3Com® Router 5000 Family
Installation Guide

Router 5012 (3C13701)
Router 5232 (3C13751)
Router 5682 (3C13701)
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ABOUT THIS GUIDE

This guide provides all the information you need to install and configure the 3Com® 5000 Router.

The guide is intended for use by network administrators who are responsible for installing and setting up network equipment; consequently, it assumes a basic working knowledge of LANs (Local Area Networks).

Before You Start
This section contains information about the documents and CD-ROM that accompany your Router 5000.

Release Notes
The Release Notes provide important information about the current software release, including new features, modifications, and known problems. You should read the Release Notes before installing the router in your network.

If the information in the Release Notes differ from the information in this guide, follow the instructions in the Release Notes.

Organization of the Manual
The 3Com® Router 5000 Family Installation Guide consists of the following chapters:

- **Overview**—Provides a brief overview of the main features of the Router 5000 Family.
- **System Specifications**—Provides system descriptions and LED information.
- **Installation Preparation**—Provides environmental requirements, ESD information and tool and meter information.
- **Startup and Configuration**—Provides instructions on how to set up the configuration environment, and power up and configure the router.

Conventions
Table 1 and lists conventions that are used throughout this guide.

Table 1 Notice Icons

<table>
<thead>
<tr>
<th>Icon</th>
<th>Notice Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Information note" /></td>
<td>Information note</td>
<td>Information that describes important features or instructions.</td>
</tr>
<tr>
<td><img src="image" alt="Caution" /></td>
<td>Caution</td>
<td>Information that alerts you to potential loss of data or potential damage to an application, system, or device.</td>
</tr>
<tr>
<td><img src="image" alt="Warning" /></td>
<td>Warning</td>
<td>Information that alerts you to potential personal injury.</td>
</tr>
</tbody>
</table>
In addition to this guide, the 3Com® Router 5000/6000 Family documentation set includes the following:

- **3Com® Router 5000 Getting Started Guide**
  This guide provides information that enables you to start and configure the router. It is supplied in PDF format on the CD-ROM that accompanies the router.

- **3Com® Router 6000 Getting Started Guide**
  This guide provides information that enables you to start and configure the router. It is supplied in PDF format on the CD-ROM that accompanies the router.

- **3Com® Router 6000 Installation Guide**
  This guide describes how to install the Router 6000 system. It is supplied in PDF format on the CD-ROM that accompanies the router.

- **3Com® Router 5000/6000 Configuration Guide**
  This guide contains information on the features supported by your router and how they can be used to optimize your network. It is supplied in PDF format on the CD-ROM that accompanies the router.

- **3Com® Router 5000/6000 Quick Reference Guide**
  This guide contains:
  - a list of the features supported by the router.
  - a summary of the command line interface commands for the router. This guide is also available under the Help button on the web interface.

- **3Com® Router 5000/6000 Command Reference Guide**
  This guide provides detailed information about the web interface and command line interface that enable you to manage the router. It is supplied in PDF format on the CD-ROM that accompanies the router.

- **The3Com® Router 5000/6000 Family Module Guide**
  This manual provides information about the Smart Interface Cards (SICs), Multi-Functional Interface Modules (MIMs), and Flexible Interface Cards (FICs) associated with this release.

Most user guides are available in Adobe Acrobat Reader Portable Document Format (PDF) or HTML on the 3Com World Wide Web site:

[http://www.3com.com/](http://www.3com.com/)
OVERVIEW

Introduction

3Com 5000 Routers are intended for use on enterprise-level networks. Depending on the network size, 3Com 5000 Routers can either be core routers on small and medium enterprise networks, or access routers for network branches on some large-sized enterprise networks. Therefore, 3Com 5000 Routers are suitable for the application on the carrier-level networks, such as telecom management networks and billing networks. 3Com 5000 Routers adopt modular design and provide multiple optional MIMs (Multifunctional Interface Modules) and SICs (Smart Interface Cards). In addition they provide two host types: AC-powered and DC-powered.

3Com 5000 Routers adopt high speed PowerPC microprocessor and the network operation system platform developed by 3Com Corporation. Besides the benefit of simple configuration, the router provides rich network security features, and supports dumb terminal access, SNA (Systems Network Architecture)/DLSw (Data-Link Switching), IP multicast, ATM, MPLS and abundant QoS (Quality of Service) features. Thereby, 3Com 5000 Routers can operate together with other 3Com series routers and Ethernet switches to provide overall end-to-end network solutions for clients in industries such as telecommunication, ISP, finance, taxation, public security, and transportation, medium-and-large-sized enterprises.

3Com 5000 Routers provide the following features:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High-Performance Processor</strong></td>
<td>3Com 5000 Routers use high-performance processors to process all the integrated interface data. All the performance indices, such as packet processing capacity, maximum traffic on interfaces, delay, frame drop rate, restoration period due to overloading of the system and system reset period, can meet users’ requirements.</td>
</tr>
<tr>
<td><strong>Multiple Interface Card/Interface Module Options</strong></td>
<td>3Com 5000 Routers provide SIC slots and MIM slot, where you can install various types of SICs and MIMs. The available interfaces include synchronous/asynchronous serial interface, asynchronous serial interface, T1/CT1/PRI interface, E1/CE1/PRI interface, BRI S/T and U interfaces, Ethernet interface (including FE/GE, electrical interface and fiber interface), ADSL/G.SHDSL interface, ATM 25M/155M interface, and so on. SICs or MIMs can be changed or extended as needed. Thereby, the investment that has been made can be protected to the maximum degree.</td>
</tr>
<tr>
<td><strong>Multiple Channels of Asynchronous Serial Interface Access</strong></td>
<td>• Connected to PSTN (Public Switched Telephone Network) via the asynchronous serial interface, the router can work as a small Internet access server. • With an analog Modem interface card, the router can be directly connected to PSTN to serve as a small access server.</td>
</tr>
<tr>
<td><strong>Ethernet Access Solution</strong></td>
<td>By extending SICs and MIMs, 3Com 5000 Routers can provide multiple forms of Ethernet interfaces, such as optical/electrical interface, 10/100/1000Mbps interface. Thereby, the networking capability of the router can be significantly improved.</td>
</tr>
</tbody>
</table>
**Voice Capabilities**

3Com 5000 Routers support multiple voice interface modules, which can provide such interfaces as FXO/FXS/E&M, E1VI, T1VI. The FXS/FXO/E&M interface can connect common phone sets, fax machines and private branch exchanges (PBXs); the CE1/PRI or CT1/PRI interface can connect the E1 or T1 interface of switches, as well as communicating with the gatekeeper (GK). With high-speed CPU and digital signal processing (DSP) technology, 3Com 5000 Routers can provide voice over IP (VoIP) services with high quality voice. They can drive down the cost of long distance communications between main office and branches in enterprise deployment.

**xDSL /MPLS Features**

xDSL is a simple but highly-efficient broadband technology that achieves the maximum data transmission capacity over existing copper wiring by using the digital code modulation technology. The ADSL/ADSL-I/G.SHDSL module for 3Com 5000 Routers allows the medium-to-small-sized enterprises to access the Internet over DSLAM equipment via PSTN.

MPLS, a combination of IP and ATM technologies, replaces the traffic identified by IP header with a short and length-fixed label, based on which a router makes the forwarding decision. It can provide faster forwarding speed, get support from IP routed protocols, and control protocols, thus satisfying the requirements that various new applications put on the network. MPLS VPN is a VPN technology that implements the interconnection of private networks via Label Switched Paths (LSPs). As LSP is a tunnel across the public network on its own, MPLS has an inherent advantage in terms of VPN implementation. 3Com 5000 Routers usually act as Label Edge Routers (LERs) to implement service classification, label distribution, encapsulation, and multi-label peel-off by connecting an MPLS domain to a non-MPLS domain or connecting MPLS domains of different service providers.

**Data Security**

- Supports ID authentication protocols, including PAP (Password Authentication Protocol), CHAP (Challenge Handshake Authentication Protocol), RADIUS (Remote Authentication Dial in User Service), TACACS+.
- Implements firewall to prevent invasions from external networks.
- Supports VPN (Virtual Private Network, including GRE, L2TP) and provides IPSec (IP Security) and IKE (Internet Key Exchange) technologies. Hence, the security of your private network in the Internet environment can be guaranteed.
- Provides backup solutions based on the backup center technology.

**Online Software Upgrade**

512 KB Boot ROM and 32 MB Flash memory provides adequate physical carrier to upgrade the software online, add new features, and extend new functions according to market demands.

**Chassis**

3Com 5000 Router adopts integrated structure design. It performs excellently on heat dissipation, EMC (Electromagnetic Compatibility) and safety.
### Types of SICs

3Com 5000 Router Family provides two SIC slots which can accept the following types of SICs for this release:

<table>
<thead>
<tr>
<th>Voice Interface Card</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Router 1-port FXS SIC card (3C13725)</td>
</tr>
<tr>
<td>■ Router 2-port FXS SIC card (3C13726)</td>
</tr>
<tr>
<td>■ Router 1-port FXO SIC card (3C13727)</td>
</tr>
<tr>
<td>■ Router 2-port FXO SIC card (3C13728)</td>
</tr>
</tbody>
</table>

### Types of MIMs

3Com 5000 Router Family modular routers provide MIM slots for this release and support the following MIMs:

<table>
<thead>
<tr>
<th>Voice Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Router 2-port FXS MIM module (3C13780)</td>
</tr>
<tr>
<td>■ Router 2-port FXO MIM module (3C13782)</td>
</tr>
<tr>
<td>■ Router 2-port E&amp;M MIM module (3C13784)</td>
</tr>
<tr>
<td>■ Router 4-port FXS MIM module (3C13781)</td>
</tr>
<tr>
<td>■ Router 4-port FXO MIM module (3C13783)</td>
</tr>
<tr>
<td>■ Router 4-port E&amp;M module (3C13785)</td>
</tr>
<tr>
<td>■ Router 1-port E1 Voice MIM module (3C13786)</td>
</tr>
<tr>
<td>■ Router 1-port T1 Voice MIM module (3C13787)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Encryption Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Router NDEC2 Encryption Accelerator MIM (3CR13773-75)</td>
</tr>
</tbody>
</table>
3Com Router
Router 5012

**Appearance**

*Figure 1* Front view of 3Com Router 5012

- 1) Power
- 2) SYSTEM
- 3) SLOT1
- 4) SLOT2
- 5) SLOT3
- 6) WAN
- 7) LAN

*Figure 2* Rear view of 3Com Router 5012

- 1) Power switch
- 2) Power socket
- 3) Grounding screw
- 4) Fixed interface (WAN)
- 5) Console port (CON)
- 6) Auxiliary port (AUX)
- 7) Fixed Ethernet interface (LAN)
- 8) MIM slot 1
- 9) SIC slot 2
- 10) SIC slot 3
Panel LEDs

