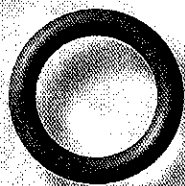
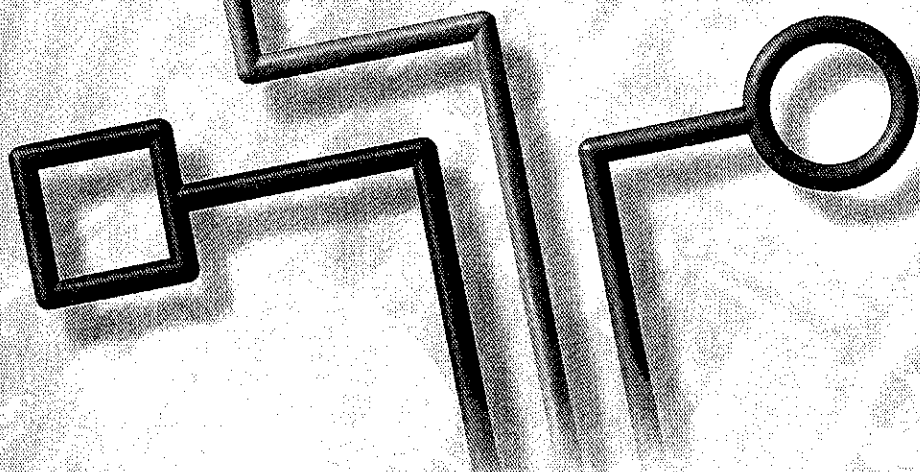
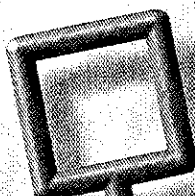
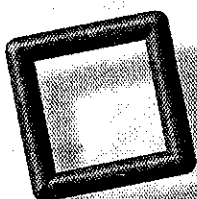
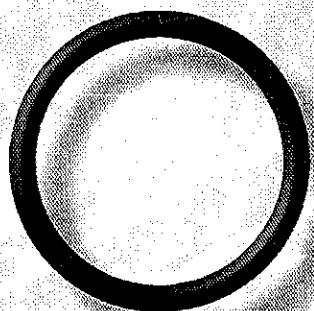
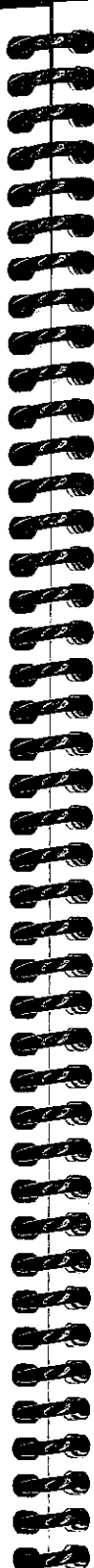


TOKEN RING

TC4046 16/4 TOKEN RING ADAPTER/MC INSTALLATION GUIDE



THOMAS • CONRAD[®]
CORPORATION



**THOMAS-CONRAD CORPORATION
TC4046 16/4 TOKEN RING ADAPTER/MC
INSTALLATION GUIDE**

Document No. 615-4046-003
Version 2.0
April 1994

Thomas-Conrad Corporation
1908-R Kramer Lane, Austin, Texas 78758
24 Hour Technical Support, (800) 334-4112
Sales, (800) 332-8683, (512) 836-1935
In Canada, (800) 654-3822
In Europe, + 49 (211) 5048-781

Copyright 1994
All Rights Reserved

DISCLAIMER

THOMAS-CONRAD CORPORATION (HEREAFTER REFERRED TO AS "TCC") MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THE CONTENTS OR USE OF THIS DOCUMENT OR ANY TCC SOFTWARE, ALL OF WHICH IS PROVIDED AS IS, WITH ALL FAULTS, AND WITHOUT WARRANTY, EXPRESS OR IMPLIED. IN PARTICULAR, BUT WITHOUT LIMITATION OF THE FOREGOING, TCC MAKES NO WARRANTIES OF DESIGN, MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE OR WARRANTIES ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE, ALL OF WHICH ARE SPECIFICALLY DISCLAIMED BY TCC. Additionally, TCC reserves the right to revise or make changes to all or any portion of any publication or any TCC software, at any time, without obligation to notify any person or entity of such revisions or changes.

TRADEMARKS

The Thomas-Conrad logo is a registered trademark of Thomas-Conrad Corporation. TXD and Sectra are trademarks of Thomas-Conrad Corporation. IBM, PS/2 and Micro Channel and OS/2 are registered trademarks of International Business Machines Corporation. Novell, NetWare, NetWare Loadable Module, IPX and NetWare SFT III are trademarks or registered trademarks of Novell Inc. Microsoft is a registered trademark of Microsoft Corp. Banyan and VINES are registered trademarks of Banyan Systems International. AppleTalk is a registered trademark of Apple Computer, Inc. ARCnet is a registered trademark of Datapoint Corporation. Ethernet is a registered trademark of Xerox Corporation. CompuServe is a registered trademark of CompuServe Incorporated.

LIMITED HARDWARE WARRANTY

TCC warrants to the original user of the TC4046 16/4 Token Ring Adapter/MC that the hardware (but not any software contained in or used with such product) will be free from defects in materials and workmanship for a period of five (5) years from the date of delivery to such user. The registration card received with such product must be returned to TCC in order to validate this limited warranty and register the product. TCC makes no warranty with respect to any TCC software and does not warrant that any product will meet any specific requirements or that the operation of any product will be uninterrupted or error free. TCC shall have no obligation hereunder if the product has been subject to misuse, neglect, accident, or the elements; if the product has been improperly installed, tested or maintained; if the product has been modified, altered or defaced; or if the product has been repaired by anyone other than TCC or its authorized representative or such other party as TCC may approve in writing. TCC's sole obligation under the foregoing limited warranty shall be limited to repairing or replacing, at TCC's option, a defective product. The product must be returned with proof of purchase in its original (or other adequate) package, to the point of purchase or, by prior arrangements, to TCC. Claims must be made in accordance with the provisions of this paragraph within the specified warranty period or they will not be honored.

TCC reserves the ultimate authority to determine what constitutes warranty repair. If it is determined that the product is not under warranty, it will be repaired using TCC's standard rates for parts and labor. In the event that TCC reasonably determines that any returned product is nondefective, such product shall be returned to the sender, freight collect, and TCC shall have no further obligation with respect to such warranty claim. TCC will not be responsible for delays caused by shipping or non-availability of replacement components or other similar or dissimilar causes, events, or conditions beyond its reasonable control.

THE ABOVE LIMITED WARRANTY IS THE ONLY WARRANTY AUTHORIZED BY TCC AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION WARRANTIES OF DESIGN, MERCHANTABILITY, AND FITNESS FOR PURPOSE AND WARRANTIES ARISING FROM THE COURSE OF DEALING, USAGE OR TRADE PRACTICE, ALL OF WHICH ARE SPECIFICALLY DISCLAIMED BY TCC. THE ABOVE LIMITED WARRANTY STATES SUCH USER'S EXCLUSIVE REMEDY FOR ANY BREACH OF TCC'S WARRANTY AND FOR ANY CLAIM, WHETHER SOUNDING IN CONTRACT, TORT OR NEGLIGENCE, FOR LOSS OR INJURY CAUSED BY THE SALE OF ANY PRODUCT. IN THE EVENT THAT SUCH REMEDY IS HELD

BY A COURT OF COMPETENT JURISDICTION TO FAIL OF ITS ESSENTIAL PURPOSE WITHIN THE MEANING OF SECTION 2.719 (B) OF THE TEXAS BUSINESS AND COMMERCE CODE, THEN SUCH USER SHALL BE ENTITLED TO RECOVER FROM TCC THE NET INVOICE PRICE OF THE PRODUCTS THAT ARE THE SUBJECT OF THE CLAIM. TCC'S LIABILITY FOR DAMAGES FOR ANY CAUSE WHATSOEVER AND REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT OR IN TORT INCLUDING NEGLIGENCE, SHALL BE LIMITED TO THE NET INVOICE PRICE OF THE PRODUCTS THAT CAUSED THE DAMAGES OR THAT ARE THE SUBJECT MATTER OF, OR ARE DIRECTLY RELATED TO, THE CAUSE OF ACTION. IN NO EVENT SHALL TCC BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR RELATED TO SUCH WARRANTY OR PRODUCT INCLUDING, BUT NOT LIMITED TO, INTERRUPTION OF SERVICE, LOSS OF DATA, LOSS OF REVENUE OR PROFIT, LOSS OF TIME OR BUSINESS, OR ANY SIMILAR LOSS, EVEN IF TCC IS ADVISED IN ADVANCE OF THE POSSIBILITY OR CERTAINTY OF SUCH DAMAGES.

FCC WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at their own expense will be required to take whatever measures may be required to correct interference.

THOMAS-CONRAD CORPORATION SOFTWARE LICENSE AGREEMENT

CAREFULLY REVIEW THESE TERMS AND CONDITIONS RELATING TO THE THOMAS-CONRAD CORPORATION ("TCC") "DRIVERS" AND/OR "TOOLS" SOFTWARE PROGRAMS INCLUDED WITH THIS PRODUCT. IN THE EVENT THAT YOU DO NOT AGREE WITH ANY OF THEM, YOU SHOULD PROMPTLY RETURN THIS PRODUCT TO TCC, AND YOUR MONEY WILL BE REFUNDED.

Pursuant to this Agreement, you may: (a) use the programs; (b) copy the programs into any computer-readable or printed form for back-up purposes; (c) merge and configure the programs with other programs for your use; and (d) transfer the programs and license to another party if the other party agrees to accept the terms and conditions of this Agreement.

Any portion of the programs merged into another program will continue to be subject to the terms and conditions of this Agreement. If you transfer the programs, you must at the same time either transfer all copies whether in printed or computer readable form to the same party or destroy any copies not transferred, including all portions of these programs contained or merged into other programs. You must also reproduce and include the copyright notice on any copy, or portion merged into another program.

YOU MAY NOT USE, COPY, MODIFY, REVERSE ENGINEER, OR TRANSFER THE PROGRAMS OR ANY COPY, OR MERGED PORTION, IN WHOLE OR IN PART, EXCEPT AS EXPRESSLY PROVIDED FOR IN THIS AGREEMENT. IF YOU TRANSFER POSSESSION OF ANY COPY, OR MERGED PORTION OF THESE PROGRAMS TO ANOTHER PARTY, YOUR LICENSE IS AUTOMATICALLY TERMINATED.

TERM

The license is effective until terminated. You may terminate it at any other time by destroying the program together with all copies, modifications and merged portions in any form. It will also terminate upon conditions set forth elsewhere in this Agreement or if you fail to comply with any term or condition of this Agreement. You agree upon such termination to destroy the program together with all copies, modifications, and merged portions in any form.

LIMITED SOFTWARE WARRANTY AND REMEDIES

Thomas-Conrad Corporation ("TCC") warrants the diskette(s) on which the program is furnished to be free from defects in material and workmanship under normal use for a period of ninety (90) days from the date of delivery to you as evidenced by a copy of your receipt. This warranty is limited to you and is not transferrable.

During the 90-day warranty period, TCC will (1) replace any diskette not meeting the foregoing warranty and which is returned to TCC or an Authorized TCC Distributor with a copy of your receipt; or (2) if TCC or the Authorized Distributor is unable to deliver a replacement diskette which is free of defects in materials or workmanship, you may terminate this Agreement by returning the program and your money will be refunded.

THE FOREGOING WARRANTY DOES NOT EXTEND TO ANY DISKETTE WHICH HAS BEEN DAMAGED AS A RESULT OF ACCIDENT, MISUSE, ABUSE, OR AS A RESULT OF SERVICE OR MODIFICATION BY ANYONE OTHER THAN TCC OR AN AUTHORIZED DISTRIBUTOR.

EXCEPT AS EXPRESSLY SET FORTH ABOVE, NO OTHER WARRANTIES, EITHER EXPRESSED OR IMPLIED, ARE MADE WITH RESPECT TO THIS PROGRAM INCLUDING, BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND TCC EXPRESSLY DISCLAIMS ALL WARRANTIES NOT STATED HEREIN. YOU ASSUME THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM SHOULD THE PROGRAM PROVE DEFECTIVE. YOU -- AND NOT TCC OR AN AUTHORIZED DISTRIBUTOR -- ASSUME THE ENTIRE COST OF NECESSARY SERVICING, REPAIR, OR CORRECTION. SOME STATES DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

TCC does not warrant that the functions contained in the program will meet your requirements or that the operation of the program will be uninterrupted or error-free. You assume responsibility for the selection of the program to achieve your intended results, and for the installation, use, and results obtained from the program.

YOUR SOLE REMEDIES AND TCC'S ENTIRE LIABILITY ARE AS SET FORTH ABOVE. IN NO EVENT WILL TCC BE LIABLE TO

YOU OR ANY OTHER PERSON FOR ANY DAMAGES, INCLUDING ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES, LOST PROFITS, LOST SAVINGS, OR OTHER DAMAGES ARISING OUT OF THE USE OF OR INABILITY TO USE SUCH PROGRAM.

SOME STATES DO NOT ALLOW THE LIMITATION OR EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR CONSUMER PRODUCTS, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU.

GENERAL

You may not sublicense, assign, or transfer the license or the program except as expressly provided in this Agreement. Any attempt to otherwise sublicense, assign, or transfer any of the rights, duties, or obligations hereunder is null and void.

If you have any questions concerning this Agreement, including warranty service, you should contact Thomas-Conrad Corporation, 1908-R Kramer Lane, Austin, Texas 78758.

This Agreement will be governed by the Laws of the State of Texas.

YOU ACKNOWLEDGE THAT YOU HAVE READ THIS AGREEMENT, UNDERSTAND IT, AND AGREE TO BE BOUND BY ITS TERMS AND CONDITIONS. YOU FURTHER AGREE THAT IT IS THE COMPLETE AND EXCLUSIVE STATEMENT OF THE AGREEMENT BETWEEN US WHICH SUPERSEDES ANY PROPOSAL OR PRIOR AGREEMENT, ORAL OR WRITTEN, AND ANY OTHER COMMUNICATIONS BETWEEN US RELATING TO THE SUBJECT MATTER OF THIS AGREEMENT.

CONTENTS

CHAPTER 1 INTRODUCTION

About this Guide.....	1-1
Features of the TC4046	1-2
Driver Diskette Version Number.....	1-3
Make Diskette Working Copy.....	1-4
Directory Structure and File Names	1-5
Adapter Definition File (ADF).....	1-6
Requesting LAN Support Drivers	1-6

CHAPTER 2 PACKAGING AND SPECIFICATIONS

Packaging	2-1
Hardware Specifications.....	2-1
Memory Upgrade Specifications.....	2-2

CHAPTER 3 CONFIGURING AND INSTALLING THE ADAPTER

Locate TC4046 Components.....	3-2
Media Options	3-3
Media Selection.....	3-3
RAM Options	3-4
Install Remote Reset ROM.....	3-6
Install the Adapter	3-7
Copy the ADF File to the Reference Diskette.....	3-8
Configuring the Adapter.....	3-9
TC9245 Adapter Configuration	3-10
Adapter Definition File (ADF) Choices	3-11
Exiting the Configuration Program.....	3-14
Additional Remote Reset ROM Instructions	3-14

CHAPTER 4 RING TOOLS AND DIAGNOSTICS

Adapter Settings	4-3
Running the Diagnostic Test Suite.....	4-3
Status LEDs	4-6

CHAPTER 5 CABLING GUIDELINES

Cable Types	5-1
General Design Guidelines	5-2
Calculating the Ring Length	5-2
Step 1: Measure Cable Length by Type	5-3
Step 2: Calculate the Type 1 Cable Equivalence	5-3
Step 3: Calculate the Type 1 MAU Equivalence	5-3
Step 4: Calculate the Total Ring Length	5-3
Conversion Factors and Network Limits	5-4
Example UTP Network	5-6
Other Calculations	5-10

CHAPTER 6 NETWARE SERVER DRIVER

Driver Support	6-1
Sectra Token Ring Server for NetWare	6-1
Edit STARTUP.NCF	6-2
Support Modules	6-3
Deciding if Modules Need to be Replaced	6-4
Replacing Support Modules	6-4
The LOAD Command	6-8
LOAD Command Parameters	6-9
Example LOAD Commands	6-11
Loading TCPIP.NLM	6-13
The BIND Command	6-14
Example LOAD and BIND Commands	6-15
NetWare v4.x and v3.12 Servers	6-15
NetWare v3.11 Server	6-16
UNLOAD and UNBIND Commands	6-17
Remote Program Load (RPL) Support	6-18

CHAPTER 7 DOS ODI WORKSTATION DRIVER

Driver Support	7-1
Remote Booting	7-1
NetWare v4.0x Installation	7-2
Example Installation Files	7-4
NetWare v3.1x installation	7-5
NET.CFG Parameters	7-6
NET.CFG Examples	7-7
Copy Files	7-8
Using the IPX (NetWare) Protocol	7-9
Load the Driver	7-10
Conserving Memory	7-10
Unloading the Protocol and/or Driver	7-10
Using the TCP/IP Protocol	7-11
Using Multiple Protocols	7-12
Loading/Unloading the Driver	7-13

CHAPTER 8 DRIVER FOR NETWARE REQUESTER FOR OS/2

Driver Support	8-1
Install the Requester	8-1
Copy the Driver	8-1
Edit CONFIG.SYS	8-2
Create/Modify NET.CFG, if Necessary	8-3
Load the Driver	8-3

CHAPTER 9 MICROSOFT LAN MANAGER DRIVERS

Copy EAGLEMAC.BIN	9-1
Driver Support	9-1
Remote Booting	9-1
LAN Manager v2.2 Installation	9-2
The PROTOCOL.INI File	9-3
PROTOCOL.INI Parameters	9-4
Example PROTOCOL.INI Files	9-5

CHAPTER 10 DRIVERS FOR OTHER NDIS-BASED SYSTEMS

Copy EAGLEMAC.BIN	10-1
Driver Compatibility and Support	10-1
IBM LAN Server	10-2
Remote Booting	10-2
Windows for Workgroups v3.11	10-3

CHAPTER 11 LAN SUPPORT DRIVERS

Requesting Drivers	11-1
Adapter Configuration	11-1
Remote Booting	11-1
Available Drivers	11-2
Copy Driver Files	11-3
Modify CONFIG.SYS	11-3
Optional Parameters	11-4
LAN Support with NetWare	11-5
DOS ODI Workstation Driver	11-5
IPX-Linkable Workstation Driver	11-6
Banyan VINES	11-6
Load the Driver	11-7

APPENDIX A NETWARE SERVER CUSTOM STATISTICS COUNTERS

Custom Statistics Descriptions	A-1
Last Adapter Check Code	A-2
Lost Synch with Adapter	A-2
Signal Loss	A-2
Hard Error	A-3
Lobe Media Fault - CLOSED	A-3
Auto Removal Error - CLOSED	A-4
Remove-Received - CLOSED	A-4
Receive Congestion	A-5

APPENDIX B REMOTE BOOTING A NETWARE WORKSTATION

Remote Booting	B-1
Using the TC9245 (RPL Protocol) Boot ROM	B-2
File servers running NetWare v3.x and up	B-2
File servers running NetWare v2.x	B-3
Running DOSGEN to set up the workstation	B-4
Using the TC9145 (NetWare-Specific) Boot ROM	B-6

INDEX

FIGURES

Figure 1-1. Driver Diskette Directory Structure	1-5
Figure 3-1. TC4046 16/4 Token Ring Adapter/MC	3-2
Figure 3-2. Connector Pinouts	3-3
Figure 3-3. Connector Selection	3-3
Figure 3-4. RAM Size Selection	3-4
Figure 3-5. Onboard RAM Sockets	3-5
Figure 3-6. Remote Reset ROM and Socket	3-6
Figure 3-7. Configuration Screen	3-9
Figure 4-1. Ring Tools Adapter Settings Screen	4-3
Figure 4-2. Ring Tools Diagnostics Menu	4-4
Figure 4-3. Ring Tools Diagnostic Test Screen	4-5
Figure 5-1. 4Mbps UTP Network	5-6
Figure 10-1. Inserting the Driver Diskette	10-3
Figure 10-2. Selecting the Thomas-Conrad Driver	10-4
Figure 10-3. Driver Parameter Selection	10-4

TABLES

Table 5-1. Type 1 Conversion Factors	5-4
Table 5-2. Maximum Total Ring Length	5-4
Table 5-3. Limits: 4Mbps Networks, Passive Concentrators	5-4
Table 5-4. Limits: 16Mbps Networks, Passive Concentrators	5-5
Table 5-5. Limits: 4/16Mbps Networks, Active Retimed Concentrators	5-5
Table 5-6. Network Cabling Distance Worksheet	5-7
Table 5-7. Your Network Worksheet	5-11
Table 6-1. Support Module Locations	6-3
Table 6-2. TCTOKH.LAN Parameters	6-8
Table 7-1. DOS ODI Workstation Driver Parameters	7-5
Table 9-1. LAN Manager Driver Parameters	9-3

CHAPTER 1

INTRODUCTION

The TC4046 16/4 Token Ring Adapter/MC is a 16-bit bus-mastering token ring adapter that can be installed in either a 16- or 32-bit slot in Micro Channel® or compatible computers. It can be used in either 16 megabit per second (Mbps) or 4Mbps token ring networks. The TC4046 is fully compatible with the IEEE 802.2 Logical Link Control (LLC) and 802.5 Media Access Control (MAC) standards.

