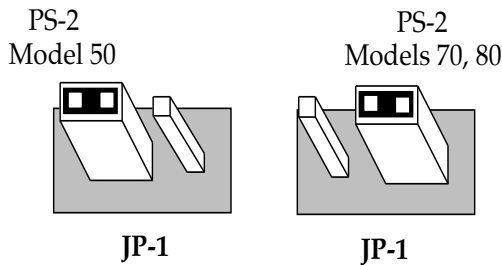


Figure 2-8. Setting Clock Source Jumper JP-1

2.7.2 Preparing the T3015 for Installation

The parameters for the T3015 adapter are set when the Adapter Description File (ADF) is configured. The ADF file distinguishes the adapter from other boards in the computer. The ADF will be configured after the adapter is installed.

2.7.3 Installing the T3015 Adapter

To install the adapter in your computer, follow these instructions:

- Turn off the power to the PC and peripherals and disconnect all power cords and cables.
- Following the instructions in your computer user manual, using static discharge precautions, remove the cover from the computer.
- Select the slot in which the adapter will be installed. Your adapter can occupy any Micro-Channel style 16-bit expansion slot. The T3015 adapter can also be used in the rearmost half of a 32-bit Micro-Channel slot.

- Remove the adapter from its protective pouch, and visually inspect it.



The adapter is sensitive to static discharges. Hold it by the corners. Avoid contact with the PC bus edge connector or any of the components. Failure to observe all static precautions may result in damage to the adapter.

- Remove the protective backplate from the selected slot, as shown in Figure 2-9. Loosen the thumbscrew holding the backplate in place over the selected slot, and slide the backplate out of the slot.
- Orient the adapter so that the ports face out the back of the PC as shown in Figure 2-9.

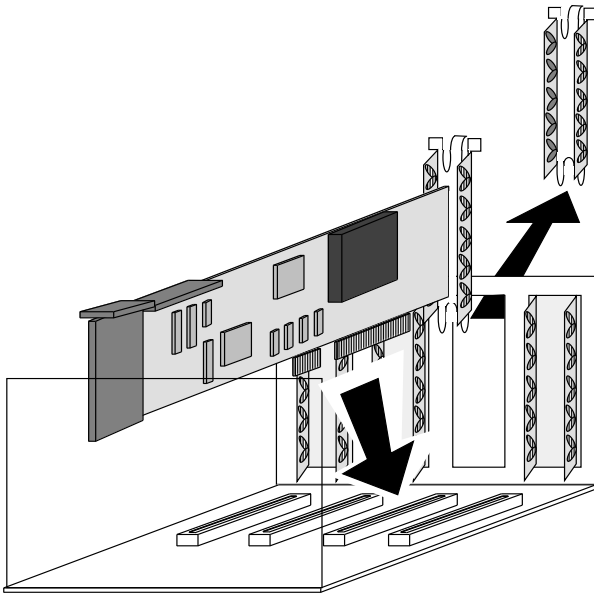


Figure 2-9. Installing the T3015 Adapter

- Slide the adapter into the guide slots and firmly press, but do not force, the adapter into the expansion slot. The plastic clips on the adapter (1, 5, Figure 2-14) will snap into place as the adapter is inserted into the expansion slot.
- Reinsert the thumbscrew, and replace the PC cover. Reattach the power and peripheral cables, and power up the PC.

2.8 COPYING THE ADF FILE

After a T3015 adapter is installed in your computer and before using it, you must copy the Cabletron Adapter Description File (ADF) onto a backup copy of your system's Reference Diskette. The ADF is supplied with your Cabletron software. The ADF provides Programmable Option Select Parameters for the System Configuration Utility. If necessary, you can change the parameters during this procedure.

***IMPORTANT:** Be sure to use a backup copy of the Reference diskette, and not the original Reference Diskette, when you perform the following procedure.*

2.8.1 Configuring the ADF file

To configure the ADF:

- Copy the two ADF Files (@ 5608.adf and @ 5609.adf) from the Cabletron diskette to your system's Reference Diskette.
- Boot from your system's Reference Diskette.
- Answer **Yes** to: Automatically configure the system?

2.9 LOADING NETWORK SOFTWARE

You must install the proper network software in order to use your PC, with an adapter, on a Token-Ring network. Network operating system software drivers are supplied on the Cabletron software diskettes that are shipped with the adapter. The drivers are grouped in subdirectories that contain readme files (a .DOC extension) to explain any recent changes in procedure, etc.

The **Network Software Installation Guide**, included with the software, contains detailed installation instructions for installing network drivers.

