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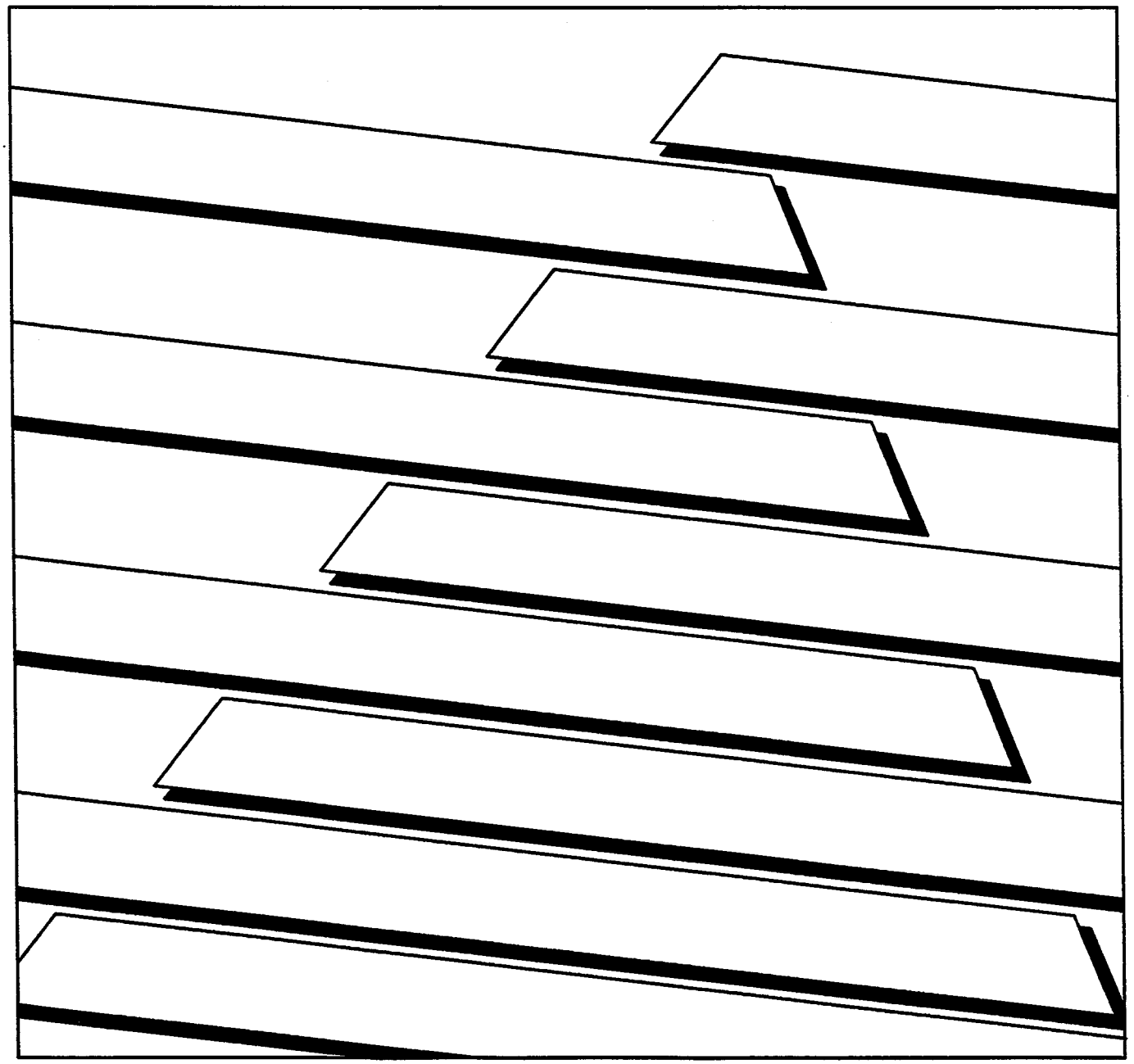
Find the *Rockwell / Allen-Bradley 1784-T35* at our website: *Click HERE*

ALLEN-BRADLEY

T35 Plant-floor Terminal

(Cat. No. 1784-T35/D, -T35/E)

User Manual



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Important User Information

Because of the variety of uses for this product and because of the differences between solid state products and electromechanical products, those responsible for applying and using this product must satisfy themselves as to the acceptability of each application and use of this product. For more information, refer to publication SGI–1.1 (Safety Guidelines For The Application, Installation and Maintenance of Solid State Control).

The illustrations, charts, and layout examples shown in this manual are intended solely to illustrate the text of this manual. Because of the many variables and requirements associated with any particular installation, Allen–Bradley Company cannot assume responsibility or liability for actual use based upon the illustrative uses and applications.

No patent liability is assumed by Allen–Bradley Company with respect to use of information, circuits, equipment or software described in this text.

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Throughout this manual we make notes to alert you to possible injury to people or damage to equipment under specific circumstances.



WARNING: Tells readers where people may be hurt if procedures are not followed properly.



CAUTION: Tells readers where machinery may be damaged or economic loss can occur if procedures are not followed properly.

Warnings and Cautions:

- Identify a possible trouble spot.
- Tell what causes the trouble.
- Give the result of improper action.
- Tell the reader how to avoid trouble.

Important: We recommend you frequently backup your application programs on the appropriate storage medium to avoid possible data loss.

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Using This Manual

Preface Objectives

This preface describes how to properly and efficiently use the *T35 Plant-floor Terminal User Manual.* It tells you:

- important user information (page P-i)
- the purpose of this manual (page P-i)
- who should read this manual (page P-ii)
- where to locate information in this manual (page P-ii)
- the terms and conventions we use (page P-ii)
- where to locate information on related products (page P-iii)
- how to use the registration card (page P-iv)
- how to guard against electrostatic discharge damage (page P-iv)

Important User Information



CAUTION:

- The disk drive used in the T35 Series D and E is **type 46.** Soft disk errors occur if the wrong type of disk drive is used.
- We ship your T35 Terminal with the hard disk initialized and formatted and with MS-DOS and GW-BASIC software installed. **DO NOT** re-format the hard disk at start up.
- When shipping the T35 plant floor terminal, place it in its **original container** separate from the panel with a consistent orientation as designated by the up arrows on the carton.

Purpose of This Manual

This manual describes how to install, start-up, and troubleshoot the T35 Plant Floor Terminal (Cat. No. 1784-T35/D, -T35/E).

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Audience

We assume that you are familiar with the other Allen-Bradley programmable controller products related to the T35 Series D and E Plant-floor Terminal. We also assume that you have copies of the related publications listed on page P-iii under "Related Publications".

Information Locator

Use the table below to locate information on T35 workstation topics:

Chapter:	Title:	What's Covered:
1	Overview of the T35 Plant Floor Terminal	Description and internal/external features of the terminal
2	Installing the T35 Plant Floor Terminal	How to install your terminal
3	Using the T35 Plant Floor Terminal	How to start up your terminal
4	Maintenance	How to keep your terminal running properly
5	Removing and Replacing Components	How to remove and replace parts
6	Diagnostics/Troubleshooting	How to run diagnostics tests to determine if your terminal is running properly
7	Peripherals and Optional Devices	How to install or set up additional optional devices to your terminal
Appendix	Specifications	Specifications for your T35 Series D and E terminal

Terms and Conventions

Throughout this manual, we abbreviate some terms. Use the table below to become familiar with our terminology:

This term:	Appears as:
T35 Series D and E Plant-floor Terminal	T35 or workstation or terminal
programmable controllers	processor

For a list of programmable controller terms and their definitions, contact your Allen-Bradley sales representative for publication PCGI-7.2.

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Related Publications

For more information about your terminal and related products, refer to these publications:

Title:	Catalog Number:	Publication Number:
PLC-2 Program Development Software User's Manual	6203-PLC2A 6213-PLC2A	6200-6.5.1
PLC-2 Programming Terminal Software User's Manual	6201-PLC2A 6211-PLC2A	6200-6.5.2
PLC-3 Programming Terminal Software User's Manual	6201-PLC3 6211-PLC3	6200-6.5.3
PLC-3 Program Development Software User's Manual	6202-PLC3A 6212-PLC3A	6200-6.5.4
PLC-5 Programming Software User's Manual	6201-PLC5 6203-PLC5 6211-PLC5 6213-PLC5	6200-6.5.5
PLC-5/15 Processor Manual	—	1785-6.8.1
PLC-5/15 Assembly and Installation Manual	—	1785-6.6.1
MS-DOS and GW-BASIC software documentation (supplied with 1784-T35 orders only).	—	—
Advisor PC Color Graphic System User's Manual	6171-PCS	6171-6.5.4
Advisor PC Mouse GRAFIX User's Manual	6171-MG	6171-6.5.10
Advisor PC Data Logger User's Manual	6171-DL	6171-6.5.11
Advisor PC Serial/Parallel Expander User's Manual	6171-MX5, MX8	6171-6.5.7
Advisor PC Real RAM Enhanced Memory Card User's Manual	6174-DMB10	6171-6.5.9
Advisor PC Intelligent Control Panel User's Manual	6172-CP14	6171-6.5.6

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Registration Card

Use the registration card in the following programming software user's manuals to make sure you receive notification of all updates to the programming software.

Title:	Catalog Number:	Publication Number:
PLC-2 Programming Terminal Software User's Manual	6201-PLC2A, 6211-PLC2A	6200-6.5.1
PLC-2 Programming Terminal Software User's Manual	6201-PLC2A, 6211-PLC2A	6200-6.5.2
PLC-3 Programming Terminal Software User's Manual	6201-PLC-3, 6211-PLC3	6200-6.5.3
PLC-3 Program Development Software User's Manual	6202-PLC3A, 6212-PLC3A	6200-6.5.4
PLC-5 Programming Software User's Manual	6201-PLC5, 6203-PLC5, 6211-PLC5, 6213-PLC5	6200-6.5.5

Guarding Against Electrostatic Discharge Damage

To guard against electrostatic discharge damage, we construct, test, and pack our products in a static safe environment. We ship products that require individual protection in bags that are sealed and shielded from static. Equipment not packed in a static shielded bag is adequately protected as long as you keep it assembled. When removing a product from a bag or disassembling a device, do so in a static safe environment.

As a minimum, we recommend the 3M Type 8005 Portable Field Service Grounding Kit or equivalent for providing a static safe environment. You can use the disposable wrist strap we ship with each product to protect from static when unpacking your product. Refer to the packing data that comes with each individual product.

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Observe the following precautions when handling the module:



CAUTION: If you handle components improperly, electrostatic discharge can damage them. Handle equipment and components only in a static safe environment.



WARNING: High voltage is present. Under some conditions, electrostatic discharge can degrade performance or damage the module. Observe the following precautions to guard against electrostatic discharge damage.

- Wear an approved wrist strap grounding device, or touch a grounded object to discharge yourself before handling the module.
- Do not touch the backplane connector or connector pins.
- If you configure or replace internal components, do not touch other circuit components inside the module. If available, use a static-free work station.
- When not in use, keep the components in a static-shielded bag.

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Chapter 1

Overview of the T35 Plant Floor Terminal

Chapter Objectives

This chapter provides an overview of the T35 Plant Floor Terminal. It contains:

- T35 product description (page 1-1)
- external features (page 1-2)
- internal features (page 1-5)

Product Description

The T35 Plant Floor Terminal is an AT-compatible rack or panel-mounted video display terminal. The terminal's 19-inch wide enclosure houses a 12-inch color CRT mounted behind a protective, scratch resistant window.

The chassis also contains the terminal's control electronics and power supply. The terminal's front panel is NEMA 4 and NEMA 12 rated, making it suitable for harsh environments and repeated washdowns. The rear chassis is NEMA 1 rated and requires an enclosure to protect it from contaminants in the plant floor environment.

Your terminal contains the following features:

- IBM-AT compatible - 16 MHz, 80286 microprocessor-based system
- 12-inch color CRT - Enhanced Graphics Adapter (EGA)
- 40Mb, 3.5-inch Winchester hard disk drive
- 1.44Mb, 3.5-inch floppy disk drive
- 1Mb of on-board RAM in T35 Series D;
  4Mb of on-board RAM in T35 Series E
- RS-232 (serial) interface
- parallel interface
- numeric/control keypad
- function keypad
- 175W internal power supply
- 5-slot AT passive backplane (3 AT slots available after CPU Bd is installed)

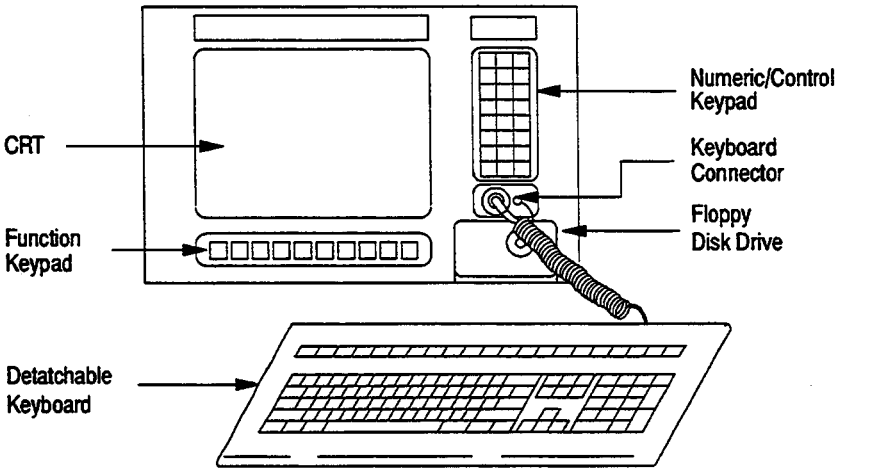
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External Features of the T35 Plant Floor Terminal

Front View of the T35 Plant Floor Terminal

Refer to Figure 1.1 for a front view of the plant floor terminal.