Eight LEDs are provided on 3Com Router 5012. Their meaning is explained in the following table:

<table>
<thead>
<tr>
<th>LED</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER</td>
<td>System power LED: OFF means power is off, ON means power is on.</td>
</tr>
<tr>
<td>SYSTEM</td>
<td>Hardware system operating LED. Blinking indicates that the system is in normal operation. Steady ON or OFF means that the system is in abnormal operation.</td>
</tr>
<tr>
<td>SLOT1</td>
<td>MIM LED. ON indicates that the interface module operates normally. OFF indicates that no module is installed in the slot or the module cannot operate properly.</td>
</tr>
<tr>
<td>SLOT2</td>
<td>SIC LED. ON indicates that the interface card operates normally. OFF indicates that no interface card is installed in the slot or the interface card cannot operate properly.</td>
</tr>
<tr>
<td>SLOT3</td>
<td>SIC LED. ON indicates that the interface card operates normally. OFF indicates that no interface card is installed in the slot or the interface card cannot operate properly.</td>
</tr>
<tr>
<td>WAN</td>
<td>Fixed synchronous/asyncronous serial interface LED: Show the status of data transceiving on the serial interface. OFF means that no data is being transceived. Blinking means that data is being transceived.</td>
</tr>
<tr>
<td>LAN</td>
<td>Fixed Ethernet interface LED: Shows the status of data transmission on the fixed Ethernet interface. OFF means that no data is being transceived. Blinking means that data is being transceived.</td>
</tr>
</tbody>
</table>

System Description

<table>
<thead>
<tr>
<th>Item</th>
<th>5012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slot</td>
<td>Two SIC slots</td>
</tr>
<tr>
<td></td>
<td>One MIM slot</td>
</tr>
<tr>
<td>Fixed interface</td>
<td>One 10/100 Mbps Ethernet interface</td>
</tr>
<tr>
<td></td>
<td>One WAN interface</td>
</tr>
<tr>
<td></td>
<td>One AUX port</td>
</tr>
<tr>
<td></td>
<td>One console port</td>
</tr>
<tr>
<td>CPU</td>
<td>MPC8241 200 MHz</td>
</tr>
<tr>
<td>Boot ROM</td>
<td>512 KB</td>
</tr>
<tr>
<td>SDRAM</td>
<td>128 MB</td>
</tr>
<tr>
<td>Flash memory</td>
<td>32 MB</td>
</tr>
<tr>
<td>Size (H x W x D)</td>
<td>44.4 x 442 x 315 mm (1.7 x 17.4 x 12.4 in.)</td>
</tr>
<tr>
<td>Weight</td>
<td>6 kg (13 lb)</td>
</tr>
<tr>
<td>Input voltage</td>
<td>AC Rated voltage range: 100 to 240 VAC, 50 or 60 Hz Max voltage range: 85 to 264 VAC, 47 to 63 Hz</td>
</tr>
<tr>
<td></td>
<td>DC Rated voltage range: -48 to -60 VDC Max voltage range: -40 to -75 VDC</td>
</tr>
<tr>
<td>System power consumption</td>
<td>60 W</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0 to 40°C (32°F to 104°F)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>5% to 90%</td>
</tr>
</tbody>
</table>
**SDRAM (synchronous dynamic random-access memory):** As the primary memory, stores data for communication with CPU during system operation.

**Flash memory:** As the primary file storage media, stores application programs, anomaly information, configuration file.

**Boot ROM:** Stores Bootstrap program.

---

**3Com Router 5232**

**Appearance**

Figure 3  Front view of 3Com Router 5232

![Front view of 3Com Router 5232](image)

1) POWER 2) SYSTEM
3) AUX 4) CON
5) SLOT1−3 (READY/ACTIVE) 6) LAN (READY/ACTIVE)

Figure 4  Rear view of 3Com Router 5232

![Rear view of 3Com Router 5232](image)

1) Power switch 2) Power socket
3) Grounding screw 4) Fixed LAN interface (LAN0)
5) Fixed WAN interface (WAN0) 6) MIM SLOT1
7) MIM SLOT2 8) MIM SLOT3

**Panel LEDs**

10 LEDs are provided on the 3Com Router 5232. Their meaning is explained in the following table:

<table>
<thead>
<tr>
<th>LED</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER</td>
<td>System power LED: OFF means power is off, ON means power is on.</td>
</tr>
<tr>
<td>SYSTEM</td>
<td>Hardware status LED: Blinking means the system runs normally. ON/OFF means the system is abnormal.</td>
</tr>
<tr>
<td>READY</td>
<td>Module status LED: ON means the module in corresponding slot runs normally. OFF means the module runs abnormally or no module is installed.</td>
</tr>
</tbody>
</table>
CHAPTER 2: SYSTEM SPECIFICATIONS

SDRAM (synchronous dynamic random-access memory): As the primary memory, stores data for communication with CPU during system operation.

Flash memory: As the primary file storage media, stores application programs, anomaly information, configuration file.

Boot ROM: Stores Bootstrap program.

Table 4  LEDS of 3Com Router 5232

<table>
<thead>
<tr>
<th>LED</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTIVE</td>
<td>Blinking means data is being transceived by the module in the corresponding slot. OFF means no data is being transceived.</td>
</tr>
<tr>
<td>1–3</td>
<td>Indicating the slot number.</td>
</tr>
<tr>
<td>LAN</td>
<td>Ethernet interface LED: Green means the interface is normal. Blinking yellow means data is being transceived over the Ethernet.</td>
</tr>
</tbody>
</table>

Table 5  System description of 3Com Router 5232

<table>
<thead>
<tr>
<th>Item</th>
<th>5232</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed interface</td>
<td>One AUX port</td>
</tr>
<tr>
<td></td>
<td>One console port</td>
</tr>
<tr>
<td></td>
<td>One LAN port</td>
</tr>
<tr>
<td>Slot</td>
<td>3</td>
</tr>
<tr>
<td>CPU</td>
<td>MPC 8245 300 MHz</td>
</tr>
<tr>
<td>NVRAM</td>
<td>128 KB</td>
</tr>
<tr>
<td>Boot ROM</td>
<td>512 KB</td>
</tr>
<tr>
<td>SDRAM</td>
<td>256 MB</td>
</tr>
<tr>
<td>Flash</td>
<td>32 MB</td>
</tr>
<tr>
<td>Size (H x W x D)</td>
<td>44.4 x 442 x 413 mm (1.7 x 17.4 x 12.4 in.)</td>
</tr>
<tr>
<td>Weight</td>
<td>8 kg (17.6 lb)</td>
</tr>
<tr>
<td>Input voltage</td>
<td></td>
</tr>
<tr>
<td>AC</td>
<td>Rated voltage range: 100 to 240 VAC, 50 or 60 Hz</td>
</tr>
<tr>
<td></td>
<td>Max. voltage range: 85 to 270 VAC, 50 or 60 Hz</td>
</tr>
<tr>
<td>DC</td>
<td>Rated voltage range: -48 to -60 VDC</td>
</tr>
<tr>
<td></td>
<td>Max. voltage range: -36 to -72 VDC</td>
</tr>
<tr>
<td>System power consumption</td>
<td>80 W</td>
</tr>
<tr>
<td>Operation temperature</td>
<td>0 to 40°C (32°F to 104°F)</td>
</tr>
<tr>
<td>Relative humidity (noncondensing)</td>
<td>5% to 90%</td>
</tr>
</tbody>
</table>
Appearance

**Figure 5** Front view of 3Com Router 5682

1) POWER  
2) SYSTEM  
3) AUX  
4) CON  
5) SLOT0~7 (READY/ACTIVE)

**Figure 6** Rear view of 3Com Router 5682

1) Power switch  
2) Power socket  
3) Grounding screw  
4) MIM SLOT1  
5) MIM SLOT0  
6) MIM SLOT2  
7) MIM SLOT3  
8) MIM SLOT4  
9) MIM SLOT5  
10) MIM SLOT6  
11) MIM SLOT7
Panel LEDs

18 LEDs are provided on 3Com Router 5682. Their meaning is explained in the following table:

**Table 6** LEDs of 3Com Router 5682

<table>
<thead>
<tr>
<th>LED</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER</td>
<td>System power LED: OFF means power is off. ON means power is on. As for the router with AC/DC power supply, OFF means it is not powered on, ON means it is powered on. As for the router with RPS (3Com Router 5682), POWER lights when RPS works normally, POWER blinks when only one power supply fails; POWER is OFF when both power supplies fail.</td>
</tr>
<tr>
<td>SYSTEM</td>
<td>Hardware status LED: Blinking means system is normal. Always on/off means system is abnormal.</td>
</tr>
<tr>
<td>READY</td>
<td>Module LED. ON means the module of the corresponding slot is working normally. OFF means the module is abnormal or means no module is installed in the corresponding slot.</td>
</tr>
<tr>
<td>ACTIVE</td>
<td>Blinking means data is being transceived by the module on the corresponding slot. OFF means no data is being transceived by the module in the corresponding slot.</td>
</tr>
<tr>
<td>0–7</td>
<td>The corresponding slot number.</td>
</tr>
</tbody>
</table>

System Description

**Table 7** System description of 3Com Router 5682

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slot</td>
<td>8</td>
</tr>
<tr>
<td>CPU</td>
<td>MPC8245 300 MHz</td>
</tr>
<tr>
<td>NVRAM</td>
<td>128 KB</td>
</tr>
<tr>
<td>Boot ROM</td>
<td>512 KB</td>
</tr>
<tr>
<td>SDRAM</td>
<td>256 MB</td>
</tr>
<tr>
<td>Flash</td>
<td>32 MB</td>
</tr>
<tr>
<td>Size (H x W x D)</td>
<td>88.2 x 442 x 413 mm (3.5 x 17.4 x 16.3 in.)</td>
</tr>
<tr>
<td>Weight</td>
<td>14 kg (31 lb)</td>
</tr>
<tr>
<td>AC Input voltage</td>
<td>Rated voltage range: 100 to 240 VAC, 50 or 60 Hz</td>
</tr>
<tr>
<td></td>
<td>Max. voltage range: 85 to 270 VAC, 50 or 60 Hz</td>
</tr>
<tr>
<td>DC Input voltage</td>
<td>Rated voltage range: -48 to -60 VDC</td>
</tr>
<tr>
<td></td>
<td>Max. voltage range: -36 to -72 VDC</td>
</tr>
<tr>
<td>System power consumption</td>
<td>120 W</td>
</tr>
<tr>
<td>Operation temperature</td>
<td>0 to 40°C (32°F to 104°F)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>5% to 90%</td>
</tr>
</tbody>
</table>
INSTALLATION PREPARATION

Requirements on Environment

3Com 5000 Routers must be used indoors. To ensure the normal operation and prolong their service life, the following requirements for installation site must be met.