ABOUT THIS GUIDE

The *TC4046 16/4 Token Ring Adapter/MC Installation Guide* contains all the information you need to configure and install the TC4046 Token Ring Adapter/MC and to use the drivers shipped with it.

Chapters 1 - 3 tell you how to configure and install the adapter.

Chapter 4 tells you how to use Ring Tools, Thomas-Conrad's setup and diagnostic utility for token ring adapters. You should run Ring Tools before installing drivers.

Chapter 5 has token ring cabling guidelines.

Chapters 6 - 11 cover the steps necessary to install drivers for each of the following network operating systems:

Chapter 6: NetWare® servers.

Chapter 7: DOS ODI workstations.

Chapter 8: NetWare Requester for OS/2®.

Chapter 9: Microsoft LAN Manager.

Chapter 10: Other NDIS-based systems.

Chapter 11: LAN Support networks.

Appendix A describes the Custom Statistics Counters for the NetWare server driver, TCTOKH.LAN.

Appendix B describes how to set up remote booting for NetWare workstations.

FEATURES OF THE TC4046

FEATURE	BENEFIT
16-bit bus-master interface	The TC4046 transfers data directly to system memory for faster, more efficient performance.
16Mbps and 4Mbps ring speeds	Works with both token ring network line speeds.
Upgradable onboard RAM	Shipped with 128KB of RAM, upgradable to 512KB or 2MB. Provides a large data buffer, helping to eliminate traffic congestion and retransmissions due to lost data.
Token Ring Accelerated Drivers	Included with adapter. Drivers bypass the standard adapter handler interface (AHI), improving throughput. Includes versions for many network operating systems.
Token Ring LAN Support Drivers	Available on request. Work with LAN Support networks.
Remote Reset ROM socket	Uses the TC9145 Remote Reset ROM or TC9245 RPL ROM to allow a workstation to remote boot from a file server.
Can be installed in 16-bit slot or 32-bit slot	When installed in a 16-bit slot, the adapter drives 24 address lines, providing access of up to 16MB of RAM. When installed in a 32-bit slot, the adapter is capable of driving all 32 address lines, up to 4GB of RAM, for maximum use of the Micro Channel bus.

DRIVER DISKETTE VERSION NUMBER

Before you begin, take the following steps:

STEP	ACTION
1	<p>Insert the Thomas-Conrad driver diskette into your diskette drive, switch to the drive, and enter the command TCCDISK. For example, if your driver diskette is in drive A:, you would type the following:</p> <p>a: tccdisk</p> <p>TCCDISK tells you the correct diskette version number and the version numbers of the drivers on the diskette. If you need an updated driver, call Thomas-Conrad Technical Support toll-free, 24 hours-a-day, 7 days-a-week at (800) 334-4112.</p>
2	<p>The README file on your driver diskette contains the latest release information and all the facts that came to light after the manual went to press. You are strongly encouraged to review it. To read the README file, enter the following command:</p> <p>more<readme</p>

MAKE DISKETTE WORKING COPY

Before you install any drivers, make a working copy of the driver diskette.

STEP	ACTION
1	To copy one diskette to another diskette of the same format (for example, a high density 5-1/4" diskette to another high density 5-1/4" diskette), use the DISKCOPY command (see step 2). To copy one diskette to another diskette of a different format (a high density 5-1/4" diskette to a high density 3-1/2" diskette, or <i>vice versa</i>), use the XCOPY command (see step 3).
2	DISKCOPY command (to copy diskettes of the same format): diskcopy a: a: Follow the instructions on your screen to insert source and target diskettes.
3	XCOPY command (to copy diskettes of different formats): xcopy a: b: /s Follow the instructions on your screen to insert source and target diskettes.
4	Put the original driver diskette in a safe place and use the working copy to install drivers.

DIRECTORY STRUCTURE AND FILE NAMES

Figure 1-1 shows the directory structure and filenames of the Thomas-Conrad driver diskette.

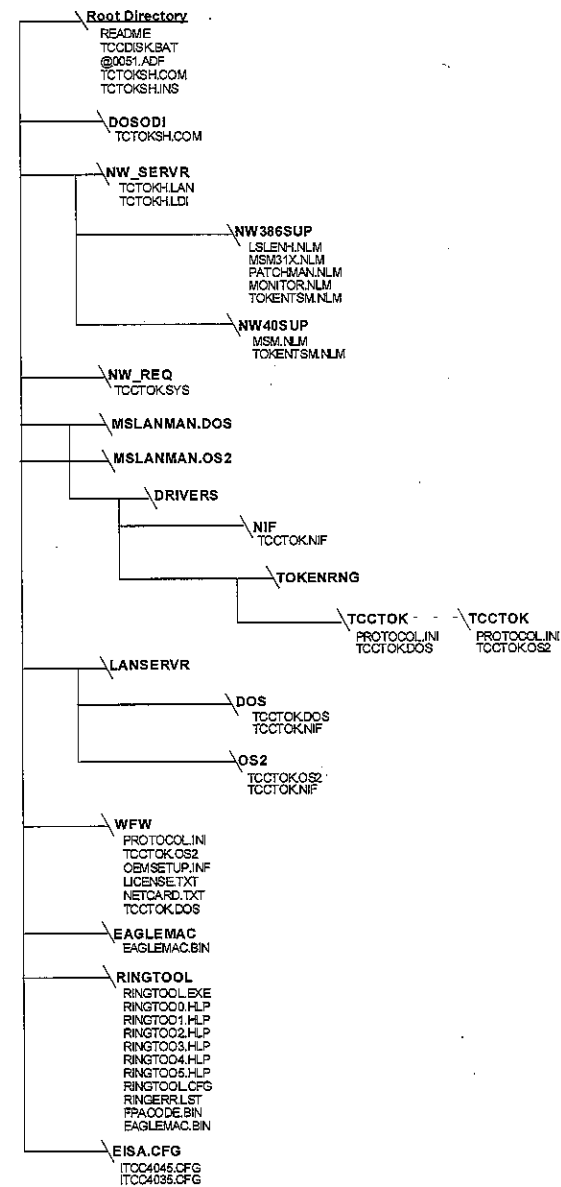


Figure 1-1. Driver Diskette Directory Structure

ADAPTER DEFINITION FILE (ADF)

The Adapter Definition File (ADF) for the TC4046, named @0051.ADF, contains configuration information and help for setting up your TC4046 adapter. The file is located in the driver diskette's root directory. Instructions for installing and configuring the adapter are found in Chapter 3.

REQUESTING LAN SUPPORT DRIVERS

You can request 5-1/4" or 3-1/2" diskettes containing the drivers for LAN Support networks.

NOTE

If you are currently using any Thomas-Conrad TC4035, TC4045 or TC4046 token ring adapters in a LAN Support environment, you should verify the driver version (displayed during boot-up). If the driver version is prior to v3.00, contact Thomas-Conrad to obtain current drivers as shown below. The v3.00 drivers can be used with all TC4035, TC4045 and TC4046 adapter models.

Diskette	Part Number	
	5-1/4" diskette	3-1/2" diskette
Token Ring LAN Support Driver	TC4040-105	TC4040-103

LAN Support driver diskettes are available free of charge. You can request them in one of the following ways:

- By mail. Your adapter package contains a driver request card. Complete the card and mail it to Thomas-Conrad.
- By phone. Call Thomas-Conrad Technical Support and request the diskettes that you need. You can call toll-free 7 days a week, 24 hours-a-day, (800) 334-4112.
- Thomas-Conrad bulletin board. Call Thomas-Conrad Technical Support for more information.

CHAPTER 2 PACKAGING AND SPECIFICATIONS

PACKAGING

When you open your TC4046 16/4 Token Ring Adapter/MC package, you should find the following items:

- TC4046 16/4 Token Ring Adapter/MC, enclosed in its anti-static protective shell.
- One copy of this manual, the *TC4046 16/4 Token Ring Adapter/MC Installation Guide*.
- One copy of the *TC4046 16/4 Token Ring Adapter/MC Pocket Guide*.
- Reply card for requesting LAN Support drivers.
- Product registration card.

HARDWARE SPECIFICATIONS

Bus Data Interface: 16-bit bus-mastering, 24- or 32-bit addressing.

Compatibility: Micro Channel architecture computers.

Network Interface: IEEE 802.5 token ring network. 16Mbps or 4Mbps line speed.

Interrupt (IRQ): Choose from eight: 3, 4, 9, 10, 11, 12, 14, 15

Arbitration Levels: Choose from sixteen: Levels 0 - 14, and disable bus-mastering.

Base I/O Addresses: Choose from eight: 1A20h (Primary), 2A20h (Secondary); Extended: 3A20h, 4A20h, 5A20h, 6A20h, 7A20h, 8A20h

Remote Reset ROM: Socket provided on adapter. Uses a TC9145 Remote Reset ROM or TC9245 RPL ROM.

Node ID: Globally-administered node ID allocated by IEEE. Locally-administered node ID can be set in software.

RAM:	128KB onboard, upgradable to 512KB or 2MB
Connectors:	Type 1 (DB9), Type 3 (RJ-45)
Dimensions:	11.5L x 3.4H, inches 29.2L x 8.6H, centimeters
Power Requirements:	2.0A @ +5V, typical
Temperature Range:	Operating: 0°C to 40°C Storage: -45°C to 80°C
Humidity (non-condensing):	Operating: 10% to 90% Storage: 5% to 95%

MEMORY UPGRADE SPECIFICATIONS

The TC4046 is shipped with 128KB of onboard RAM. You can upgrade the adapter's onboard RAM to 512KB or 2MB for high-capacity applications. To upgrade the adapter's memory, purchase five RAM chips that meet the following specifications:

512KB Upgrade: Five 256Kbx4 dynamic RAM chips
100 nanosecond access

2MB Upgrade: Five 1024Kbx4 dynamic RAM chips
100 nanosecond access

CHAPTER 3 CONFIGURING AND INSTALLING THE ADAPTER

This chapter tells you how to choose and set the configuration options for your TC4046, and how to install the TC4046 in your computer. You must set two kinds of configuration options:

- Hardware options (set with jumpers on the adapter itself):
 - Media Options (STP or UTP)
 - Onboard RAM size
- Software options (set by running your computer's configuration routine):
 - Ring Speed
 - Adapter I/O Address
 - Bus Master Arbitration Level
 - Fairness
 - Adapter Interrupt Level
 - Adapter ROM Address

CAUTION

Discharges of static electricity from your hands into your TC4046 can damage its components. Keep the TC4046 in its anti-static protective shell until you are ready to use it.

LOCATE TC4046 COMPONENTS

Figure 3-1 shows the location of the jumpers used to configure the TC4046 16/4 Token Ring Adapter/MC. It also shows the cable connectors and LEDs on the retaining bracket, as well as sockets for the adapter's onboard RAM.

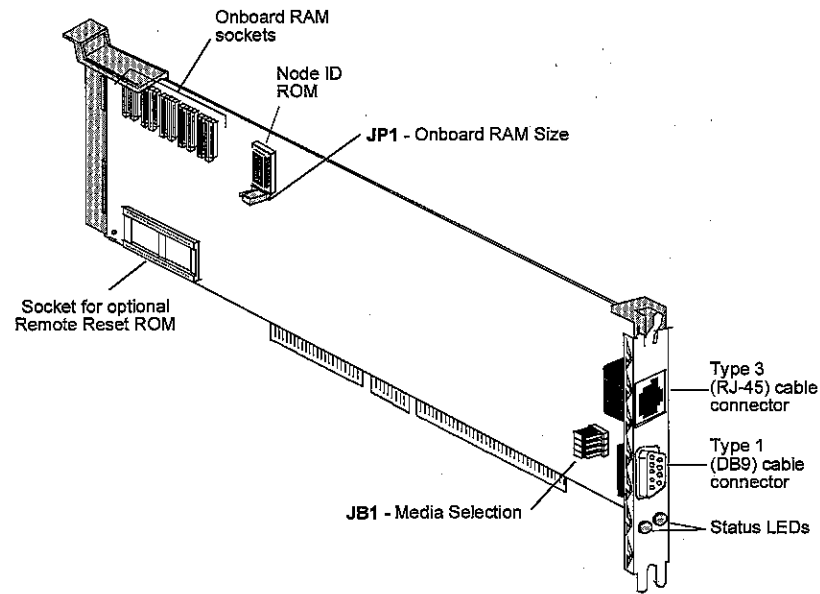


Figure 3-1. TC4046 16/4 Token Ring Adapter/MC

MEDIA OPTIONS

The TC4046 has two cable connectors on the adapter retaining bracket. Figure 3-2 shows their pin assignments. Use the Type 3 (RJ-45) connector for unshielded twisted-pair (UTP) cable. Use the Type 1 (DB9) connector for shielded twisted-pair (STP) cable.

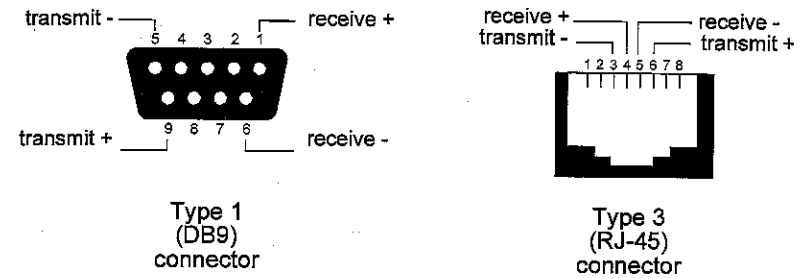


Figure 3-2. Connector Pinouts

MEDIA SELECTION

The TC4046 is factory-set to connect to STP cable via the DB9 media connector. To connect to UTP cable via the RJ-45 connector, place the shunts on the media jumper block JB1 as shown in Figure 3-3 below.

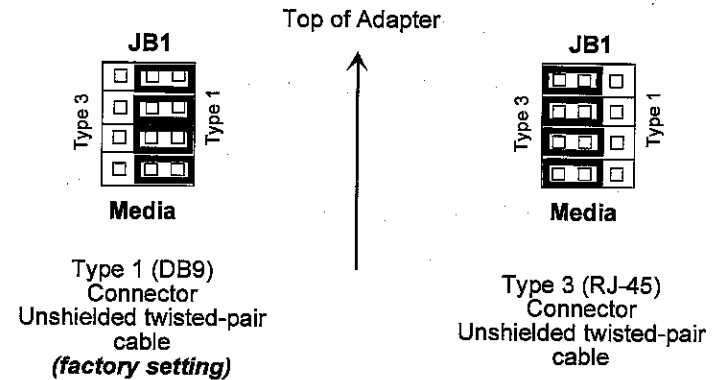


Figure 3-3. Connector Selection

RAM OPTIONS

The TC4046 is shipped with 128KB of onboard RAM. To upgrade to 512KB or 2MB, carefully follow the instructions below. Requirements for RAM upgrade chips are found in Chapter 2.

CAUTION

Before installing the RAM chips, ground yourself by touching the computer case. Also, take precautions to avoid static electric discharge into the RAM chips, the adapter or the computer.

STEP	ACTION
1	Change the RAM size by locating jumper block JP1 and placing the shunt across one pair of jumper pins, as shown in Figure 3-4 below. (Use the 1M jumper setting for the factory-installed 128KB of onboard RAM. Use the 4M jumper setting to upgrade to 512KB or 2MB of onboard RAM.)

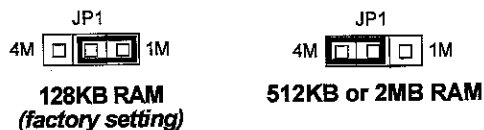


Figure 3-4. RAM Size Selection

- | STEP | ACTION |
|------|--------|
| 2, | cont. |
-
- 2 Locate the sockets for the RAM chips, shown in Figure 3-5 on the next page. The sockets are dual-size sockets. Use the 20-pin socket for upgrades to 512KB or 2MB

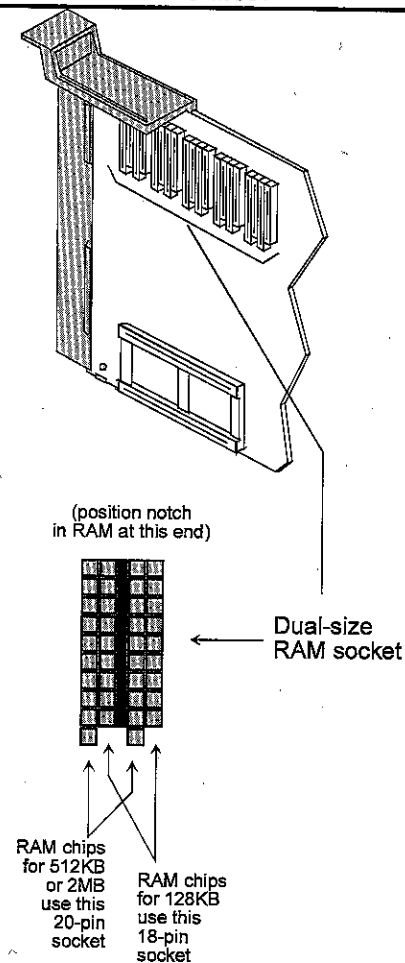


Figure 3-5. Onboard RAM Sockets

- 3 Carefully remove the current RAM chips from their sockets, using a chip extraction tool. Immediately insert the chips into anti-static packaging.

STEP**ACTION**

- 4 Open the package containing the new RAM chips. Hold each RAM chip, without touching its pins, so that its notch is toward the rear of the adapter (see Figure 3-5). Carefully insert the RAM chips in the sockets. Be sure all pins are in the proper socket holes.

INSTALL REMOTE RESET ROM

The TC4046 includes a socket for a Remote Reset ROM (also called a Boot ROM), used if the workstation boots from a file server rather than from a local disk. The adapter can use two types of Thomas-Conrad Remote Reset ROMs. A brief description of the use of each ROM is shown below:

- ❑ The TC9145 Remote Reset ROM uses a NetWare-specific booting procedure, and can be used in any NetWare environment, but not in others.
- ❑ The TC9245 RPL Remote Reset ROM is designed to be used in any network environment that supports remote booting with the Remote Initial Program Load (RPL) protocol, including NetWare v2.x and up; Microsoft LAN Manager v2.x; and IBM LAN Server v2.x or v3.0.

Install the Remote Reset ROM in the socket so that the ROM's notch is aligned with the notch on the socket, as shown in Figure 3-6 below.

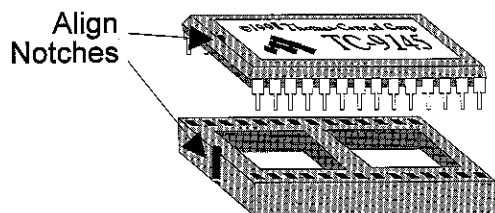


Figure 3-6. Remote Reset ROM and Socket

INSTALL THE ADAPTER

To install the TC4046 in your computer, follow these steps:

WARNING
TO AVOID RISK OF EQUIPMENT DAMAGE OR PERSONAL INJURY, TURN OFF THE COMPUTER AND PERIPHERALS BEFORE YOU INSTALL THE TC4046. ALSO, TAKE PRECAUTIONS TO AVOID STATIC ELECTRIC DISCHARGE INTO THE COMPUTER OR ADAPTER DURING INSTALLATION.