Figure 1.1
T35 Plant Floor Terminal (front view)



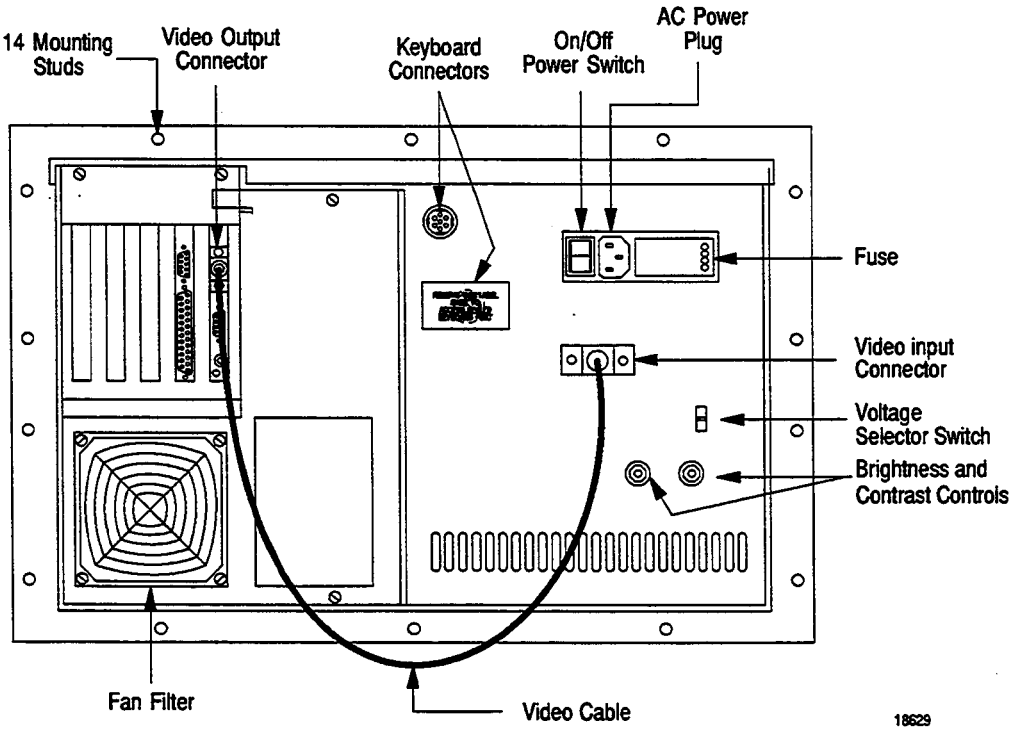
Feature:	Description:
CRT	12-inch, EGA color monitor protected by a scratch resistant, Lexan faceplate.
Detachable Keyboard	Any 1784-T50, 6160-KBD1, or XT/AT compatible keyboard can be used.
Keyboard Connector	Use this connector to connect any 1784-T50, 6160-KBD1, or XT/AT compatible keyboard.
Numeric/Control Keypad	Sealed-membrane keypad includes: Shift, Control, Alt, Esc, Page Up, Page Down, Up, Down, Right, Left, Numeric Cursors, +, -, ., and Enter.
Function Keypad	Sealed-membrane keypad includes 10 function keys labeled F1 through F10.
Floppy Disk Drive	1.44Mb, 3.5-inch floppy disk drive.

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Rear Panel Controls and Connectors

Refer to Figure 1.2 and Figure 1.3 to locate the rear panel connectors, jacks and switches.

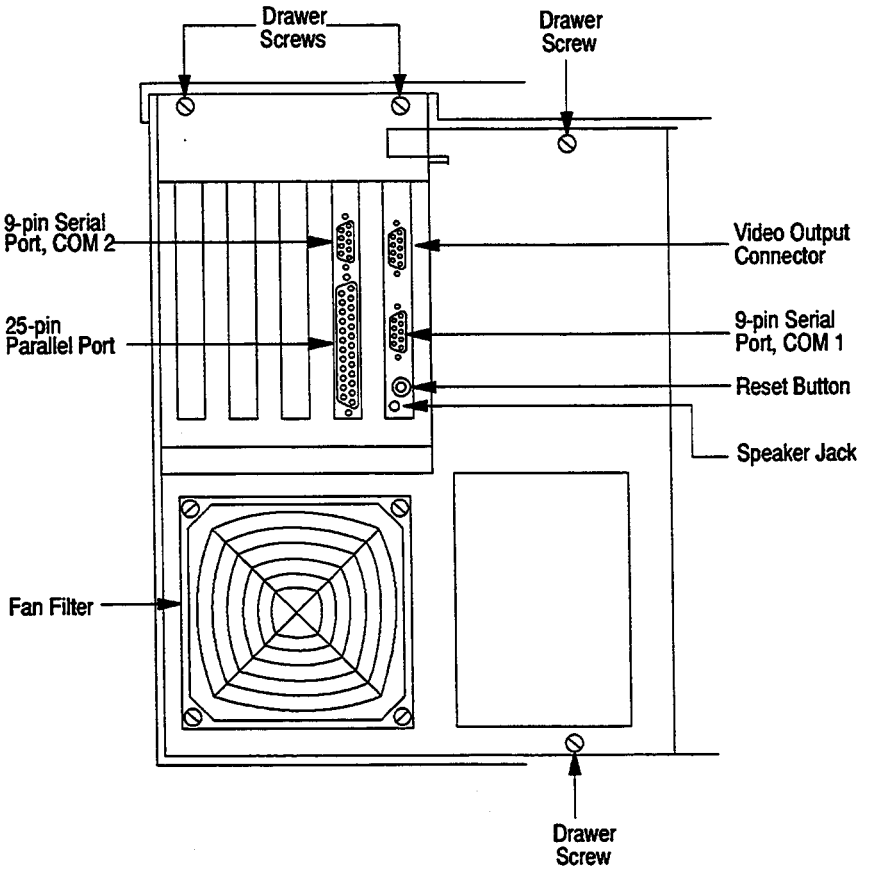
Figure 1.2
T35 Plant Floor Terminal (rear view)



Feature:	Description:
On/Off Power Switch	Rear mounted power switch turns power on or off to the terminal.
AC Power Plug	Allows AC Power Cord attachment.
Fuse	The T35 has an in-line 250V, 4A fuse and an ac line filter to reduce electrical noise. Disconnect ac power. Insert a narrow, blunt instrument (screwdriver) into the notch on the fuse block door and pry it open. Snap the door back into place after replacing the fuse.
Video Input Connector	Allows for connection to video output connector.
Voltage Selector Switch	External switch allows 115/230V, 50/60Hz operation.
Brightness and Contrast Controls	Controls to adjust CRT appearance.
Fan Filter	Snap on/off type air filter.
Keyboard Connectors	Allows for connection to XT/AT compatible, 1784-T50, 6160-KBD1, or 1784-WAB external keyboards.

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Figure 1.3
T35 Plant Floor Terminal Rear Panel



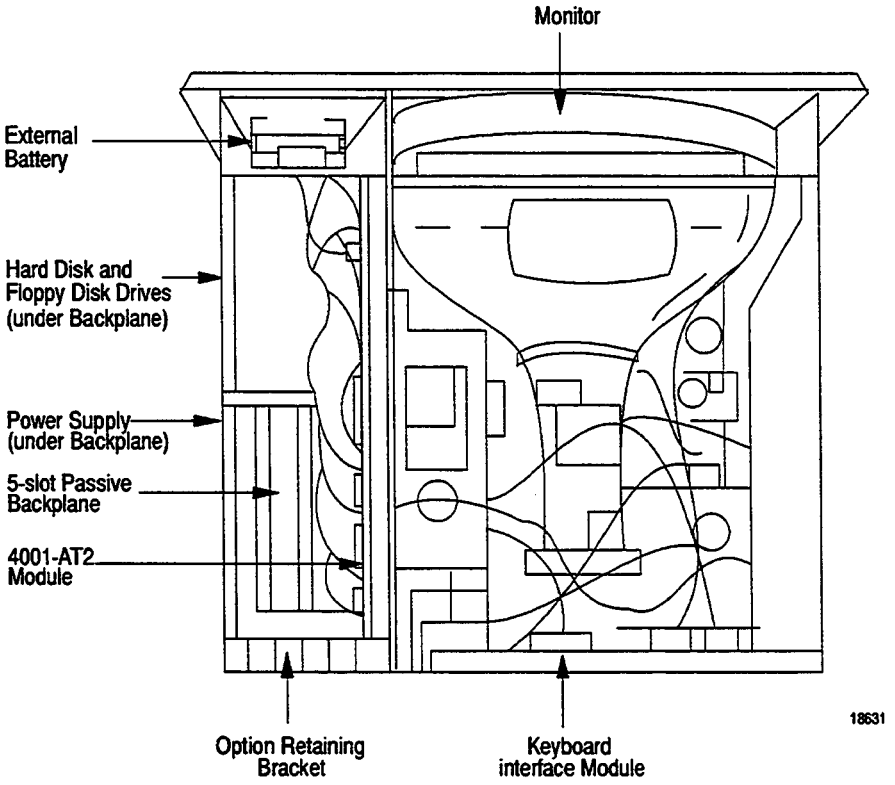
Feature:	Description:
9-pin serial ports (2)	Allows for connection to RS-232 devices.
25-pin parallel port	Allows for connection to printers.
Video output connector	Allows for connection to the video input connector.
Reset button	Recessed button forces the system into a reset condition. The system also resets each time power is turned on.
External speaker jack	Provides for audio output to an optional external speaker. Your T35 has no internal speaker.

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Internal Features of the T35 Plant Floor Terminal

Refer to Figure 1.4 to view the internal features (top view) of the terminal.

Figure 1.4
T35 Plant Floor Terminal Internal Features



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Feature:	Description:
Battery	A 3.5V lithium battery mounts on the AT2 Module and provides backup power for the calendar/real time clock and for configuration information (If your unit is over 5 years old and/or configuration or clock related problems occur, you may need to replace the battery. Refer to page 5-8 under "installing the CMOS RAM Battery" for more information).
Hard Disk Drive	3.5-inch Winchester disk drive provides 40Mbyte of formatted storage (see Appendix A for hard disk drive specifications).
Floppy Disk Drive	3.5-inch floppy disk drive reads data from double-sided 3.5-inch floppy diskettes (see Appendix A for floppy disk drive specifications).
Power Supply	The 175W system power supply is located inside the unit directly below the backplane. It provides power to the backplane, system modules, hard and floppy disk drives, keyboards and front panel mounted keypads (see Appendix A for power supply specifications).
Backplane	5-slot passive backplane.
4001-AT2 Module	The T35 terminal has a 16 MHz, 80286 microprocessor factory set for these conditions. On board memory: Series D - 1Mbyte, Series E - 4Mbyte
Keyboard Interface Module	Refer to page 5-7 for KIM instructions.
Floppy Diskette Media	Floppy diskette media is 3.5-inch, double-sided with 720K or 1.44Mbyte of formatted storage capacity (see Appendix A for specifications).
Disk Operating System	The T35 is shipped with MS-DOS software installed (refer to your MS-DOS documentation).

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Chapter 2

Installing the T35 Plant Floor Terminal

Chapter Objectives

This chapter describes how to:

- receive and ship your terminal (page 2-1)
- mount your T35 (page 2-2)
- prepare your ac wiring (page 2-6)
- install your video cable (page 2-7)
- set your line voltage (page 2-7)
- connect external keyboards (page 2-8)
- start and restart your terminal (page 2-12)
- set up and configure your system (page 2-13)
- install your software (page 2-22)
- set your connector pinouts (page 2-28)

Receiving and Shipping Your Terminal

Your T35 plant floor terminal comes in a re-usable shipping container. Save this box and foam packing material for repacking and moving the unit. The T35 terminal is industrially hardened to withstand the rigors of plant floor use. **However, the shock mounting used within the unit is not designed to protect the unit during shipping when the unit is installed in a panel.** The type of shock imparted to the unit during transportation, when the unit is installed in a panel, is sufficient to destroy the shock mounting and make the terminal inoperative.



CAUTION: When shipping the T35 plant floor terminal, place it in its original container, with a consistent orientation as designated by the up arrows on the carton, and shipped separate from the panel.



CAUTION: When removing a product from a bag or disassembling a device, do so in a static safe environment. Refer to "Guarding Against Electrostatic Discharge Damage," on page P-iv in the preface for further information.

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Mounting the T35

This section describes:

- how to choose a mounting location
- the dimensions of the system
- how to mount your T35 plant floor terminal

Choosing the Mounting Location

Use the measurements in Table 2.A to help you choose a mounting location for your T35 plant floor terminal.

Table 2.A
T35 Mounting Factors and Measurements

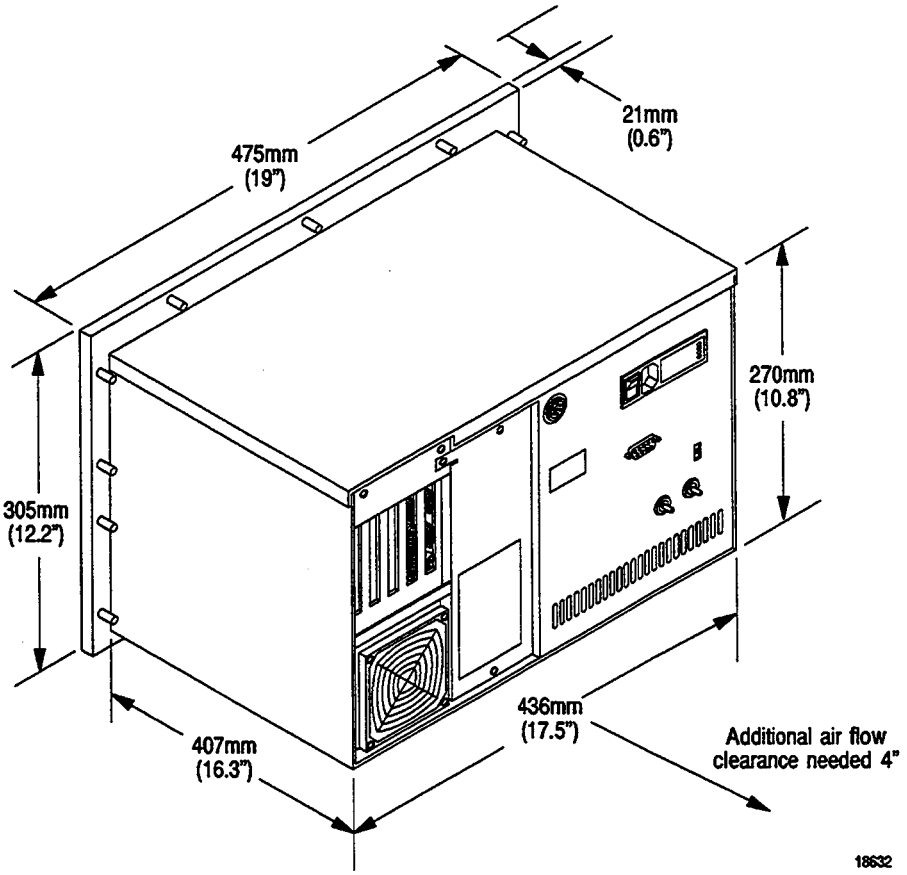
This factor:	Has the following measurement(s):
Clearance for air flow	Allow 50 mm (2 in.) from bottom and sides Allow 102 mm (4 in.) from top and back Also, allow additional space below, behind, and above the chassis to remove the drawer and lid
Operating temperature	41 to 122°F (5 to 50° C)
Thermal rating	1,962 BTU/hour maximum
Maximum thermal excursion rate operation non-operating	 36°F or 20°C per hour 18°F or 10°C per hour
Relative humidity	10% to 80% non-condensing
Relative humidity excursion rate	10% per hour
Weight	50lbs.
Mounting studs	14 threaded studs (The workstation comes with nuts for its 14 studs)
Holes for mounting studs	6.35 mm (.250 in.) in diameter

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Dimensions of the System

Figure 2.1 shows the measurements of the chassis and the faceplate.

Figure 2.1



Dimension	Main chassis	Faceplate
Height	10.8 in. (270 mm)	12.2 in. (305 mm)
Width	17.45 in. (436 mm)	19 in. (475 mm)
Depth	16.25 in. (407 mm)	.6 in. (21 mm)

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Mounting the T35 Workstation

You can mount your terminal in:

- a panel
- a standard 19-in EIA equipment rack



CAUTION: Do not mount the T35 plant floor terminal more than ±5° from vertical (90°). Exceeding this angle will result in soft sector errors which reduce the life of the disk drive.

Panel Mounting

The .25 in. (6.35 mm) holes in the panel accommodate the 14 studs on the back of the terminal front panel.