Requirements on Temperature/Humidity

Certain requirements on temperature and humidity in the equipment room shall be met. If the relative humidity is too high, the insulation materials in it will deteriorate easily or even lead to electric leakage. Sometimes this will result in change to the mechanical performance of the materials and rusting of the metal components. If the relative humidity is too low, the fastening screw will become loosen due to shrinkage of the isolation spacer. In an environment with dry climate, static electricity may be produced, putting the CMOS of the router to risk. High temperature is of the greatest risk: for it will significantly degrade the router's reliability, speed up aging process of the insulating materials, and shorten the service life of the router. The requirements on the temperature and humidity for 3Com 5000 Routers are shown in Table 8:

Table 8 Humidity requirements in the equipment room

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Relative humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°C to 40°C</td>
<td>5% to 90%, non-condensing</td>
</tr>
</tbody>
</table>

Requirements on Cleanness

Dust is harmful to the safe operation of the Router. Dust on the chassis may result in static absorption, thus causing poor contact of the metal connection components or points. Especially under the condition of low indoor humidity, dust is easier to be absorbed, which not only shortens the operational lifetime of the equipment, but also results in communication failure.

There should not be explosive, conductive, magnetic and corrosive dust in the equipment room where 3Com 5000 Routers are located, and the dust concentration should meet the following requirements:

Table 9 Limitation on dust content in equipment room

<table>
<thead>
<tr>
<th>Diameter (μm)</th>
<th>Concentration (particle/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>$1.4 \times 10^7$</td>
</tr>
<tr>
<td>1</td>
<td>$7 \times 10^5$</td>
</tr>
<tr>
<td>3</td>
<td>$2.4 \times 10^5$</td>
</tr>
<tr>
<td>5</td>
<td>$1.3 \times 10^5$</td>
</tr>
</tbody>
</table>
Besides the dust specifications, the equipment room of the Router should also meet the rigorous requirements for the content of salt, acid and sulfide. These harmful gases could accelerate the metal erosion and aging process of some parts. The specific limits of these harmful gases are given in the following table:

<table>
<thead>
<tr>
<th>Gas</th>
<th>Max. (mg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO₂</td>
<td>0.2</td>
</tr>
<tr>
<td>H₂S</td>
<td>0.006</td>
</tr>
<tr>
<td>NH₃</td>
<td>0.05</td>
</tr>
<tr>
<td>Cl₂</td>
<td>0.01</td>
</tr>
</tbody>
</table>

### Requirements on Electrostatic Discharge Prevention

Although many anti-static considerations have been given to 3Com 5000 Routers, damage to the router’s circuit or even the whole equipment may still happen when the static electricity exceeds the tolerance threshold.

In the communication network to which the routers are connected, static induction mainly comes from:

- External electric fields such as outdoor high voltage power line or thunder.
- Internal environment like flooring materials or the whole equipment structure.

Thus, the following should be considered to safeguard the equipment against the ESD:

- Make sure that the equipment and the floor are well grounded.
- Make sure that dust-proof measures are taken.
- Maintain an appropriate humidity and temperature.
- Wear an ESD-preventive wrist strap and uniform when contacting the circuit board.
- Place the uninstalled circuit board on the anti-static workbench, with its face upward, or put it into the static shielding bag.
- When observing or removing the uninstalled circuit board, please touch the edge of the circuit board, and avoid contacting the devices on it.

### Requirements on Electromagnetic Environment

The interference sources, no matter where they come from, affect the routers with capacitance coupling, inductance coupling, radiation of electromagnetic wave, common impedance (including the grounding system) or conducting line (power line, signal line and transmission line etc.).

So the following should be considered:

- Take effective measures to prevent the power system from being interfered with by the power grid system.
- Keep the router far away from the radio launcher, radar launcher, and high-frequency devices working in high current.
- Use electromagnetic shielding when necessary.
Precautions

Although many measures have been taken to protect 3Com 5000 Routers from lightning, if the lightning intensity exceeds a certain range, damage to the router may still happen. To protect the router from lightning better, the following should be considered:

■ Ensure the PGND wire of the chassis is well grounded.
■ Ensure the ground point of the socket of AC power supply is well grounded.
■ To enhance the lightning protection capability of the power supply, a lightning arrester could be installed at the input end of the power supply.
■ As for the signal line outdoors to which the interface modules of 3Com 5000 Routers are connected (such as an ISDN line, telephone line, E1/T1 line, etc.) a special lightning arrester should be installed at the input end of the signal line to enhance the lightning protection capability.

Requirements on Workbench

No matter whether you are to install the router in the cabinet or directly place it on the workbench, it is necessary to ensure that:

■ There is spacing reserved at the air inlet and outlet in the router so as to facilitate the radiation of the router cabinet.
■ The cabinet and workbench have good radiation systems.
■ The cabinet and workbench are firm enough to support the router and other installation accessories.
■ The cabinet and workbench are well grounded.

Precautions

Routers play a key role in data communications network. Please pay attention to the following:

WARNING: It indicates that this operation is incorrect and may seriously damage the router or endanger the operator. Please follow the correct operation procedures for sake of safety.

CAUTION: It indicates that during the installation and usage of the router, the operation needs attention. This operation is incorrect and may affect the normal operation of the router.

Please follow the following safety recommendations during the installation and use of the router:

■ Keep the router away from any wet place or heat source.
■ Make sure that the router is normally grounded.
■ Please wear an ESD-preventive wrist strap before installation, and make sure one end of it well contacts your skin, and the other end is well grounded.
■ Do not hot swap the interface modules of the router and any cable.
■ Correctly connect the interface cable for the router. Do not connect the telephone cable (including the ISDN cable) to the AUX port or the console port.
■ Always use Uninterrupted Power Supply (UPS).
3Com 5000 Routers are not shipped with installation tools. Assemble the following items prior to installation:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Phillips screwdriver</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Straight screwdriver</td>
</tr>
<tr>
<td></td>
<td>ESD-preventive wrist strap</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cables</th>
<th>PGND wire and power cord</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Console cable</td>
</tr>
<tr>
<td></td>
<td>Auxiliary cable</td>
</tr>
<tr>
<td></td>
<td>Ethernet cable</td>
</tr>
<tr>
<td></td>
<td>Interface cable for selected interface modules</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Devices</th>
<th>A Router, optional Multi-functional Interface Modules (MIMs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ethernet HUB or LAN Switch</td>
</tr>
<tr>
<td></td>
<td>CSU/DSU (channel service unit/data service unit) or other DCE devices</td>
</tr>
<tr>
<td></td>
<td>Console terminal (can be an ordinary PC)</td>
</tr>
<tr>
<td></td>
<td>Multimeter</td>
</tr>
</tbody>
</table>
CAUTION:

- You must follow this procedure to install the router. Otherwise, failed installation or device damage may result.
- Turn off the power switch and disconnect the power cord before installing interface cards and interface modules.
- Before installing the router, make sure that you have read Chapter 3 “Installation Preparation” of this manual carefully and verify that the requirements listed have been satisfied.
CHAPTER 4: INSTALLATION OF THE ROUTER

Installing the Router to the Specified Location

Install the router after you have completed the installation preparations. The installation of the router will be respectively described below according to the positions that it will be placed:

- Installing the router on a workbench
- Installing the router in a rack

Installing the Router on a Workbench

In many circumstances, you may not own a 19-inch standard rack. Usually, the router will be installed on a clean workbench. The operations are very simple, but still, you should be aware of the following items:

- Ensure the stability and well-grounding of the workbench.
- Leave a space of 10cm around the router for heat dissipation.
- Do not place heavy objects on the router.

Installing the Router in a Rack

3Com 5000 Routers are designed according to the dimensions of a 19-inch standard rack.

As shown in Figure 8, follow the steps below to install the router:

1. Check the grounding and stability of the rack. Use the screws to fix the mounting ears at both sides of the front panel or the rear panel of the router.
2. Put the router in a rack tray. Depending on the actual situation, slide the router along the chassis guides to an appropriate place.
3. Fasten the mounting ears with the recess screws to fix the router in the rack horizontally and firmly. The specifications of recess screws should satisfy the installation requirements and the surface of the screws should be anti-rust.

Figure 8  Installing the router in a rack

1) Mounting ear  2) Guide
**Connecting the PGND Wire**

**WARNING:** The normal connection of the PGND wire is an important guard against lightning and interference. Therefore, you must correctly connect the PGND wire before installing and using the device.

The power input end of 3Com 5000 Routers is connected to a noise filter. The neutral point of the noise filter is directly connected to the chassis and is called protection ground (PGND). The PGND wire must be well grounded, so as to safely conduct the faradism and leaky electricity to the earth ground, and thereby improve the capability of the whole device to guard against the electromagnetic interference. This PGND wire can also protect the router against the lightning caused by the connection with the external network lines, such as E1/T1 line, ISDN/PSTN line.

The grounding screw of 3Com 5000 Routers, which is marked with grounding label, is located near the AC power socket and its switch on the rear panel of the chassis, as shown in the following figure:

**Figure 9** Grounding screw of the router

![Diagram of grounding screw](Image)

(1) Power switch  
(2) AC input  
(3) Grounding terminal

Use a PGND wire to connect the screw to the earth ground, and the grounding resistance should not be greater than 5-ohm. Likewise, if the router is installed in a 19-inch standard rack, this rack is required to be grounded too.

**CAUTION:** When the router is in normal operation, it is required to be well grounded. Otherwise, the router cannot reliably avoid lightning, which may damage the router itself and even the peer device.
CHAPTER 4: INSTALLATION OF THE ROUTER

Connecting the Power Cord

Two types of 3Com 5000 Routers are provided:

- AC-powered
- DC-powered

Except for the input power, these two types have exactly the same features and functions.

Power Input and PGND

Table 11  Power input and PGND

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power input</td>
<td>Input voltage 12VDC, connected through the external power module to the 110/220V site power</td>
</tr>
<tr>
<td>PGND</td>
<td>Connected to the earth ground with ground cable</td>
</tr>
</tbody>
</table>

Table 12  Power input and PGND of other models

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power input</td>
<td>AC model: 100 to 240VAC power input socket</td>
</tr>
<tr>
<td></td>
<td>DC model: -48 to -60VDC power input socket</td>
</tr>
<tr>
<td>PGND</td>
<td>Connected to the earth ground with ground cable</td>
</tr>
</tbody>
</table>

Connecting AC Power Cord

AC Power Supply

Rated voltage range: 100 to 240VAC, 50 Hz to 60 Hz.