STEP**ACTION**

- 1 Turn the computer OFF and unplug the power cord. Remove the computer's cover.
- 2 Choose an expansion slot for the TC4046 and remove the slot cover. The TC4046 can be installed in either a 16- or 32-bit slot. When installed in a 32-bit slot, the TC4046 is capable of driving all 32 address lines, accessing up to 4GB of RAM. When installed in a 16-bit slot, the TC4046 drives 24 address lines, allowing access up to 16MB of RAM.
- 3 Ground yourself by touching the metal case of the computer. Remove the TC4046 from its anti-static packaging.
- 4 Place the TC4046 into the slot you have chosen, making sure the gold edge connectors are pushed down snugly into the slot.
- 5 Replace the computer's cover. Reconnect the power cord.
- 6 Place the working copy of your computer's Reference Diskette in drive A:. Attach the network cable to the connector on the TC4046.

COPY THE ADF FILE TO THE REFERENCE DISKETTE

The driver diskette shipped with the TC4046 adapter contains, in its root directory, @0051.ADF, the Adapter Definition File (ADF) your computer's configuration routine uses to allow you to configure the adapter. First, copy the ADF file from the Thomas-Conrad driver diskette onto the working copy of your Reference Diskette by taking the following steps:

STEP	ACTION
1	Make sure the working copy of your Reference Diskette is in drive A:, then turn the computer ON. Configuration begins when your computer powers up.
2	Follow the instructions on your screen for any preliminary action that might be required (such as pressing <Enter> or <F1>), then proceed with the next Step.
3	The message "Automatically configure the system? yes/no." appears. Answer No.
4	Select Copy an Option Diskette from the system menu.
5	A message appears on your screen telling you to insert an option diskette. Remove the working copy of your Reference Diskette and insert the working copy of your driver diskette. Press <Enter>. The computer will automatically copy the TC4046 ADF file into RAM.
6	Remove the Thomas-Conrad diskette and insert the Reference Diskette in the diskette drive as prompted. Follow the instructions on your screen to copy the Thomas-Conrad option file from RAM onto the Reference Diskette.
7	Follow the instructions on your screen to exit the copy routine and return to the menu. Select Change Configuration and follow the directions on the next page.

CONFIGURING THE ADAPTER

Use your computer's configuration routine to set the options on the TC4046 by taking the following steps:

STEP	ACTION
1	Use the <↑> and <↓> arrow keys to locate the slot designated as Thomas-Conrad TC4046 on the Change Configuration menu (in the example below, Slot1).

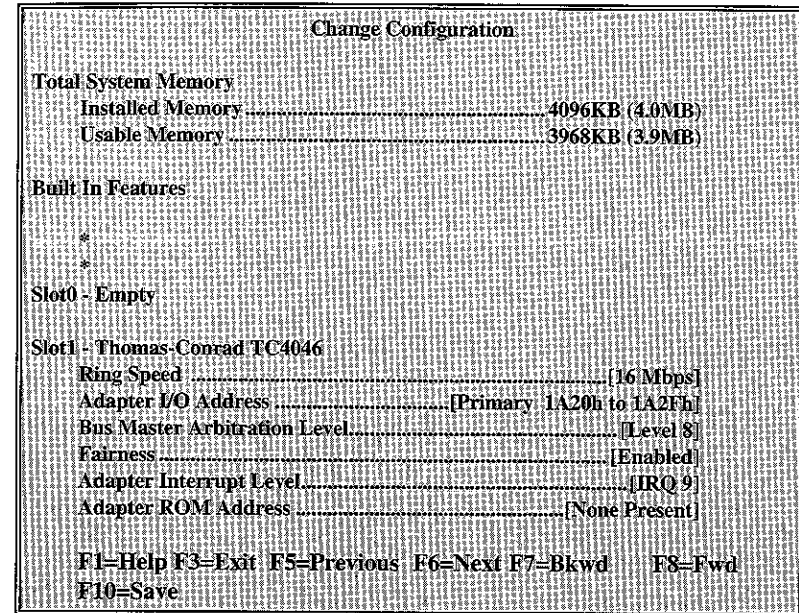


Figure 3-7. Configuration Screen

- This step describes how to change the default settings for the TC4046, shown in Figure 3-7 above. A detailed description of all configuration options begins in the next section.

Move the cursor to the setting you wish to change, using the <↑> or <↓> arrow keys. Scroll through the list of available options by pressing <F6> to view the next option, or <F5> to view the previous option. Press <F1> for help about an option.

STEP	ACTION
2, cont.	After you have made your selections, press <F10> or another key (as required by the program you are using) to save the configuration. Then, restart your computer using the changes you made.

You can use this procedure to reconfigure the adapter whenever you want.

CAUTION

An asterisk (*) and an advisory message appear if you make a selection that conflicts with another adapter installed in your computer. If a conflict exists, the TC4046 will fail to initialize unless you change the configuration of one of the devices causing the conflict.

TC9245 ADAPTER CONFIGURATION

If you are using the TC9245 RPL (Remote Program Load) Remote Reset ROM on the adapter, the adapter must be set for one of the following combinations of Base I/O address, IRQ, and Bus Master Arbitration Level. If you are using the TC9145 Remote Reset ROM, you can set the adapter for any Base I/O address, IRQ line and arbitration level you wish.

Base I/O address	IRQ	Arbitration
1A20h	2	any level*
2A20h	3	any level
3A20h	5	any level†

* - The settings in this row are factory defaults.

† - The settings in this row are not available in LAN Support environments (such as IBM LAN Server).

ADAPTER DEFINITION FILE (ADF) CHOICES

The TC4046 adapter configuration options are listed below in the order they appear on the **Change Configuration** menu. You do not need to follow each step in order. Use the <↑> or <↓> arrow keys to select only the options you wish to change. After you are finished configuring the TC4046, press <F10>.

STEP	ACTION
1	Ring Speed. The default setting is 16 Mbps. Change the setting to 4 Mbps if the TC4046 is attached to a 4 Mbps ring.

CAUTION

All adapters connected to the same token ring must use the same ring speed. Failure to properly configure the TC4046 will disrupt the ring and will result in the adapter being disconnected from the network.

- 2 **Adapter I/O Address.** The default setting is **Primary 1A20h to 1A2Fh**. Seven other addresses are available:

Secondary	2A20h to 2A2Fh
Extended	3A20h to 3A2Fh
Extended	4A20h to 4A2Fh
Extended	5A20h to 5A2Fh
Extended	6A20h to 6A2Fh
Extended	7A20h to 7A2Fh
Extended	8A20h to 8A2Fh

NOTE

In order to maintain compatibility with some IBM applications, the Primary and Secondary addresses also reserve 4-byte address ranges from 0A20h to 0A23h and 0A24h to 0A27h, respectively.

STEP**ACTION**

- 3 Bus Master Arbitration Level.** The default is **Level 8**. A total of 16 options are available: **Level 0** through **Level 14** and **Disable Bus Master**. Level 0 is the highest priority; Level 14 is the lowest priority. Assigning the highest priority to the TC4046 allows it to access the computer's bus more often than other adapters installed in the computer, if Fairness is **Disabled** as described in the next Step. (If Fairness is set to **Enabled**, each device in the computer is guaranteed timely access to the Micro Channel bus.)

Select **Disable Bus Master** if you do not want the TC4046 to operate in bus-mastering mode. Since bus-mastering significantly improves performance, you should disable it only if other adapters are using the available bus-master arbitration levels, or if you have an older Micro Channel machine that does not support bus-mastering.

- 4 Fairness.** The default is **Enabled**. (This is the usual setting for bus-mastering adapters.) If Enabled is selected, each bus-mastering device in the computer is guaranteed timely access to the Micro Channel bus, preventing any single device from monopolizing bus access. This setting is recommended if you have more than one bus-mastering device installed in your computer.

The **Disabled** setting allows the TC4046 to access the bus more often than lower- priority devices by taking advantage of a higher arbitration level. This setting might be necessary if network-intensive applications are used.

- 5 Adapter Interrupt Level.** The default is **IRQ 9**. (IRQ 9 is the same as IRQ 2). Seven other choices are available: IRQs 3, 4, 11, 12, 14, and 15. The TC4046 can share an interrupt with another device in the computer, but performance degradation will result.

STEP**ACTION**

- 6 Adapter ROM Address.** The default setting is **None Present**. Use this setting if you do not have a Boot ROM on the adapter. If you are using either the TC9145 ROM or TC9245 RPL ROM, you must select one of the addresses shown below. Each ROM address range is 16KB. If the workstation uses any type of memory manager and/or Microsoft® Windows v3.x, you must also follow the procedures in the next step.

D0000 to D3FFF	C4000 to C7FFF
D4000 to D7FFF	C8000 to CBFFF
D8000 to DBFFF	CC000 to CFFFF
DC000 to DFFFF	

- 7** Memory manager programs and Windows v3.x in Enhanced mode can overlap the memory address range you selected for the Boot ROM. If so, you will not be able to boot the computer or you will experience problems with the ROM installed unless you take one or both of the actions shown below.

The examples below assume you selected a Boot ROM address of C4000h, which means you need to exclude the range of memory from C4000h to C7FFFh (16KB) from use by the memory manager and by Windows. If you are using a memory manager and Windows v3.x in Enhanced mode, take both of the actions shown below.

Memory manager: Put an exclusion statement in the memory manager's load command (typically in CONFIG.SYS), similar to the one shown below. Consult your memory manager's documentation for the format of its exclusion command.

Example (EMM386 memory manager):

```
device=emm386.exe x=c400-c7ff
```

Windows v3.x in Enhanced mode: Include the following statement in your SYSTEM.INI file, under the [386Enh] heading:

```
EMMExclude=c400-c7ff
```

EXITING THE CONFIGURATION PROGRAM

To use the configuration you just selected for the TC4046, take the following steps:

STEP	ACTION
1	Press <F10> to save your changes.
2	Follow the directions on your screen to exit the menu.
3	Remove the Reference Diskette from Drive A: and follow the directions on your screen to restart your computer, using the changes you have made.
4	Run Ring Tools as described in Chapter 4.

ADDITIONAL REMOTE RESET ROM INSTRUCTIONS

After you have installed a Remote Reset ROM on the adapter and configured the adapter for a ROM address, see one of the following sources for additional actions (these actions must be taken by the LAN administrator or network supervisor):

- NetWare environments: See Appendix B of this manual.
- All other environments: See the diskette shipped with the TC9245 for installation instructions.

CHAPTER 4 RING TOOLS AND DIAGNOSTICS

The diskette shipped with your TC4046 includes the latest version of Ring Tools, the setup/diagnostic utility program for Thomas-Conrad token ring adapters. Running Ring Tools before loading a driver for the TC4046 can reveal potential problems (such as memory conflicts with other adapters, bad cabling or a malfunctioning MAU port) before errors are introduced onto the network.

If you experience intermittent problems during network operation, Ring Tools can help you isolate the cause of unreliable performance and assist you in troubleshooting. Finally, Ring Tools includes a graphical configuration aid to help you set the switches and jumpers on Thomas-Conrad token ring adapters.

Ring Tools can be executed from a local hard drive or local floppy drive containing all of the Ring Tools program and help files listed below. (*Before running Ring Tools, you should log off the network and boot your computer with DOS loaded only.*)

Ring Tools program and help files. All the files listed below are contained on the diskette shipped with the TC4046. If you are running Ring Tools from a local hard drive, all files must be copied into the same directory:

ringtool.exe	ringtoo4.hlp
ringtoo0.hlp	ringtoo5.hlp
ringtoo1.hlp	ringerr.lst
ringtoo2.hlp	ringtool.cfg
ringoo3.hlp	eaglemac.bin
fpacode.bin	

Then take the following steps:

STEP	ACTION
1	Reboot your computer <i>with DOS loaded only</i> . Loading device drivers, memory-resident programs, memory managers or Microsoft Windows before you run diagnostic tests may result in data corruption on your local disk.

STEP**ACTION**

2 Start Ring Tools in one of the following ways:

To run Ring Tools from a local floppy drive, insert the working copy of your diskette into drive A: and type the following commands:

```
a:
cd\ringtool
ringtool
```

To run Ring Tools from a local hard drive, copy all of the files listed on the previous page into the same directory. To start the program, switch to the drive and directory in which you placed the files and type **ringtool**.

WARNING

LOADING DRIVERS OR PROGRAMS BEFORE RUNNING RING TOOLS DIAGNOSTIC TESTS MAY CAUSE INACCURATE TESTS RESULTS AND/OR DATA CORRUPTION ON YOUR LOCAL DISK.

Once Ring Tools starts, you are presented with a welcome screen. Press <Enter> to view the **Ring Tools** menu, which displays the choices shown below. Make an appropriate selection using the <↑> and <↓> arrow keys and press <Enter> (press <F1> for help at any time):

- Adapter Settings:** A graphical aid that assists you in configuring your adapter by showing the location of switch or jumper blocks and the options available for each. The adapter does not need to be installed in the computer before running this option.
- Diagnostics:** Performs card-level diagnostic tests on the adapter, which indicate hardware or adapter faults. The adapter must be installed in the computer and attached to the network cable in order to use this option.
- Exit:** Exit Ring Tools.

ADAPTER SETTINGS

When you select **Adapter Settings** from the **Ring Tools** menu, you will be required to select an adapter model. Select the TC4046. Then, the screen shown in Figure 4-1 appears with a list of options that show you how to set the jumpers on the adapter.

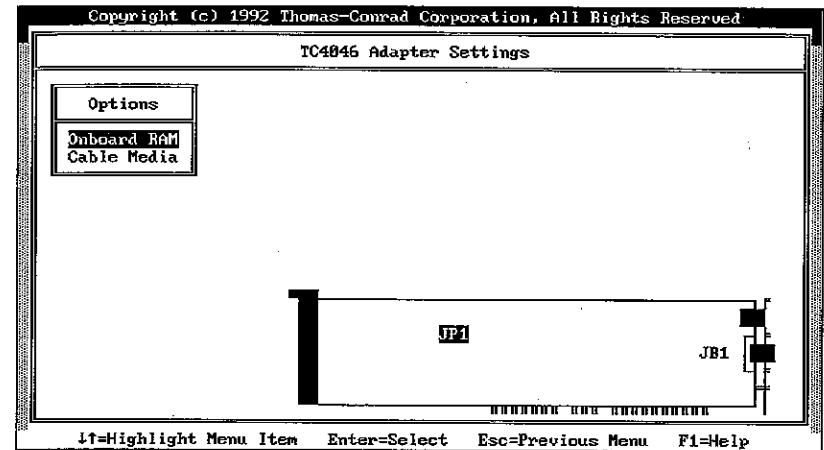


Figure 4-1. Ring Tools Adapter Settings Screen

RUNNING THE DIAGNOSTIC TEST SUITE

Before running diagnostic tests, make sure the adapter is properly configured and that it is attached to the network cable. Make sure you do not have any device or network drivers loaded, since Ring Tools will disrupt your network connection. If you need to configure an adapter, use the **Adapter Settings** option on the Ring Tools menu, as shown in the previous section, or see Chapter 3 of this manual.

First, choose an adapter from the **Select Adapter to Test** menu. If you have two TC4046s installed in the computer, select an adapter by its Base I/O address. If there are other Thomas-Conrad token ring adapters installed in your computer, they will also appear on this screen (although certain early adapter models will not appear). Follow the prompts on your screen, or press <F1> for help.

After you select an adapter to test, the following screen appears:

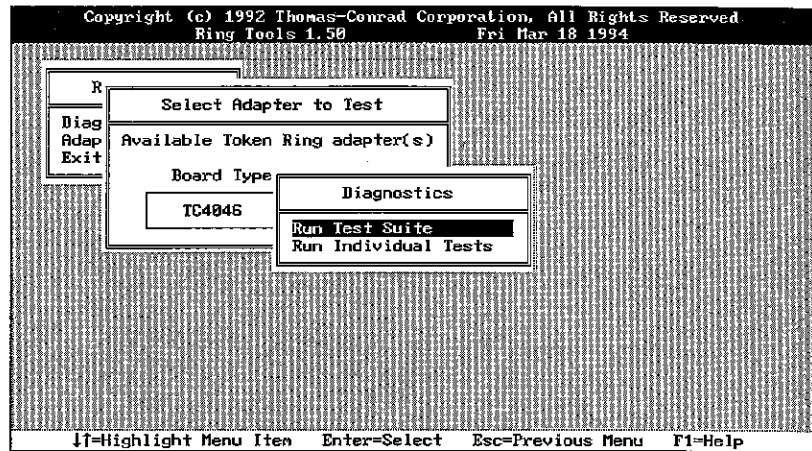


Figure 4-2. Ring Tools Diagnostics Menu

The **Run Test Suite** option runs all of the diagnostics tests in the order shown below. If you select **Run Individual Tests**, you will be prompted to choose a test(s) to run.

- Register Test:** Verifies that the registers on the adapter are functioning properly.
- Memory Test:** Verifies that the memory and internal data interface of the adapter are functioning properly.
- Open in Wrap Mode:** The adapter is opened, verifying the analog functionality of the adapter, the cable connection, the cable integrity, and that the globally-administered node ID can be read from the ROM on the adapter.
- Transmit in Wrap Mode:** Complementary to the “Open in Wrap Mode” test, above. If the adapter opens successfully, 2000 packets of 4KB size containing random data are transmitted. This tests the adapter's ability to transmit and further verifies the interface to the cable. These packets are not transmitted on the ring; therefore, this test will not affect ring communications.
- Open in Insert Mode:** This test verifies that the cable is properly attached to the MAU, that the adapter's node address is unique on the ring, and that the addition of this station does not exceed the maximum capabilities of the ring.

- Transmit in Insert Mode:** Complementary to the “Open in Insert Mode” test, above. If the adapter opens successfully, the same packets used in the Transmit in Wrap Mode test are transmitted to the adapter. These packets are transmitted on the ring and therefore can impact the operation of the ring. This test verifies that the adapter can successfully transmit packets on the ring.

The diagnostic test screen is similar to the one shown in Figure 4-3 below while the tests are running:

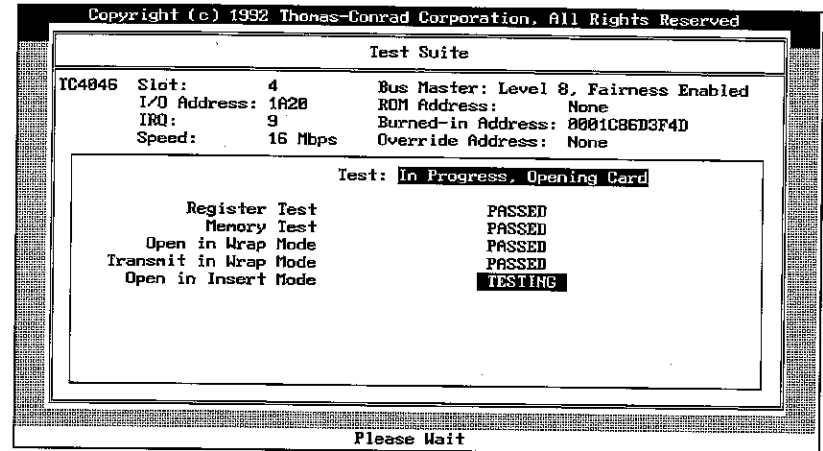


Figure 4-3. Ring Tools Diagnostic Test Screen

NOTE

The configuration you selected for the adapter (as well as a node ID override, if you selected one) also appear on this screen.

If the adapter fails any of the Ring Tools tests, a help screen appears with a description of the error and suggested actions. For additional assistance, call Thomas-Conrad Technical Support, 24 hours-a-day, 7 days-a-week, toll-free at (800) 334-4112.

STATUS LEDS

The TC4046 end bracket has two status LEDs that facilitate network troubleshooting and maintenance:

LED	Use
Green	On: The adapter is inserted into the ring. Off: The adapter is not inserted into the ring.
Red	On: The adapter is transmitting data. Off: The adapter is not transmitting data.

CHAPTER 5 CABLING GUIDELINES

This chapter explains token ring cabling guidelines that are based on Thomas-Conrad's laboratory testing and field experience. These guidelines should result in reliable network performance if you follow them carefully. If you need a more detailed explanation than you find in this chapter, consult one of the following documents:

- IBM Cabling System Planning and Installation Guide* (document GA27-3710-3).
- Electronics Industry Association/Telecommunications Industry Association (EIA/TIA) publication number 568, *Commercial Building Telecommunication Wiring Standard* (July 1991).
- EIA/TIA Technical System Bulletin TSB-36, November 1991.