When panel mounting the T35 terminal, provide sufficient clearance:

- at the rear for removal of the drawer
- at the top of the unit for removal of the cover

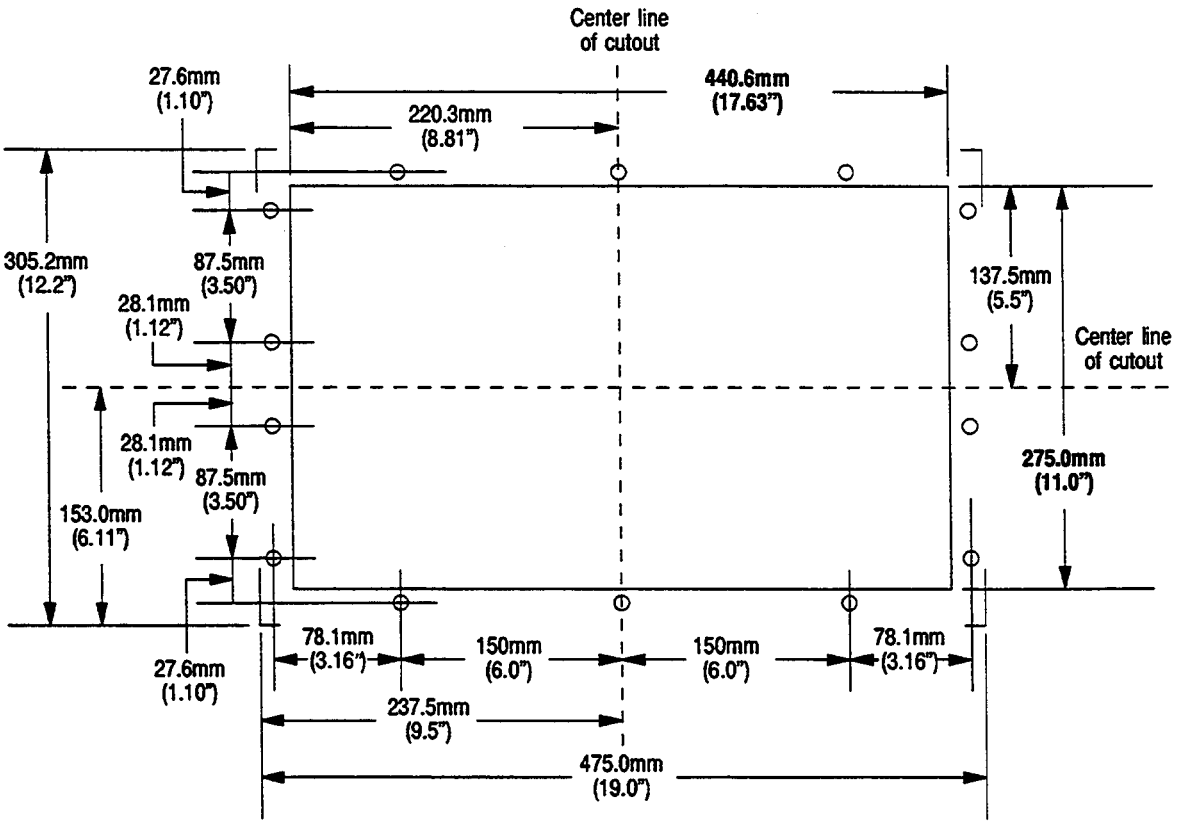
This factor:	Has the following measurement(s):
Clearance for air flow	Allow 50 mm (2 in.) from bottom and sides Allow 101.5 mm (4 in.) from top and back.
Clearance for parts replacement	Allow additional space below, behind, and above the chassis to remove the drawer and lid. As a minimum, the drawer requires 20 inches (500 mm) to slide out of the workstation. Add additional space for handling.

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Rack Mounting

Figure 2.2 shows the locations of the studs on the back of the terminal front panel. Since these studs are threaded, install the terminal in a rack in which the holes are not threaded. If the rack has threaded holes, drill them out to .250 in., 6.35 mm to provide clearance for the 14 studs.

Figure 2.2
T35 Workstation cutout dimensions



- Cutout dimensions are symmetric about center lines
- Measurements from center to center of each hole.

mm
(inches)

18633

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Preparing AC Wiring

Your T35 workstation comes with an ac power cord. The cord is 2m (6'7" approximately) long with a 3 prong plug at the end, suitable for 115V ac operation. This cord includes the grounding wire.

WARNING: High voltage is present. To avoid electrical shock, make sure the T35 terminal power is off before connecting any ac wiring.

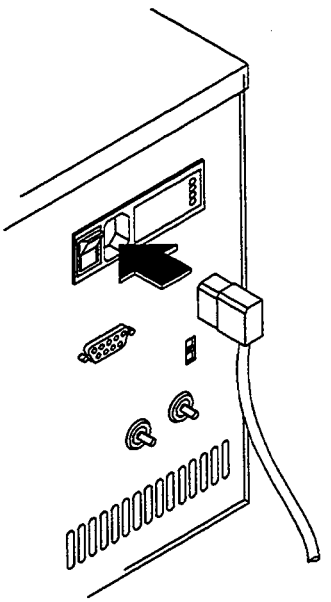
To prepare the ac wiring:

1. Use Table 2.B to choose your ac wiring cord. Under certain operating conditions the workstation may require a different power cord.

Table 2.B
Choosing the AC Wiring Cord

If you have these conditions:	And:	Then:
115V @ 50/60Hz	The 2m (6'7") cord is long enough to reach your power source	Use the supplied power cord (proceed to step 2).
	You need a cord longer than 2m (6'7")	Build your own power cord using 18 AWG or larger wire.
Power source operating at 230V @ 50/60Hz	———	Build your own power cord using 18 AWG or larger wire.

2. Plug the cord into the power outlet as shown as shown below.

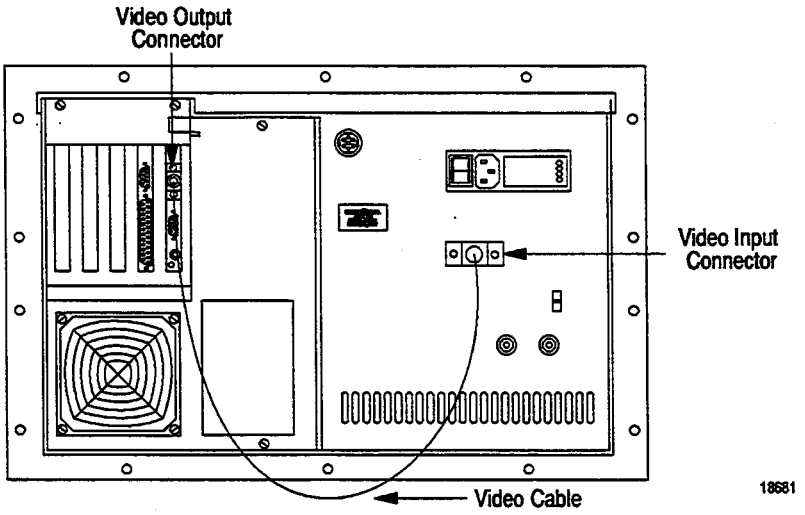


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Installing the Video Cable

Important: Install the video cable to the video output and video input connectors (Figure 2.3). Failure to connect the video cable results in loss of monitor display.

Figure 2.3
T35 Video Input and Output Connectors

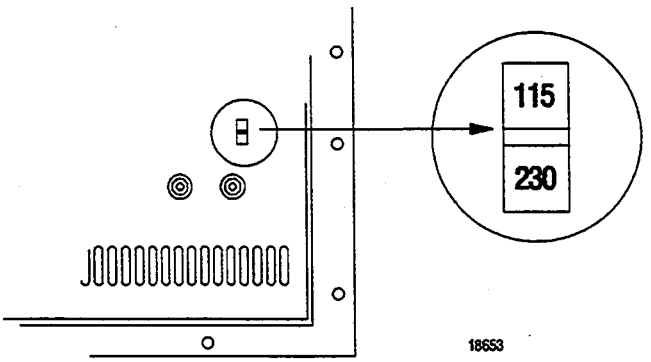


Setting the Line Voltage

CAUTION: Make sure the power switch is set at OFF until the terminal is properly configured and connected to a 115V ac or 230V ac power source. The power supply can fail if you incorrectly set the line voltage while the terminal is on.

Your T35 terminal operates at line voltages of 115V or 230V at frequencies of 50 to 60Hz. We set the terminal at 115V, 60Hz at the factory. If the voltage needs to be changed or reset, move the voltage selector switch (Figure 2.4) to the desired voltage.

Figure 2.4
Setting the Line Voltage



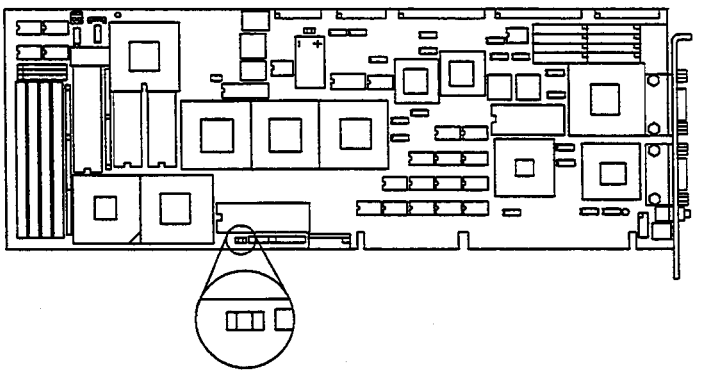
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Connecting External Keyboards

Your terminal runs with any XT/AT compatible, 1784-T50, 1784-WAB, or 6160-KBD1 keyboard.

Jumper J30 on the AT2 module determines whether or not the keyboard port will function. Jumper J30 set on inhibits the keyboard. Off allows it to operate as a NORMAL PC/AT keyboard. The keyboard port is set at the factory with jumper J30 off.

Figure 2.5
Jumper J30

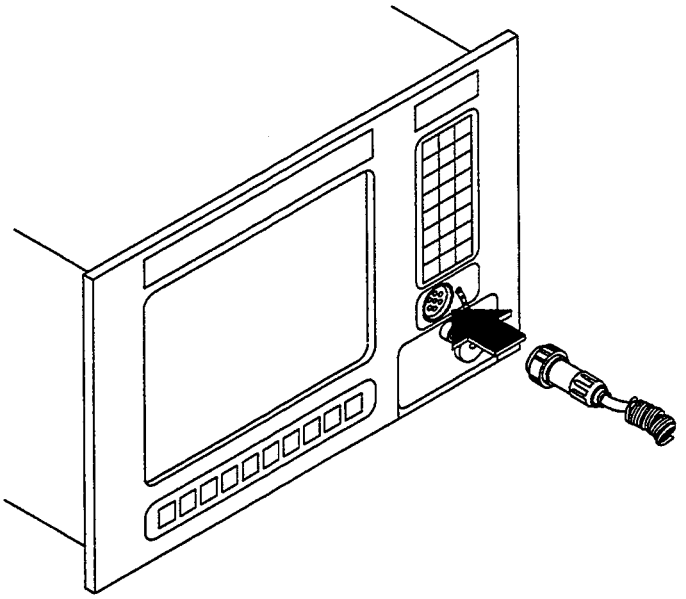


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XT/AT Compatible, 1784-T50, or 6160-KBD1 Keyboard Connection

To connect the XT/AT Compatible, 1784-T50, or 6160-KBD1 Keyboards:

1. Locate and unscrew the front keyboard connector cover.
2. Attach the keyboard cable to the terminal's connector.



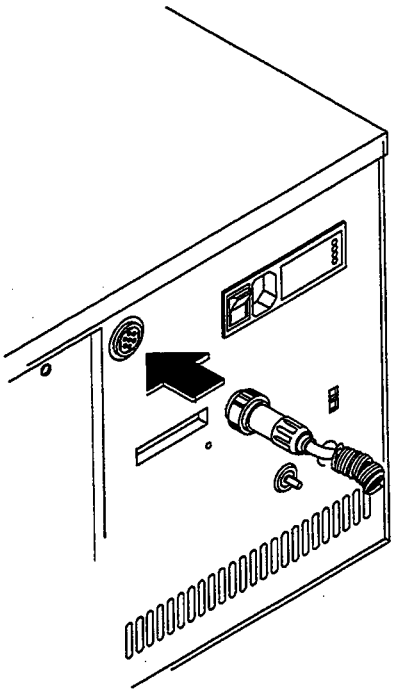
Refer to the switch settings information on page 5-7 under "Keyboard Interface Module (KIM)". This tells you how to set switches for an XT or AT keyboard.

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XT/AT Compatible, 1784-T50, or 6160-KBD1 Keyboard Connection

To connect the XT/AT Compatible, 1784-T50, or 6160-KBD1 Keyboards:

1. Locate the rear keyboard connector.
2. Attach the keyboard cable to the terminal's connector.



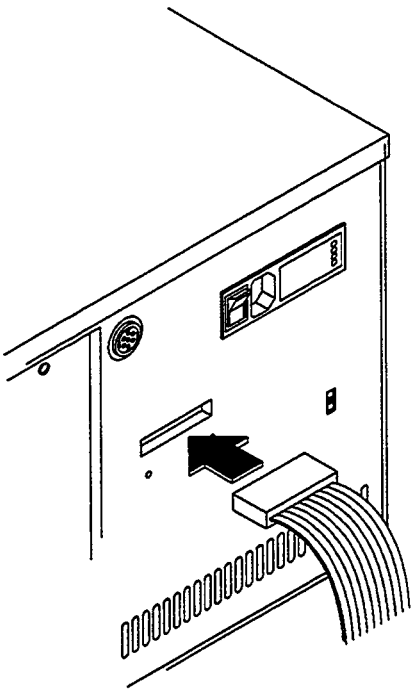
18636

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1784-WAB Keyboard Connection

To connect the 1784-WAB Keyboard:

1. Turn system power off.
2. Locate the keyboard connector port cover.
3. Remove the label from in front of the connector.
4. Attach the keyboard cable to the terminal's connector.



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Starting/Restarting the Workstation

Important: If you have not installed all your peripheral devices and internal components you ordered with your T35 workstation, do so now. Refer to page 7-1 for installation instructions, or to the installation data sheets you received with your components.

Starting the Workstation

When power is applied, the T35 workstation performs a series of startup self-tests to determine if its components are properly installed and operating.

If you see this:	Do this:
C> (The C> prompt is part of the power up of MS DOS, the software that is shipped with your terminal).	The terminal is working properly. Proceed to "System Setup and Configuration" on page 2-12.
Any test failed	Press `[Ctrl-Alt-Del]` to reboot the system and try again. If the system still fails to come on line, contact your local Allen-Bradley representative for assistance.

Restarting the Workstation

Important: Any of the steps below can result in loss of data if a program is in process.

If your T35 Terminal system locks up, you can restart the system three ways:

- Turn power off then back on using the ON/OFF power switch on the rear panel.
- Reboot the system by simultaneously pressing `[CTRL-ALT-DEL]` on the system keyboard.
- RESET by pressing the reset button on the rear panel.