The following figure illustrates the partial external appearance of the power socket for a AC-powered router:

Figure 10  Partial external appearance of the power socket for the AC-powered router

(1) Power switch  (2) AC input receptacle

Recommended Power Outlet

A single-phase 3-core outlet with a neutral point or a multi-functional computer power socket is recommended. The neutral point of the outlet should be grounded reliably. Normally, the neutral point of the power supply system in a building is buried in the ground during the construction and cabling. Verify that the power supply for the building is grounded before connecting the AC power cord.
Connecting the Power Cord

**Connection of AC Power Cord**

1. Confirm that the PGND wire is correctly connected.
2. Make sure that the power switch for the router is placed in the OFF position. Then, connect one end of the power cord, which came with the device, to the power socket on the rear panel of the router chassis, and the other end to the AC power outlet.
3. Press the power switch of the router to the ON position.
4. Check that the Power LED on the front panel is on, which indicates that the connection of power cord is correct.

**Connecting DC Power Cord**

**DC Power Supply**

Rated voltage range: -48 to -60VDC

The following figures illustrate the partial external appearance of the power socket for a DC-powered router:

- DC input

**Figure 11** Partial external appearance of the DC power socket

![Figure 11]

(1) Power switch  (2) DC input receptacle

- DC input

**Figure 12** Partial external appearance of the DC power socket for a DC-powered router

![Figure 12]

(1) Power switch  (2) DC input receptacle
**Connection of the DC Power Cord**

The DC power cords consist of one –48V blue power cord and one black PGND wire that are bound together.

**Figure 13** DC power cord

1. Confirm that the PGND wire has been correctly connected.
2. Make sure that the power switch of the router is in the OFF position. Then, connect one end of the DC power cord (including DC PGND connector and –48V power cord connector), which is shipped with the router, to the power socket on the router chassis, and the other end (including DC PGND connector and –48V power cord connector) to the DC power supply.

**WARNING:** To avoid the connection errors, identify the label on the power cord when connecting the DC power cord.

3. Place the power switch of the router to the ON position.
4. Check that the POWER LED on the front panel of the router is ON, which indicates that the connection of the power cord is correct.
Connecting Console Terminal

**Introduction to Console Port**

3Com 5000 Router provides an RS232 asynchronous serial console (CON) port, through which configuration of the router can be performed. For the attributes of the console port, refer to Table 13.

**Table 13** Attributes of the console port

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector</td>
<td>RJ45</td>
</tr>
<tr>
<td>Interface standard</td>
<td>RS232</td>
</tr>
<tr>
<td>Baud rate</td>
<td>9600 bps (default) to 115200 bps</td>
</tr>
<tr>
<td>Function</td>
<td>Connecting with character terminal</td>
</tr>
<tr>
<td></td>
<td>Connecting with the serial interface of the local PC and operating the terminal emulator on the PC</td>
</tr>
<tr>
<td></td>
<td>Command line interface</td>
</tr>
</tbody>
</table>

**Console Cable**

Console cable is an 8-core shielded cable. One end is an RJ45 connector for CON of the router. The other end is a DB9 (female) connector. You can plug either of them into the serial port of the console terminal as needed.

Console cable is shown in the following figure:

**Figure 15** Console cable assembly

![Console Cable Assembly](image)

**Connection of the Console Cable**

When configuring the router through the terminal, follow the procedure below to connect the console cable:

1. Select a console terminal.
   
The console port can be either a standard ASCII terminal with an RS232 serial interface, or an ordinary PC, the latter being more widely used.

2. Connect the cable.
   
   Turn the power switch off, then connect the DB9 serial interface of the console cable to the PC, and connect the RJ45 interface to the console port of the router.
   
   After the connection and verification, power on the router. Normally, the startup information of the router displays on the console terminal. For more details, refer to Chapter 5.
Connecting Router to the LAN

Introduction to the Ethernet Interface

3Com 5000 Routers provide fixed 100BASE-TX FE interface(s). For the interface attributes, refer to Table 14.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector</td>
<td>RJ45</td>
</tr>
<tr>
<td>Interface</td>
<td>MDI</td>
</tr>
<tr>
<td>Operating mode</td>
<td>10/100Mbps auto-sensing</td>
</tr>
<tr>
<td></td>
<td>Full duplex/half duplex</td>
</tr>
</tbody>
</table>

Ethernet MDI (Media Dependent Interface) is the typical Ethernet interface on ordinary network cards. MDIX is crossover media-dependent interface, which is generally used on Hubs or LAN switches.

Ethernet Cable

100BASE-TX Ethernet interface usually uses Category-5 twisted pair as shown in the following figure:

Figure 16 Ethernet cable assembly

The Ethernet cables are classified into straight-through cable and crossover cable. They are introduced respectively as follows:

- The wire sequences of the twisted pair cable crimped by the RJ45 connectors at both ends of the cable are totally the same. It is used to connect the terminal equipment, such as PCs and routers to HUBs or LAN Switches.
- The wire sequences of the twisted pair wires crimped by the RJ45 connectors at both ends of the cable are different. It is used to connect the terminal equipment (such as PCs) to the terminal equipment (such as PCs). If needed, you can make such cables yourself.

**CAUTION:** When making the cable, use the shielded cable to ensure EMC (Electromagnetic Compatibility).

Connection of the Ethernet Cable

**CAUTION:**

- Prior to connection, please identify the mark on the interface in order to plug correctly.
- While connecting the Ethernet cable to a LAN Switch, plug the cable into the 10/100BASE-T interface marked with MDIX.
Follow the steps below to connect the Ethernet cable (taking LAN0/1 as an example):

1. While connecting the Router with a PC or a Router, please use the crossover cable, plug one end of the cable to an Ethernet interface of the Router, and plug another end to a PC or a Router. While connecting the Router with a Hub or a LAN Switch, please use the straight-through network cable, plug one end of the cable to an Ethernet interface of the Router, and plug another end to a HUB or LAN Switch.

2. Please check the LAN LED on front panel of the Router. ON means the link is connected.

Connecting Router to the WAN

3Com 5000 Routers provide multiple types of WAN interfaces, and the fixed WAN interfaces include an AUX port and a WAN interface (synchronous/asynchronous serial interface). This section describes the connection of the two interfaces.

Connecting the AUX Port to the Modem

Introduction to the AUX Port

As an RS232-compliant asynchronous serial interface, the AUX port can be used as the backup of other WAN interface in the dial-up mode. In the event that the console port fails, the AUX port can serve as a console port. For the attributes of the AUX port, please refer to Table 15.

Table 15  Attributes of the AUX port

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector</td>
<td>RJ45</td>
</tr>
<tr>
<td>Interface standard</td>
<td>RS232</td>
</tr>
<tr>
<td>Baud rate</td>
<td>300 bps to 115200 bps</td>
</tr>
<tr>
<td>Function</td>
<td>Modem dial-up, Backup</td>
</tr>
<tr>
<td></td>
<td>Operating as the console port when the CON fails</td>
</tr>
<tr>
<td>Protocol</td>
<td>PPP</td>
</tr>
<tr>
<td></td>
<td>SLIP</td>
</tr>
<tr>
<td></td>
<td>MP</td>
</tr>
</tbody>
</table>

AUX Cable

AUX cable is an 8-core shielded cable. One end of the cable is an RJ45 connector, which can be plugged into the AUX port of the device. The other end is furnished at the same time with a DB9 (male) connector and a DB25 (male) connector. Choose either one to plug into the serial port of the modem as needed.
Connection of the AUX cable

Follow these steps to connect the AUX cable:

1. Plug the RJ45 connector of the AUX cable into the AUX port of the router.
2. Connect the DB25 or DB9 connector of the AUX cable to the serial interface of the analog Modem.

In general, the AUX port is used for remote configuration or dial-up backup. The local Modem is first connected to the remote Modem through PSTN, and then to the remote device.
Connecting WAN Interface to DSU/CSU

**Introduction to the Synchronous/Asynchronous Serial Interface.** The fixed WAN interface of 3Com 5000 Routers is a synchronous/asynchronous serial interface, which is usually used for the connection with a WAN device, such as a Modem or CSU/DSU. It can operate in the synchronous/asynchronous mode or DTE/DCE mode, depending on the application. For the attributes of the interface, please refer to Table 16.

**Table 16** Attributes of the synchronous/asynchronous serial interface

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Synchronous</td>
</tr>
<tr>
<td>Connector type</td>
<td>DB28 or DB50</td>
</tr>
<tr>
<td>Interface standard and operating mode</td>
<td>V.24</td>
</tr>
<tr>
<td></td>
<td>DTE/DCE</td>
</tr>
<tr>
<td>Minimum baud rate (bps)</td>
<td>1200</td>
</tr>
<tr>
<td>Maximum baud rate (bps)</td>
<td>64K</td>
</tr>
<tr>
<td>Matching cable</td>
<td>V.24 (RS232) DTE cable</td>
</tr>
<tr>
<td></td>
<td>V.24 (RS232) DCE cable</td>
</tr>
<tr>
<td></td>
<td>V.35 DTE cable</td>
</tr>
<tr>
<td></td>
<td>V.35 DCE cable</td>
</tr>
<tr>
<td></td>
<td>X.21 DTE cable</td>
</tr>
<tr>
<td></td>
<td>X.21 DCE cable</td>
</tr>
<tr>
<td>Function</td>
<td>DDN leased line backup</td>
</tr>
<tr>
<td></td>
<td>Terminal access</td>
</tr>
<tr>
<td></td>
<td>Modem dial-up</td>
</tr>
<tr>
<td></td>
<td>Backup</td>
</tr>
<tr>
<td></td>
<td>Asynchronous lease line terminal access</td>
</tr>
<tr>
<td>Protocol</td>
<td>PPP</td>
</tr>
<tr>
<td></td>
<td>MP</td>
</tr>
<tr>
<td></td>
<td>LAPB</td>
</tr>
<tr>
<td></td>
<td>HDLC</td>
</tr>
<tr>
<td></td>
<td>X.25</td>
</tr>
<tr>
<td></td>
<td>Frame Relay</td>
</tr>
<tr>
<td></td>
<td>PPP</td>
</tr>
<tr>
<td></td>
<td>SLIP</td>
</tr>
<tr>
<td></td>
<td>MP</td>
</tr>
</tbody>
</table>

**Synchronous/asynchronous mode**

Synchronous/Asynchronous serial interface can work in either synchronous or asynchronous mode. Different signaling standards are supported in these two modes. V.35 and V.24 (RS232) support synchronous operating mode, while V.24 (RS232), support the asynchronous operating mode. The maximum transmission distance and baud rate of the signal vary with the operating mode.
CHAPTER 4: INSTALLATION OF THE ROUTER

CAUTION: The baud rate should not exceed 64kbps when the V.24 cable operates in synchronous mode.