All TIA standards, including TSBs, are available for a fee by calling IBM Global Engineering Documents.

CABLE TYPES

This chapter contains information about using the following types of token ring cabling in a network:

- Shielded twisted-pair (STP):** Type 1 or 2 shielded twisted-pair data grade cable and Type 6 shielded twisted-pair patch cable.
- Unshielded twisted-pair (UTP):** Type 3 unshielded twisted-pair cable. UTP cable is classified into the categories shown below. Category 5 cable is the most suitable for longer cable runs and inter-MAU connections, because it has the greatest bandwidth and the least susceptibility to noise and interference.
 - Category 3 UTP, 10MHz bandwidth
 - Category 4 UTP, 20MHz bandwidth
 - Category 5 UTP, 100MHz bandwidth

GENERAL DESIGN GUIDELINES

In general, you should observe the following rules when designing or expanding a token ring network:

- ❑ Use all STP (Types 1, 2 and/or 6) or all UTP (Category 3, 4 and/or 5) cable in a particular network. Mixing UTP and STP cable causes electrical impedance imbalances, which can result in errors and poor performance.
- ❑ Category 3 UTP cable is not suitable for use near devices that cause electromagnetic interference, such as fluorescent lighting, electrical motors or elevators.
- ❑ The guidelines in this chapter allow for one wall connector at each end of the MAU-to-node connection, and for one punchdown block in the wiring closet. Avoid introducing additional cable discontinuity (for example, patch cables between wall connectors or additional punchdown blocks in wiring closets). Doing so tends to decrease signal quality and to introduce data errors.
- ❑ Use STP (Types 1, 2 or 6) or Category 4 or 5 UTP cable to interconnect MAUs within a wiring closet.
- ❑ Use Type 1 STP or Category 5 UTP cable between wiring closets.

CALCULATING THE RING LENGTH

To calculate token ring cable length, take the steps shown below. Each step is explained in more detail in the following pages.

STEP	ACTION
1	Measure the total cable length used to interconnect MAUs. Also measure the length of the <i>longest</i> MAU-to-node connection. Keep cable lengths separated by cable type.
2	Convert cable lengths to their Type 1 equivalents.
3	Add the Type 1 equivalent of the MAUs on the network.
4	The sum of the Steps 2 - 4 is the total length of the cable in your network. This total should not exceed the values in the tables shown later in this chapter.

STEP 1: MEASURE CABLE LENGTH BY TYPE

Measure the length of each type of cable used in MAU-to-MAU connections, and in the *longest* MAU-to-node connection. You can add the length of Types 1 and 2 STP cable together, since they are equivalent in distance calculations. Keep other cable types in separate categories.

STEP 2: CALCULATE THE TYPE 1 CABLE EQUIVALENCE

Convert the measured cable distance to a Type 1 equivalent using the conversion factors shown in Table 5-1.

STEP 3: CALCULATE THE TYPE 1 MAU EQUIVALENCE

Count the total number of non-retiming MAUs (such as the TC4050) on the network. Multiply the total number of MAUs by 25 feet and add it to the total from Step 2. Omit from your count any MAUs that actively retime and regenerate the data signal (such as the IBM 8250).

STEP 4: CALCULATE THE TOTAL RING LENGTH

The sum of Steps 2 and 3 is your network's total ring length. If your total ring length is greater than the allowable lengths shown in the tables later in this chapter, you need to take steps to reduce the amount of cabling in the network. Call Thomas-Conrad Technical Support for additional assistance. Support is available toll-free 24 hours-a-day, 7 days-a-week at (800) 334-4112.

CONVERSION FACTORS AND NETWORK LIMITS

Table 5-1 below shows how to convert cable lengths to their Type 1 equivalents:

Table 5-1. Type 1 Conversion Factors

If the cable is of this type:	The conversion factor for Type 1 is:
Type 1 or 2 STP	n/a
Category 3 or 4 UTP	2.25
Type 6 STP or Category 5 UTP	1.3

Table 5-2 below shows the maximum allowable total ring length for 4Mbps and 16Mbps token ring networks, after adjustment for MAUs. Type 1 equivalent lengths are shown.

Table 5-2. Maximum Total Ring Length

Ring Speed	Maximum Total Ring Length (MAX)
4Mbps	1200 feet 360 meters
16Mbps	550 feet 168 meters

Table 5-3 shows limits for 4Mbps token ring networks in which passive concentrators* (such as TC4050s) are used:

Table 5-3. Limits: 4Mbps Networks, Passive Concentrators*

Cable Type	Maximum number of nodes	Maximum Lobe Length (MLL)
Type 1 STP	260	1000 feet 305 meters
Cat. 3 UTP	72	328 feet 100 meters
Cat. 4, 5 UTP	132	328 feet 100 meters

Table 5-4 shows limits for 16Mbps token ring networks in which passive concentrators* (such as TC4050s) are used:

Table 5-4. Limits: 16Mbps Networks, Passive Concentrators*

Cable Type	Maximum number of nodes	Maximum Lobe Length (MLL)
Type 1 STP	260	550 feet 168 meters
Cat. 3, 4, 5 UTP**	72	250 feet 76 meters

Table 5-5 shows limits for 4Mbps or 16Mbps token ring networks in which active retimed concentrators (such as IBM 8250s) are used:

Table 5-5. Limits: 4/16Mbps Networks, Active Retimed Concentrators

Cable Type	Maximum number of nodes	Maximum Lobe Length (MLL)
Type 1 STP	260	1000 feet 305 meters
Cat. 3, 4, 5 UTP	132	328 feet 100 meters

* - "Concentrator" is synonymous with "MAU" as used elsewhere in this manual; however, "concentrator" is more consistent with proposed IEEE standards.

** - Currently, the IEEE 802.5 specification and IBM guidelines do not include support for Category 3 UTP cabling at 16Mbps. The values shown in this table are based on Thomas-Conrad testing and experience.

EXAMPLE UTP NETWORK

The example 4Mbps network shown below uses UTP cabling. Cable types are shown in parentheses.

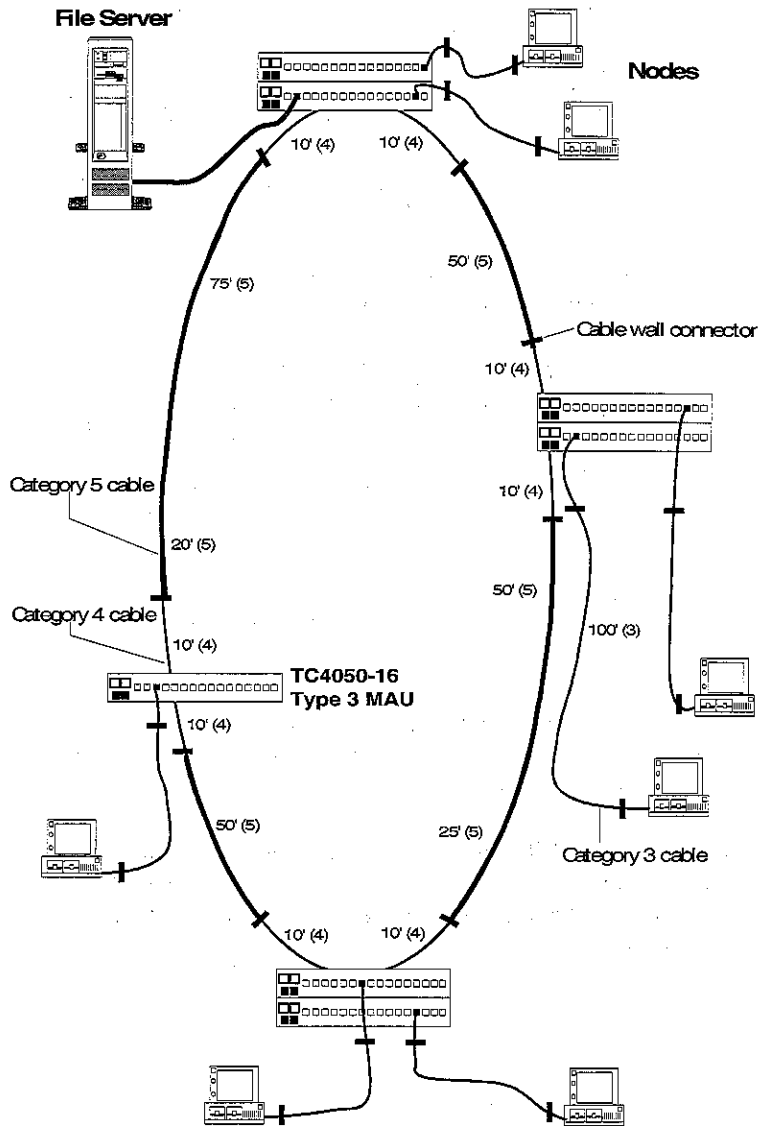


Figure 5-1. 4Mbps UTP Network

Table 5-6. Network Cabling Distance Worksheet

Conversion Factors		Limits, Non-Retiming MAUs (such as TC4050s)			
Type 1 STP	1.0	4Mbps, Type 1 STP	260 nodes	16Mbps, Type 1 STP	280 nodes
Type 2 STP			1000 feet MLL		550 feet MLL
Cat. 3/4 UTP	2.25	4Mbps, Cat. 3 UTP	72 nodes	16Mbps, Cat. 4/5 UTP	132 nodes
			328 feet MLL		328 feet MLL
Type 6 STP	1.3	4Mbps, Cat. 4/5 UTP	132 nodes	Max. Type 1 Length	4 - 1200 ft.
Cat. 5 UTP			328 feet MLL		16 - 550 ft.

PART I: MAU-TO-MAU LENGTH					
STP Cable Type/ UTP Category	Measured Length	Multiply by		Type 1 equiv. length	
Cat. 4	98 ft.	2.25		220.5 ft.	
Cat. 5	270 ft.	1.3		351 ft.	
PART II: MAU ADJUSTMENT					
No. of MAUs	Multiply by			Type 1 equiv. length	
7	25 ft.			175 ft.	
PART III: MAXIMUM LOBE LENGTH (MLL)					
STP Cable Type/UTP Category	Measured Length	Multiply by		Type 1 equiv. length	
Cat. 3	100 ft.	2.25		225 ft.	
PART IV: TOTAL RING LENGTH					
Sum of all Type 1 equivalent lengths				971.5 ft.	

NOTE: The sum of Parts I and II is the Main Ring Length (MRL).

The information below and on the following pages is taken from the network diagram in Figure 5-1 and is shown in worksheet form in Table 5-6.

First, note that all MAU-to-MAU connections in the network shown in Figure 5-1 are made using Category 5 UTP cabling. This type of cabling provides the greatest immunity to noise and the greatest possible distances. Category 4 UTP cabling is used to connect MAUs within a wiring closet and Category 3 UTP cable is used to connect MAUs to nodes.

If your network uses STP cabling, use the same procedure shown below. Keep in mind that Type 1 and 2 STP cabling require no adjustment (see Table 5-1).

Step 1: Measure cable length by cable type

The cable type is shown in parentheses next to the cable length in Figure 5-1. MAUs in a wiring closet are connected with 6-foot Category 4 cable.

The cable lengths you need to add are *all* cables connecting MAUs to other MAUs, and the *longest* cable between a MAU and a node (the MLL). Remember to separate cable lengths by cable type.

Category 3 (MLL):	100'
Category 4 (MAU-to-MAU):	98'
Category 5 (MAU-to-MAU):	270'

Step 2: Convert cable distances to Type 1 equivalents (Table 5-1)

Category 3:	$2.25 * 100' =$	225'
Category 4:	$2.25 * 98' =$	220.5'
Category 5:	$1.3 * 270' =$	351'

Type 1 equiv. cable length:	$225' + 220.5' + 351' =$	796.5'
-----------------------------	--------------------------	---------------

Step 3: Calculate the MAU adjustment

There are seven TC4050 non-retiming MAUs on the network. Multiply that number by 25 feet to obtain their Type 1 equivalent:

Type 1 equivalent of MAUs:	$25' * 7 =$	175'
----------------------------	-------------	-------------

At this point you can also calculate the Main Ring Length (MRL), which is the total inter-MAU cable length adjusted for cable type and MAUs. You won't use the MRL in the overall cable length calculation since it has already been included; however, it is useful if you are expanding a network as shown in the section titled "Other Calculations" at the end of this chapter.

Main Ring Length (MRL) =	Type 1 equivalent of cable connecting MAUs + MAU adjustment
	$= (98' * 2.25) + (270' * 1.3) + 175'$
	$= 220.5' + 351' + 175'$
	$= 746.5'$

Step 4: Calculate the total ring length

Add the numbers shown in **bold**:

$$796.5' + 175' = \mathbf{971.5'}$$

This number is below the maximum for 4Mbps networks, which gives this network room for expansion.

OTHER CALCULATIONS

If you are expanding an existing network, you can use the formulas below to determine the Maximum Lobe Length or the longest Main Ring Length allowable on your network. However, you must *never* exceed the maximum values shown in the tables on the previous pages.

$$\text{MLL} = \text{MAX} - \text{MRL}$$

$$\text{MRL} = \text{MAX} - \text{MLL}$$

MLL = Maximum Lobe Length. The maximum allowable length of any lobe (connection from a MAU to a node) in a particular token ring. This value must include adjustments for cable type as shown in Steps 2 and 3. The MLL must *never* exceed the limits shown in the tables on the previous pages.

MRL = Main Ring Length. The maximum allowable sum of cable distances on the main ring (i.e., this length does not include the MLL), adjusted for cable type and MAUs as shown in Steps 2 and 3.

MAX = Maximum Total Ring Length.

Table 5-7. Your Network Worksheet

Conversion Factors		Limits, Non-Retiming MAUs (such as TC4050s)			
Cat. 3/4 UTP	2.25	4Mbps, Type 1 STP	260 nodes 1000 feet	16Mbps, Type 1 STP	260 nodes 550 feet
Type 6 STP Cat. 5 UTP	1.3	4Mbps, Cat. 3 UTP	72 nodes 328 feet	16Mbps, Cat. 4/5 UTP	132 nodes 328 feet
		4Mbps, Cat. 4/5 UTP	132 nodes 328 feet	Max. Type 1 Total Length	4 - 1200 ft. 16 - 550 ft.

PART I: MAU-TO-MAU LENGTH					
STP Cable Type/UTP Category	Measured Length	Multiply by		Type 1 equiv. length	
PART II: MAU ADJUSTMENT					
No. of MAUs	Multiply by		Type 1 equiv. length		
PART III: MAXIMUM LOBE LENGTH (MLL)					
STP Cable Type/UTP Category	Measured Length	Multiply by		Type 1 equiv. length	
PART IV: TOTAL RING LENGTH					
				Sum of all Type 1 equivalent lengths	

CHAPTER 6

NETWARE SERVER DRIVER

You should run the Ring Tools diagnostic test suite on the adapter before you attempt to install drivers. Ring Tools will indicate serious hardware problems, such as hardware incompatibility or adapter faults.

DRIVER SUPPORT

The driver on this diskette, named TCTOKH.LAN in directory NW_SERVR, is a high-performance, NetWare v4.x-compatible server driver. It can be used in all the environments shown below:

- NetWare v4.x servers
- NetWare v3.1x servers
- NetWare v3.11 SFT III™ (System Fault Tolerant Level III) servers

SECTRA TOKEN RING SERVER FOR NETWARE

If you want to use Thomas-Conrad's Sectra™ Token Ring Server for NetWare, named SECTRATR.NLM, the server must be running NetWare v3.11 and you must obtain previous versions of the driver, named TCTOK16M.LAN or TCTOK386.LAN. These drivers are available from Thomas-Conrad in one of the ways shown below (instructions for installing the drivers are included).

- The Thomas-Conrad bulletin board at (512) 836-8012. Specifications: V.32 protocol with MNP Level 5, 1200/2400/4800/9600 bps, 8 data bits, 1 stop bit, and no parity.
- The Thomas-Conrad forum on CompuServe®. Enter GO TCCFORUM at any CompuServe ! prompt.

CAUTION

Do not use TCTOKH.LAN with SECTRATR.NLM (the NLM for Thomas-Conrad's Sectra Token Ring Server for NetWare). Doing so will cause the server to Abend.

EDIT STARTUP.NCF

You must edit STARTUP.NCF before continuing if one of the following is true.

- NetWare v4.x or v3.12 servers: If the server has 16MB of RAM or more, and the TC4046 is installed in a 16-bit slot.
- If the server runs NetWare v3.11 or v3.11 SFT III™, regardless of the amount of RAM in the server.

First, take the following steps:

- Start the NetWare SERVER program on the file server.
- Once SERVER has loaded, type **LOAD INSTALL** at the server console to start the INSTALL utility (NLM).

Then edit STARTUP.NCF to include the parameters shown below. Change an existing value only if it is less than the ones shown. For v3.11 SFT III servers, you must take the steps shown at each server's IO Engine. Consult the documentation provided with SFT III for more information.

```
set maximum physical receive packet size = 42021
```

```
set reserved buffers below 16 meg = [max-value]2,3
```

¹ - This parameter is normally necessary only in servers running NetWare v3.11 or v3.11 SFT III, because it is the default for NetWare v4.x and v3.12 servers; for those servers, change an existing value only if it is less than the one shown.

² - If the TC4046 is installed in a 32-bit slot, you do not have to use this parameter, regardless of the amount of RAM in the server or the version of NetWare the server is running.

³ - The maximum value for this parameter in NetWare v3.1x servers is 200; for NetWare v4.x servers, the maximum value is 300.

Save your changes to STARTUP.NCF and exit INSTALL. You must then down the server and restart it in order to make the changes effective.

SUPPORT MODULES

The driver diskette includes the versions of Novell NetWare Loadable Modules™ (NLMs) required for v4.x-compatible token ring server drivers. You *must* use these NLMs, or more recent versions, with TCTOKH.LAN. Take one of the following actions first:

- If NetWare v3.x or v4.x is already installed on the file server:**
Enter the **MODULES** command at the console command prompt to determine if other versions of MSM.NLM, or TOKENTSM.NLM are currently running.
- If you are installing/upgrading to NetWare v3.x or v4.x for the first time:** Load the support modules and the server driver from the driver diskette as shown in the next section. *Do not use the NetWare v4.x INSTALL.NLM utility to load the server driver.*

Table 6-1 below shows the names, versions and locations of the support modules contained on the driver diskette.

Table 6-1. Support Module Locations

Version of NetWare	NLM Name and Version	Directory Name
v4.x	MSM.NLM (v2.20) TOKENTSM.NLM (v2.20)	\NW_SERVER\NW40SUP
v3.1x	LSLENH.NLM ¹ PATCHMAN.NLM ¹ MSM31X.NLM (v2.20) TOKENTSM.NLM (v2.20) MONITOR.NLM (v1.75)	\NW_SERVER\NW386SUP
v3.11 SFT III ²	MSM31X.NLM (v2.20) TOKENTSM.NLM (v2.20)	\NW_SERVER\NW386SUP

¹ - The versions of these NLMs are not critical to the operation of the server driver.

² - Use the Patch Manager NLM and the LSL enhancement NLM shipped with SFT III.

DECIDING IF MODULES NEED TO BE REPLACED

You must replace modules MSM31X.NLM, MSM.NLM or TOKENISM.NLM if any of the versions currently running on the file server is prior to v2.20. If your server runs NetWare v3.11 only, you must replace MONITOR.NLM if the version is prior to v1.75. The versions of PATCHMAN.NLM, LSLNH.NLM (and their SFT III equivalents) are not critical, and those modules do not need to be replaced.

NOTE

If you replace MSM31X.NLM or MSM.NLM, and the file server currently supports protocols besides token ring, you should obtain the current versions of the topology support modules (TSMs) for the other protocols from Novell or an authorized reseller. Examples are RXNETTSM.NLM (for ARCnet®) or ETHERTSM.NLM (for Ethernet®).

If you need to replace any or all of the modules, continue with the next section. If you do not need to replace any modules, see the section titled "The LOAD Command".

CAUTION

Using versions of MSM.NLM, MSM31X.NLM, and TOKENISM.NLM prior to v2.20 with TCTOKH.LAN can cause the server to Abend. Using a version of MONITOR.NLM prior to v1.75 with TCTOKH.LAN in a NetWare v3.11 server can cause the server to Abend.