2.10 TROUBLESHOOTING CHECKLIST FOR ADAPTERS

- Make sure the adapter is installed and properly seated in the PC chassis connector.
- On the adapter, if the coax port is used it is necessary to have a Tee and terminator attached to it.
- If the adapter does not initialize, verify that the bus slot is operational by swapping the adapter with an adapter that you know is functioning.
- Try swapping the adapter with a known working adapter.
- The interrupt, I/O address or memory parameters could be conflicting with another adapter. Use a program like “Check-It” to determine what settings are currently in use by other adapters.
- Verify that the cable is attached to the media port that you want to use, and that the cable is actually a Token-Ring twisted pair cable.
- If a connection to a server or another host cannot be maintained, check the cable first with a TDR or pair scanner. After verifying the cable, check the device that you are trying to communicate with. Verify that you can ping it or that other clients can contact it.

2.11 SOFTWARE CHECK LIST

Software drivers, related software, and diagnostics are supplied by Cabletron Systems on floppy diskette(s) shipped with the adapter. The drivers support a variety of network platforms. For network software installation instructions, refer to the **Network Software Installation Guide** that accompanies the software.

2.11.1 Diagnostics

Diagnostics are included in the Cabletron software diskette under the directory DIAGS. These diagnostics are menu driven and can be run from the floppy diskette, or copied onto your hard disk into the directory containing the Cabletron software.

2.11.2 Software Tips

The following tips may help you avoid software related problems:

- Cabletron supplies different drivers for use with different operating systems. Make sure that you are using the correct driver and that the I/O hardware switch setting agrees with the software I/O setting that you selected.
- If you are using Novell NetWare, Cabletron supplies a direct IPX and a packet driver IPX. Make sure you are using the correct IPX.COM file. See the **Network Software Installation Guide** included with the Cabletron software for more information.
- When using the packet driver version 4.0 or above, you must use IPX (NSHPD) LAN Option 1.05.03 or above.
- If you are using a Kingston Memory Board, DO NOT use automatic configuration after copying the Cabletron ADF file.

CHAPTER 3

NETWORK CONNECTIONS

The network connections for all Cabletron Systems Token-Ring adapters are the same. An adapter can be connected to the network through either the adapter's DB-9 shielded twisted pair port or RJ-45 port. The port should have been selected during installation procedures. Refer to the appropriate installation chapter for your model adapter for further information on selecting a port.

3.1 CONNECTING TO AN STP CABLE

The Token-Ring adapter can be connected to a shielded twisted pair lobe link through the DB-9 port. The shielded twisted pair connection consists of two twisted pairs:

- One pair (RX+, RX-) for the incoming (receive) signal from the upstream neighbor in the Token-Ring.
- One pair (TX+, TX-) for the outgoing (transmit) signal to the downstream neighbor in the Token-Ring.

The T2015 Token-Ring adapter (Figure 3-1) is used here for a connection example. To connect the adapter to a Token-Ring lobe link via the DB-9 port:

- Connect the DB-9 connector (2, Fig. 3-1) on the end of the lobe link to the DB-9 port (1).
- Tighten the screws (3) to secure the connector to the port.

Once the PC is powered up and on the network, check the condition of the bicolor LED. The bicolor LED will be off when the PC is first powered up. The LED will turn green when the adapter has accessed the network. If the bicolor LED turns red, there is a wire fault present. See Section 1.6, LANVIEW LEDs, for more information.

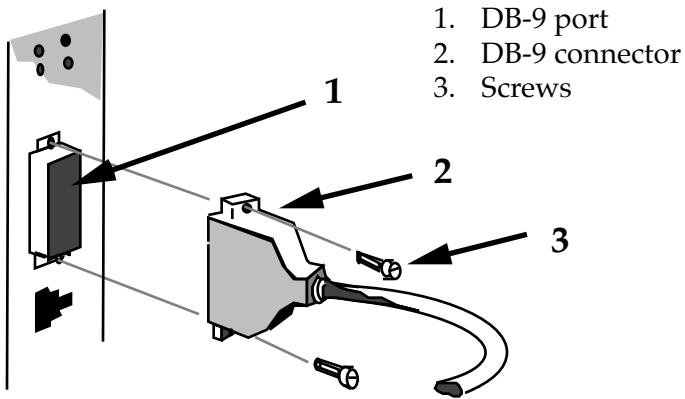


Figure 3-1. Attaching an STP Lobe Link

If the bicolor LED is not lit or remains red, check the following items:

- Verify that the PC is powered up.
- Check that the device at the other end of the lobe link is properly connected.
- Verify that the DB-9 connector on the lobe link has the proper pin-outs (see Section 3.3).
- Check the cable for continuity, and ensure that the cable is a twisted pair Token-Ring cable.
- Check that the adapter is properly seated in the expansion slot.
- Check that the twisted pair connection meets dB loss and cable specifications outlined in Section 3.3.