- DTE and DCE

Synchronous serial interface can operate in both DTE and DCE mode. For two devices connected directly, one should operate in DTE mode, and the other should operate in DCE mode. The device at the DCE side provides a synchronous clock and specifies the transmission rate, while the device at the DTE side accepts the synchronous clock and communicates at the specified baud rate. Usually, the router serves as a DTE device. To determine whether the device connected to the router is a DTE or DCE, please refer to the manual that came with the device. Also the following table will be helpful in identifying DTE and DCE. Usually, the PC or Router serves as a DTE device and the Modem, Multiplexer or CSU/DSU serves as a DCE device.

In general, the asynchronous serial interface is connected to an external Modem or a Terminal Adapter (TA) to work as the dial-up interface. In this case, it is unnecessary to determine whether the device is DTE or DCE, and just choose an appropriate baud rate.

**Synchronous/Asynchronous Serial Interface Cable**  The WAN interface of the router is a DB50 receptacle. Proper connection cable needs to be selected for the protocol applied. By far, nine types of synchronous/asynchronous serial interface cables are available. One end of all the nine types of cables is DB50 connector, the other end (network end) varies with the cable type, which can be:

- V.24 (RS232) DTE cable: DB25 (male) connector
- V.24 (RS232) DCE cable: DB25 (female) connector
- V.35 DTE cable: 34PIN (male) connector
- V.35 DCE cable: 34PIN (female) connector
- X.21 DTE cable: DB15 (male) connector
- X.21 DCE cable: DB15 (female) connector

<table>
<thead>
<tr>
<th>Baud rate (bps)</th>
<th>V.24 (RS232)</th>
<th>V.35</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum transmission distance (m)</td>
<td>Baud rate (bps)</td>
</tr>
<tr>
<td>2400</td>
<td>60</td>
<td>2400</td>
</tr>
<tr>
<td>4800</td>
<td>60</td>
<td>4800</td>
</tr>
<tr>
<td>9600</td>
<td>30</td>
<td>9600</td>
</tr>
<tr>
<td>19200</td>
<td>30</td>
<td>19200</td>
</tr>
<tr>
<td>38400</td>
<td>20</td>
<td>38400</td>
</tr>
<tr>
<td>64000</td>
<td>20</td>
<td>64000</td>
</tr>
<tr>
<td>115200</td>
<td>10</td>
<td>64000</td>
</tr>
<tr>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

*Table 17: Transmission rate and transmission distance of V.24 (RS232)/V.35 cable*
The following figures show the cable assembly of all these types:

- **V.24 (RS232) DTE cable assembly**

  **Figure 18**  V.24 (RS232) DTE cable assembly

- **V.24 (RS232) DCE cable assembly**

  **Figure 19**  V.24 (RS232) DCE cable assembly
- V.35 DTE cable assembly

**Figure 20** V.35 DTE cable assembly

- V.35 DCE cable assembly

**Figure 21** V.35 DCE cable assembly
- X.21 DTE cable assembly

*Figure 22* X.21 DTE cable assembly

- X.21 DCE cable assembly

*Figure 23* X.21 DCE cable assembly

The synchronous/asynchronous series interface matches a DB28 connector, and current these types of synchronous/asynchronous series interface cables are supported:

- V.24 (RS232) DTE cable: DB25 (male) connector
- V.24 (RS232) DCE cable: DB25 (female) connector
- V.35 DTE: 34PIN (male) connector
- V.35 DCE: 34PIN (female) connector
- X.21 DTE: DB15 (male) connector
- X.21 DCE: DB15 (female) connector

The following figures show the cable assembly of all these types:

- V.24 DTE cable assembly

*Figure 24* V24 DTE cable assembly
- V.24 DCE cable assembly

**Figure 25** V.24 DCE cable assembly

- V.35 DTE cable assembly

**Figure 26** V.35 DTE cable assembly

- V.35 DCE cable assembly

**Figure 27** V.35 DCE cable assembly

- X.21 DTE cable assembly

**Figure 28** X.21 DTE cable assembly
Connecting Router to the WAN

- X.21 DCE cable assembly

**Figure 29** X.21 DCE cable assembly

---

**CAUTION:** The aforementioned cables are optional, so you have to order them when purchasing the router if needed.

**Connection of Synchronous/Asynchronous Serial Cable**  Follow the steps below to connect the synchronous/asynchronous cable (taking the connection from WAN to DSU/CSU as an example):

---

**CAUTION:** Do not hot swap the synchronous/asynchronous cable. Otherwise, the router or the connected remote equipment may be impaired.

1. Check that a proper synchronous/asynchronous cable is shipped with the router.
2. Plug the DB50 connector of the cable into the interface WAN on the router.
3. Connect the other end of the cable to the CSU/DSU device. If the WAN adopts dial-up line, connect the cable to the serial interface of the analog modem.

---

**Connecting E1 Interface to DSU/CSU**

**Introduction to the E1 Interface**  E1 interface, which stands for channelized CE1/PRI interface, is responsible for forwarding and processing E1 data flow, delivering CE1 access and implementing ISDN PRI function. Its attributes are listed in the following table:

---

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector type</td>
<td>DB15</td>
</tr>
<tr>
<td>Interface standard</td>
<td>G.703, G.704</td>
</tr>
<tr>
<td>Maximum baud rate</td>
<td>2.048Mbps</td>
</tr>
<tr>
<td>Matching cable</td>
<td>E1 75Ω unbalanced coax cable</td>
</tr>
<tr>
<td></td>
<td>E1 120Ω balanced coax cable</td>
</tr>
<tr>
<td></td>
<td>Coax connector, network interface connector, 75Ω–120Ω converter</td>
</tr>
<tr>
<td></td>
<td>(with BNC connector)</td>
</tr>
<tr>
<td>Operating mode</td>
<td>E1, CE1, ISDN PRI</td>
</tr>
<tr>
<td>Function</td>
<td>Backup</td>
</tr>
<tr>
<td></td>
<td>Terminal access</td>
</tr>
<tr>
<td></td>
<td>ISDN PRI</td>
</tr>
</tbody>
</table>
**E1 Interface Cable**  
E1 interface cable, which is G.703-compatible, may be 75Ω unbalanced coax cable or 120Ω balanced twisted pair cable.

- **75Ω unbalanced coax cable**

**Figure 30**  
E1 75Ω unbalanced coax cable

You can also choose to attach both ends with BNC connectors, for extending two 75Ω unbalanced coax cables.

- **120Ω balanced twisted pair cable**

The cable is attached with DB15 (male) connector for the router end, and with RJ45 connector for the network end. See the following figure:

**Figure 31**  
E1 120Ω balanced twisted pair cable

You can also choose to attach both ends with RJ45 connectors, for extending two 120Ω balanced twisted pair cables.

**E1 interface cable, coax connector assembly, network connector assembly and 75Ω-120Ω converter all are optional.**

**Impedance Inverter Switch**  
Impedance inverter switch is also available, through which you can choose the interface impedance value.

- Turn on the switch to change the interface impedance to 75Ω, and then you need to connect the 75Ω cable.
- Turn on the switch to change the interface impedance to 120Ω, and then you need to connect the 120Ω cable.
Connecting E1 Interface Cable

**CAUTION:**

- Examine the interface mark before connection to avoid cable mis-insertion and router damage.
- When the E1 interface cable is routed outdoors, you need use the special lightning protection unit at the input end to prevent possible damage.

1. Check the E1 cable type and choose correct impedance value of the E1 interface through the inverter switch.
2. Insert the DB15 connector into the E1 interface of the router.
3. Connect the other end to the right network devices.

- For 75Ω unbalanced coax cable

   Connect the cable in this way:

   If you choose only a single BNC connector, just connect the BNC connector to the peer device.

   If you choose two BNC connectors (for extending E1 interface cables), connect the BNC connector of the 75Ω unbalanced coax cable to a coax connector assembly, which is connected to a 75Ω E1 trunk cable. The 75Ω E1 trunk cable is then connected to the peer device.

   **CAUTION:** Connect the Tx end of the E1 interface cable to the Rx end of the peer unit, and Rx end of the E1 interface cable to the Tx end of the peer unit.

   **Figure 32** Extending two E1 75Ω unbalanced coax cables

If the peer device provides the 120Ω interface, you need to use 75Ω–120Ω converter or 120Ω cable.

- For 120Ω balanced twisted pair cable

  Connect the cable in this way:

  If you choose only a single RJ45 connector, just connect the RJ45 connector to the peer device.
If you choose two RJ45 connectors (for extending E1 interface cables), connect the RJ connector of the 120Ω balanced twisted pair cable to a network connector assembly, which is connected to a 120Ω E1 trunk cable. The 120Ω E1 trunk cable is then connected to the peer device.

**Figure 33** Extending E1 120Ω balanced twisted pair cable

4. Observe the status of the Link LED for the E1 interface. ON means that a link is present. OFF means that no link is present and you need to check the line.

### Connecting T1 Interface to DSU/CSU

**Introduction to the T1 Interface**

T1 interface, which stands for channelized CT1/PRI interface, is responsible for forwarding and processing T1 data flow, delivering CT1 access and implementing ISDN PRI function. Its attributes are listed in the following table:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector type</td>
<td>RJ45</td>
</tr>
<tr>
<td>Interface standard</td>
<td>G.703/T1 102, G.704</td>
</tr>
<tr>
<td>Maximum baud rate</td>
<td>1.544 Mbps</td>
</tr>
<tr>
<td>Matching cable</td>
<td>T1 cable (100Ω standard shielded cable)</td>
</tr>
<tr>
<td>Operating mode</td>
<td>T1, CT1, ISDN PRI</td>
</tr>
<tr>
<td>Function</td>
<td>Backup</td>
</tr>
<tr>
<td></td>
<td>Terminal access</td>
</tr>
<tr>
<td></td>
<td>ISDN</td>
</tr>
</tbody>
</table>

*For the T1 module, corresponding serial interface shall be created after you use the timeslot bundling command on the Controller T1 interface.*

**T1 Interface Cable**

T1 interface matches 100Ω standard shielded cable. See the following figure:

**Figure 34** Interface cable
You can also choose to use network connector assembly, for extending two T1 interface cables.

*T1 interface cable and network connector assembly are optional.*

**Connecting T1 Interface Cable**

**CAUTION:**

- Examine the interface mark before connection to avoid cable mis-insertion and router damage.
- When the T1 interface cable is routed outdoors, you need use the special lightning protection unit at the input end to prevent possible damage.

1. Insert one end of the T1 interface cable into the E1 interface of the router.
2. Insert the other end to the peer device.
   - If one cable is enough in length, insert the other end to the peer device.
   - If not, you need to extend the T1 interface cable with a network connector assembly as shown in the following figure:

**Figure 35** Extending two T1 interface cables

3. Observe the status of the Link LED for the T1 interface. ON means that a link is present. OFF means that no link is present and you need to check the line.
Connecting Router to a Voice Device

The optional interface cards/interface modules on 3Com 5000 Router also provides many types of voice interfaces.