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System Setup and Configuration

Your T35 is set up and shipped from the factory with the standard features. These features are shown in the Setup Utility and Main Menu screens:

- time
- date
- system configuration

The T35 Series D shows the following screen at power-up if all the tests are running properly:

```
286 MODULAR BIOS V3.11 P/N 11220006
COPYRIGHT (c) 1984-90 AWARD SOFTWARE INC

TESTING INTERRUPT CONTROLLER #1.....PASS
TESTING INTERRUPT CONTROLLER #2.....PASS
TESTING CMOS RAM BATTERY.....PASS
TESTING CMOS CHECKSUM.....PASS
TESTING EXTENDED CMOS CHECKSUM.....PASS
SIZING SYSTEM MEMORY.....640K FOUND
TESTING SYSTEM MEMORY.....640K PASS
CHECKING UNEXPECTED INTERRUPT AND STUCK NMI.....PASS
TESTING PROTECTED MODE.....PASS
SIZING EXTENDED MEMORY.....00384K FOUND
TESTING MEMORY IN PROTECTED MODE.....01024K FOUND
TESTING PROCESSOR EXCEPTION INTERRUPTS.....PASS
BIOS SHADOW RAM.....DISABLED
VIDEO SHADOW RAM.....DISABLED

<PRESS [CTRL-ALT-ESC] FOR SETUP>
```

The T35 Series E shows the following screen at power-up if all the tests are running properly:

```
286 MODULAR BIOS V3.11 P/N 11220006
COPYRIGHT (c) 1984-90 AWARD SOFTWARE INC

TESTING INTERRUPT CONTROLLER #1.....PASS
TESTING INTERRUPT CONTROLLER #2.....PASS
TESTING CMOS RAM BATTERY.....PASS
TESTING CMOS CHECKSUM.....PASS
TESTING EXTENDED CMOS CHECKSUM.....PASS
SIZING SYSTEM MEMORY.....640K FOUND
TESTING SYSTEM MEMORY.....640K PASS
CHECKING UNEXPECTED INTERRUPT AND STUCK NMI.....PASS
TESTING PROTECTED MODE.....PASS
SIZING EXTENDED MEMORY.....3072K FOUND
TESTING MEMORY IN PROTECTED MODE.....3712 PASS
TESTING PROCESSOR EXCEPTION INTERRUPTS.....PASS
BIOS SHADOW RAM.....DISABLED
VIDEO SHADOW RAM.....DISABLED

<PRESS [CTRL-ALT-ESC] FOR SETUP>
```


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If you must make changes to your terminal's setup, use the Setup Utility shown below.

To access the Setup Utility, you have two options:

- simultaneously press the **[CTRL-ALT-ESC]** keys (as prompted after the bootup screen)
- install the floppy diskette AT2 Utilities into the floppy disk drive, type **a: [RETURN]** to change drives, and type **setup [RETURN]** at the A:> prompt

The T35 Series D displays the following Setup Utility screen:

```
                        Award Software CMOS Setup

DATE (MM/DD) 6/4/91        TIME (HH:MM:SS) 9:20:12

Diskette 1:                    1.4M  (720K)
Diskette 2:                          None

                                     CYLS.  HEADS  SECTORS  PRECOMP  LANDZONE
Disk  1.........42Mb  Type 46          733      7       17      512       733
Disk 2.........****Mb

Video Type.............................................EGA/VGA
C&T Configuration.....................................1Mb 16Mhz

Base memory size.......................................640K
Extended memory size...................................384K

Error Halt.................................Halt on all errors
Shadow Ram.................................................Disable
Speed Select.......................................No Change

          ↑↓ MOVES BETWEEN ITEMS, →← ARROWS SELECT VALUES
           F10 RECORDS CHANGES, F1 EXITS, F2 FOR COLOR TOGGLE
```

The T35 Series E displays the following Setup Utility screen:

```
                        Award Software CMOS Setup

DATE (MM/DD) 6/4/91        TIME (HH:MM:SS) 9:20:12

Diskette 1:                    1.4M  (720K)
Diskette 2:                          None

                                     CYLS.  HEADS  SECTORS  PRECOMP  LANDZONE
Disk  1.........42Mb  Type 46          733      7       17      512       733
Disk 2.........****Mb

Video Type.............................................EGA/VGA
C&T Configuration.....................................4Mb 16Mhz

Base memory size.......................................640K
Extended memory size..................................3072K

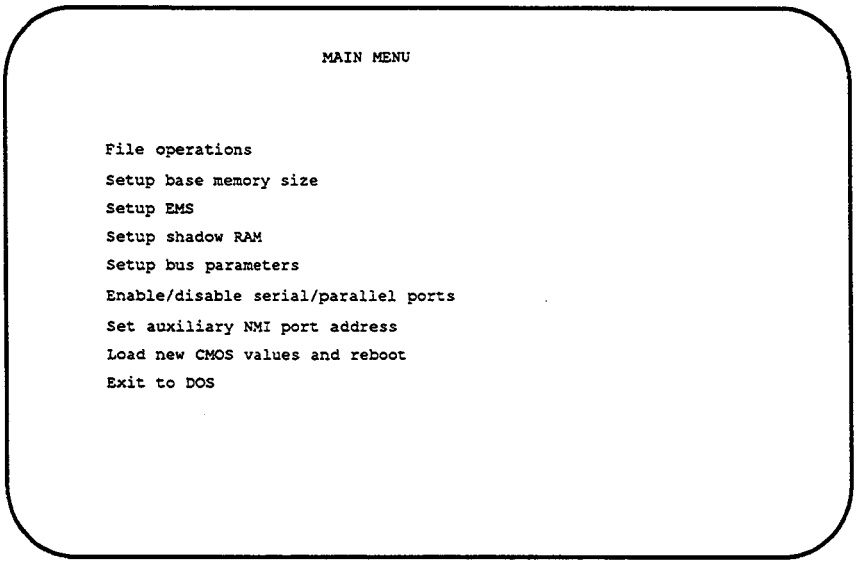
Error Halt.................................Halt on all errors
Shadow Ram.................................................Disable
Speed Select.......................................No Change

          ↑↓ MOVES BETWEEN ITEMS, →← ARROWS SELECT VALUES
           F10 RECORDS CHANGES, F1 EXITS, F2 FOR COLOR TOGGLE
```


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Main Menu

The Main Menu, as shown below, allows you to perform the following operations:



To call up the main menu screen, follow the steps below:

1. Insert the AT2 UTILITIES diskette into the floppy disk drive.

2. At the C> prompt, type `a:` **[RETURN]** to move to the floppy disk drive. You will see the `a:` prompt.

3. At the `a:` prompt, type **`setct`** **[RETURN]** to call up the main menu.

To copy the main menu to the hard drive, at the C> type:

   a. **`copy a: setct.exe c:`** **[RETURN]** This allows you to access the main menu without using the floppy drive.

   b. If setct is copied to the hard drive, type **`setct`** **[RETURN]** at the C> to show the main menu screen.

4. Modify the screen if needed. To reach designated areas on the screen, use the up and down arrows, the press **[RETURN]** to execute the option.

Important: To run 6200 Series software you must set memory size to 640K base memory and 384K expanded memory.

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Important: If you change configuration information and do not restart the system, operating inconsistencies may result which may cause the system to "lock up". If this happens, restart the system using any of the methods listed under, "Starting/Restarting the Workstation" on page 2-12.

File Operations

The File Menu shows the following screen:

```
Exit this menu
Save the current configuration to a file
Read in a configuration from a saved file
```

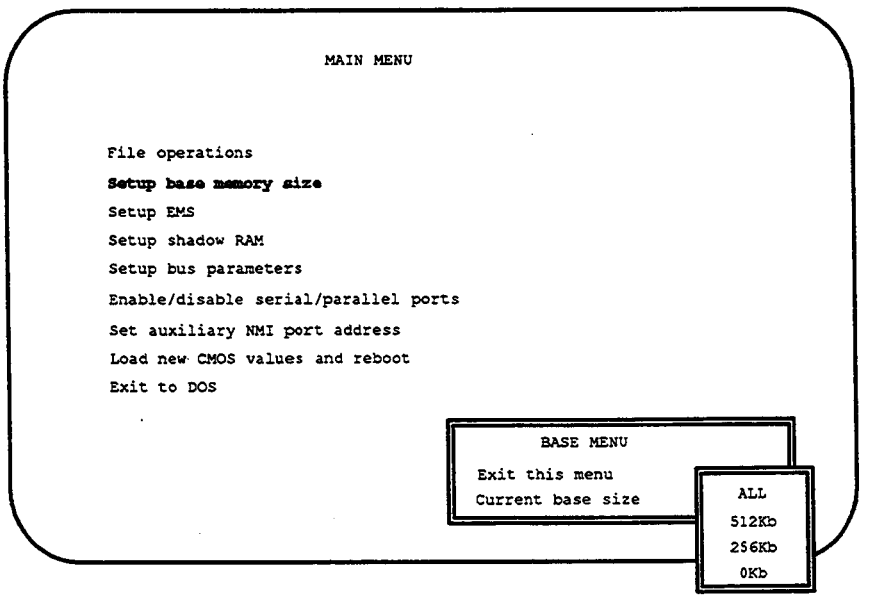
When the SAVE or READ option is selected, it prompts the user for a file name.

- The SAVE option writes the current displayed configuration settings and header as the specified file name in the current working directory. Existing files are not written over.
- The READ option retrieves a specified file. An error message displays if the file to be retrieved does not exist or contain the correct header.
- The EXIT option and the [ESC] key return the user to the main menu.

Setup Base Memory Size

1. Use the arrow keys to highlight `Setup base memory size` from the Main Menu screen.

2. Press **[RETURN]**. You see the following Base Menu screens:



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3. Use the arrow keys to select the correct memory size. Press **[RETURN]**.

4. Select **Load new CMOS values and Reboot** from the main menu to save the changes.

Important: `Exit to DOS` does not save changes. Select this option only if no changes were made or you do not want any changes saved.

Important: If the memory is set to anything but `ALL` the user cannot enter the EMS or Shadow Menus.

Important: On the 1 Mb card **only**, the user cannot enable EMS if Shadow RAM is enabled .

When this option is chosen, the EMS Menu appears. When any option except `EXIT` is selected, the user sees the valid EMS parameters and can change the current settings if desired. The choices for each option are `YES` and `NO(default)`.

The choices for Base Addresses must be selected as a group. They are:

```
C8000h, CC000h, D0000h, D4000h-maps to D7FFFh (default)
CC000h, D0000h, D4000h, D8000h-maps to DBFFFh
D0000h, D4000h, D8000h, DC000h-maps to DFFFFh
D4000h, D8000h, DC000h, E0000h-maps to E3FFFh
D8000h, DC000h, E0000h, E4000h-maps to E7FFFh
DC000h, E0000h, E4000h, E8000h-maps to EBFFFh
E0000h, E4000h, E8000h, EC000h-maps to EFFFFH
```



CAUTION: To prevent damage to modules, **DO NOT** select an address that another card is currently using.

The choices for Register I/O Base Address are:

```
208h/209h (default)
218h/219h
258h/259h
268h/269h
2A8h/2A9h
2B8h/2B9h
2E8h/2E9h
```

```
The choices for size are:  <1Mb   1Mb   2Mb   3Mb
     The default value is board dependent.
```


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Setup EMS

This part of the UTILITY program is used only if the current base memory setting is `ALL`. If not, a message window informs the user that the EMS cannot be enabled.

The EMS size is only allowed within the available memory. For example, only the first choice can be selected with the T35 Series D.

The `EXIT` option and the `[ESC]` keys return the user to the main menu.

Important: None of the changes will be saved unless the "`Load new CMOS values and Reboot`" option is selected to exit the Setup Utility.

Setup Shadow RAM

This part of the UTILITY program is used only if the current base memory setting is `ALL`. If not, a message window informs the user that the EMS cannot be enabled.

Important: On the 1 Mb card **only**, the user cannot enable the EMS if Shadow RAM is enabled.

When this option is chosen, the Shadow Menu appears. When any option except `EXIT` is selected, the user sees the valid Shadow RAM parameters and can change the current settings if desired. The options are either enabled or disabled, and can be set independently. The choices for both video and system shadow RAM are:

```
No (default for both)
Yes

where:
Yes = enable the Shadow RAM function
No = disable the Shadow RAM function
```

The `EXIT` option and the `[ESC]` key return the user to the Main Menu.

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Setup Bus Parameters

When this option is chosen, the Bus Menu appears. When any option except `EXIT` is selected, the user sees the valid ATbus parameters and can change the current settings if desired.

The bus clock has two choices: `SYNC` `ASYNC (default)`

Choosing the ASYNC setting sets the clock source as the ATbus clock, and brings the following message window to the screen:

```
When choosing ASYNC for the bus clock source,
the AT bus clock jumper J29, found physically on
the board, must be set to one of the following:

     Position              Bus Speed
       A                     6 Mhz
       B                     8 Mhz
       C                    10 Mhz
```

Choosing the SYNC setting sets the clock source as the CPU bus clock and uses half of that value.

Both the 8 and 16 bit cycle wait states can be set in the Bus Menu. The choices are as follows:

```
8 bit AT cycle wait states     3            4 (default)     5
16 bit AT cycle wait states    1 (default)   2               3
```

The `EXIT` option and the `[ESC]` key return the user to the main menu.



CAUTION: Additional cards in the backplane may not function when the 8 bit AT cycle wait state is set to 3.

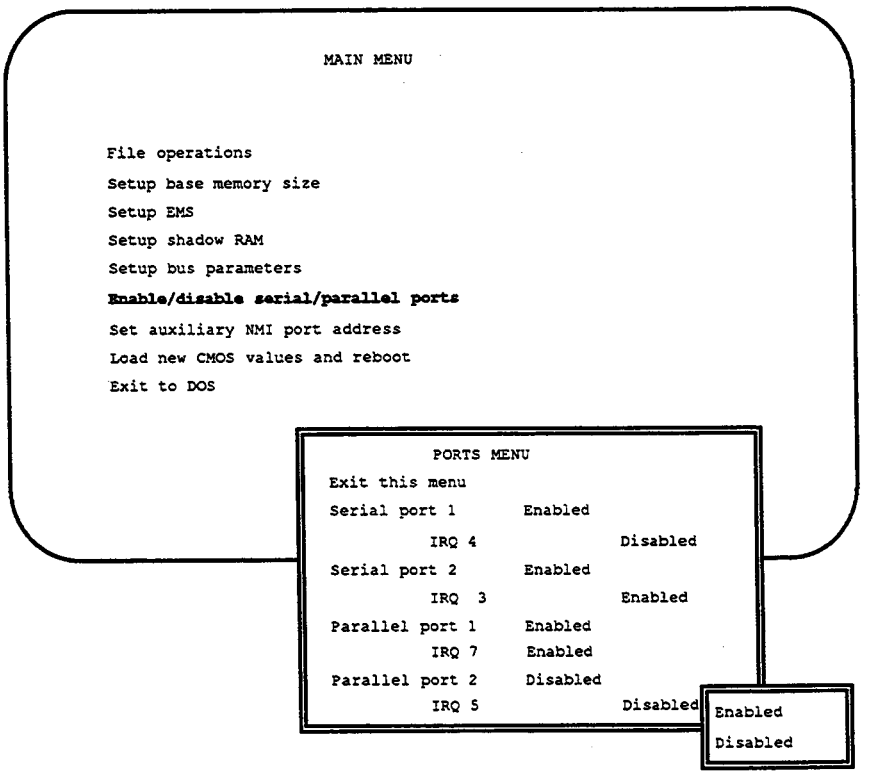
The default settings for the standard PC/AT are 4 wait states for 8 bit AT cycles and 1 wait state for 16 bit AT cycles. The 3 wait state option can be selected for 8 bit At cycles, but any additional cards in the backplane may not function properly.