If the bicolor LED is still not lit, or is red, call Cabletron Systems Technical Support.

3.2 DB-9 CONNECTOR

Below in Figure 3-2 is the DB-9 shielded twisted pair port. Table 3-1 shows the pinouts for the shielded twisted pair port.

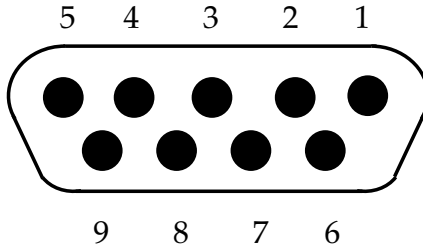


Figure 3-2. DB-9 Shielded Twisted Pair Port

3.2.1 DB-9 Port Pinouts

The DB-9 connector pinouts are listed in the table below.

Pin	Signal	Pin	Signal
1	RX+	5	TX-
2	Logic Gnd.	6	RX-
3	+5 Vdc	7	Logic Gnd.
4	Logic Gnd.	8	Logic Gnd.
Connector Shell	Chassis Gnd.	9	TX+

Table 3-1. DB-9 Port Pinouts

3.2.2 RJ-45 Port

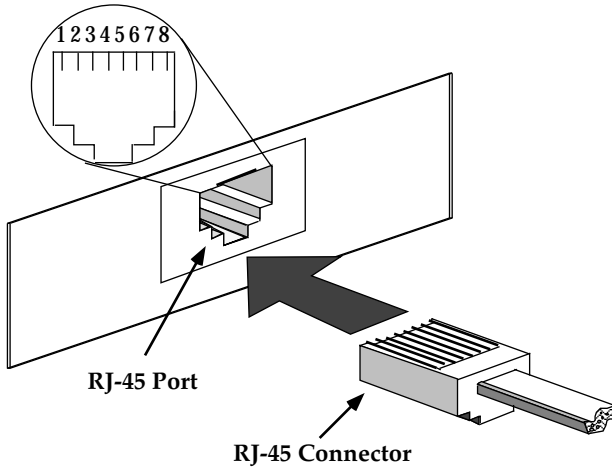


Figure 3-3. RJ-45 Port Connections

3.2.3 RJ-45 Pinouts

Table 3-2. The pinouts for the adapter’s RJ-45 port are listed in the table below. RJ-45 Pinouts

Pin	Signal	Pin	Signal
1	no connection	5	RX-
2	no connection	6	TX+
3	TX-	7	no connection
4	RX+	8	no connection

3.2.4 Connecting to a UTP Cable

The Token-Ring adapter can be connected to an unshielded twisted pair lobe link through the RJ-45 port. The unshielded twisted pair connection consists of two twisted pairs:

- One pair (RX+, RX-) for the incoming (receive) signal from the upstream neighbor in the Token-Ring.
- One pair (TX+, TX-) for the outgoing (transmit) signal to the downstream neighbor in the Token-Ring.

To connect the adapter to a Token-Ring lobe link, via the RJ-45 port, connect the UTP lobe link (4, Fig. 3-3) to the adapter by inserting the RJ-45 connector (3) into the RJ-45 port (2) on the adapter.

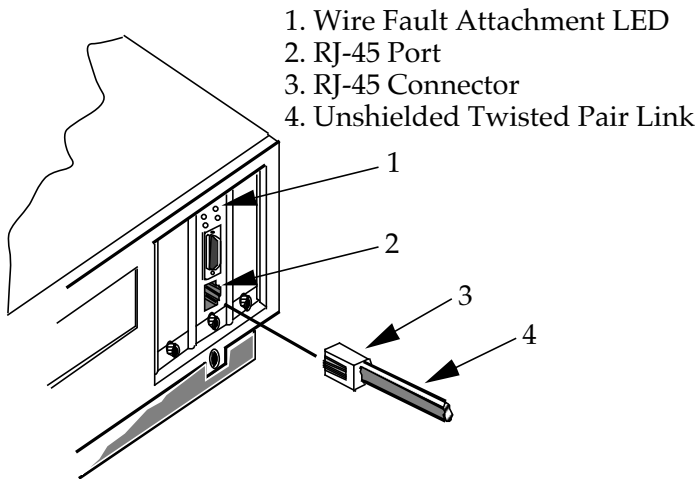


Figure 3-4. Attaching a UTP Lobe Link

Once the PC is powered up and on the network, be sure the bicolor LED (1) is lit. The LED will be off when the PC is first powered up. The LED will turn green when the adapter has accessed the network.