Checking After the Installation

During the installation of the router, it is necessary to perform the following installation checks before powering on the router:

- Whether there is enough space around the router for heat-dissipation, and whether the workbench is stable enough.
- Whether the power supply that the power cord connects to is compliant with that required by the router.
- Whether the PGND wire of the router is correctly connected.
- Whether the router is correctly connected to other devices, such as the console terminal.

**CAUTION:** The check after installation is very important. The stability, grounding of the router, and power supply directly affects the operation of the router.
STARTUP AND CONFIGURATION OF THE ROUTER

Startup of the Router

You can only configure the router through the console port if it is the first time you use it.

Connecting the Router to a Console Terminal

To set up the local configuration environment, the RJ-45 connector of the console cable needs to be connected to the console port on the router, and the DB-25 or DB-9 connector to the serial interface of a PC.

Setting the Parameters for Console Terminal

Opening the Console Terminal and Setting Up a New Connection

If the configuration is performed through a PC, the terminal emulator (such as Terminal of Windows 3.1 and HyperTerminal of Windows 95/98/NT) should be run on the PC to set up a new connection. Enter a name for the new connection and click <OK>.

Figure 36 Opening the console terminal and setting up a new connection
Setting Terminal Parameters  Follow these steps to set the parameters of the Hyper Terminal in Windows98:

1 Select a connection port.

Select the serial interface to be connected in the [Connect using] box, as shown in Figure 37. Please note that the selected serial interface should be consistent with the actual serial interface connected by the console cable.

Figure 37  Setting the connection port in the local configuration
2 Set the serial interface parameters. As shown in Figure 38, in the properties dialog box of the serial interface, set the baud rate to 9600, data bit to 8, no parity check, stop bit to 1, and flow control to none. Then, click <OK> to return to the HyperTerminal window.

Figure 38 Setting serial interface parameters

3 Set HyperTerminal properties. Select [Properties\Port Settings] in the HyperTerminal to enter the properties setting window. Select the terminal emulation type to be VT100 or Auto detect, and click <OK> to return to the HyperTerminal window.

**Powering On the Router**

**Checking Before Power-On**

Check according to the following items before powering on the router.

- Whether the power cord and PGND wire are correctly connected.
- Whether the voltage of the power supply complies with the requirement of the router.
- Whether the console cable is correctly connected, whether the PC or terminal for configuration is open, and whether the settings are done.

**WARNING:** Before powering on the router, be aware of where the power supply switch to the router is located, so that the power supply can be disconnected quickly if an accident should occur.

**Powering On the Router**

- Turn on the site power.
- Turn on the power switch of the router.
CHAPTER 5: STARTUP AND CONFIGURATION OF THE ROUTER

Checking/Operating After Power-On

After the router is powered on, please perform the following inspection.

1. Whether the LEDs on the front panel are normal
   - In the process of the Power On Self Test (POST), the LEDs light in the following sequence: SLOT1 to 3 are ON first. Then, if SLOT 2 and 3 are ON, it means that the memory test is successful. If SLOT 1 and 2 are ON, it indicates the failure of the memory test.
   - For the status of the LEDs during normal operation after power-on, please refer to Chapter 2 “Startup and Configuration of the Router”.

2. Whether the console terminal display is normal

The startup interface on the console terminal can be seen after the router is powered on (please see "Startup Process" in this manual for reference).

After the startup (in other words, self-test), you are prompted to press <Enter>. When “<3Com>“ is displayed, you can proceed to configure the router.

Startup Process

3Com 5000 Routers use the same version of Boot ROM program.

After the startup of the router, Boot ROM program will be run first and the following system information will be displayed on the terminal screen:

```
The interfaces displayed on the terminal may vary slightly with different versions of Boot ROM.
```

```
Router start booting,(V2.00)
Starting at 0x1500000...
********************************************
*                                          *
*  3Com 5000 Routers Boot ROM, V9.13  *
*                                          *
********************************************
Testing memory...OK!
256M bytes SDRAM
32768k bytes flash memory
Hardware Version is MTR 1.0
CPLD Version is CPLD 1.0

Press Ctrl-B to enter Boot Menu
```

Press <Ctrl+B> and the system will enter the Boot menu. Otherwise, the system will enter the program decompression process.

```
After “3Com 5000 Router Boot ROM, V9.13” appears, “3Com start booting, (V2.00)” will disappear immediately.
```

```
The system enters the Boot menu only if <Ctrl+B> is pressed immediately (within three seconds) after the statement “Press Ctrl-B to Enter Boot Menu...” appears. Otherwise, you will enter the program decompression process. To re-enter the Boot menu during the decompression process, you need to reboot the router.
```
System is self-decompressing...........................................
OK!
System is starting...
Starting at 0x10000...
User interface Con 0 is available.
Press ENTER to get started.

Press <Enter> and the screen will display:

<3Com>

This prompt indicates that the router has entered the system view, and now the router can be configured.

---

**Configuration Fundamentals of the Router**

**Basic Configuration Steps**

1. Before configuring the router, the networking requirements should be made specific, which include networking purpose, the role of the router in the network, the division of subnets, WAN type and transmission medium, the network security policy and reliability.

2. Based on the above requirements, draw a clear and integrated networking diagram.

3. Configure the WAN interface of the router. First, configure the physical operating parameters (e.g., the operating mode of the serial interface, baud rate and synchronous clock) of the interface according to the transmission medium of the WAN. For the dial-up interface, you also need to configure DCC parameters. Then, configure the link layer protocol encapsulated on the interface and the related operating parameters according to the WAN type.

4. Configure the IP addresses or IPX network numbers of all the interfaces on the router according to the division of the subnets.

5. Configure the routes. If it is necessary to enable a dynamic routing protocol, configure the related operating parameters of the protocol.

6. If special security is required, perform the security configuration for the router.

7. If special reliability is required, perform the reliability configuration for the router.
Command Line Interface

Characteristics of the Command Line Interface

The command line interface of 3Com 5000 Routers provides a number of configuration commands, which can be used to configure and manage the router. The command line interface has the following characteristics:

- Performs the local configuration through CON port.
- Performs the local or remote configuration through `telnet` command, which can be used to directly log on and manage other routers.
- Users can enter `?` anytime to get online help.
- Provides network diagnostic tools, such as Tracert and Ping, to quickly diagnose the availability of the network.
- Provides all kinds of detailed debugging information to diagnose network faults.
- The command line interpreter adopts fuzzy search for the keywords of the command. If you enter the conflict-free keyword for a command, the command will be interpreted accordingly. For example, for a `display` command, you can just enter `dis`.

Command Line Interface

The command line interface of 3Com 5000 Routers provide plenty of configuration commands. Hierarchical user protection is adopted to prevent unauthorized users from illegal invading. Each group corresponds to a view. These commands can be used to switch between different configuration views. In general, only certain commands can be executed under a particular view. But some common commands (such as `ping`, `display current-configuration`, `interface`) can be executed in all views.
### ROUTER MAINTENANCE

#### Software Maintenance

**Introduction**

The Router manages three types of files:

- Boot ROM image file used for booting the application at boot
- Application image file (main software)
- Configuration file

Software maintenance mainly involves these three types of files, including:

- Upgrading application and Boot ROM image through XMODEM
- Upgrading the application image through TFTP
- Uploading/downloading the application image and configuration file through FTP

3Com 5000 Routers are loaded initially. You may need to upgrade it and its corresponding Boot ROM image to accommodate new product features.

---

*Examine the current version of the application and Boot ROM program before software upgrade. For the association between the version and Boot ROM image, see the corresponding Release Notes.*
This section describes how to maintain the Boot ROM image using V9.13 as an example.

The entire Boot ROM image file in this section includes two segments: extended and basic. You can separately upgrade and back up the extended segment.

Boot Menu

Start the router; when the message “Press Ctrl-B to enter Boot Menu ...........” appears, press <Ctrl+B>. The console screen displays:

Please input bootrom password:

Enter the correct password (void by default) to have the system enter Boot Menu:

```
Boot Menu:
1:  Download application program with XMODEM
2:  Download application program with NET
3:  Set application file type
4:  Display applications in Flash
5:  Clear application super password
6:  Reset console authentication
7:  Start up and ignore configuration
8:  Enter debugging environment
9:  Boot Rom Operation Menu
   a:  Do not check the version of the software
   b:  Exit and reboot
Enter your choice(1-b):
```

These options are described in sequence as follows:

1. Download the application image with XMODEM. Refer to the subsection “Upgrading Software Through XMODEM” in this section.

2. Download the application image through Ethernet. Refer to the subsection “Upgrading the Application Image Through Ethernet” in this section. If you select this option, the following Net Port Download Menu appears:

```
Net Port Download Menu:
1:  Change Net Parameter
2:  Download From Net
3:  Exit to Main Menu
Enter your choice(1-3):
```

3. Set the type of the application image file to change the type of a boot file or order in which the boot files are selected.

The dual image function is available with the router. By default, the system defines and attempts to boot in order with three boot files: main, backup, and secure, provided they are available from Flash memory. If the router fails to boot with the secure boot file, it prompts the boot failure.
The following table gives default names and types of the boot files.

**Table 20  Default names and types of the boot files**

<table>
<thead>
<tr>
<th>Boot file</th>
<th>File name</th>
<th>File type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main boot file</td>
<td>main.bin</td>
<td>M</td>
</tr>
<tr>
<td>Backup boot file</td>
<td>backup.bin</td>
<td>B</td>
</tr>
<tr>
<td>Secure boot file</td>
<td>secure.bin</td>
<td>S</td>
</tr>
</tbody>
</table>

Note that:

The application images for system boot can be type M, B and S, but not type N/A. You can store them in Flash memory, but only one for each. For example, if an M+B file exists, it is impossible to have another M or B file. If you change the file type of another file to B, the M+B file becomes a type M file.

You can modify the file name of an application image in Flash memory using the command after it boots.

You cannot modify the file type of the type S application image file, but you can modify the file type of type M/B and N/A application image files in the Boot ROM menu or using commands after the application image boots.

Secure boot file is the last resort for system boot. You can download it in the Boot ROM menu and must name it secure.bin. However, you cannot modify this file or change the type of another file to S. If you change the name of the secure boot file with the `rename` command after the system boots, the file is removed from Flash memory. To use the secure boot file after that, you need to download it again.