REPLACING SUPPORT MODULES

If you are required to replace your currently-running support modules with more recent versions, you can use the steps below to load the support modules from the driver diskette and copy them to the file server.

STEP	ACTION
1	Unload any existing server drivers that depend on the support modules you need to replace using the UNLOAD command from the console command prompt. This command will completely unload the drivers from memory, and will disrupt communication with currently-attached network users.

STEP	ACTION
1, cont.	The format of the command is shown below: UNLOAD [driver-name] <i>NetWare v3.11 SFT III servers only:</i> Continue to use the versions of the patch manager support module, the enhanced LSL support module, and MONITOR.NLM that shipped with SFT III.
2	<i>NetWare v3.11 servers only:</i> You must also unload MONITOR.NLM, if the version on your file server is previous to v1.75 (the version on the driver diskette). Use the MODULES command at the console command prompt to determine the version of MONITOR.NLM you are using. CAUTION Using a version of MONITOR.NLM prior to v1.75 in a NetWare v3.11 server can cause the server to Abend.
3	Unload the support modules by entering the commands in the order shown below. UNLOAD TOKENISM UNLOAD MSM
4	Load the support modules from the working copy of the driver diskette. Insert the working copy of the driver diskette in a server diskette drive and enter the commands in the order shown below: <i>NetWare v4.x servers:</i> LOAD A:\NW_SERVR\NW40SUP\MSM LOAD A:\NW_SERVR\NW40SUP\TOKENISM

STEP**ACTION**

4, *NetWare v3.1x servers:*
cont.

LOAD A:\NW_SERVER\NW386SUP\MSM31X
LOAD A:\NW_SERVER\NW386SUP\TOKENSM
LOAD A:\NW_SERVER\NW386SUP\MONITOR¹

¹ - Load this module *only* if the server runs NetWare v3.11 and you were required to update your version of MONITOR.NLM.

CAUTION

Do NOT use the version of MONITOR.NLM on the driver diskette in an v3.11 SFT III server.

5 Reload a previously-unloaded server driver and bind it to a protocol so you can attach a workstation to the file server as shown in the next step.

6 Locate a workstation with a floppy drive that is capable of logging in to the file server you wish to copy the NLMs to. In order for this procedure to complete successfully, the **SYS** volume on the file server must be already mounted, and you must have sufficient rights to copy files to the **SYS** volume.

7 Log in to the file server. Insert the working copy of the Thomas-Conrad driver diskette in a floppy drive and enter the following command if the diskette is in Drive A:

COPY A:\nw_servr\nwXXXsup\(*name*) F:\system

nwXXXsup is the name of the diskette directory containing the appropriate module(s) you need to copy. See Table 6-1 earlier in this chapter.

(*name*) is the name of the module you wish to copy.

STEP**ACTION**

7, For example, to copy TOKENSM.NLM to **SYS:SYSTEM:**
cont.

COPY A:\nw_servr\nwXXXsup\tokensm.nlm F:\system

8 Copy the Thomas-Conrad server driver, named **TCTOKH.LAN**, to **SYS:SYSTEM** by entering the command shown below. Instructions for loading the server driver begin on the next page.

COPY A:\NW_SERVER\TCTOKH.LAN F:\SYSTEM

THE LOAD COMMAND

You can enter the LOAD command from the SERVER console prompt, or you can include it in your AUTOEXEC.NCF file, which will automatically load the driver when you start SERVER. The format of the command is shown below:

LOAD (path)\TCTOKH [parameter-list]

(path)

The full pathname where TCTOKH.LAN is located, if not **SYS:SYSTEM**.

Table 6-2 below summarizes all of the valid parameters that can be used with TCTOKH.LAN. A detailed description of all parameters begins after the table.

Table 6-2. TCTOKH.LAN Parameters

Parameter	Units	Supported Values	Description
SLOT=	dec	1 - 8	The TC4046 slot number.
FRAME=	text	TOKEN-RING, TOKEN-RING_SNAP	Default is TOKEN-RING
NODE=	hex	400000000000 to 40007FFFFFFF	Overrides default node ID.
NAME=	any	Optional adapter/driver name; 17 characters maximum.	
REINSERT	n/a	Allows the driver to automatically reinsert into the ring after receiving a MAC "Remove" frame.	
LLCPOLL	n/a	Allows the driver to receive and respond to LLC POLL packets, used by some software management products.	
BELOW16	n/a	Forces adapter to use communication buffers below 16MB. Must also use BUFFERS16=	
BUFFERS16=20	int	Allocates reserved buffers below 16MB for this driver. Must be used with BELOW16 .	

LOAD COMMAND PARAMETERS

Following is a detailed description of all parameters that can be used with the LOAD command. Place each parameter you wish to use on the same line as the LOAD command statement.

SLOT=(slot)

The slot number in which the TC4046 is installed. If you have only one TC4046 installed in the machine, you can omit this parameter. The driver will then obtain the following adapter settings from the configuration routine: Base I/O address, IRQ, ring speed, and disabled bus-mastering (if you selected it).

FRAME=TOKEN-RING_SNAP

Supports frame type TOKEN-RING_SNAP, for example, for use with the TCP/IP protocol stack. This parameter is required for Remote Program Load (RPL) support for workstations that boot from the file server. If you omit this parameter, you will use the default frame type TOKEN-RING. You must load the driver once for each frame type you wish to use.

NODE=(node-ID)

(Locally-administered Node ID). A hexadecimal node ID in the range 400000000000h to 40007FFFFFFFh. (This is the range of locally-administered node IDs permitted under IEEE guidelines.)

For example: **NODE=4000123AB678**

REINSERT

Causes the driver to automatically reinsert into the ring after receiving a MAC "Remove" frame. Some network management programs, such as Sectra Token Ring Manager for DOS, allow "Remove" frames to be issued in certain conditions (such as error conditions). Using this keyword effectively prevents management software from removing the server from the ring. The default, with no keyword specified, is for the server to be removed from the network after the driver receives a MAC "Remove" frame.

NAME=(name)

Optional name that you can use for convenience to identify this adapter (or this instance of loading the driver); it is commonly used when you bind a protocol to the driver. This parameter is limited to 17 alphanumeric characters, and must be unique among adapters and drivers in the file server.

LLCPOLL

Allows the driver to receive and respond to LLC POLL packets, which are used by some management software programs. The default mode, with no keyword specified, is for the driver to ignore LLC POLL packets.

BELOW16

This parameter forces the driver to use communication buffers in the area below 16MB, and is required if the server has 16MB of RAM or more, and the TC4046 is installed in a 16-bit slot. **BELOW16** has no effect if the server has less than 16MB of RAM. Use this parameter once every time the server driver is loaded. If you use **BELOW16**, you must also use **BUFFERS16=**.

NOTE

If the TC4046 is installed in a 32-bit slot, you do not have to use this parameter even if the server has more than 16MB of RAM.

BUFFERS16=20

Allocates buffers below 16MB for this server driver (these buffers will be taken from the pool you reserved earlier with the "Set Reserved Buffers Below 16 Meg =" statement in the server's STARTUP.NCF file.) This parameter must be used every time the server driver is loaded with **BELOW16**, shown above.

NOTE

If the TC4046 is installed in a 32-bit slot, you do not have to use this parameter even if the server has more than 16MB of RAM.

EXAMPLE LOAD COMMANDS

The examples below are shown on multiple lines because of space limitations. The LOAD command must be entered on a single line.

NOTE

All examples show how to load all necessary support modules before loading the server driver. It is not necessary to load support modules again if they are already running.

Example #1 (NetWare v4.x, two adapters, 16-bit slot): TCTOKH.LAN driver in a NetWare v4.x server with 16MB of RAM or more; first adapter installed in slot 4 (a 16-bit slot), second adapter installed in slot 5 (also a 16-bit slot); both drivers using the TOKEN-RING_SNAP frame type, automatic ring reinsertion enabled:

LOAD MSM

```
LOAD TCTOKH slot=4 frame=TOKEN-RING_SNAP reinsert
below16 buffers16=20
LOAD TCTOKH slot=5 frame=TOKEN-RING_SNAP reinsert
below16 buffers16=20
```

Example #2 (NetWare v4.x, one adapter, 32-bit slot): TCTOKH.LAN driver in a NetWare v4.x server with 16MB of RAM or more; this adapter installed in slot 3 (a 32-bit slot), using the TOKEN-RING_SNAP frame type, automatic ring reinsertion enabled:

LOAD MSM

```
LOAD TCTOKH slot=3 frame=TOKEN-RING_SNAP reinsert
```

Example #3 (NetWare v3.12, two adapters, 16-bit slot): TCTOKH.LAN driver in a NetWare v3.12 server with 16MB of RAM or more; first adapter installed in slot 4 (a 16-bit slot), second adapter installed in slot 5 (also a 16-bit slot); both drivers using the TOKEN-RING_SNAP frame type, automatic ring reinsertion enabled:

LOAD MSM31X

```
LOAD TCTOKH slot=4 frame=TOKEN-RING_SNAP reinsert
below16 buffers16=20
LOAD TCTOKH slot=5 frame=TOKEN-RING_SNAP reinsert
below16 buffers16=20
```

Example #4 (NetWare v3.12, one adapter, 32-bit slot): TCTOKH.LAN driver in a NetWare v3.12 server with 16MB of RAM or more; this adapter installed in slot 3 (a 32-bit slot), using the TOKEN-RING_SNAP frame type, automatic ring reinsertion enabled:

```
LOAD MSM31X
LOAD TCTOKH slot=3 frame=TOKEN-RING_SNAP reinsert
```

Example #5 (NetWare v3.11, two adapters, 16-bit slot): TCTOKH.LAN driver in a NetWare v3.11 server with 16MB of RAM or more; first adapter installed in slot 4 (a 16-bit slot), second adapter installed in slot 5 (also a 16-bit slot); both drivers using the TOKEN-RING_SNAP frame type, automatic ring reinsertion enabled:

```
LOAD LSLENH
LOAD MSM31X
LOAD TCTOKH slot=4 below16 buffers16=20 reinsert
LOAD TCTOKH slot=5 below16 buffers16=20 reinsert
```

Example #6 (NetWare v3.11, one adapter, 32-bit slot): TCTOKH.LAN driver in a NetWare v3.11 server with 16MB of RAM or more; this adapter installed in slot 3 (a 32-bit slot), using the TOKEN-RING_SNAP frame type, automatic ring reinsertion enabled:

```
LOAD LSLENH
LOAD MSM31X
LOAD TCTOKH slot=3 reinsert
```

LOADING TCPIP.NLM

This section describes how to load the Thomas-Conrad server driver and Novell's TCPIP.NLM, which provides TCP/IP support on the file server. In many cases, other steps will be required. Refer to Novell's documentation for additional information. TCPIP.NLM ships with NetWare v3.11 and up.

Before loading TCPIP.NLM, you must load a server driver with frame type TOKEN-RING_SNAP, as described above. If you also want to use the Internetwork Packet Exchange (IPX™) protocol, you must also enter FRAME=TOKEN-RING, as shown in the example below.

The example below loads TCTOKH.LAN, and loads TCPIP.NLM with the forwarding feature enabled, which allows the server to act as an internet router:

```
LOAD TCTOKH slot=3 frame=TOKEN-RING_SNAP reinsert
name=TOK_IP
LOAD TCPIP forward=yes
```

After loading the server driver and TCPIP.NLM, you must bind the IP protocol to the driver, as described in the next section.

THE BIND COMMAND

After configuring your server adapter(s) with the LOAD command, you must bind each adapter to a protocol using the BIND command. Enter the command from the NetWare console prompt, or include the command in your AUTOEXEC.NCF file to automatically bind the driver when you start SERVER.

**BIND {IPX | IP} [to] {Name | Drivername}
{NET=(number) | ADDR=(number)}**

{IPX | IP}

The name of the protocol to which you are binding the driver (IPX or IP). If you specify IP, other parameters are required; consult your TCP/IP documentation for more information.

NAME

(Optional) The name you assigned to the adapter with the LOAD command. If you use an adapter name, you do not have to specify DRIVERNAME, shown below.

For example: **Name Accounting**

DRIVERNAME

The name of the driver you are using. Do not specify a driver name if you specified an adapter name with the NAME parameter, shown above.

NET=(NUMBER)

(IPX protocol only.) The unique number you have assigned to this network (maximum length is 8 hexadecimal characters).

For example: **NET=5A5AB**

ADDR=(NUMBER)

(TCP/IP protocol only.) The adapter's network address. The address must be unique on the internetwork.

For example: **addr=250.111.112.10**

To view the current configuration, type **CONFIG** and <Enter> at the SERVER console prompt.

EXAMPLE LOAD AND BIND COMMANDS

The commands shown below can be entered at the SERVER command prompt, or included in your AUTOEXEC.NCF file for automatic execution when you start SERVER. The commands must be entered in the order shown below (each command must be entered on a separate line, but are shown here on multiple lines because of space limitations).

NOTE

If you include the LOAD and/or BIND commands in your AUTOEXEC.NCF file, you must re-enter the commands at the SERVER command prompt, or exit SERVER and restart it in order to load and bind the driver.

NETWARE v4.x AND v3.12 SERVERS

These examples are for using TCTOKH.LAN in a NetWare v4.x server with 16MB of RAM or more that is installed in slot 3 (a 32-bit slot), using the TOKEN-RING_SNAP frame type, automatic ring reinsertion enabled.

NOTE

All examples show how to load all necessary support modules before loading the server driver. It is not necessary to load support modules again if they are already running.

If the server runs NetWare v3.12, the first command is **LOAD MSM31X** instead of **LOAD MSM**.

IPX only:

```
LOAD MSM
LOAD TCTOKH slot=3 reinsert name=tok_ipx
bind IPX to tok_ipx net=5
```

IP only:

```
LOAD MSM
LOAD TCTOKH slot=3 frame=TOKEN-RING_SNAP
reinsert name=tok_ip
LOAD TCPIP forward=yes
BIND IP to tok_ip addr=250.111.112.10 mask=255.255.255.0
```

IPX and IP:

```
LOAD MSM
LOAD TCTOKH slot=3 reinsert name=tok_ipx
LOAD TCTOKH slot=3 frame=TOKEN-RING_SNAP
  reinsert name=tok_ip
BIND IPX to tok_ipx net=6
LOAD tcpip forward=yes
BIND IP to tok_ip addr=250.111.112.10 mask=255.255.255.0
```

NETWARE v3.11 SERVER

TCTOKH.LAN driver in a NetWare v3.11 server with 16MB of RAM or more that is installed in slot 3 (a 32-bit slot), using the TOKEN-RING_SNAP frame type, automatic ring reinsertion enabled.

NOTE

All examples show how to load all necessary support modules before loading the server driver. It is not necessary to load support modules again if they are already running.

IPX only:

```
LOAD LSLENH
LOAD MSM31X
LOAD TCTOKH slot=3 name=tok_ipx
BIND IPX to tok_ipx net=5
```

IP only:

```
LOAD LSLENH
LOAD MSM31X
LOAD TCTOKH slot=3 frame=TOKEN-RING_SNAP
  reinsert name=tok_ip
LOAD TCPIP forward=yes
BIND IP to tok_ip addr=250.111.112.10 mask=255.255.255.0
```

IPX and IP:

```
LOAD LSLENH
LOAD MSM31X
LOAD TCTOKH slot=3 reinsert name=tok_ipx
LOAD TCTOKH slot=3 frame=TOKEN-RING_SNAP
  reinsert name=tok_ip
BIND IPX to tok_ipx net=6
LOAD TCPIP forward=yes
BIND IP to tok_ip addr=250.111.112.10 mask=255.255.255.0
```

UNLOAD AND UNBIND COMMANDS

You can use the **UNLOAD** or **UNBIND** commands to undo the adapter's current configuration. The commands have the format shown below:

```
UNLOAD TCTOKH
UNBIND IPX TCTOKH
```

The **UNLOAD** command completely unloads the driver from memory. If you wish to reload the driver, you will be required to use the **LOAD** and **BIND** commands.

The **UNBIND** command requires only that you reenter the **BIND** command, and does not affect the **LOAD** command.

REMOTE PROGRAM LOAD (RPL) SUPPORT

In order to provide support for Remote Program Load (RPL), you must follow the directions below. This action is necessary for workstations to boot from the file server using the RPL protocol.

The steps below summarize the essential steps for providing RPL support on a NetWare v3.1x or v4.x server. For more information, consult your Novell documentation:

STEP	ACTION
1	Load RPL.NLM by entering LOAD RPL at your server console command prompt.
2	Make sure the .RPL files (shipped with NetWare) reside in the SYS:LOGIN directory of the server the workstations requiring RPL support will log into. Consult the Novell documentation for the names and function of the currently-shipping .RPL files.
3	Bind RPL.NLM to the server driver by entering the following command at your server console command prompt. BIND RPL to TCTOKH NOTE Other parameters can be used with the BIND RPL command. Consult your Novell documentation for more information.
4	See Appendix B for additional information.

CHAPTER 7 DOS ODI WORKSTATION DRIVER

You should run the Ring Tools diagnostic test suite on the adapter before you attempt to install drivers. Ring Tools will indicate serious hardware problems, such as hardware incompatibility or adapter faults. See Chapter 4 for detailed instructions.

DRIVER SUPPORT

This driver can be used in networks running NetWare v2.x (except v2.0a), v3.1x and v4.0x. The driver operates in promiscuous mode, which is required for some network management programs, such as Thomas-Conrad's Sectra™ Token Ring Server for DOS and LANalyzer (DOS- and Windows-based versions).

It also supports the use of ODINSUP (Open Datalink Interface Network Driver Specification Support), a driver "shim" that allows ODI and NDIS-based network operating systems to communicate, transparently to the users on the networks. Instructions for using ODINSUP can be found in the file named ODINSUP.DOC, which ships with ODINSUP.

REMOTE BOOTING

For detailed instructions on remote booting a workstation in a NetWare environment, also see Appendix B.

NETWARE v4.0x INSTALLATION

This section shows the essential steps for configuring the driver on a workstation attached to a network running NetWare v4.0x. In some installations, other steps might be required; for more information, consult your Novell documentation.

NOTE

The DOS ODI workstation driver for NetWare v4.0x is referred to by Novell as the "DOS Requester" or the "DOS Client".

Make sure you are not connected to the network, that no network drivers are loaded on the machine. Then locate the diskettes labeled **Workstation for DOS**, **Workstation Drivers Disk 1**, **Workstation Drivers Disk 2** and **Workstation for Windows** (if the workstation runs Microsoft Windows). These diskettes ship with NetWare v4.0x, and they contain the workstation installation program, support files, and workstation drivers.

After you have located the diskettes, take the following steps:

STEP	ACTION
1	You should run the installation program from a DOS prompt. (If the workstation runs Windows, exit Windows first.) Insert the diskette labeled Workstation for DOS into a diskette drive, switch to the drive, and type INSTALL and <Enter>.
2	INSTALL presents you with a multi-step menu. You can scroll through the menu steps by pressing the <↑> or <↓> arrow keys, and press <Enter> to edit the information in a particular step.
3	Locate the option Press <Enter> to install the driver for your network board . This is the option that installs the Thomas-Conrad network driver; press <Enter> at the prompt.

STEP	ACTION
4	Insert the diskette labeled Workstation Drivers Disk 2 into the diskette drive when INSTALL prompts you to insert a driver diskette. The Network Board menu displays available network drivers. Press <T> to locate the Thomas-Conrad driver, which appears as shown below: Thomas-Conrad TC4046 Adapter
5	After you select this driver, the Settings for the Thomas-Conrad TC4046 adapter menu displays its available options. If you want to use the default TOKEN-RING frame type and default 4KB packet size, press <Esc> and continue with Step 7; otherwise, see the next Step.
6	If you wish to change any of the settings displayed on the menu, use the <↑> or <↓> arrow keys to highlight the setting you wish to change and press <Enter>. A help screen appears to assist you in making an appropriate selection. When you are finished, press <Esc>. Keep the following points in mind when you are making your choices: <ul style="list-style-type: none"><input type="checkbox"/> The Non_VDS option is normally not needed with this driver, although you may use it if you wish, or if you have problems running an application (such as a memory manager) that does not conform to VDS (Virtual DMA Services).<input type="checkbox"/> The default frame size (4KB) is the largest allowed for a 4Mbps network.<input type="checkbox"/> The following options have no meaning in the INSTALL program because they are set for the adapter using your computer's configuration routine: Base I/O Address DMA Channel Hardware Interrupt Line Speed (in Mbps) Non-DMA (non-bus-mastering) Mode

STEP**ACTION**

- 7 After you have selected the options for the driver, follow the instructions on your screen to complete the installation. All necessary files will be copied to the directory you selected. Example NET.CFG and STARTNET.BAT files are shown below.
- 8 If you are using the TCP/IP protocol, also see the sections titled "Using the TCP/IP Protocol" and "Using Multiple Protocols" later in this chapter.