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Enable/Disable Serial/Parallel Ports

1. Use the arrow keys to select `Enable/disable serial/parallel ports` from the Main Menu screen.

2. Press **[RETURN]**. You see the following screens:



3. Use the arrow keys to select the correct port. Press **[RETURN]**.

4. Select **Load new CMOS values and Reboot** from the main menu to save the changes.

Important: `Exit to DOS` does not save changes. Select this option only if no changes were made or you do not want any changes saved.

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Set Auxiliary NMI Port Address

When this option is chosen, the Auxiliary NMI Menu appears.

When the `Current auxiliary NMI port address` is selected, the user sees the valid Auxiliary NMI Address parameters and can change the current setting if desired.

The `EXIT` option and the `[ESC]` key return the user to the main menu.

The current AUX_PORT default address is 331h, while in earlier version of the board the default was 201h. The IBM architecture defines port address 201h as the game port address. Some software packages that use the game port may write to this address and cause an NMI. Later versions of the AT2 card will have the default setting 331h, but using 201h as an optional AUX_PORT address remains for programs developed on earlier versions.

Load New CMOS values and Reboot

Important: No changes are saved unless the `Load new CMOS values and Reboot` option is selected to exit the Setup Utility.

This option prompts the user to answer yes or no `(y/n)`. If the user types **y**, the system reboots with all of the configuration values set while in the SETUP Utility program. An **n** or `[ESC]` returns the user to the Main Menu.

Changing any of the default settings changes the setting in the C & T Configuration section of the BIOS Setup Menu to `DISABLED`.

Exit to DOS

Important: No changes are saved unless the `Load new CMOS values and Reboot` option is selected to exit the Setup Utility.

Like the `Load new CMOS values and Reboot` option, this option also prompts the user to answer yes or no `(y/n)`. If the user types **y**, the system returns to DOS without saving changes made in the SETUP Utility program. An **n** or `[ESC]` returns the user to the Main Menu.

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Installing the Software

CAUTION: We ship your T35 terminal with the hard disk initialized and formatted and with MS-DOS software installed. **DO NOT** re-format the hard disk at start up.

You can re-install MS-DOS software if you:

- have deleted all or part of them from the hard disk
- have re-formatted the hard disk
- are having any other problems

Installing MS-DOS

MS-DOS software employs a menu-oriented installation program called `SELECT`. This program asks you to respond to a series of simple questions about how you want to set up MS-DOS on your system. For most of these questions, you need only press **`[RETURN]`** to accept the preselected value. MS-DOS is then installed automatically based on your responses.

The Select Program

Among other tasks, the `SELECT` program:

- creates the primary DOS partition
- formats the disk
- copies MS-DOS to a subdirectory on the disk
- creates the files `autoexec.bat` and `config.sys`

With MS-DOS software, you can use your entire fixed disk drive for MS-DOS files and programs, even if its capacity exceeds 32MB. The `SELECT` program also allows you to create multiple DOS partitions.

MS-DOS software is distributed on three 3.5-inch diskettes. These are:

- install disk
- MS-DOS shell
- operating

Also, you will need one blank formatted floppy disk for backup during the installation procedure. Have all four diskettes on hand before beginning the installation procedure.

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CAUTION: Make sure the blank diskette (referred to as SELECT COPY) is **not** write-protected; the write-protect tab should be in the closed position (All other disks should be write-protected.)

The SELECT program copies all the files required for you to start and to use MS-DOS to the blank select copy diskette. Use this diskette as your working copy whenever you need to boot MS-DOS from drive A.

Important: If you misplace your select copy diskette, and must reload software, use a 720KB diskette only.

Using the Select Program

The following steps guide you through a first-time installation of MS-DOS. These procedures supplement the information contained in the MS-DOS documentation. These steps assume you are dedicating your entire fixed disk to MS-DOS software, and that you are not installing the MS-DOS Shell.

If, while using the SELECT program, you are uncertain about what selection to make, accept the default (preselected) choice. If you want to change an earlier selection, press the **[ESC]** key until the screen you want to change appears. After making the necessary changes, press **[RETURN]** to page back to the screen from which you interrupted the installation procedure.

Table 2.C lists the keys you may use with the SELECT program.

Table 2.C
Keys Used With the SELECT Program

Key(s)	Action
Return	Moves to the next step
Esc	Exits the current screen and displays the preceding one
Tab	Moves to the next entry
Page Up/Page Down	Scrolls information one page at a time
Up/Down Arrow	Moves the highlight bar to the next selection
F3	Exits the SELECT program
F9	Displays key assignments (accessible only from the Help screen)
Left/Right arrow	Shifts data fields left or right

Important: The RETURN and ESC keys are active only when listed as options on a given SELECT program screen.

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To run the SELECT program:

1. Insert the diskette labeled INSTALL in drive a.
2. Press **[CTRL-ALT-DEL]**. Follow the instructions below:

You see:	Do this:
WELCOME	Press **[RETURN]** to display the INTRODUCTION screen. This screen displays the key assignments shown in Table 2.C. Press **[RETURN]** to continue.
SPECIFY FUNCTION AND WORKSPACE	Choose Balance 2 (Balance DOS 1 function with program workspace).
SELECT COUNTRY AND KEYBOARD	Press **[RETURN]** to accept the default selection, 1 (Accept predefined country and keyboard).
SELECT INSTALLATION DRIVE	Press **[RETURN]** to accept the default selection, 1 (C), to indicate you that are installing MS-DOS on drive C.
SPECIFY DOS LOCATION	Press **[RETURN]** to accept option 1 ([C:\DOS]). All required MS-DOS files will be copied to this subdirectory. Press **[RETURN]** again to accept the highlighted selection, 1 (Install all DOS files on fixed disk).
NUMBER OF PRINTERS	If you **do not** intend to connect a printer to your system, press **[RETURN]** to accept the default selection, (0). If you will be connecting a printer to your system, choose option 1. The PARALLEL PRINTER PORT screen will appear. Press **[RETURN]** to accept the default selection (LPT1-first port).
MS-DOS SHELL OPTION	Press **[RETURN]** to accept the default selection, 2 (Do not install the MS-DOS Shell).
INSTALLATION OPTIONS	If you are satisfied that you have made the appropriate selections, press **[RETURN]** to accept the default option, 1 (Accept configuration and continue with installation). If you want to change a selection, press the **[ESC]** key to return to the screen requiring correction, then press the **[RETURN]** key to return to the INSTALLATION OPTIONS screen.
CONTINUING INSTALLATION	Read it, leave the INSTALL diskette in drive A, and press **[RETURN]** to continue. The message, Copying diskette . . . appears.
Remove the INSTALL diskette from drive A Insert the SELECT COPY diskette in drive A	Remove the INSTALL diskette from drive A and insert the SELECT COPY diskette in its place. Press **[RETURN]** to continue. Again, the message Copying diskette... appears.

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Responding to the screen prompts, continue switching the INSTALL and SELECT COPY diskettes until the copying process is complete. The following appears:

You see:	Do this:
`PARTITION FIXED DISK`	Press **[RETURN]** to accept the default selection, `1 ( Let SELECT define partition sizes)`, which lets MS-DOS access your entire fixed disk as a single partition. If you want to create additional partitions, select `option 2` and refer to the discussion of fdisk in MS-DOS documentation.

3. Press **[CTRL-ALT-DEL]** as instructed to reboot your system. Leave the SELECT COPY diskette in drive A.

4. After a few moments, the message `Formatting disk...` appears. The `SELECT` program monitors the progress of the formatting procedure, and displays the current percentage of the disk that has been formatted. When formatting is complete, the CONTINUING INSTALLATION screen appears, displaying the message
`Copying diskette ...`
This process takes about a minute.

You see:	Do this:
`Insert OPERATING diskette in drive A`	Remove the SELECT COPY diskette from drive A, insert the OPERATING DISKETTE, and press **[RETURN]**. The message `Copying diskette...` appears.
After the contents of the OPERATING DISKETTE have been copied to disk, the message `Installation of MS-DOS is complete` appears.	Remove the OPERATING DISKETTE from drive A, and press **[CTRL-ALT-DEL]** to start MS-DOS software from drive C. Store the three MS-DOS diskettes in a safe place.

Formatting 720KB Diskettes

When formatting 720KB diskettes on your T35 terminal system, you must specify the number of sectors per track: the 1.44MB drive **does not** automatically recognize that a 720KB diskette is in the drive. The command:

```
format a: /f:720
```

correctly formats a 720KB diskette with 80 tracks (the default) and 9 sectors per track. If you do not specify the `/f:720` switch, the system formats the 720KB diskette as a 1.44MB diskette; you cannot use it reliably in systems other than the T35 terminal.

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Automating System Startup

When started, MS-DOS executes the instructions in the files `autoexec.bat` and `config.sys`. This feature provides a consistent means of configuring software and performing routine operations each time you start your system.

Autoexec.Sys

MS-DOS executes a batch file named `autoexec.bat` each time it starts. This file, created by the `SELECT` program, resides in the root directory `(c:\)`. You may set up the `autoexec.bat` file to execute MS-DOS commands, load memory-resident (TSR) programs, or start an application each time you start your system. You must, however, use a text editor or word processor that allows you to edit ASCII files.

To do this	Type
examine the screen below	**`Type autoexec.bat`** at the C> prompt
execute the file	**`autoexec.bat`**

```
@ECHO OFF
SET COMSPEC=C: \DOS\ COMMAND.COM
VERIFY OFF
PATH C: \DOS
APPEND /E
APPEND C: \DOS
PROMPT $P$G
C: \DOS\GRAPHICS
VER
PRINT /D: LPT1
```

Important: MS-DOS includes the Edlin line editor. Refer to the MS-DOS documentation for more information.

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Config.Sys

The file `config.sys` initializes certain software automatically each time you start MS-DOS. It, too, is created by the SELECT program. Among other tasks, `config.sys`:

- initializes device drivers such as `ansi.sys` and `ramdrive.sys`.
- specifies the number of open files MS-DOS can access at one time
- specifies the number of buffers for transferring data between memory and disk during input or output operations

When MS-DOS starts, it searches for `config.sys` in the root directory `(c:\)` of your disk and executes its contents. You may modify this file to customize the operating environment for your application software. You must, however, use a text editor or word processor that allows you to edit ASCII files. Refer to the MS-DOS documentaiton for detailed information about commands and device drivers you can include in the `config.sys` file.

To do this	Type
examine the screen below	**`Type config.sys`** at the C> prompt
execute the file	**`config.sys`**

```
BREAK=ON
BUFFERS=20
FILES=20
LASTDRIVE=E
SHELL=C: \DOS\COMMAND.COM /P /E: 256
DEVICE=C: \DOS\ANSI.SYS
INSTALL=C: \DOS\FASTOPEN.EXE C: = (50,25)
```


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Connector Pinouts

Table 2.D, Table 2.E, and Table 2.F show the pinouts for the video input connector, serial port connector and parallel port connector.

Table 2.D
Video Input Connector Pinouts

Pin	Signal
1	GND(Ground)
2	SRED(Secondary Red)
3	PRED(Primary Red)
4	PGREEN(Primary Green)
5	PBLUE(Primary Blue)
6	SGREEN(Secondary Green)
7	SBLUE(Secondary Blue)
8	HRCT(HS (+))
9	VRCT(VS (-))

Table 2.E
Serial (RS-232C) Port Pinouts

Pin	Signal
1	DCD1(Carrier detect)
2	RXD1(Receive data)
3	TXD1(Transmit data)
4	DTR1(Data terminal ready)
5	GND(Signal ground)
6	DSR1(Data set ready)
7	RTS1(Request to send)
8	CTS1(Clear to send)
9	RI1(Ring indicator/)

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Table 2.F
Parallel (Centronix) Port Pinouts

Pin	Signal
1	Strobe
2	AutoFEED
3	PDOUT 0
4	PERROR
5	PDOUT 1
6	INIT
7	PDOUT 2
8	SELIN
9	PDOUT 3
10	GND
11	PDOUT 4
12	GND
13	PDOUT 5
14	GND
15	PDOUT 6
16	GND
17	PDOUT 7
18	GND
19	PACK
20	GND
21	PBUSY
22	GND
23	PE
24	GND
25	SELECT
26	GND

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Chapter 3

Using the T35 Plant Floor Terminal

Chapter Objectives

This chapter describes how to:

- use the 2 built-in keypads (page 3-1)
- use the optional keyboard (page 3-2)
- insert and remove a floppy diskette (page 3-3)

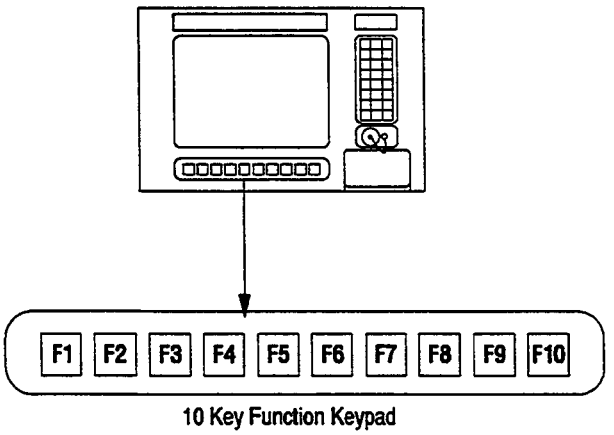
Using the T35 Keypads

Each T35 terminal has 2 built-in, sealed membrane keypads. The 10-Function Keypad and the Numeric/Control Keypad correspond with the keys of any XT/AT compatible keyboard. Refer to your software manual(s) for information on how to use the keypads in your particular application.

Using the 10-Function Keypad

A 10-key function keypad is located below the monitor. These keys are labeled [F1] through [F10]. See Figure 3.1. The function keys can be configured by the user.

Figure 3.1
10-key Function Keypad

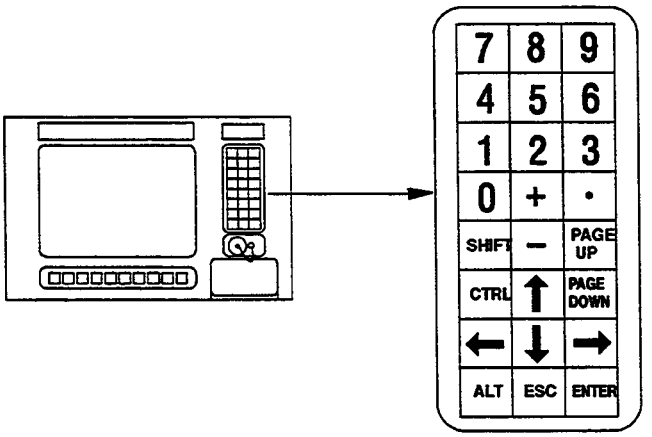


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Using the Numeric/Control Keypad

A numeric/control keypad is located to the right of the monitor. See Figure 3.2. It provides cursor control, dedicated control functions and numeric features. Use this keypad for all manual input to the workstation when an external keyboard is not used.

Figure 3.2
Numeric/Control Keypad



Numeric Control Keypad 18638

Using the Optional Keyboard

The optional 101-key AT-style keyboard (cat. no. 6160-KBD1) has the same keys as a standard typewriter keyboard as well as function keys, keys used by standard calculators, screen control keys and cursor control keys.