Select <3> in Boot Menu. The console screen displays the following menu, provided four application image files have existed in Flash memory:

```
M=MAIN      B=BACKUP      S=SECURE
*************************************************************************
NO.   Name                      Size      Type        Time
1     main.bin               5988025      M           Oct/10/2002 10:10:10
2     backup.bin             5985198      B           Oct/10/2002 10:10:10
3     a.bin                   987491      N/A         Oct/10/2002 10:10:10
4     secure.bin             5988022      S           Oct/10/2002 10:10:10
*************************************************************************
*                          *
5      Exit to main menu
Enter your choice(1-5):    3
```

In this menu, select <3> for example to change the file type of a.bin. The console screen displays:

```
Set this file as:
1.   Main
2.   Backup
3.   Exit
Enter your choice(1-3):   1
```
To use a.bin as the main boot file, select <1> in this menu. Upon validation of the setting, the file type of the original main boot file changes to N/A. Now, the a.bin file is the first boot file.

4 Display applications in Flash memory.

Select <4> in Boot Menu. The console screen displays:

<table>
<thead>
<tr>
<th>NO.</th>
<th>Name</th>
<th>Size</th>
<th>Type</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>main.bin</td>
<td>5988025</td>
<td>N/A</td>
<td>Oct/10/2002 10:10:10</td>
</tr>
<tr>
<td>2</td>
<td>backup.bin</td>
<td>5985198</td>
<td>B</td>
<td>Oct/10/2002 10:10:10</td>
</tr>
<tr>
<td>3</td>
<td>a.bin</td>
<td>5987491</td>
<td>M</td>
<td>Oct/10/2002 10:10:10</td>
</tr>
<tr>
<td>4</td>
<td>s_system.bin</td>
<td>5988022</td>
<td>S</td>
<td>Oct/10/2002 10:10:10</td>
</tr>
</tbody>
</table>

Where, you can see that the type of a.bin is now M.

Press <Enter> to return to Boot Menu.

5 Clear the application super password.

Selecting this option allows you to access system view at the first reboot of the router after this option is selected. This, however, is a one-time operation. You must provide the super password at the next reboot.

6 Clear console authentication.

This option allows you to log in from the console port without authentication.

Select the option; exit and then restart the router. The screen displays “Login authentication ignored”, allowing you to log in from the console port without authentication.

Note that this is a one-time operation. It takes effect only at the first reboot after resetting console authentication is selected. At the next reboot, console authentication is required.

7 Start up and ignore configuration.

Select option 7. The system sets an Ignore flag to Flash memory and displays:

Flag set successfully.

Thus, empty configuration applies at reboot. The system removes the Ignore flag after its boot is completed.

In case you forget the password, you may select this option to have the router boot with the configuration file ignored. After accessing the system, you may change or delete the password. Note that if not saved, the modified configuration cannot survive a reboot. To have the router reboot with the new configuration, you must perform the save operation after completing configuration.
8 Enter debugging environment in case of faults.
9 Enter the Boot ROM operation menu.

Select <9> to enter Boot ROM Download Menu as follows for upgrade, backup, or recovery:

Boot ROM Download Menu:
1: Download Boot ROM with XModem
2: Download Extended Segment of Boot ROM with XModem
3: Restore Extended Segment of Boot ROM from FLASH
4: Backup Extended Segment of Boot ROM to FLASH
5: Exit to Main Menu
Enter your choice(1-5):

1 Ignore software version check for backward compatibility. The likelihood exists that your upgrade attempt fails even when you select the correct software version. If the system prompts “invalid version” in this case, you can select <a> from Main Menu to have the system skip version check during upgrade. This, however, works only once; the system checks software version all the same at reboot.

2 Select <b> to exit and reboot the router.

\textit{To enter Boot Menu, you must press \textit{<Ctrl+B>} within three seconds after the information “Press Ctrl-B to enter Boot Menu...” appears. Otherwise, the system starts decompressing images. To re-enter the menu after that, you must reboot the router.}

Upgrading Software Through XMODEM

When upgrading software through XMODEM, you can directly use the console port without building up another configuration environment.

\textbf{Upgrading the Application Image}

1 Enter Boot Menu (refer back to the subsection “Boot Menu” in this section), press <1> to select the XMODEM protocol for downloading the application image. The following download speeds are available with the router:

Please choose your download speed:
1: 9600 bps
2: 19200 bps
3: 38400 bps
4: 57600 bps
5: 115200 bps
6: Exit and reboot
Enter your choice(1-6):

2 Select an appropriate download speed, <5> for 115200 bps for example. The console screen displays:

Download speed is 115200 bps. Change the terminal's speed to 115200 bps, and select XModem protocol. Press ENTER key when ready.

3 Change the baud rate on the console terminal (see Figure 5-4) to the software download speed, 115200 bps in this example. After that, select [Dial-in/Disconnect] and then [Dial-in/Dialing] to disconnect and reconnect the terminal. Press <Enter> to start downloading. The console screen displays:

Please Select Program File
Downloading ... CCCCC
To validate the new baud rate set on the console terminal, you must disconnect and then reconnect the terminal emulation program.

4 Select [Transfer/Send file…] in the HyperTerminal window. The following window opens:

**Figure 39** Send File dialog box

![Send File dialog box](image)

5 In the displayed *Send file* dialog box, click <Browse…> to select the application image file to be downloaded, and select XMODEM for the Protocol field. Then click <Send>. The following interface appears:

6 After completing download, the system begins writing to Flash memory and upon its completion outputs the following information:

   Download completed.

   For an 3Com 5000 router, the system also prompts you to select file type upon completion of downloading.

   please select file to be saved as
   1. main application file
   2. backup application file
   3. secure application file
   4. cancel downloading
   Enter your choice(1-4):

   The system starts writing to Flash memory after you enter your choice and displays:

   Writing to flash memory...
   Please wait, it needs a long time. Please wait...
  ########################################################
   Writing FLASH Success.
   Please use 9600 bps. Press <ENTER> key to reboot the system.

   Restore the baud rate of the console terminal to 9600 bps as prompted, disconnect the terminal and dial again. Then, you can see the system boot banner.
Upgrading the Entire Boot ROM Image

1. Enter Boot Menu, and select <9> to enter Boot ROM Download Menu as follows:

   Boot ROM Download Menu:
   1: Download Boot ROM with XModem
   2: Download Extended Segment of Boot ROM with XModem
   3: Restore Extended Segment of Boot ROM from FLASH
   4: Backup Extended Segment of Boot ROM to FLASH
   5: Exit to Main Menu

   Enter your choice(1-5):

2. Select <1> in Boot ROM Download Menu to download the Boot ROM image through XMODEM. Multiple download speeds are available. The subsequent steps are the same as those described in the item “Upgrading the Application Image” in this subsection.

   CAUTION: Only upgrade the entire Boot ROM program when absolutely necessary and with the guidance of technical staff. There is no on-site recovery in the event of an upgrade failure.

Upgrading the Extended Segment of the Boot ROM Image

1. Enter Boot Menu, select <9> to enter Boot ROM Download Menu.

2. Select <2> in the menu to upgrade the extended segment of the Boot ROM image through XMODEM. Multiple speed options are available. The subsequent steps are the same as those described in the item “Upgrading the Application Image” in this subsection.

   CAUTION: This upgrade approach upgrades only a portion of the Boot ROM image, so you can make a second attempt once errors occur.

Backing Up and Restoring the Extended Segment of the Boot ROM Image

1. Back up the extended segment of the Boot ROM image to Flash memory
   a. Enter Boot Menu, select <9> to enter Boot ROM Download Menu.
   b. In Boot ROM Download Menu, select <4> to copy the current extended segment to Flash memory.

      Backup Extended Segment, are you sure?[Y/N]

   c. Enter <Y>. For a successful backup, the console screen displays:

      Writing to FLASH. Please wait...###

      Backup Boot ROM program to FLASH successed!

   d. When Boot ROM Download Menu appears again, select <5> to and reboot the router.

2. Restore the extended segment of the Boot ROM image from Flash memory

   In case faults occur to the extended segment or the upgrade is done inadvertently, take these steps to restore the extended segment of the Boot ROM image from Flash memory to the Boot ROM:

   a. Enter Boot Menu, select <9> to enter Boot ROM Download Menu.
   b. In Boot ROM Download Menu, select <3> to restore the extended segment from Flash memory.

      Restore Extended Segment, are you sure?[Y/N]
c Enter <Y>. The system starts restoring and, if successful, displays:

```
Writing to Boot ROM. Please wait...#
Restoring Boot ROM program succeeded!
```

d When Boot ROM Download Menu appears again, select <5> to exit and reboot the router.

### Upgrading the Application Image Through Ethernet

Upgrading the application image with NET is to download using an Ethernet interface. In this approach, the router is TFTP or FTP Client and needs connecting to TFTP or FTP Server using a fixed Ethernet interface.

⚠️ **CAUTION:** No TFTP/FTP Server is available with the 3Com 5000 Routers. You must install one yourself.

1. Start TFTP or FTP Server on the PC connected to the Ethernet interface on the router and set the path for getting the source file. Given FTP Server, you need to set user name and password in addition.

2. In Boot Menu, select <2> to enter Net Port Download Menu as follows:

   Net Port Download Menu:
   1: Change Net Parameter
   2: Download From Net
   3: Exit to Main Menu

   Enter your choice (1-3): 1

3. In Net Port Download Menu, select <1> for example to change the download parameters as follows:

   Change Boot Parameter:
   
   - '.' = clear field; '-' = go to previous field; ^D = quit
   
   boot device : fei0
   processor number : 0
   host name : 8040
   file name : M8240ram.arj
   inet on ethernet (e) : 169.254.10.10
   inet on backplane (b):
   host inet (h) : 169.254.10.11
   gateway inet (g) :
   user (u) : 8040
   ftp password (pw) (blank = use rsh):
   flags (f) : 0x0
   target name (tn) :
   startup script (s) :
   other (o) :

- When upgrading with TFTP, set these parameters:

  - file name: Name of the file to be downloaded
  - inet on ethernet (e): IP address of the Ethernet interface for downloading
  - host inet (h): IP address of TFTP Server
  - flags (f): 0x80

- When upgrading with FTP, set these parameters:

  - file name: Name of the file to be downloaded
  - inet on ethernet (e): IP address of the Ethernet interface for downloading
host inet (h) : IP address of FTP Server
user (u): User name, same as the one configured at FTP Server.
ftp password (pw) (blank = use rsh): Password, which must be consistent with that at FTP Server
flags (f): 0x0

After you configure these parameters, the system saves them automatically.

4 Press <Enter> to return to Net Port Download Menu, and there select <2>. The console screen displays:

```
boot device : fei
unit number : 0
processor number : 0
host name : 8040
file name : Q8040.BIN
inet on ethernet (e) : 10.110.27.235
host inet (h) : 10.110.27.231
user (u) : 8040
ftp password (pw) : 8040
flags (f) : 0x80
```

Attached TCP/IP interface to fei0.
Subnet Mask: 0xfffff800
Attaching network interface lo0... done.