EXAMPLE INSTALLATION FILES

The INSTALL program creates two files, named STARTNET.BAT (which loads the network driver and support files) and NET.CFG (which includes the adapter configuration). These files are located in the directory you selected with INSTALL (by default, C:\NWCLIENT).

Example files are shown below. Yours might be different, depending on the installation options you selected. You can modify these files using a text editor.

STARTNET.BAT	NET.CFG
@ECHO OFF C: CDNWCLIENT SET NWLANGUAGE = ENGLISH LSL TCTOKSH.COM IPXODI VLM CD \	LINK DRIVER TCTOKSH FRAME TOKEN-RING Slot 7 NetWare DOS Requester FIRST NETWORK DRIVE = F

NOTE

The NET.CFG file shown is for an adapter installed in Slot 7 using the default frame type, TOKEN-RING. It also sets the first available network drive as drive F:. NET.CFG typically includes other Novell-specific information; consult your Novell documentation for more information.

NETWARE v3.1x INSTALLATION

To use the DOS ODI workstation driver on a NetWare v3.1x network, you must edit the NET.CFG file. NET.CFG is a text file that contains configuration information for your Thomas-Conrad token ring adapter, in addition to other information relating to the network and workstation.

NET.CFG must reside in the same directory as LSL.COM (the Link Support Layer, provided by Novell) and TCTOKSH.COM (the Thomas-Conrad workstation driver). The statement shown below (which identifies the driver) must precede the other driver parameters. Put this statement on the left-hand margin.

LINK DRIVER TCTOKSH

Table 7-1 below summarizes all Thomas-Conrad driver parameters that can be included in NET.CFG. Put each statement on a separate line and indent each with a single space or tab character. A detailed description of all parameters begins after the table.

Table 7-1. DOS ODI Workstation Driver Parameters

Parameter	Units	Supported Values	Description
SLOT	int	1 - 8	The TC4046 slot number.
NODE ADDRESS	hex	400000000000 to 40007FFFFFFF	Overrides default node ID.
FRAME	text	TOKEN-RING TOKEN-RING_SNAP	Default is TOKEN-RING
MAX FRAME SIZE	bytes	618 to 16490	Default is 4202 (4KB).
NON_VDS	n/a		Can be used with memory managers that do not conform to VDS (Virtual DMA Services).
DETR	n/a		Disables the early token release feature for 16Mbps networks.
REINSERT	n/a		Causes the driver to automatically reinsert into the ring after receiving a MAC "Remove" frame.

NET.CFG PARAMETERS

Following is a detailed description of NET.CFG parameters for the Thomas-Conrad DOS ODI workstation driver. Put each statement shown below on a separate line under **LINK DRIVER TCTOKSH** and indent each with a single space or tab character.

SLOT (slot)

The slot number in which you installed the TC4046. If you have only one TC4046 in the machine, you can omit this parameter. The driver will then obtain the following adapter settings from the configuration routine: base I/O address, IRQ line, ring speed, disabled bus-mastering (if you selected it), and adapter ROM address (if you selected it).

NODE ADDRESS (NUMBER)

(Locally-administered Node ID). A hexadecimal node ID in the range of locally-administered node IDs permitted under IEEE guidelines. The **NODE ADDRESS** option overrides the pre-assigned globally-administered node ID.

For example: **NODE ADDRESS 400023456789**

FRAME TOKEN-RING_SNAP

Include this statement to use frame type **TOKEN-RING_SNAP** (for use with the TCP/IP protocol stack, for example). If you omit this parameter, you will use only the default frame type **TOKEN-RING**. If you want to use both frame types to support the TCP/IP and IPX protocol stacks, you must also enter **FRAME TOKEN-RING** on separate lines.

MAX FRAME SIZE (SIZE)

Default is (4KB). (**SIZE**) can range from 618 to 16490. This parameter sets the maximum frame size (in bytes) the driver can transmit or receive. The maximum frame size allowable for 16/4Mbps NetWare v3.1x networks, and for 4Mbps NetWare v4.0x networks, is the default (4KB). For NetWare v3.1x networks, this corresponds to a value of 4202 for (**SIZE**); for NetWare v4.0x networks, this corresponds to a value of 4216 for (**SIZE**).

NON_VDS

This parameter, which is not normally needed, can be used if the workstation is using a memory manager that does not comply to VDS (Virtual DMA Services). Try using this parameter if you are using a memory manager and have problems with the driver.

DETR

Disables the early token release feature for 16Mbps networks. Has no effect on 4Mbps networks.

REINSERT

Causes the driver to automatically reinsert into the ring after receiving a MAC "Remove" frame. Some network management programs, such as Sectra Token Ring Manager for DOS, allow "Remove" frames to be issued in certain conditions (such as error conditions). Using this keyword effectively prevents management software from removing the workstation from the ring. The default, with no keyword specified, is for your computer to be removed from the network after the driver receives a MAC "Remove" frame.

NET.CFG EXAMPLES

<u>REQUIREMENTS</u>	<u>EXAMPLE</u>
Adapter in Slot 5 with a locally-administered Node ID.	LINK DRIVER TCTOKSH SLOT 5 NODE ADDRESS 400023456789
Adapter using two frame types.	LINK DRIVER TCTOKSH FRAME TOKEN-RING FRAME TOKEN-RING_SNAP

COPY FILES

Copy both of the following files into the same directory as NET.CFG for easiest installation.

LSL.COM The Link Support Layer, supplied by Novell
TCTOKSH.COM The Thomas-Conrad DOS ODI driver

To find the version and date of LSL.COM or TCTOKSH.COM, enter the following:

LSL ?
TCTOKSH ?

Then see one of the sections below, depending on which protocol(s) you are using:

- IPX (NetWare) protocol:** See the next section.
- Transmission Control Protocol/Internet protocol (TCP/IP):** See the section titled "Using the TCP/IP Protocol".
- Both IPX and TCP/IP protocols:** Follow the instructions in the section titled "Using the IPX (NetWare) Protocol" (the next section) *and* the section titled "Using the TCP/IP Protocol", *then* see the section titled "Using Multiple Protocols".

USING THE IPX (NETWARE) PROTOCOL

To use the IPX protocol stack, copy the files shown below into the same directory as LSL.COM, NET.CFG and the Thomas-Conrad DOS ODI workstation driver. The files shown below are supplied by Novell:

- IPXODI.COM, the IPX protocol stack.
- The shell program that intercepts DOS requests. (Examples: NETX.COM, EMSNET3.COM, EMSNETX.COM; there are others). See your Novell documentation for the command required to load it.

To read the version and date of IPXODI, type the following:

IPXODI ?

If you are using the TCP/IP protocol in addition to IPX, see the section titled "Using the TCP/IP Protocol".

To load the driver, enter the commands shown below. You can enter the commands from the DOS system prompt. If the files are located in any other than the root directory, you must switch to that directory before entering the commands.

To automatically execute the commands when you start your computer, you can include them in the AUTOEXEC.BAT file. If the files are located in any other than the root directory, include the directory name in the PATH= statement in AUTOEXEC.BAT.

The commands *must* be entered in the order shown below:

LSL
TCTOKSH
IPXODI
(shell)

The command required to load your shell program (example: NET3, NETX, EMSNET3, EMSNETX; there are others). See your Novell documentation for the command required to load it. It is only required for the IPX protocol stack.

LOAD THE DRIVER

If your installation was successful, you will see a driver description statement (similar to the example below) as the driver initializes the adapter:

```
Thomas-Conrad Token Ring DOS MLID Vx.xx (yyymmdd)
(C) Copyright 1991-199x Thomas-Conrad, Corp. All Rights Reserved.
Slot 2h, Node Address 1C87221B1 M
Max Frame 4216 bytes, Line Speed 4Mbps
Board 1, Frame TOKEN-RING, MSB Mode
```

CONSERVING MEMORY

You can save memory by eliminating parts of IPXODI.COM that you do not need. IPXODI.COM contains three parts:

- IPX protocol
- SPX protocol
- Remote Diagnostics Responder

You can save memory by not loading SPX or the Remote Diagnostics Responder. However, some utilities, such as Novell's RCONSOLE and NVER, and Thomas-Conrad's TXD™ require both SPX and the Remote Diagnostics Responder.

To load only some parts of IPXODI.COM, use one the following commands. These commands can be entered from your DOS system prompt, or put in your AUTOEXEC.BAT file for automatic execution when you boot your computer.

- IPXODI** Loads IPX, SPX, and the Diagnostics Responder.
- IPXODI d** Loads only IPX and SPX. (Saves about 4KB of memory.)
- IPXODI a** Loads only IPX. (Saves about 8KB of memory.)

UNLOADING THE PROTOCOL AND/OR DRIVER

You must unload the protocol, shell and/or Thomas-Conrad driver programs in reverse order. For example:

```
VLM u or NETX u
IPXODI u
TCTOKSH u
```

USING THE TCP/IP PROTOCOL

TCP/IP (Transmission Control Protocol/Internet Protocol) is an industry standard protocol suite. To use the TCP/IP protocol, first install the software onto your computer's hard drive or workstation boot diskette.

Next, edit NET.CFG to include **FRAME TOKEN-RING_SNAP** and other required parameters. Your NET.CFG will look different, depending on which TCP/IP software package you are using and your system requirements. The **Link Support** statements determine the number of packet buffers, the packet size, and the size of the memory pool.

Link Support

```
Buffers 8 4202
MemPool 4096
```

Link Driver TCTOKSH

```
Slot 6
Frame TOKEN-RING_SNAP
```

Protocol TCPIP

```
ip_address      250.111.112.24
ip_router       250.111.112.15
ip_netmask      255.255.255.0
tcp_sockets     8
udp_sockets     8
raw_sockets     1
nb_sessions     4
nb_commands    8
nb_adapter     0
nb_domain
```

After modifying NET.CFG, load the driver. The example below loads the Thomas-Conrad driver with only the TCP/IP protocol stack. See the next section if you also need IPX support. Enter the following commands in the order shown from the DOS command line, or you can put them in your AUTOEXEC.BAT file for automatic execution when you boot your computer:

```
LSL
TCTOKSH
TCPIP
```

USING MULTIPLE PROTOCOLS

You can use the workstation driver with multiple protocols, such as IPX and TCP/IP. Using IPX and TCP/IP protocols can enable the workstation to simultaneously communicate with machines on an IPX network, with TCP/IP-based networks, and with host machines on TCP/IP-based networks.

To use both IPX and IP, you must modify the NET.CFG file to include information necessary to run the protocols (such as frame types). Your NET.CFG will look different, depending on which TCP/IP software package you are using and your system requirements. The **Link Support** statements determine the number of packet buffers, the packet size, and the size of the memory pool (the **Buffers** and **MemPool** statements are used only by the IP protocol; they are not used by IPX).

Link Support

Buffers 8 4202
MemPool 4096

Link Driver TCTOKSH

Slot 6
Frame TOKEN-RING_SNAP
Frame TOKEN-RING
Protocol IPX E0 TOKEN-RING

Protocol TCPIP

ip_address 250.111.112.24
ip_router 250.111.112.15
ip_netmask 255.255.255.0
tcp_sockets 8
udp_sockets 8
raw_sockets 1
nb_sessions 4
nb_commands 8
nb_adapter 0
nb_domain

Example startup commands (yours might be different):

LSL
TCTOKSH
IPXODI
TCPIP
(shell) or **VLM**

(shell)
or
VLM

LSL
TCTOKSH
IPXODI
(shell) or **VLM**
TCPIP

(shell) The command required to load your shell program (example: NET3, NETX, EMSNET3, EMSNETX; there are others). See your Novell documentation for the command required to load it. It is only required for the IPX protocol stack.

VLM The NetWare DOS requester shell for NetWare v4.0x and v3.12. For more information, consult your Novell documentation.

Since protocol stacks such as TCP/IP do not require a shell, you can enter (shell) and TCPIP in either order shown above. Loading TCPIP last allows you to unload it first if you need to save memory.

LOADING/UNLOADING THE DRIVER

If your installation was successful, you will see a driver description statement (similar to the example below) as the driver initializes the adapter:

Thomas-Conrad Token Ring DOS MLID Vx.xx (yymmdd)
(C) Copyright 1991-199x Thomas-Conrad, Corp. All Rights Reserved.
Slot 2h, Node Address 1C87221B1 M
Max Frame 4216 bytes, Line Speed 4Mbps
Board 1, Frame TOKEN-RING, MSB Mode

If you want to unload the protocol(s) and/or Thomas-Conrad driver, you must unload them in reverse order. For example:

TCPIP u
NETX u or VLM u
IPXODI u
TCTOKSH u

CHAPTER 8

DRIVER FOR NETWARE REQUESTER FOR OS/2

You should run the Ring Tools diagnostic test suite on the adapter before you attempt to install drivers. Ring Tools will indicate serious hardware problems, such as hardware incompatibility or adapter faults. See Chapter 4 for detailed instructions.

DRIVER SUPPORT

The OS/2 ODI workstation driver for NetWare works with NetWare Requester for OS/2 v1.x and up running on a network using OS/2 v1.x and up, including OS/2 v2.1.

This driver supports the use of the ODINSUP (Open Datalink Interface Network Driver Specification Support) "shim" which allows ODI and NDIS network operating systems to communicate on the same network. Instructions for using ODINSUP.COM can be found in the file named ODINSUP.DOC, which ships with ODINSUP.

INSTALL THE REQUESTER

Install the NetWare Requester for OS/2 if you have not already done so, following the directions in Novell's documentation. Select any supplied network adapter driver when the installation procedure prompts you to do so. You must select a driver in order for the installation to complete successfully.

COPY THE DRIVER

Once you have installed the Requester, copy the Thomas-Conrad driver (named TCCTOK.SYS) from the **NW_REQ** directory of the working copy of your driver diskette to the destination directory you selected when you installed the Requester (the default directory is **NETWARE**).

EDIT CONFIG.SYS

Use the OS/2 System Editor to edit the workstation's CONFIG.SYS file, which resides in the root directory of your boot drive. Between the statements that read

```
REM __ NetWare Requester Statements __ BEGIN
```

and

```
REM __ NetWare Requester Statements __ END
```

you will see several lines specifying device drivers or other options (such as ROUTE.SYS or NETBIOS.SYS).

- If you selected an adapter driver with the Requester's installation procedure but do not intend to use that driver, disable the driver statement by preceding it with the keyword REM, or write over it with the Thomas-Conrad driver statement described below. Consult your NetWare Requester documentation if you are not sure which driver(s) to disable or overwrite.
- If you are currently using another adapter driver with the Requester, add the statement to load the Thomas-Conrad TC4046 adapter driver after the existing driver statement.

In either case, you must include the Thomas-Conrad TC4046 driver statement before the statement **DEVICE=IPX.SYS**.

The format of the Thomas-Conrad driver statement is shown below:

```
DEVICE=(pathname)\TCCTOK.SYS
```

(pathname)= the directory containing TCCTOK.SYS.

Example: **DEVICE=C:\NETWARE\TCCTOK.SYS**

CREATE/MODIFY NET.CFG, IF NECESSARY

NET.CFG is a text file that includes the following configuration information for your Thomas-Conrad TC4046 adapter:

- Assigning a locally-administered node ID.
- Changing the number of packet buffers or the packet size.

NET.CFG is located in the directory you selected when you installed the NetWare Requester. The following lines allow you to use 15 packet buffers and a 4KB packet size (consult your NetWare Requester documentation for other supported values):

```
Link Support  
Buffers 15 4202
```

Leave one blank line after those statements and type the following:

```
LINK DRIVER TCCTOK
```

If you wish to override the adapter's default globally-administered node ID, include the following statement in the NET.CFG file after the **LINK DRIVER TCCTOK** statement, indented with a single space or tab character.

```
NODE ADDRESS (node-id)
```

(Optional.) Sets a locally-administered node ID, a hexadecimal number in the range 400000000000h to 40007FFFFFFFh. (This is the range of locally-administered node IDs permitted under IEEE guidelines.)

For example:

```
LINK DRIVER TCCTOK  
Node Address 40002C00112B
```

LOAD THE DRIVER

Save the changes to NET.CFG and reboot your computer to load the driver. If your workstation displays a hardware initialization error or if it fails to initialize, check for conflicting hardware settings with other adapters installed in the computer.

CHAPTER 9

MICROSOFT LAN MANAGER DRIVERS

You should run the Ring Tools diagnostic test suite on the adapter before you attempt to install drivers. Ring Tools will indicate serious hardware problems, such as hardware incompatibility or adapter faults.

COPY EAGLEMAC.BIN

Copy EAGLEMAC.BIN from the EAGLEMAC directory of the working copy of your driver diskette to the root directory of your boot drive or boot diskette.

DRIVER SUPPORT

This driver supports source-routing, and will automatically send and respond to LLC POLL packets (used by some management systems). No driver parameter or other action is necessary to enable either of these features.

REMOTE BOOTING

To remote boot a workstation on a LAN Manager network, obtain the TC9245 RPL Remote Reset ROM, install it on the adapter using the instructions in Chapter 3, and see the documentation on the diskette that ships with the TC9245.

LAN MANAGER v2.2 INSTALLATION

Run the LAN Manager SETUP program to install the Thomas-Conrad driver, as described in the steps below:

STEP	ACTION
1	Start the LAN Manager SETUP program, according to the manufacturer's directions.
2	From the Configuration menu, select Network Drivers .
3	Remove existing drivers, if necessary, by highlighting the driver and selecting Remove Config from the actions at the bottom of the screen.
4	Select Add New Config from the actions at the bottom of the screen. The Network Adapter Drivers screen appears. Select Other Driver .
5	The Copy Driver or Protocol Files screen appears. Insert the working copy of your Thomas-Conrad driver diskette in the drive indicated on this screen (or type in the letter of another drive) and select OK .
6	The Other Network Adapter Drivers screen appears. Select Thomas-Conrad Token Ring Adapter , then select OK .
7	The Network Protocols for Thomas-Conrad Token Ring Adapter screen then appears. Make all appropriate selections from this screen, then select OK from the actions at the bottom of the screen.
8	Install other adapters, if necessary, starting with Step 4.
9	After you have set up the adapter(s), the Workstation Configuration Screen shows all the choices you have made. Follow the prompts on your screen to save or edit the configuration.

THE PROTOCOL.INI FILE

PROTOCOL.INI is a text file that includes configuration information for your Thomas-Conrad token ring adapter. You *must* modify PROTOCOL.INI if you want to set a locally-administered node ID. Use a text editor to modify the PROTOCOL.INI file.

Find the driver description section that begins with the following:

```
[TCCTOK_NIF]
  drivename=TCCTOK$
```

[TCCTOK_NIF] and TCCTOK\$ indicate the first, or only, driver for a Thomas-Conrad token ring adapter. If you have a second Thomas-Conrad adapter installed in the same computer, you will also see the following heading:

```
[TCCTOK_NIF2]
  drivename=TCCTOK2$
```

Configuration parameters go under the driver description headings shown above. The following table summarizes all parameters that can be used with the driver. Enter each parameter you wish to use on a separate line and indent each with a single space or tab character. A detailed description of all parameters begins after the table.

Table 9-1. LAN Manager Driver Parameters

Parameter	Units	Supported Values	Description
MICROCHANNEL	n/a	Driver uses the settings from the adapter configuration routine.	
PACKETSIZE=	bytes	512 to 17408	Default is 4096 (4KB packets).
MAXTRANSMITS=	dec	6 to 100	(OS/2 driver only). Number of transmit queue buffers. Default is 6.
NETADDRESS=	hex	400000000000 to 40007FFFFFFF	Overrides default node ID.

PROTOCOL.INI PARAMETERS

The following is a detailed description of all parameters that can be entered in PROTOCOL.INI. Enter each parameter you wish to use on a separate line and indent each with a single space or tab character.