Using Key Combinations

Use the Control (`Ctrl`), Shift (`Shift`), and Alternate (`Alt`) keys, located on either side of the spacebar, in combination with one or more keys to perform special functions. For example, pressing the `[Ctrl] [Alt] [Del]` keys simultaneously reboots your system. Pressing Print Screen from the MS-DOS command line prints what appears on your screen. You may use either the left or right key of each pair when entering key combinations.

Using Function Keys

Note the function keys labeled [F1]-[F12] on the top row of the keyboard. Applications assign various tasks to these keys. Refer to your software documentation for instructions on using function keys.

MS-DOS software uses function keys [F1]-[F5] for editing the command line. The most frequently used is F3, which displays the last command entered. Refer to the MS-DOS 4.01 manual for a complete explanation of command line editing.

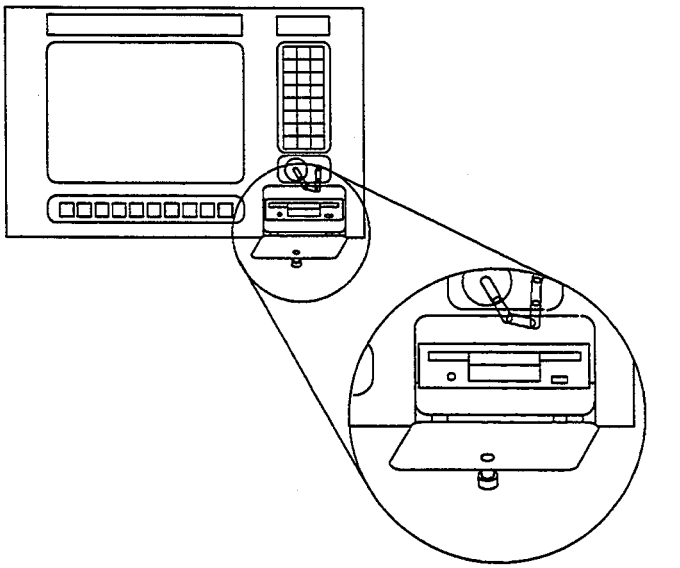
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Inserting Diskettes In the Disk Drive

To insert a diskette into the floppy disk drive, refer to the section below:

CAUTION: Do not power up or down the terminal with a diskette in the disk drive. Damage to the diskette and loss of data can occur.

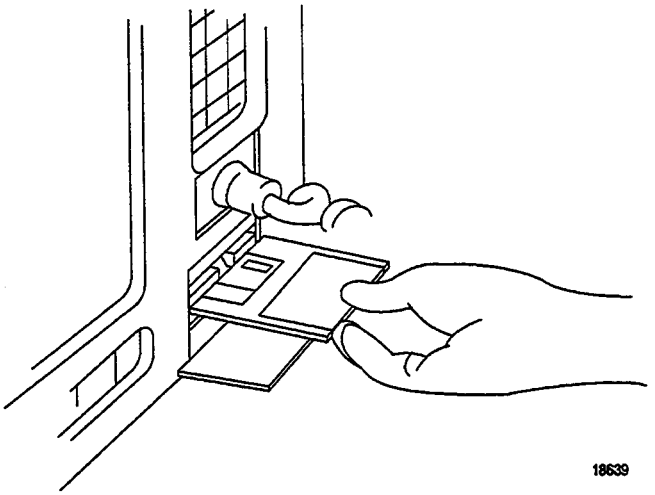
1. Open the drive door.



CAUTION: Do not insert the diskette with the labels facing down. Damage to the diskette, loss of data or damage to the disk drive can occur.

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2. Gently but firmly push the diskette into the drive with the metal spindle facing down and the read/write access slot nearest the drive.



Removing Diskettes From the Disk Drive

To remove a diskette from the floppy disk drive, refer to the section below.

CAUTION: Do not power up or down the terminal with a diskette in the disk drive. Damage to the diskette and loss of data can occur.

1. Make sure that the screen is inactive and the LED drive light is off.
2. Push the drive button to eject the disk.
3. Pull the disk straight out from the drive.
4. Close the drive door.

Important: To run 6200 Series software you must set memory size to 640K base memory and the rest of the memory is designated expanded memory. Refer to "System Setup and Configuration" on page 2-13.

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Chapter 4

Maintenance of the T35 Plant Floor Terminal

Chapter Objectives

This chapter tells you about your T35 warranty coverage and how to:

- clean the fan filter (page 4-2)
- care for your hard disk drive (page 4-3)
- care for you floppy diskettes and disk drive (page 4-3)
- clean your floppy disk drive heads (page 4-4)
- clean your CRT (page 4-5)
- guard against shock and vibration damage (page 4-5)
- guard against dust damage (page 4-5)
- guard against humidity and corrosive vapor damage (page 4-5)

Warranty Coverage

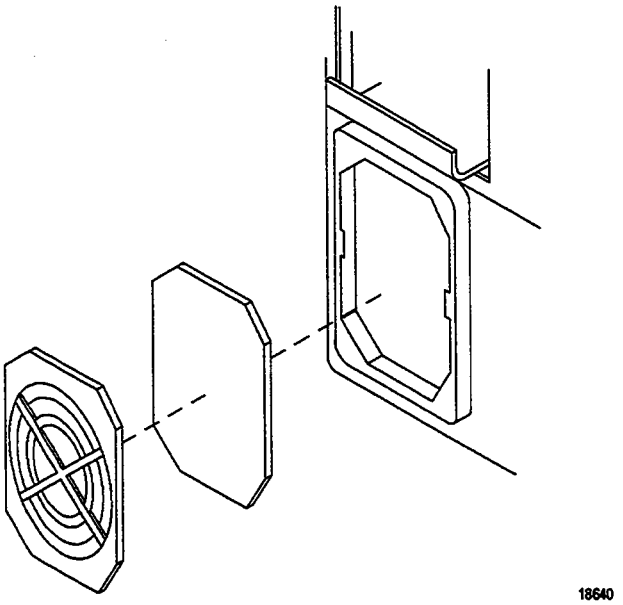
Your T35 Plant Floor Terminal hardware has full warranty coverage for 12 months from the date of purchase from Allen-Bradley or an Allen-Bradley distributor. Refer to publication PCGI-9.7, "Allen-Bradley Programmable Controller Division Terms and Conditions of Sale" for more information on your equipment warranty.

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Cleaning the Fan Filter

Locate the fan in the bottom rear corner of the back panel. This filter removes harmful particles and impurities from the air as the fan draws air into the unit. You need to clean the fan filter at least **once a month** during operation for proper air filtering. Follow these steps to clean your filter:

1. Remove the filter.



2. Wash the filter with warm water and a mild detergent, making sure the filter is thoroughly soaked (Do not use an abrasive detergent).
3. Rinse the filter well by spraying or pouring water through its foam.
4. Make sure all dirt, dust, and soapy residue are gone.
5. Dry the filter completely.
6. Reverse the above procedure to reinstall the filter.

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Caring for your Hard Disk Drive

Observe the following precautions to help maintain trouble-free service with your hard disk drive:

- operate your terminal in an environment that is within shock, vibration, and moisture specifications (refer to "Specifications" in Appendix A for more information)
- use the original shipping container when shipping the unit

Caring for your Floppy Diskettes and Floppy Drive

Handle your floppy diskettes carefully. Your terminal uses a 3-1/2 inch square hard-cased floppy diskette. Although a hard plastic case protects the floppy diskette, you should observe the following precautions.

DO NOT:

- touch the recording surface
- clean with chemicals
- place the diskette near magnets or magnetic fields
- place under heavy objects
- expose to direct sunlight or place near heaters
- force the diskette into the access slot of the diskette drive
- remove from the floppy disk drive while the access light is on
- turn the system on or off with the floppy diskette in the floppy drive

ALWAYS:

- place identifying labels on the area provided
- protect the diskette from dust, food, and tobacco particles
- store the diskettes in their original container

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Cleaning your Floppy Disk Drive Heads

The floppy head cleaning diskette (Cat. No. 1770-MMA) contains a dry cleaning medium that cleans the read/write heads of the floppy disk drive. Ignore the instructions on the cleaning diskette label. Refer to the following section titled, "Using the Cleaning Diskette". Care and use of the cleaning diskette is identical to that of a floppy diskette.

Using the Cleaning Diskette

Use the cleaning diskette to:

- remove contaminants such as grease, dust, and ferrous oxide powder from the read/write heads
- improve disk drive performance
- lower equipment service cost
- extend the life of floppy diskettes

Use the following procedure to ensure proper cleaning of the read/write heads.

Important: Do not clean the read/write heads while running your programming software. Loss of data may occur.

1. Turn on system power.

2. Hold the cleaning diskette with its labels facing up and the read/write access slot nearest the drive.

3. Insert the cleaning diskette into the disk drive access slot.

4. Restart the system by pressing `[Ctrl-Alt-Del]`. Refer to "Starting/Restarting the System" on page 2-12.



CAUTION: Do not power down before removing the cleaning diskette. Damage to the cleaning diskette can occur.

5. Remove the cleaning diskette and store it in its original storage sleeve.

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When to Clean the Floppy Disk Drive

Clean the floppy disk drive when hard or soft errors occur. To prevent reoccurring contamination, clean the disk drive approximately **once a month**. Clean it more frequently if used in dirty environments.

Important: When cleaning the floppy disk drive heads we recommend that you inspect the fan filter. If necessary, refer to "Cleaning the Fan Filter" on page 4-2.

Cleaning your CRT

Your 12-inch color monitor is protected by a scratch resistant, Lexan faceplate and should be cleaned periodically with a glass cleaner.

Guarding Against Shock and Vibration Damage

The head of your hard disk drive is suspended above the disk, by less than a micron (0.001 mm), when the unit is operating. The head rests on the disk when the drive is turned off or is in position for transport. Impact can damage the head or the disk.

Guarding Against Dust Damage

The hard disk drive contains its own air filtration system. The system permits circulation of internal air and equalization of atmospheric pressure inside and outside the drive. The filter prevents the entry of particles as small as 0.3 microns.

The chassis is NEMA 1 rated and requires an enclosure to properly protect it from contaminants in the plant environment. Inspect the inside of the terminal **once each year** (or more often depending on the operating environment) for any accumulation of dust. If dust is present, clean the fan filter and remove any dust accumulation from inside of the chassis. See the fan filter cleaning procedure on page 4-2.

Guarding Against Humidity and Corrosive Vapor Damage

Water vapor causes corrosion if it condenses on the disk. Condensation occurs when you move from a cool dry environment to a warm humid environment. Corrosive vapors also damage the hard disk. The filter does not remove water vapor and corrosive vapors.



CAUTION: Operate your terminal in an environment protected from high humidity and corrosive vapors. Always ship your terminal in its shipping container sealed and protected from possible corrosion caused by humidity or corrosive vapors.

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Chapter 5

Removing and Replacing Components

Chapter Objectives

This chapter describes how to:

- choose which sub-assemblies are user replaceable (page 5-1)
- remove the equipment drawer (page 5-2)
- remove and replace the AT2 module (pages 5-4)
- replace the KIM module (page 5-7)
- remove and replace the CMOS RAM battery (page 5-8)
- replace the equipment drawer (page 5-13)
- remove and replace the keyboard assembly (page 5-16)

Replaceable Sub-Assemblies

You should remove the following components and return them to Allen-Bradley for service if you find them to be faulty using the diagnostic procedures. Technical assistance is available from Allen-Bradley if you need help diagnosing problems with your terminal or removing and replacing these components.

Sub-assemblies that can be removed from the T35 by the user are as follows:

- AT2 module
- CMOS RAM battery (external)
- Allen-Bradley keyboard assembly

Important: If the CRT is faulty, return the entire terminal for service.



WARNING: High voltage is present. To avoid electrical shock, turn power off and unplug the main power cord before removing any T35 terminal replaceable sub-assemblies.

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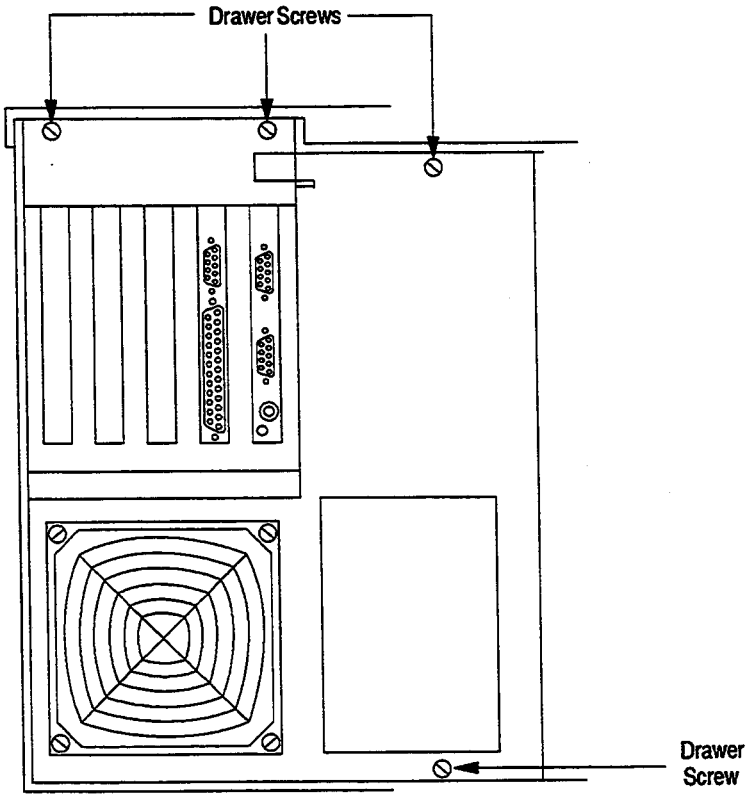
Removing the Drawer

To remove the drawer, refer to the illustration below and proceed as follows:

CAUTION: Electrostatic discharge can degrade performance or damage modules located inside your terminal. This damage is prevented by wearing your wrist strap grounding device when working on the T35 workstation. Refer to "Guarding Against Electrostatic Discharge Damage" on page P-iv of the preface for further information.

---

1. Attach your wrist strap grounding device.
2. Turn off the system power and unplug the power cord.
3. Disconnect power cables and other cables on the rear of the T35 workstation.
4. Loosen the screws on the rear of the unit.