If the bicolor LED remains unlit or turns red, check the following items:

- Verify that the PC is powered up.
- Check that the device at the end of the lobe link is properly connected.
- Verify that the RJ-45 connector on the lobe link has the proper pin-outs (see Section 3.3).
- Check the cable for continuity, and ensure that the cable is actually a twisted pair cable.
- Check that the adapter is properly seated in the expansion slot.
- Check that the twisted pair connection meets dB loss and cable specifications outlined in Section 3.3.

The Token-Ring adapter is now ready for operation. If you encounter any problems, contact Cabletron Systems Technical Support.

3.3 NETWORK SPECIFICATIONS

This section outlines the Token-Ring Network operating and environmental specifications.

3.3.1 Cable Specifications

Each Token Ring adapter supports IBM shielded twisted pair (STP) cable Types 1, 2, 6, 8, and 9. The adapters also support voice grade, unshielded twisted pair cable (IBM Type 3).

- Type 1 - Two shielded twisted pairs (STP) of 22 AWG solid wire for data. Typically used for the longest cable runs in walls of buildings.

- Type 2 - Similar to Type 1 data cable, with four additional unshielded twisted pairs of 24 AWG solid wire. The additional wires are outside of the shield casing and are typically used for voice communication. Type 2 is frequently used to wire cable runs within the walls of buildings.
- Type 3 - Usually four unshielded twisted pairs (UTP) of 24 AWG solid wire for data or voice communication, such as telephone lines. Used for cable runs in walls of buildings.
- Type 6 - Two STP of 26 AWG stranded wire for data. This type is used in patch panels or to connect devices with wall jacks. Due to the higher attenuation, Type 6 cable is good for up to 66 meters for every 100 meters of Type 1 cable (Type 6 cable distance = $2/3 \times$ Type 1 cable distance).
- Type 8 - One flat STP of 26 AWG stranded wire for under carpet installation. Type 8 STP has the same characteristics as Type 9 cabling.
- Type 9 - Similar to Type 1, but uses 26 AWG solid wire. Due to the higher attenuation, Type 9 cable is good for up to 66 meters for every 100 meters of Type 1 cable (Type 9 cable distance = $2/3 \times$ Type 1 cable distance).

3.3.2 Cable Lengths

Lobe length is the physical length of the cable connecting a PC to a trunk coupling unit port on the ring concentrator. Lobe length limits for the Token-Ring adapters are shown in Table 3-1 on the following page. To determine the specific lobe link length, refer to the manual for the concentrator to which your Token-Ring adapter is connected.

Table 3-3. Maximum Lobe Length

Table 1:

Cable Type	at 4 Mbps	at 16 Mbps
STP (IBM Types 1 and 2)	200 meters (656 feet)	100 meters (328 feet)
Voice Grade UTP (IBM Type 3)	100 meters (328 feet)	60 meters (196 feet)
STP (IBM Type 6) (only for station to wall plate and patch panels)	30 meters (98 feet)	30 meters (98 feet)
STP (IBM Type 9)	130 meters (427 feet)	65 meters (213 feet)

3.4 SAFETY

The Cabletron Token-Ring adapters are designed in accordance with UL478, UL910, NEC 725-2(b), CSA, IEC, TUV, VDE Class A. Meets FCC, Part 15, Class A limits.

3.5 ATTENUATION

Maximum attenuation for specific cable types is shown in Table 3-2. Since there are two possible ring speeds, both frequencies are listed, 4.0 MHz and 16 MHz. The attenuation values include cables, connectors, and patch panels.

Table 3-4. Maximum Allowable Attenuation

Table 2:

Cable Type	at 4 Mbps	at 16 Mbps
STP (IBM Types 1 and 2)	22 dB/Km	45 dB/Km
Voice Grade UTP (IBM Type 3)	56 dB/Km	131 dB/Km
STP (IBM Types 6 and 9)	33 dB/Km	66 dB/Km

3.6 IMPEDANCE

The characteristic impedance for UTP cable is 100 ohms $\pm 15\%$. For STP cable, the characteristic impedance is 150 ohms $\pm 10\%$.

3.7 CROSSTALK

Is caused by signal coupling between the different cable pairs contained within a multi-pair cable bundle. In shielded pair cables, the effects of crosstalk are minimized.

3.8 NOISE

Can be caused by either crosstalk or externally induced impulses. If noise induced errors are suspected, it may be necessary to re-route cabling away from potential noise sources (motors, switching equipment, high current equipment), or to ensure that the electrical wiring in the area is properly wired and grounded.

WARNING: It is the responsibility of the person who sells the system of which the adapter will be a part to ensure that the total system meets allowed limits of conducted and radiated emissions.

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