MICROCHANNEL

Causes the driver to use the following settings for the adapter you selected with the configuration routine: Base I/O address, IRQ, ring speed.

PACKETSIZE=(size)

Specifies the packet size (in bytes) that the adapter transmits. The default is 4096, or 4KB packets.

MAXTRANSMITS=(number)

(OS/2 driver only.) Determines the number of transmit queue buffers. If the adapter is installed in a server, this value should be at least equal to the transmit window size multiplied by the maximum number of sessions you anticipate. The range is from 6 - 100. The default is 6.

For example: **MAXTRANSMITS=40**

NETADDRESS=(node-ID)

Sets a locally-administered node ID. The node ID is a 12-digit hexadecimal string in the range 400000000000h to 40007FFFFFFFh.

EXAMPLE PROTOCOL.INI FILES

Example PROTOCOL.INI files for LAN Manager v2.2 are shown on the following pages. Your PROTOCOL.INI might look different if, for example, other protocols are used.

Example (one adapter): Adapter using a locally-administered node ID.

```
[PROTMAN]
  DRIVERVERNAME = PROTMAN$
```

```
[NETBEUI_XIF]
  Drivervname = netbeui$
  SESSIONS = 40
  NCBS = 85
  BINDINGS = "TCCTOK_NIF"
```

```
[TCCTOK_NIF]
```

; protocol.ini section for the Thomas-Conrad Token Ring Adapter

```
  drivervname = TCCTOK$
  MICROCHANNEL
  NETADDRESS=4000123AB678
```

Example (two adapters): Second adapter using a locally-administered node ID.

```
[PROTMAN]
DRIVERNAME = PROTMAN$
```

```
[NETBEUI_XIF]
Drivername = netbeui$
SESSIONS = 40
NCBS = 85
BINDINGS = "TCCTOK_NIF", "TCCTOK_NIF2"
```

```
[TCCTOK_NIF]
```

```
; protocol.ini section for the Thomas-Conrad Token Ring Adapter
```

```
drivername = TCCTOK$
MICROCHANNEL
```

```
[TCCTOK_NIF2]
```

```
; protocol.ini section for the Thomas-Conrad Token Ring Adapter
```

```
DRIVERNAME = TCCTOK2$
MICROCHANNEL
NETADDRESS=4000123AB678
```

CHAPTER 10

DRIVERS FOR OTHER NDIS-BASED SYSTEMS

You should run the Ring Tools diagnostic test suite on the adapter before you attempt to install drivers. Ring Tools will indicate serious hardware problems, such as hardware incompatibility or adapter faults.

COPY EAGLEMAC.BIN

Before installing the drivers, copy EAGLEMAC.BIN from the EAGLEMAC directory of the working copy of your driver diskette to the root directory of your boot drive or boot diskette. (Windows for Workgroups users: this action will be taken by Windows for Workgroups when you install the driver.)

DRIVER COMPATIBILITY AND SUPPORT

The WFW directory on the driver diskette contains drivers that can be used in network operating systems compatible with the NDIS specification. Drivers for DOS-based and OS/2-based machines are included in the directory, as well as additional support files for Microsoft Windows for Workgroups installations.

Drivers and configuration files for IBM LAN Server are located in the LANSERVR\DOS and \LANSERVR\OS2 directories on the driver diskette (more information about LAN Server appears on the next page).

These drivers support source-routing, and will automatically send and respond to LLC POLL packets (used by some management systems). No driver parameter or other action is necessary to enable either of these features.

IBM LAN SERVER

To use the Thomas-Conrad driver in a LAN Server environment, first make sure the adapter is set as shown below (see Chapter 3 for information about adapter settings):

IRQ: 2/9, 3, 6 or 7
Base I/O: Base I/O 1A20h (Primary, also adapter default)
Base I/O 2A20h (Secondary)

Set up the driver in LAN Server by running the LAN Support Program configuration utility (DXMAID.EXE), which ships with the LAN Server program. Follow the prompts on your screen to complete the installation process. The driver and configuration file for DOS-based systems are located in the \LANSERV\VDOS directory on the Thomas-Conrad driver diskette; the driver and configuration file for OS/2-based systems are located in the \LANSERV\IOS2 directory on the driver diskette.

REMOTE BOOTING

To set up a DOS-based workstation to remote boot in a IBM LAN Server environment, take the following actions:

- Install the TC9245 RPL (Remote Program Load) Remote Reset ROM on the adapter as shown in Chapter 3. The diskette that ships with the TC9245 has installation instructions that must be followed by the network administrator to enable remote booting.
- Obtain Thomas-Conrad LAN Support drivers as shown in Chapter 1.

WINDOWS FOR WORKGROUPS v3.11

Take the following steps to use the Thomas-Conrad NDIS driver in a machine running Microsoft Windows for Workgroups v3.11:

CAUTION

Currently, there is a known problem using this driver with protected-mode services (also called "server services") in a machine running Windows for Workgroups v3.11. See the README file in the root directory of the driver diskette for more information.

STEP	ACTION
1	Open the Network group, then select the Network Setup icon.
2	The Network Setup menu displays various information about the machine and the network. Select Drivers from the bottom of the screen.
3	The Network Drivers window displays all network adapters that have currently been installed in your system. Select Add Adapter .
4	Select Unlisted or Updated Network Adapter (typically the first selection on the menu).
5	The Install Driver window is displayed, as shown in Figure 10-1 below. Insert the working copy of your Thomas-Conrad driver diskette into a disk drive and type A:\WFW (or B:\WFW) and press <Enter>.

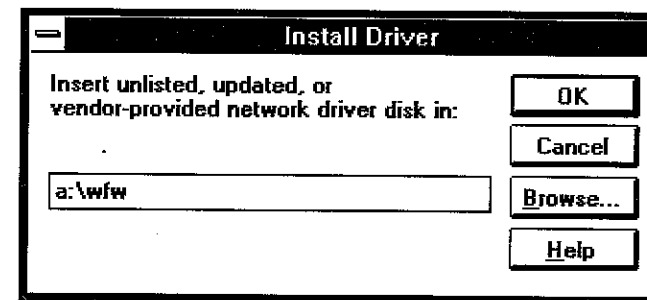


Figure 10-1. Inserting the Driver Diskette

STEP**ACTION**

- 6 After a short delay, the entry **Thomas Conrad Token Ring Adapter** appears in the window, as shown in Figure 10-2 below. Select this entry.

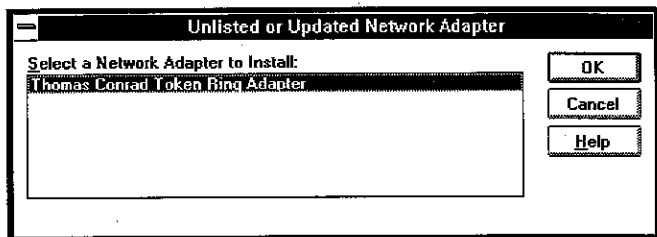


Figure 10-2. Selecting the Thomas-Conrad Driver

- 7 The screen shown in Figure 10-3 below then appears. The options **Interrupt (IRQ)** and **Base I/O Port** are both set with the adapter's configuration routine, so they have no effect for the TC4046.

Pressing the **Advanced** button gives you access to two additional options: **DMA CHANNEL** (which has no function for the TC4046) and **Packet Size in Bytes**.

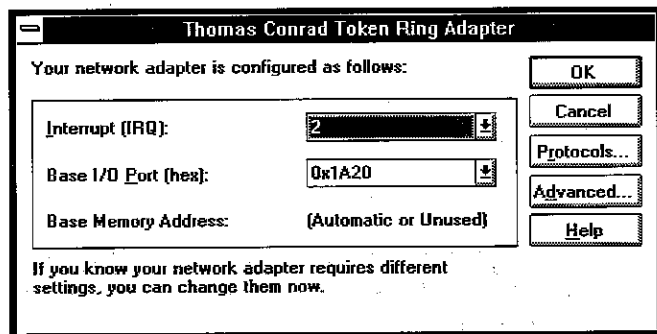


Figure 10-3. Driver Parameter Selection

- 8 Follow the prompts on your screen to complete the installation process. You are then ready to use the Thomas-Conrad token ring adapter with Windows for Workgroups.

CHAPTER 11

LAN SUPPORT DRIVERS

You should run the Ring Tools diagnostic test suite on the adapter before you attempt to install drivers. Ring Tools will indicate serious hardware problems, such as hardware incompatibility or adapter faults.

REQUESTING DRIVERS

The driver for LAN Support networks ship free of charge on a separate diskette. You can request the diskette by any of the methods listed in the section titled "Requesting LAN Support Drivers" in Chapter 1.

NOTE

If you are currently using any Thomas-Conrad TC4035, TC4045 or TC4046 token ring adapters in a LAN Support environment, you should verify the driver version (displayed during boot-up). If the driver version is prior to v3.00, contact Thomas-Conrad Technical Support to obtain current drivers. The v3.00 drivers can be used with all TC4035, TC4045 and TC4046 adapter models.

ADAPTER CONFIGURATION

LAN Support networks support only certain options for Base I/O and IRQ. You must select one of the Base I/O combinations listed below with any of the IRQ lines shown.

IRQ:	2/9, 3, 6 or 7
Base I/O:	Base I/O 1A20h (Primary, adapter default)
	Base I/O 2A20h (Secondary)

REMOTE BOOTING

To remote boot a workstation in a LAN Support environment (including IBM LAN Server), obtain the TC9245 RPL Remote Reset ROM, install it on the adapter using the instructions in Chapter 3, and follow the directions in the README file on the diskette that ships with the TC9245. You can also use the information in this manual to help you install the driver, if you wish.

AVAILABLE DRIVERS

The files included on the Thomas-Conrad *LAN Support Drivers* diskette are shown below:

<u>File Name</u>	<u>Description</u>
README	Driver release information
TCCDISK.BAT	Disk and driver version numbers
@0051.ADF	TC4046 ADF file
TCC_CPL.EXE	LAN Support driver
TCC_AHI.EXE	Additional LAN Support driver for local-booting workstations
TCRPLAHI.EXE	Additional LAN Support driver for remote-booting workstations
CONFIG.TCC	Example CONFIG.SYS file

CONFIG.TCC is a text file that includes the commands necessary to load Thomas-Conrad's LAN Support driver. CONFIG.TCC consists of the commands shown below:

```
device=dxma0mod.sys
device=tcc_cpi.exe
device=tcc_ahi.exe
device=dxmt0mod.sys
```

If your computer does not have a CONFIG.SYS file, you can copy CONFIG.TCC to the root directory of your boot drive and rename it using the commands shown below:

```
copy a:\config.tcc (path)
ren config.tcc config.sys
```

(path) is the root directory of your boot drive.

CAUTION

If DOS returns the message "Duplicate file name or File not found," then you already have a CONFIG.SYS file. In that case, you must modify CONFIG.SYS as described below. *Never delete an existing CONFIG.SYS file.*

COPY DRIVER FILES

To use the Thomas-Conrad LAN Support driver shipped on your *LAN Support Drivers* diskette with any NOS listed at the beginning of this chapter, copy the Thomas-Conrad drivers from your *LAN Support Drivers* diskette to the root directory of your boot drive. Insert the Thomas-Conrad *LAN Support Drivers* diskette in drive A: and type:

```
copy a:\*.exe (path)
```

(path) is the root directory of your boot drive.

MODIFY CONFIG.SYS

Skip this section if you renamed CONFIG.TCC to CONFIG.SYS.

Use a text editor to modify CONFIG.SYS, which resides in the root directory of your boot drive.

The statement shown below is the first LAN Support device driver statement (although not necessarily the first statement in CONFIG.SYS):

```
device=dxma0mod.sys
```

After that statement, you will see the following:

```
device=dxmc0mod.sys
```

The device driver shown above is specifically for IBM Token-Ring adapters. You must inactivate it by preceding it with the REM keyword, as shown below:

```
REM device=dxmc0mod.sys
```

Then add the commands shown below in the order shown:

```
device=tcc_cpi.exe
device=tcrcplahi.exe (if the workstation boots from the file server)
or
device=tcc_ahi.exe (if the workstation boots from a local disk)
```

Example portion of CONFIG.SYS file showing the Thomas-Conrad driver statements for a workstation that boots from a file server:

```
device=dxma0mod.sys
REM device=dxmc0mod.sys
device=tcc_cpi.exe
device=tcrlahi.exe
```

NOTE

Your CONFIG.SYS may contain other statements (such as **device=dxmt0mod.sys**) that load drivers that are not supplied by Thomas-Conrad. For more information about those drivers, consult the driver vendor's documentation.

OPTIONAL PARAMETERS

The following parameters must be used with one of the device driver statements in CONFIG.SYS.

s=(buffer-size)

This parameter specifies the size, in bytes, of packet buffers. The default value of (buffer-size) is 4096 (4KB packets), and it can range from 1024 to 16384. This parameter is used with the DEVICE=TCC_CPI.EXE driver.

For example (1KB buffer): **device=tcc_cpi.exe s=1024**

b=n

The "n" parameter sets the number of buffers. The value of n can range from 1 - 9. For example, if you are using the default buffer size of 4KB, **b=2** sets aside 8KB of buffer space. (This setting is recommended if your computer uses a memory manager that does not support Virtual DMA Services). Using a setting of **b=3** or greater provides extra buffer space, but may not result in a significant performance increase; it is, however, recommended if the adapter is in a server running PC LAN v1.3. This parameter is used with the DEVICE=TCC_CPI.EXE driver.

(node-ID)

This parameter assigns a locally-administered node ID. It is used with the DEVICE=TCRPLAHI.EXE or DEVICE=TCC_AHI.EXE driver. A locally-administered node ID is a hexadecimal number in the range 40000000000h to 40007FFFFFFh.

For example, to set a locally-administered node ID of 40002c00112b on a workstation that boots from a file server, enter:
DEVICE=TCRPLAHI.EXE 40002c00112b

LAN SUPPORT WITH NETWARE

Follow these steps if the workstation is attached to a network running NetWare v2.1x, v3.1x or v4.x and requires the LAN Support protocol. A brief overview of the procedures for using DOS ODI and IPX-linkable workstation drivers are shown below. For more information, consult your NetWare or LAN Support documentation.

DOS ODI WORKSTATION DRIVER

STEP	ACTION
1	Create or edit a CONFIG.SYS file for the workstation as shown in this chapter. Then create or edit an AUTOEXEC.BAT file for the workstation that includes the commands in the order shown below: LSL LANSUP IPXODI NETX (or VLM) LSL.COM, LANSUP.COM, IPXODI.COM, and the workstation shell (NETX.COM or VLM.EXE) ship with NetWare.

STEP	ACTION
2	If the workstation requires driver information in a NET.CFG file (for example, to specify the adapter slot number), make sure NET.CFG resides in the same directory as the files in Step 1 above. An example partial NET.CFG is shown below, specifying that the TC4046 is installed in Slot 3:

**LINK DRIVER LANSUP
SLOT 3**

NOTE

If you already have a NET.CFG file that references the Thomas-Conrad DOS ODI workstation driver TCTOKSH.COM, you can use the same NET.CFG file as long as you search for the statement **LINK DRIVER TCTOKSH** and replace "TCTOKSH" with "LANSUP".

IPX-LINKABLE WORKSTATION DRIVER

STEP	ACTION
1	Use the WSGEN (for NetWare v2.22 and up) or SHGEN (for NetWare v2.1x) program to load and configure the driver, creating IPX.COM.
2	When you are prompted by WSGEN or SHGEN to select an adapter driver, choose an IBM PC LAN or LAN Support-compatible driver, such as the IBM LAN Support Program Driver . <i>Do not select a Thomas-Conrad adapter driver.</i>

BANYAN VINES

After creating a CONFIG.SYS file as described earlier in this chapter, follow the instructions below to use the Thomas-Conrad token ring adapter in a Banyan® VINES® workstation. If you are creating a boot diskette, copy BAN.EXE (the file created by this procedure), CONFIG.SYS, TOKUIBAN.COM, and all other necessary files to the diskette's root directory.

STEP	ACTION
1	Start the PCCONFIG program. From the PCCONFIG menu, select Network Card Settings .
2	A list of VINES-supported adapters is displayed. Select IBM Token Ring (TOKREUI/LAN Support Program) . A listing of adapter hardware options is displayed. Choose the settings that you selected on the adapter.
3	Press <F10> to save your selections and return to the PCCONFIG menu. Select Login Environment Settings .
4	Select Default Communications Driver , then choose IBM Token Ring (TOKREUI/LAN Support Program) .
5	Press <F10> until you exit from PCCONFIG. Follow the instructions on your screen to reboot your computer.
6	After your computer restarts, run the BAN.EXE program (created by this procedure), which connects your workstation to the VINES file server.

APPENDIX A

NETWARE SERVER

CUSTOM STATISTICS COUNTERS

This appendix lists the custom statistics counters compiled by Thomas-Conrad token ring NetWare v4.x server driver. To view the custom statistics counters, first load MONITOR.NLM at the server console or access MONITOR remotely through the RCONSOLE program.

Once MONITOR has loaded, select **LAN Information** from the MONITOR main menu, then choose a Thomas-Conrad server driver. The statistics listed in this appendix appear under the **Custom Statistics** heading.

CUSTOM STATISTICS DESCRIPTIONS

Thomas-Conrad's Custom Statistics are listed below in the order they appear in MONITOR. Because every node in a token ring network receives every frame, including error indicators, some of the statistics recorded by the server driver could have originated anywhere on the network. The *Specific to this adapter?* entry indicates whether the error was generated by the server adapter or could have occurred elsewhere on the network.

- If the *Specific to this adapter?* entry is **Yes**, the error indicates a **problem with the server adapter**. You should run Ring Tools on that adapter as described in Chapter 4 of this Guide.
- If the *Specific to this adapter?* entry is **No**, the error cannot be **isolated to the server adapter**. Use management software, such as Thomas-Conrad's Sectra Token Ring Manager for DOS, to locate the source of the error. If errors can be traced to a Thomas-Conrad token ring adapter, you should remove that station from the network and run Ring Tools as described in Chapter 4 of this Guide.

Last Adapter Check Code

Definition: Not an incrementing counter. A diagnostic code appears in this field, indicating the token ring controller has detected a serious problem with the adapter.

Use: Problem determination

Specific to this adapter?: Yes.

Possible Causes/Remedies: This type of error can close the adapter and halt the network. Write down the code number and run Ring Tools on the server adapter immediately, as described in Chapter 4. If you call Thomas-Conrad Technical Support, be sure to identify the error code and any Ring Tools error messages.

Lost Synch with Adapter

Definition: The driver temporarily lost the ability to receive network packets, probably due to heavy traffic.

Use: Load determination.

Specific to this adapter?: Yes.

Error threshold: Counter rapidly incrementing for short periods.

Possible Causes/Remedies: If these errors persist, you should upgrade the adapter's onboard RAM.

Signal Loss

Definition: The number of times the network signal was lost.

Use: Problem determination.

Specific to this adapter?: Yes.

Error threshold: One or more.

Possible Causes/Remedies: This error indicates a serious cable fault, such as a cable disconnection. Check the cable connections at the adapter and the MAU port it is attached to; make sure the connectors are attached snugly.

Hard Error

Definition: The number of beacon frames the adapter detects. Hard errors (which cause beacon frames) indicate serious problems on the network, and can disable the network.

Use: Problem determination.

Specific to this adapter?: No.

Error threshold: Counter rapidly incrementing for short periods.

Possible Causes/Remedies: Beacon frames indicate there are serious problems on the network, such as an adapter set for the wrong ring speed attempting to insert into the network, cable breaks, or serious adapter problems. You can use management software, such as Sectra Token Ring Manager for DOS or LANalyzer for DOS or Windows, to determine the reason for the error and its source.

Lobe Media Fault - CLOSED

Definition: This counter increments every time the adapter detects an open or short circuit in the cable between the adapter and the MAU it is attached to. This error causes the adapter to close, although the server driver will immediately attempt to reinsert into the ring.

Use: Problem determination.

Specific to this adapter?: Yes.

Error threshold: Counter rapidly incrementing for short periods.

Possible Causes/Remedies: This error occurs when the adapter is attempting to insert into the ring, and indicates the adapter cannot transmit frames to itself. The most common cause is a faulty cable, incorrect media selection, or bad cable connection. Check the cable at the adapter and the MAU port it is attached to; make sure the connectors are attached snugly.