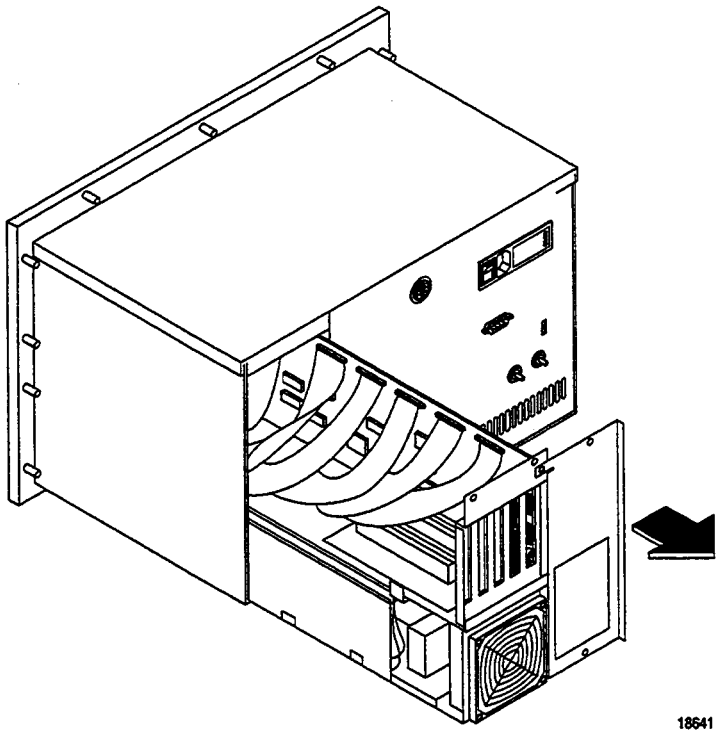


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5. Pull the drawer out completely and put it on a flat working surface.

CAUTION: Pull the drawer out horizontally. Do not lift up when removing the drawer from the chassis. Damage to the internal components could result.

CAUTION: Do not touch any of the internal components. Doing so without being properly grounded can damage the components.



6. Proceed to remove and replace the desired components.

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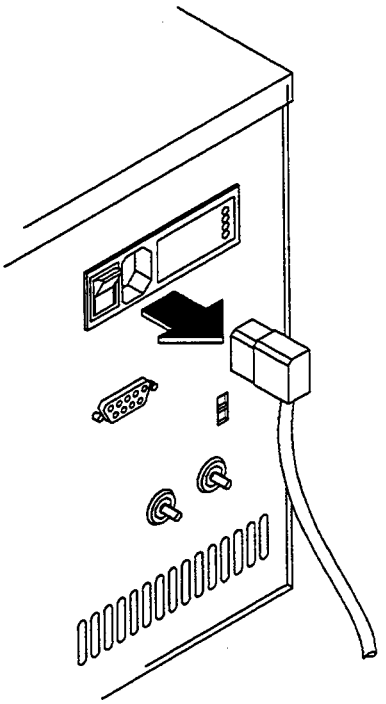
Removing and Replacing Modules

This section describes procedures for removing and replacing the 4001-AT2 and the KIM modules.

4001-AT2 Module

1. Turn off system power and disconnect the power cord. Attach your wrist strap grounding device.

WARNING: High voltage is present. Never attempt to open any piece of equipment before disconnecting all external power supplies. Electrical shock may occur if components are removed while the system power is on or the power cord is still attached.



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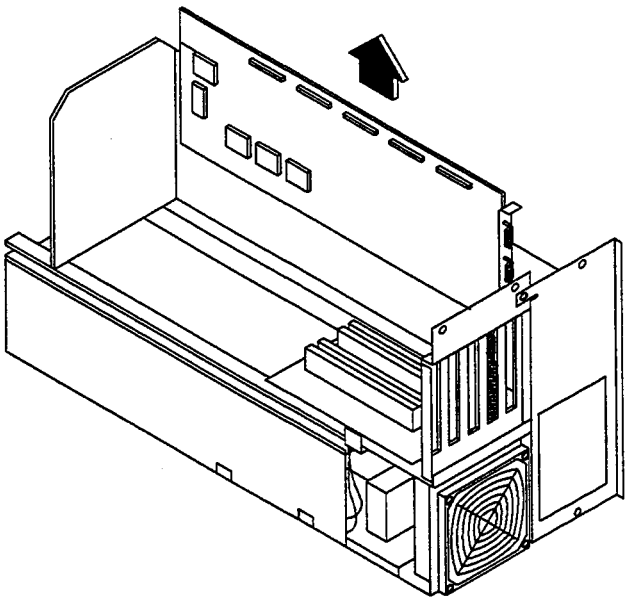
CAUTION: Check configurations to verify the positions of all jumpers and switches before installation. If incorrectly configured, your power supply can fail at power up.

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2. Remove the drawer as described on page 5-2.

3. Disconnect all cables attached to the AT2 card. Cables should be marked to correspond with the proper connector.

4. Remove the AT2 module from the drawer.



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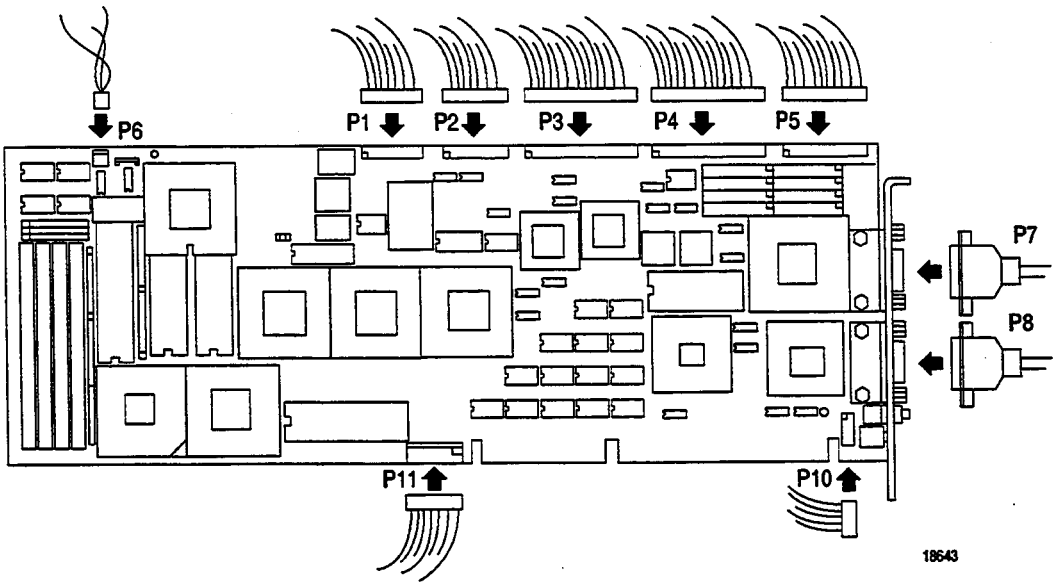
5. Slide the replacement AT2 module into the slots in the backplane and push down evenly until it firmly seats into the connectors on the bottom of the drawer.

6. If an external battery is used, connect the lead to P6 and remove jumper J2. If the on-board battery will be used, leave J2 on.

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CAUTION: Connectors P1-P5 and P10 can be connected backward. Ensure that the markings on the ribbon wire mate to pin 1 on both the board and other component.

Reconnect the AT2 cables using the figure below.



Connector Pinout Number:	Function:
P1 and P2	Hard drive data connectors. If only one drive is used, attach to P2.
P3	Hard drive control.
P4	Floppy drive connector.
P5	Parallel port.
P6	CMOS RAM Battery connector.
P7	Monitor.
P8	Serial devices (COM 1).
P10	Serial devices (COM 2).
P11	Keyboard connector.

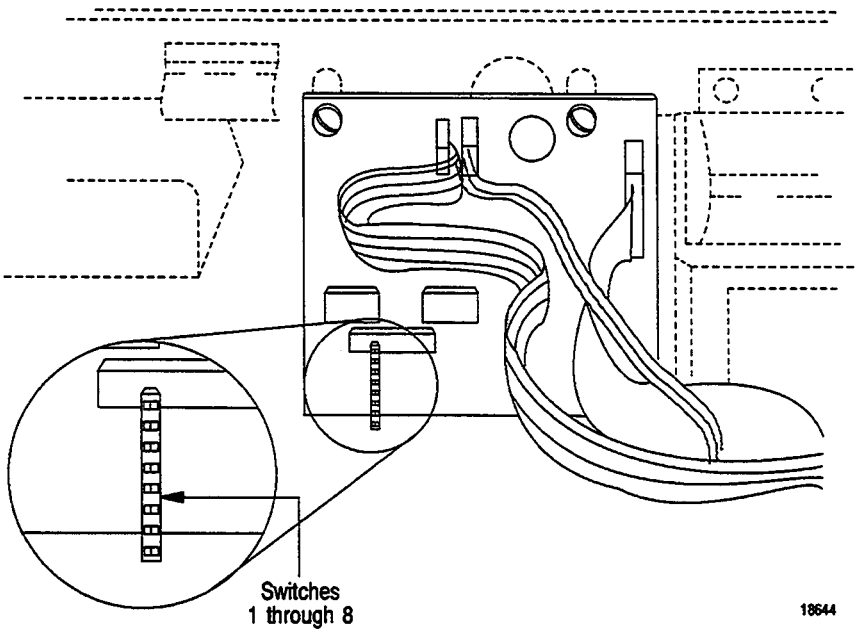
7. Reinstall the equipment drawer as described on page 5-13.
8. Install cover on cabinet.
9. Reconnect all power cables removed from the rear of the terminal.
10. Turn on system power.

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Keyboard Interface Module (KIM)

Important: DO NOT attempt to replace the Keyboard Interface Module. If the KIM is faulty, return the T35 terminal to Allen-Bradley for service or replacement.

The Keyboard Interface Module provides an interface point for the keyboards and keypads to the AT2 module.



Check the switch settings on the Keyboard Interface Module as shown in Table 5.A.

Table 5.A
KIM Switch Settings

Switch Number	Switch Setting
Switch 1	OFF
Switch 2	OFF (for AT keyboard) ON (for PC/XT keyboard)
Switch 3	OFF (for 84-key keyboard) ON (for 101-key keyboard)
Switches 4 thru 8	OFF

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Important: Turn off system power before changing KIM switches. Switches are only read at power-up; switches changed without powering down the terminal are not read.

The following keyboards have been checked for proper operation with the switch settings shown above:

- IBM AT Series A (keyboard supplied with 6121-COR, -COF)
- IBM AT Series B (keyboard supplied with 6121-CORB, -COFB)
- IBM XT (keyboard supplied with 6120-COA)
- 1784-T50 keyboard
- Everex Part Number 00120-00
- Maxi Switch 8600 Series III
- AID Model EKT 101 (6160-KBD1)

Installing the CMOS RAM Battery

Your T35 Terminal contains one 3.5V lithium battery for backup power located on the CPU Module. Follow the procedures listed below for proper battery operation, terminal functions and to reduce personal hazards.



WARNING: The lithium battery information provided here must be followed. If you fail to do so, you will increase the risk of damaged equipment and personal injury.

Handling

Misuse of the battery could result in overheating and explosion, exposing toxic, corrosive, and flammable chemicals. Use **only** for the intended applications.

DO NOT:

- charge the battery. The cell could explode or overheat, causing injuries to personnel.
- open, puncture or crush the battery. Damage to the battery could result in an explosion and/or the exposure of toxic, corrosive, and flammable chemicals.
- incinerate or expose the battery to high temperatures. The battery could explode and cause injuries to personnel.
- solder the battery or leads. An explosion could result.
- short positive or negative terminals together. The battery will heat up.
- ship the battery while it is connected to equipment.
- ship the battery on passenger aircraft.

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Storage

Store in a cool, dry place; typically 20° to 25°C (68° to 77°F) and 40% to 60% relative humidity.

Replacement

If your T35 Terminal is over five years old, or clock related problems occur, you may need to replace the battery. Check that battery voltage is at least 3.0V. If battery voltage is low, return the CPU Module to Allen-Bradley for battery replacement.

The Auxiliary Battery Connector is a two pin friction header. Attach it to an external battery to power the Real Time Clock and CMOS RAM.

Disposal



WARNING: DO NOT incinerate or dispose of a lithium battery in general trash collection. It may explode or rupture violently. Check state and local regulations that deal with the disposal of these materials. Remember that you will be held legally responsible for any hazard created while disposing your battery.

The table below shows the P6 battery pinouts.

PIN #	SIGNAL
1	POS
2	GND

You have two options with your CMOS RAM battery, as shown in Table 5.B

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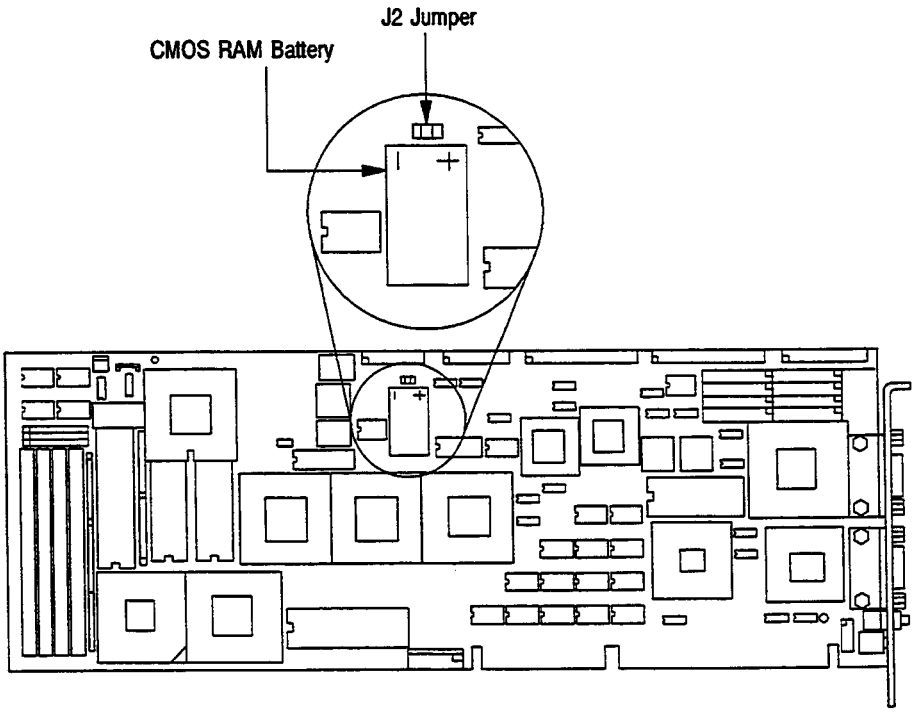
Table 5.B
CMOS RAM Battery Options

Type of battery:	Jumper J2 setting:	Do this if the battery needs replacement:
Onboard	ON	Return AT2 module to Allen-Bradley for battery replacement (See Figure 5.1).
External	OFF	Refer to the section "Replacing your External Battery" on page 5-11.

Onboard Battery

Figure 5.1 shows the onboard battery.