Loading...
NET download completed...
read len = [04378489]
Please wait, it needs a long time
####################################################################
#########################################################################
###########################
Writing software File Succeeds!

Press <Enter> to reboot the system.

The router can serve as FTP Server when loading v 3.0. You can run FTP Client to upload or download the files of application image, Boot ROM image, and configuration.

---

**Required Tools**

Installation tools are not provided with the 3Com 5000 Routers. You must have the following tools available.

- Phillips screwdriver
- Flat-blade screwdriver
- ESD-preventive wrist strap
- Static shielding bag
Opening the Chassis Cover

Follow these steps to open the chassis cover:

1. Turn off the power switch of the router and remove the power cord.
2. Remove all interface cables from the rear panel. When doing this, note to retain the grounding wire.
3. Place the router on a flat surface, with its rear panel forward. Use the Phillips screwdriver to remove the four fastening screws from the rear panel.
4. Raise the chassis cover until its front edge is separated from the chassis bottom completely.
5. Pull the chassis cover towards you until the tab on the back edge is disengaged from the front panel, and put away the cover.

![Open the chassis cover](image)

Figure 40 Open the chassis cover

CAUTION:

- On a mounting screw of your router chassis, there is an anti-dismantle seal of 3Com Corporation. You must keep it in good condition when asking your sales agent for servicing. You can open the chassis yourself but with permission of your sales agent and must operate following the related rules. The company is not liable for any damage or consequence resulted from users' operation without permission.
- Do not replace the hardware unless necessary and under the guidance of technical staff.
- Ensure that no electricity is present before servicing the device to avoid bodily injuries and device damage.
- Wear an ESD-preventive wrist strap when servicing the device, making sure it has good skin-contact.
- Use the SDRAMs provided by 3Com Corporation only. Otherwise, anomalies might occur to the device.

Replacing the SDRAM

The storage media available with the router include:

- SDRAM: where the host program is running.
- Flash memory: stores the application and configuration files.
- Boot ROM: stores the Boot ROM program.
Hardware maintenance mainly involves SDRAM.

Follow this procedure to replace the SDRAM:

Figure 41  SDRAM card replacement process

SDRAMs are main board components that you can expand or upgrade as needed. Generally, you need to do that in the following situations:

- More memory is required for the upgraded application image, maintaining a large routing table, or processing memory-consuming tasks.
- The existing SDRAM is damaged.

You can see this banner at boot:

Router starts booting ... (V2.00)
******************************************************************************
*                                                                          *
* 3Com 5000 Routers Boot ROM, V9.13 *
*                                                                          *
******************************************************************************
Copyright(C) 1997-2003 by 3Com Corporation.
Testing memory...OK!
128M bytes DDR SDRAM
32768K bytes flash memory
Hardware Version is MTR 1.1
CPLD Version is CPLD 3.0
Press Ctrl-B to enter Boot Menu
Where, “128M bytes SDRAM” means that the router is installed with a 128 MB SDRAM.

There is a limit on the times that you can install the SDRAM.

Checking Position of the SDRAM

The following table describes the memory types and their requirements.

<table>
<thead>
<tr>
<th>Item</th>
<th>5009</th>
<th>5012A/5013/5014</th>
<th>5232</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory type</td>
<td>SDRAM</td>
<td>SDRAM</td>
<td>SDRAM</td>
</tr>
<tr>
<td>Acceptable maximum size of a single memory (MB)</td>
<td>128</td>
<td>256</td>
<td>128</td>
</tr>
<tr>
<td>Extension</td>
<td>Not extendable</td>
<td>Extendable to 256MB at the original memory slot</td>
<td>Extendable to 256MB at any or both of the memory slots</td>
</tr>
</tbody>
</table>

The following figure shows the position of the SDRAM on the 3Com Router.

Figure 42  Position of the SDRAM on the 3Com Router
The following figure shows the position of the SDRAM on the 3Com Router 5232.

Figure 43  Position of the SDRAM on the 3Com 5232

To ensure you can install the SDRAM correctly, there are two clips in the SDRAM slot matching two concave points in the SDRAM card.

Removing the SDRAM

1 Locate the position of the SDRAM card on the main board.
2 Press the locking spring clips at both sides of the SDRAM slot outward with appropriate strength to unseat the SDRAM.

Figure 44  Remove/install the SDRAM

3 Hold the SDRAM by its edges with your thumb and index finger and pull it out from the slot. Put the SDRAM into an anti-static bag to avoid ESD damage.

CAUTION: To avoid damage to the SDRAM:

- Hold the SDRAM by its edge and avoid touching the components on its surface.
- Use firm but not forced pressure when removing the SDRAM.
- Do not touch the components on the surface of the SDRAM with bare hands.
Installing the SDRAM
1. Locate the position of the SDRAM slot.
2. Take out a new SDRAM. Hold the SDRAM by its top edge and put it into the SDRAM slot in correct orientation.
3. Press the SDRAM down into the slot with appropriate pressure, and close the locking spring clips at both sides of the slot until the pins at both ends of the clip snap into the notches at both sides of the SDRAM.

Follow the same procedure to install another SDRAM card, if there is any.

Closing the Chassis Cover

**CAUTION:** Roll up all the cables inside the router and put them into the chassis before closing the chassis cover, preventing them from being pressed or cut off.
1. Place the router on a flat surface, with its rear panel forward.
2. Align the tabs on one edge of the cover to the bottom edge of the chassis.
3. Push the cover towards you until the tabs engage with the front panel of the chassis.
4. Put the whole cover onto the router base, until the tabs on the side edges of the cover engage with the side panels of the chassis bottom.

**Figure 45** Close the chassis cover

1) Chassis bottom 2) Chassis cover 3) Captive screw

5. Secure the chassis cover to the router base with the captive screw.
Troubleshooting of the Power System

Fault:
POWER LED is OFF or blinking.

Troubleshooting:

Check:

■ Whether the power switch of the router is turned on.
■ Whether the power supply switch is turned on.
■ Whether the power cord of the router is properly connected.
■ Whether the power supply matches the requirement of the router.

⚠️ CAUTION: Do not hot swap the power cord. After having checked the items above, if the POWER LED is still OFF, please contact the agent.

Troubleshooting of the Console Terminal

After the Power-On Self-Test (POST) of the router, if the system operates normally, the start-up information should be displayed on the console terminal. If the configuration system has some faults, the terminal may not display anything or may display only illegible characters.

Nothing Displays After POST

Fault:
After the POST of the router, the terminal does not display any information.

Troubleshooting:

1 Check:

■ Whether the power system is normal.
■ Whether the console cable is connected correctly.

2 If no problems are found after performing the above checks, it is likely to be the problem of the console cable or the terminal (e.g., the HyperTerminal) parameters. Please check the cable or the parameters.
Displays Illegible Characters After POST

Fault:
After the POST of the router, the console terminal displays illegible characters.

Troubleshooting:
Verify whether the terminal (e.g., the HyperTerminal) parameter settings are as follows:
Baud rate: 9600, Data bits: 8, Stop bit: 1, Parity: None, Flow control: None and Terminal emulation: VT100 If the parameter settings differ from the above values, please reconfigure.

Troubleshooting of SDRAM

Nothing Displays After POST

Fault:
After the POST of the router, despite the normal power system (the POWER LED is ON) and proper connection of the console cable, there is no display on the console terminal.

Troubleshooting:
If you are sure that the power system and configuration system have no faults, please contact the agent of 3Com Corporation Co., Ltd. With his consent, open the chassis to check whether the SDRAM has become loose. If that is the case, you may remove and reinstall the SDRAM. For the operation method, please refer to Section 6.2 “Hardware Maintenance” in this manual.

Repeated Reboots

Fault 1:
After the information “Now testing memory...” appears, the system restarts repeatedly.

Fault 2:
After displaying the information “System now is Starting ...”, the system restarts repeatedly, and sometimes gives a prompt message “Copied program error”.

Troubleshooting:
Generally, such faults are caused by the damage to SDRAM. If the SDRAM is seriously damaged, the problem will be found while testing the memory, and the system will reboot. If the SDRAM is slightly damaged, the problem will be found during the process of system starting, and the system will reboot, giving the prompt message “Copied program error”.

You can decide whether the SDRAM has fault by checking the LED status of the router. During the router’s POST, the SLOT1 to 3 LEDs and SERIAL0 LED will be ON first. In this case, if the SLOT1 and SLOT2 LEDs light, it can be concluded that the SDRAM test has failed.

If the SDRAM is damaged, replace it with a new one (before opening the chassis, please contact the agent of 3Com Corporation Co, Ltd. and get his permission to continue with the operation). For the operation method, please refer to Section 6.2 “Maintain the Hardware” in this manual.
Fault 1:
When upgrading the software using the TFTP approach, the system displays the following message:

Loading... tftpGet: Error occurred while transferring the file.
An Error Occurred!:tftp transfer failed: error 0x43
download error!!!
Something is wrong. Please check.

Troubleshooting:
The symptom described above means that the new software version has not been loaded. Fault isolation can be carried out from three aspects:

■ Check the TFTP server to see whether information can be sent. If not, the problem is likely to result from an incorrectly-configured TFTP server IP address. In this case, make sure that IP address of the TFTP server is the IP address of the network interface on the PC, to which the Ethernet interface is connected. (For the procedure of selecting an Ethernet interface for TFTP upgrade on 3Com 5000 Routers.

Run the `winipcfg` command and the system will prompt the IP address of the Ethernet interface.

■ If Windows prompts “The system detected conflict between the IP address xxxx and the system hardware address xxxx” in this case, it is very likely that the IP address of the TFTP server was incorrectly assigned to the upgrading Ethernet interface on the Router.

■ Check the TFTP server. If it prompts “The system cannot find the specified file”, check whether the path set on the TFTP server and the file name (including the extension) of the application software set on the Router are correct.

Upgrade the application software again after the problem is solved.

Fault 2:
When upgrading the software using the TFTP approach, and the system displays the following message:

Loading...
NET download completed...
read len = [05567609]

The downloaded software is not a valid version.
Please download the correct version.
Press <Enter> key when ready.

Troubleshooting:
3Com 5000 Routers should be loaded with different application software versions. The problem described above is likely to result from a mismatch between the application software version and the router model. In this case, contact your agent to obtain the correct software version and upgrade it again.
If the improper software has been loaded, the Router cannot start or work correctly. In this case, select XModem or TFTP mode in the boot menu to restore/upgrade the software version (FTP upgrade mode cannot be used here).

If similar symptoms present when upgrading the software with other approaches, solve the problem with reference to this example.

*The bar code labeled on the Router host and the MIM contains the relevant manufacturing and maintenance information. If you want to repair the device, inform your agent of the bar code on the problem device.*