Auto Removal Error - CLOSED

Definition: The number of times the adapter failed the lobe media test after beaconing reconfiguration and removal. This error causes the adapter to close, although the server driver will immediately repeat the removal/reinsertion process.

Use: Problem determination.

Specific to this adapter?: Yes.

Error threshold: Counter rapidly incrementing for short periods.

Possible Causes/Remedies: Auto-removal is part of the beacon recovery process, in which two nodes that mark the boundary of a fault domain attempt to verify their operation by removing themselves from the network and attempting a lobe media test. (A fault domain consists of two nodes between which beaconing, or hard errors, originate.) If an adapter fails this test, it indicates serious problems with the adapter or cabling. Check the cabling at the adapter and the MAU port it is attached to; make sure connectors are attached snugly.

Remove-Received - CLOSED

Definition: The number of times the adapter receives a MAC "Remove" frame. This error causes the adapter to close, although the server driver will immediately reinsert into the ring if the driver was loaded with the REINSERT parameter. If the server driver was loaded without the REINSERT parameter, the adapter will close, halting the network.

Use: Problem determination.

Specific to this adapter?: Yes.

Error threshold: (see Definition)

Possible Causes/Remedies: MAC "Remove" frames can be issued by network management software (such as Sectra Token Ring Manager for DOS or LANalyzer) in the event of user-defined error conditions. The LAN administrator should review the error threshold settings in management software to determine the nature of the problem.

Receive Congestion

Definition: This counter increments every time the adapter receives a packet but has insufficient onboard memory to store it.

Use: Network load determination, Problem determination.

Specific to this adapter?: Yes.

Error Threshold: Counter rapidly incrementing for short periods.

Possible Causes/Remedies:

Cause	Remedy
Overloaded network	Divide the network to reduce traffic, or increase the amount of adapter onboard RAM using the instructions in Chapter 3.
A network that has exceeded the server's capacity to process network data	Divide the network to reduce traffic or increase the amount of adapter onboard RAM using the instructions in Chapter 3.
When all of the following are true: you unloaded the server driver, left the computer powered on, and kept the adapter physically attached to the network	Hard-reset the machine or power it off.

APPENDIX B

REMOTE BOOTING A NETWARE WORKSTATION

This Appendix contains information on setting up a workstation to remote boot from a NetWare v2.x, v3.x or v4.x file server. This information is intended for experienced network administrators who have sufficient rights on the file server to create files and users (if necessary), and to run the DOSGEN program. You should consult your Novell documentation for specific information not found here.

REMOTE BOOTING

The procedure that allows a workstation to boot from a file server, rather than from a local disk, is called "remote booting". Workstations attached to NetWare networks can remote boot in one of the two ways shown below. More information about each is contained in a separate section in this appendix.

- Using the Remote Program Load (RPL) protocol, a method that implements a booting procedure similar to that first implemented by IBM. In order to use the RPL protocol, the adapter must have a TC9245 RPL Remote Reset ROM installed, and must be attached to a NetWare v2.x, v3.x or v4.x server driver that supports RPL booting.
- Using a NetWare-specific protocol, which is compatible with all versions of NetWare. In order to use this method, the TC4046 adapter must have a TC9145 Remote Reset ROM installed.

The TC9145 and TC9245 Remote Reset ROMs are available from Thomas-Conrad. Instructions for installing and enabling a Remote Reset ROM are found in Chapter 3.

NOTE

Currently, remote booting is supported for DOS-based workstations only. You cannot remote boot an OS/2-based workstation.

USING THE TC9245 (RPL PROTOCOL) BOOT ROM

Take the actions shown below to set up the file server and the workstation:

FILE SERVERS RUNNING NETWARE v3.x AND UP

STEP	ACTION
1	Obtain RPL.NLM (v4.05 or later) and RBOOT.RPL. If the server runs NetWare v3.11, you must obtain these files from Novell (or a Novell-authorized reseller) and see the next step. If the server runs NetWare v3.12 or later, the files were shipped with NetWare and were copied to the appropriate directories during the installation or upgrade process; skip the next step.
2	If the file server runs NetWare v3.11, copy RPL.NLM to the SYS:SYSTEM directory of the file server the workstation will remote boot from, and copy RBOOT.RPL to the file server's SYS:LOGIN directory.
3	Load a NetWare v4.x-compatible server driver and bind it to a protocol. The Thomas-Conrad NetWare server driver, TCTOKH.LAN, is NetWare v4.x-compatible (see Chapter 6 for more information). If the file server has another vendor's adapter installed, consult that vendor for more information.
4	Load RPL.NLM on the file server the workstation will remote boot from, and bind it to the server driver. Instructions for loading and binding RPL.NLM to the Thomas-Conrad NetWare server driver are located at the end of Chapter 6.

FILE SERVERS RUNNING NETWARE v2.x

NetWare v2.x environments do not allow booting of workstations with two different types of RPL ROMs, such as the TC9245 and an IBM RPL ROM, on the same network segment. This is true because these ROMs use different loaders (TOKEN.RPL for IBM and RBOOT.RPL for the TC9245). If this is the case with your network, use a TC9145 (NetWare-specific) ROM on the Thomas-Conrad adapter instead of the TC9245 RPL ROM.

STEP	ACTION
1	Obtain RPL.VP1 and RBOOT.RPL from Novell and copy both to the SYS:SYSTEM directory of the file server the workstation will remote boot from.
2	Generate the server driver (NET\$OS.EXE or NET\$OS.EX1). The server driver must support the use of AppleTalk® Phase 2 frames. The Thomas-Conrad NetWare v2.x server driver supports these frames, but does not ship on the current driver diskette. You can obtain this driver in one of the following ways: <ul style="list-style-type: none"><input type="checkbox"/> From Thomas-Conrad driver diskette v4.00 or v5.00.<input type="checkbox"/> From CompuServe. Enter GO TCCFORUM at any CompuServe ! prompt.<input type="checkbox"/> From the bulletin board. The telephone number is (512) 836-8012; 1200 bps - 9600 bps; v.32 and MNP Level 5; 8 data bits, 1 stop bit, no parity.
3	Run the RPCONFIG.COM utility to configure RBOOT.RPL for use with RPL.VP1.
4	Load RPL.VP1 on the file server.

RUNNING DOSGEN TO SET UP THE WORKSTATION

STEP	ACTION
1	Create a boot image file, using DOSGEN, for each workstation that will boot from the file server. Then create or edit BOOTCONF.SYS (if needed for customized boot image files); this file resides in the server's SYS:LOGIN directory. Guidelines for creating boot image files are found in the next steps.
2a	<i>(If the workstation uses the IPX-linkable driver):</i> Generate the driver (IPX.COM) using the Novell WSGEN or SHGEN programs. This driver does not currently ship on the Thomas-Conrad driver diskette, but you can obtain it from the bulletin board the same way as you obtain the NetWare 286 server driver (see Step 2 on the previous page). Copy IPX.COM, along with the workstation AUTOEXEC.BAT and CONFIG.SYS files (if any) to the workstation's boot diskette and run DOSGEN.
2b	<i>(If the workstation uses the DOS ODI driver):</i> Create an AUTOEXEC.BAT file and a NET.CFG file for each workstation and copy them to the workstations' boot diskette before running DOSGEN. More information about NET.CFG files can be found in Chapter 7.

Example AUTOEXEC.BAT:

```
LSL
TCTOKSH
IPXODI
NETX (or VLM)
```

NOTE

If the workstation uses VLM.EXE as its shell, also make sure all appropriate .VLM files reside on the boot diskette before running DOSGEN.

STEP	ACTION
2c	<i>(If the workstation uses LAN Support drivers):</i> LAN Support drivers can be ordered free of charge using the instructions at the end of Chapter 1. After you have obtained the drivers, create AUTOEXEC.BAT, CONFIG.SYS and NET.CFG files for the workstation similar to the ones shown below. A list of parameters that can be used with LAN Support drivers is found in Chapter 11.

Copy all appropriate files to the root directory of the workstation's boot diskette before running DOSGEN.

Example CONFIG.SYS:

```
DEVICE=DXMA0MOD.SYS
DEVICE=TCC_CPI.EXE
DEVICE=TCRPLAHL.EXE
DEVICE=DXMT0MOD.SYS
```

Example AUTOEXEC.BAT. The commands *must* be entered in the order shown:

```
LSL
LANSUP
IPXODI
NETX (or VLM)
```

Example partial NET.CFG (other statements can be included, depending on the workstation or network requirements):

```
LINK DRIVER LANSUP
SLOT 3
```

NOTE

If the workstation uses VLM.EXE as its shell, also make sure all appropriate .VLM files reside on the boot diskette before running DOSGEN.

USING THE TC9145 (NETWARE-SPECIFIC) BOOT ROM

If you are using a TC9145 Remote Reset ROM to allow a workstation to boot from a NetWare file server, take the steps shown below to set up the workstation.

STEP	ACTION
1	<p>Create a boot image file, using DOSGEN, for each workstation that will boot from the file server. Then create or edit BOOTCONF.SYS (if needed for customized boot image files); this file resides in the server's SYS:LOGIN directory.</p> <p>Guidelines for creating boot image files are shown in the next steps.</p>
2a	<p>(If the workstation uses the IPX-linkable driver): Generate the driver (IPX.COM) using the Novell WSGEN or SHGEN programs. This driver does not currently ship on the Thomas-Conrad driver diskette, but you can obtain it in one of the following ways:</p> <ul style="list-style-type: none"><input type="checkbox"/> From Thomas-Conrad driver diskette v4.00 or v5.00.<input type="checkbox"/> From CompuServe. Enter GO TCCFORUM at any CompuServe ! prompt.<input type="checkbox"/> From the bulletin board. The telephone number is (512) 836-8012; 1200 bps - 9600 bps; v.32 and MNP Level 5; 8 data bits, 1 stop bit, no parity. <p>Copy IPX.COM, along with the workstation AUTOEXEC.BAT and CONFIG.SYS files (if any) to the workstation's boot diskette and run DOSGEN.</p>

STEP	ACTION
2b	<p>(If the workstation uses the DOS ODI driver): Copy RPLODI.COM, LSL.COM, IPXODI.COM, TCTOKSH.COM and the workstation shell to the boot diskette before running DOSGEN (all files except TCTOKSH.COM are provided with NetWare). Then create a NET.CFG file and an AUTOEXEC.BAT file for the workstation (see Chapter 7 for NET.CFG details and examples).</p>

An example AUTOEXEC.BAT appears below. The commands *must* be entered in the order shown:

```
LSL
RPLODI
TCTOKSH
IPXODI
NETX (or VLM)
```

NOTE

If the workstation uses VLM.EXE as its shell, also make sure all appropriate .VLM files reside on the boot diskette before running DOSGEN.

INDEX

—A—

About this guide 1-1
Adapter
 cabling
 cable types 5-1
 calculations 5-8 to 5-10
 guidelines 5-2
 tables 5-4 to 5-5
 components 3-2
 configuring
 adapter I/O address 3-11
 adapter interrupt level 3-12
 adapter ROM address 3-13
 arbitration level 3-12
 configuration routine 3-9
 copying ADF file 3-8
 disable bus-mastering 3-12
 fairness 3-12
 media options 3-3
 onboard RAM 3-4
 ring speed 3-11
 TC9245 3-10
 diagnostics 4-3 to 4-5
 drivers see Drivers
 features 1-2
 installing 3-7
 packaging 2-1
 settings see also Adapter, configuring
 TC9245 3-10
 using Ring Tools 4-3
 specifications 2-1
 status LEDs 4-6

Adapter Definition File 1-6, 3-8
ADF file 1-6, 3-8
 @0051.ADF 1-6, 3-8
Auto Removal Error - CLOSED A-4
AUTOEXEC.NCF 6-8, 6-15

—B—

BAN.EXE 11-6
Base I/O address see Configuring, adapter I/O address
BIND command 6-14
BOOTCONF.SYS B-4, B-6
Bus-mastering
 addressing 2-1
 disabling 3-12
 feature 1-2

—C—

Cabling guidelines
 calculations 5-8, 5-10
 example network 5-6
 ring length 5-2
 tables 5-4, 5-5
 worksheet 5-7, 5-11
CONFIG.TCC 11-2
Configuration routine
 exiting 3-14
 options 3-11, 3-13
 starting 3-9

Configuring
 adapter I/O address 3-11
 adapter interrupt level 3-12
 adapter ROM address 3-13
 arbitration level 3-12
 copying ADF file 3-8
 disable bus-mastering 3-12
 fairness 3-12
 media options 3-3
 onboard RAM 3-4
 ring speed 3-11
Copying ADF file 3-8

—D—

Diagnostics 4-3 to 4-5
Disable bus-mastering 3-12
Diskette structure 1-5
DOS Requester 7-2
DOSGEN B-1, B-4, B-5, B-6
Driver diskette
 structure 1-5
 version 1-3
 working copy 1-4
Drivers
 DOS ODI workstation
 conserving memory 7-10
 INSTALL program 7-2 to 7-4
 loading the driver 7-10
 multiple protocols 7-12
 NET.CFG 7-4, 7-5, 7-6, 7-8, 7-9, 7-11, 7-12
 NET.CFG examples 7-7
 STARTNET.BAT 7-4
 TCP/IP protocol 7-11
 unloading 7-10, 7-13
 workstation shell 7-9, 7-10, 7-13

IBM LAN Server
 installing 10-2
 remote booting 10-2, 11-1
LAN Support
 configuring 11-3, 11-5
 parameters 11-4, 11-5
 remote booting 11-1
 requesting 1-6
Microsoft LAN Manager
 examples 9-5 to 9-6
 installing 9-2
 parameters 9-3 to 9-4
 PROTOCOL.INI file 9-3 to 9-4
 remote booting 9-1
 source-routing 9-1
NetWare 286
 obtaining B-3, B-6
NetWare Requester for OS/2
 editing CONFIG.SYS 8-2
 loading 8-3
 NET.CFG 8-3
NetWare server
 custom statistics description A-1
 examples 6-15 to 6-17
 parameters 6-8 to 6-10
OS/2 Requester see Drivers, NetWare Requester for OS/2
other NDIS-based systems compatibility 10-1
remote booting
 IBM LAN Server 10-2, 11-1
 LAN Manager 9-1
 LAN Support 11-1
 NetWare 7-1
Windows for Workgroups v3.11 10-3 to 10-4
DXMAID.EXE 10-2

—E—

EAGLEMAC.BIN 9-1, 10-1

—F—

Features 1-2
Frame Type see TOKEN-RING and TOKEN-RING_SNAP

—H—

Hard Error A-3

—I—

IEEE
 802.2 1-1
 802.5 1-1
INSTALL.NLM 6-2
Installing
 adapter 3-7
 onboard RAM 3-4
 Remote Reset ROM 3-6
IPXODI.COM 7-9, 7-10
IRQ see Configuring, adapter interrupt level

—L—

LAN Support drivers
 Banyan VINES 11-6
 list 11-2
 loading 11-7
 NetWare v2.1x to v4.0x 11-5
 requesting 1-6, 11-1
LANalyzer
 DOS ODI driver 7-1
Last Adapter Check Code A-2
LEDs 4-6

LINK DRIVER

 LANSUP 11-5
 TCCTOK 8-3
 TCTOKSH 7-4, 7-5, 7-6, 7-7, 7-12
LLCPOLL 6-8, 6-10, 9-1, 10-1
LOAD command 6-8
Lobe Media Fault - CLOSED A-3
LSL.COM 7-8
LSLENH.NLM 6-3, 6-4, 6-12

—M—

Media
 connector pinouts 3-3
 options 3-3
Microsoft LAN Manager
 PROTOCOL.INI file 9-3 to 9-4
 SETUP program 9-2
MONITOR.NLM 6-5, A-1
MSM.NLM 6-3, 6-4, 6-11
MSM31X.NLM 6-3, 6-4, 6-11, 6-12

—N—

NET.CFG 7-8
 DOS ODI 7-4, 7-5, 7-9, 7-11, 7-12, B-4, B-7
 examples 7-4, 7-7
 parameters 7-6
 LAN Support 11-5
 OS/2 Requester 8-3
NetWare server
 BIND command 6-14
 example LOAD commands 6-11 to 6-12
 LOAD and BIND examples 6-15 to 6-17
 LOAD command 6-8
 RPL support 6-18
 support modules

copying to server 6-4
to 6-7
loading 6-4 to 6-7
location 6-3
replacing 6-4
unloading 6-5
UNBIND command 6-17
UNLOAD command 6-17
v3.11 SFT III 6-2

NetWare SFT III 6-1, 6-2, 6-3,
6-5, 6-6

—O—

ODINSUP
DOS ODI driver 7-1
OS/2 Requester 8-1
Onboard RAM
options 3-4
specifications 2-2

—P—

PATCHMAN.NLM 6-3
PCCONFIG 11-6
Pinouts
media connector 3-3
PROTOCOL.INI 9-3 to 9-4
examples 9-5 to 9-6

—R—

RAM
options 3-4
specifications 2-2
RBOOT.RPL B-2, B-3
RCONSOLE A-1
Receive Congestion A-5
Reference Diskette see
Configuring, copying ADF
file

Remote booting
IBM LAN Server 10-2,
11-1
LAN Manager 9-1
LAN Support 11-1
NetWare 7-1
description B-1
TC9145 B-6 to B-8
TC9245 B-2 to B-5

Remote Reset ROM
installing 3-6
settings see Configuring,
adapter ROM address
TC9145 3-6
TC9245 settings 3-10

Remove-Received - CLOSED
A-4

Ring length 5-2
Ring Tools
adapter settings option 4-3
diagnostic tests 4-4
diagnostics option 4-3
options 4-2
starting 4-1

RPCONFIG.COM B-3
RPL.NLM 6-18, B-2
RPL.VP1 B-3
RPLODI.COM B-7

—S—

SECTRATR.NLM 6-1
SFT III 6-1, 6-2, 6-3, 6-4, 6-5,
6-6
Signal Loss A-2
Specifications 2-1
adapter 2-1
RAM upgrade 2-2
SPX 7-10
STARTNET.BAT 7-4

STARTUP.NCF
editing 6-2
Statistics (server)
description A-1
list
Auto Removal Error -
CLOSED A-4
Hard Error A-3
Last Adapter Check
Code A-2
Lobe Media Fault -
CLOSED A-3
Receive Congestion A-
5
Remove-Received -
CLOSED A-4
Signal Loss A-2
Status LEDs 4-6
Support modules
copying to server 6-4 to
6-7
loading 6-4 to 6-7
location 6-3
replacing 6-4
unloading 6-5

—T—

TCC_AH.EXE 11-2, 11-3
TCC_CPLEXE 11-2, 11-3,
11-4
TCCTOK.SYS 8-1, 8-2, 8-3
TCPIP.NLM 6-13
TCRPLAH.EXE 11-2, 11-3
TCTOKH.LAN 1-1, 6-1, 6-3, 6-
8, 6-11, 6-12, 6-13, 6-15, 6-
16, 6-17, B-2
TCTOKSH.COM 7-4, 7-5, 7-6,
7-7, 7-8, 7-9, 7-11, 7-12,
7-13, B-4, B-7
TOKEN-RING 6-8, 6-9, 6-13,
7-3, 7-4, 7-5, 7-6, 7-7, 7-10,
7-12, 7-13
TOKEN-RING_SNAP 6-8, 6-9,
6-11, 6-12, 6-13, 6-15,

6-16, 6-17, 7-5, 7-6, 7-7,
7-11, 7-12
TOKENSM.NLM 6-3, 6-4
TOKUIBAN.COM 11-6

—U—

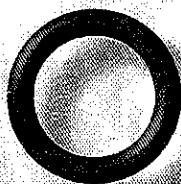
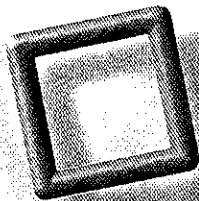
UNBIND command 6-17
UNLOAD command 6-17

—V—

VLM 7-4, 7-10, 7-13

—W—

Windows for Workgroups v3.11
10-3 to 10-4



THOMAS • CONRAD®
CORPORATION

1908-R Kramer Lane · Austin, Texas 78758

U.S.A.	(800) 332-8683	International	(512) 836-1935
Canada	(800) 654-3822	CompuServe®	GO TCCFORUM
Europe	(49) 211-5048781	BBS	(512) 836-8012

TECHNICAL SUPPORT (800) 334-4112