Figure 5.1
CMOS RAM Onboard Battery



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External Battery

To replace your external battery:

1. Access the setup screen by simultaneously pressing **[Ctrl] [Alt] [Esc]**.

2. Write down system setup information in the table below since this information is lost when you remove the battery.

System Setup Information	
Configuration Errors	
COM2 Serial Port	
Boot Device Order	
Diskette Drive A	
Diskette Drive B	
Fixed Disk Drive C	
Fixed Disk Drive D	

3. Turn off system power.

4. Remove the drawer as described on page 5-2.

5. Remove the two screws that secure the battery holder clamp against the battery.

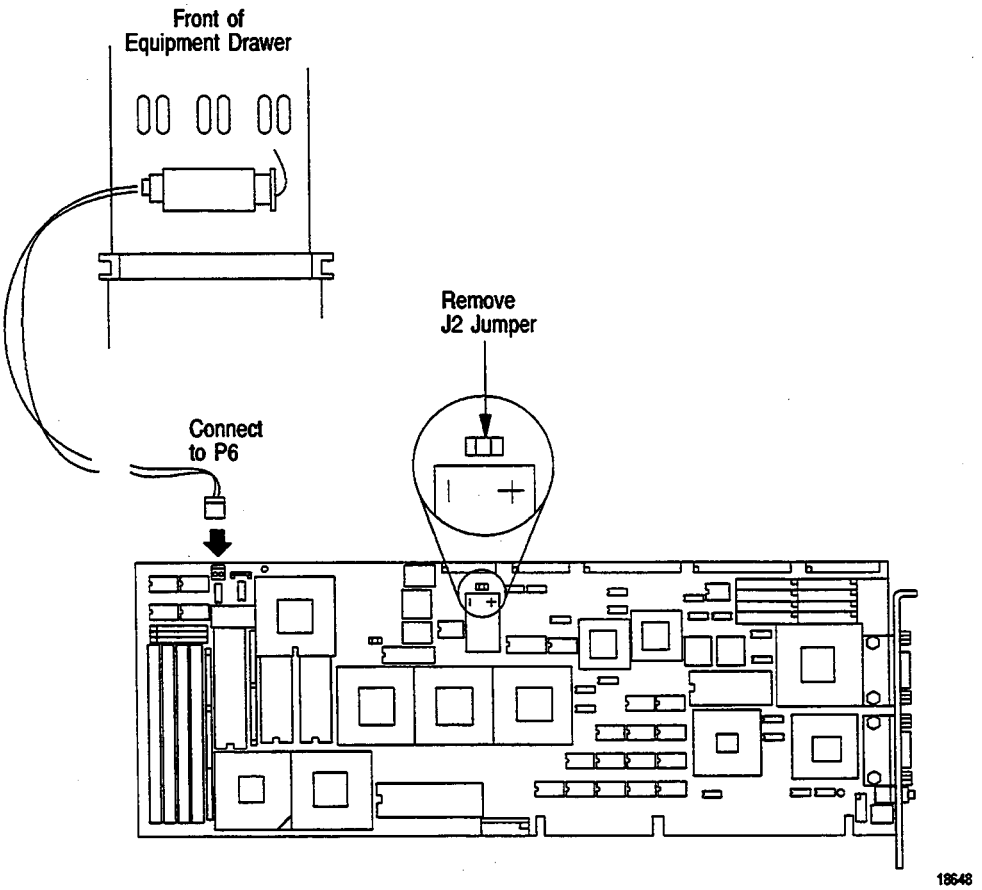
6. If the backup battery is used in conjunction with the AT2 module, jumper J2 must be pulled off the AT2 module in order to disable the onboard battery.

7. When the battery holder clamp is removed, install the battery into place. Ensure that the (+) and (-) polarities are positioned correctly.

   Important: The T35 terminal was designed to use the Tadiran memory back-up battery type AEL/S. The Allen-Bradley type designation for the backup battery is 94060101.

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8. Install the new battery and press down firmly.



CAUTION: You can damage the AT2 module's components if you do not plug the battery connector in properly. Make sure the red wire is connected to the positive output.

CAUTION: Do not lift up on the drawer when inserting it into the chassis. Damage to internal components could result.

9. Slide the drawer back into the unit. You can remove your wrist strap.
10. Tighten the back panel holding screws.
11. Re-attach the cables previously removed.
12. Re-enter system setup information as shown on page 5-14.

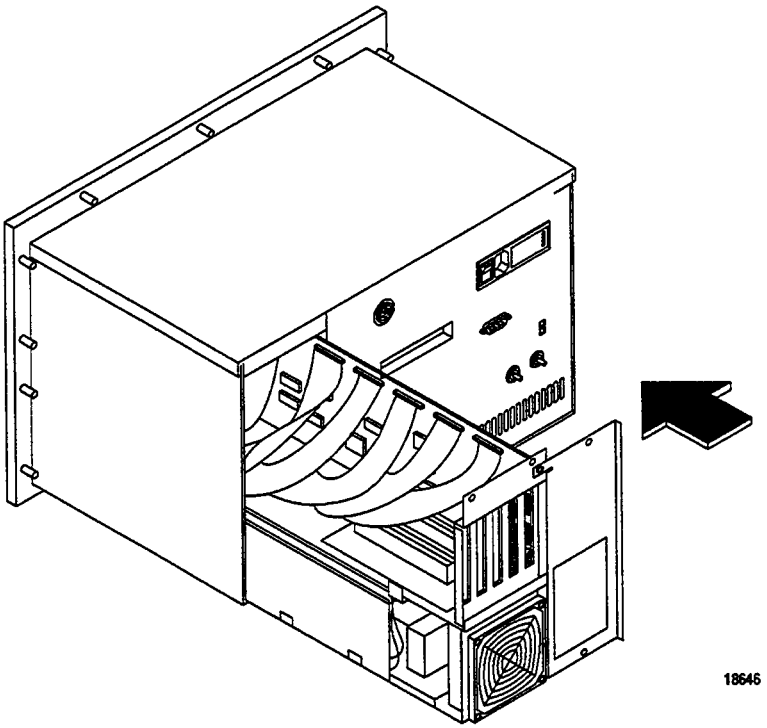
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Re-Installing the Drawer

To re-install the drawer, follow the steps below:

1. Attach your wrist strap grounding device.

2. Match the guide rails on the drawer with those on the inside of the terminal.



3. Push the drawer all the way into the terminal and re-install the four back panel holding screws.

4. Remove your wrist strap grounding device.

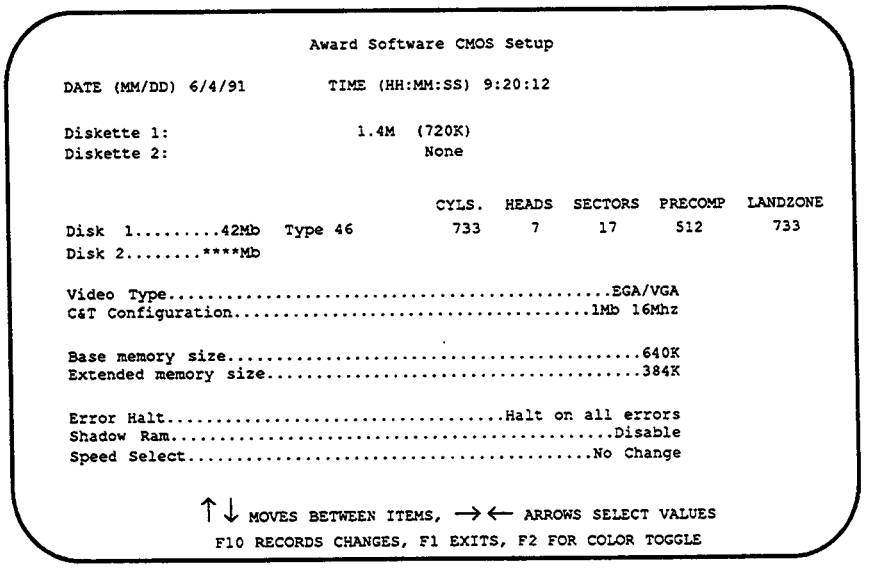
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Re-entering System Setup Information After Battery Installation

After installing the battery:

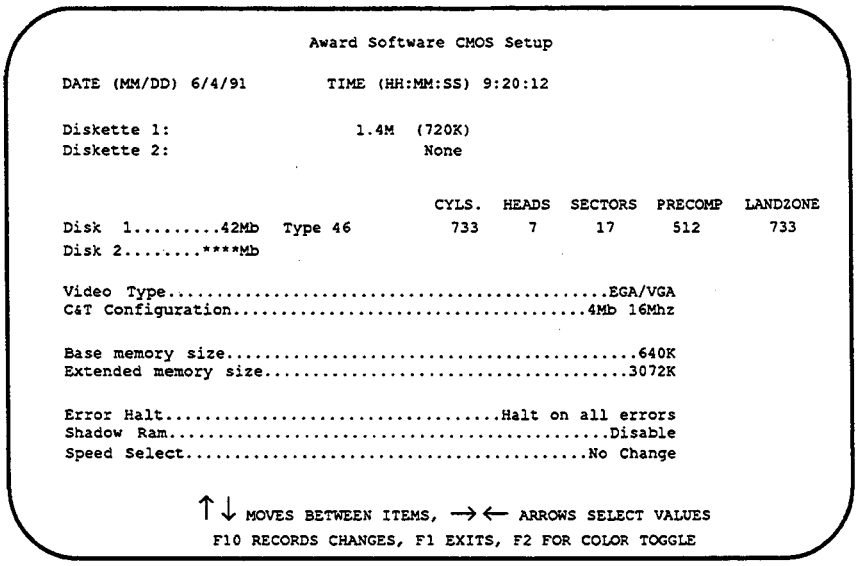
1. Turn on system power.
2. Wait until the system performs its power-on self-test. You see these messages:
   `CMOS RAM ERROR, CHECK BATTERY/RUN SETUP`
   `PRESS F1 KEY TO CONTINUE OR CTRL-ALT-ESC FOR SETUP`
3. Access the setup screen by pressing **[Ctrl-Alt-Esc]** simultaneously.

   The T35 Series D displays the following Setup Utility Screen:



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The T35 Series E displays the following Setup Utility Screen:



4. Re-enter the setup information:

   a. Use the arrow keys to move to the desired field.

   b. Enter the date, time, and disk drive information.

   c. Press **[F10]** to save.

   d. Press **[F5]** to reboot.

If you still have difficulties, contact your local Allen-Bradley sales representative for more information.

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Keyboard Assembly Removal and Replacement

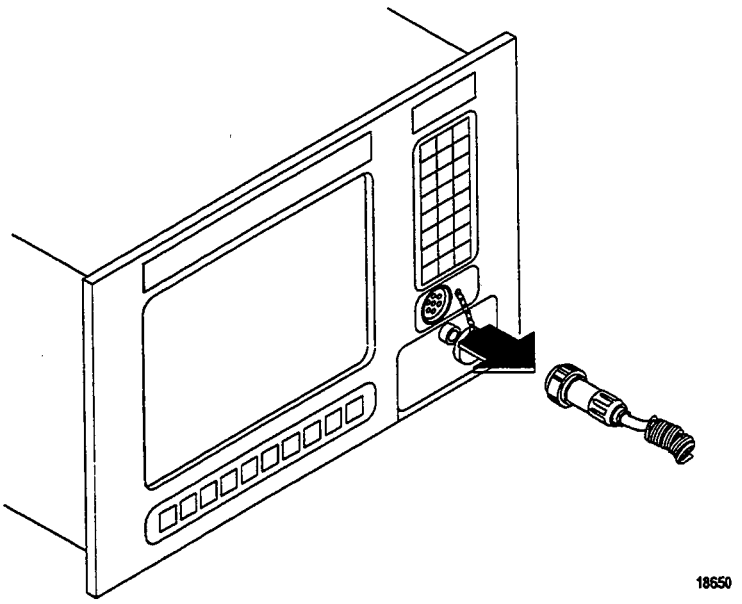
To remove and replace your Allen-Bradley keyboard assembly, refer to the sections below.

XT/AT Compatible,1784-T50, or 6160-KBD1 Keyboard Connection

To disconnect the keyboard:

1. Turn off system power.

2. Unplug the cable from the front keyboard connector.



3. Close and secure keyboard connector cover.

Important: If you use the front connection for your keyboard, you lose your NEMA 4 and 12 rating while in use. A cover is provided so that when not in use the NEMA 4 and 12 rating is maintained.

4. Repack the keyboard in its original container and return it to Allen-Bradley.

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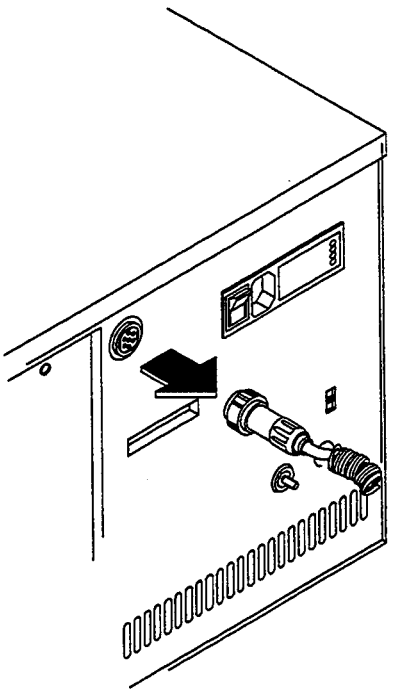
To reconnect the keyboard:

1. Unscrew cover in front of the keyboard connector.
2. Plug the keyboard cable into the front keyboard connector.
3. Turn on system power.

XT/AT Compatible, 1784-T50, or 6160-KBD1 Keyboard Connection

To disconnect the keyboard:

1. Turn off system power.
2. Unplug the cable from the rear keyboard connector.



3. Repack the keyboard in its original container and return it to Allen-Bradley.

To reconnect the keyboard:

1. Plug the keyboard cable into the rear keyboard connector.
2. Turn on system power.

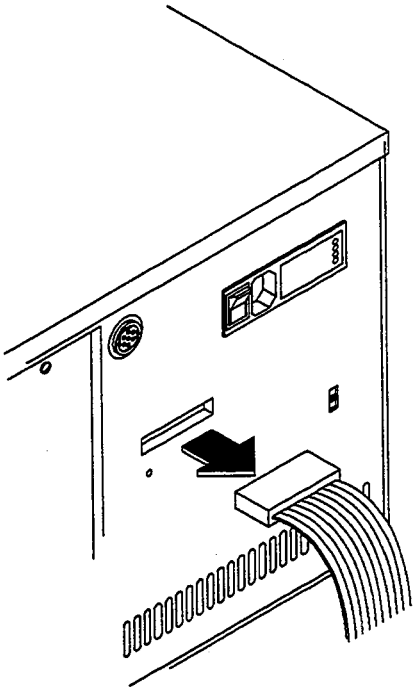
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1784-WAB Keyboard Connection

To disconnect the keyboard:

1. Turn off system power.

2. Unplug the cable from the rear keyboard connector.



3. Repack the keyboard in its original container and return it to Allen-Bradley.

To reconnect the keyboard:

1. Plug the keyboard cable into the rear keyboard connector.

2. Turn on system power.

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Chapter 6

Diagnostics and Troubleshooting

Chapter Objectives

This chapter describes how to:

- run diagnostic testing through the diagnostic menus (page 6-1)
- access, run, and read disk-based diagnostic tests (page 6-2)
- perform troubleshooting procedures through the testing and installation menus (page 6-3)
- perform the battery down procedure (page 6-11)
- access loopback test connectors (page 6-11)

About Diagnostic Testing

The diskette-based diagnostics provide detailed operational tests for your T35 industrial workstation. These tests, accessible at the DOS prompt, let you detect and isolate causes of faulty operation. The tests provide information that helps you reduce service costs and minimize hardware downtime.

Always run diagnostics from the floppy drive, not from the hard disk drive. This allows the diagnostics to accurately check the hard disk drive.

Important: Tests requiring manual intervention return an error message if you attempt to run them without properly setting up the hardware. These tests are identified in the diagnostic menus.



CAUTION: Electrostatic discharge can degrade performance or damage modules located inside your terminal. Refer to "Guarding Against Electrostatic Discharge Damage" on page P-iv in the preface for further information.

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Running Diagnostic Tests

The diagnostics package provided with your T35 terminal performs tests at power-up and on-demand. It can also generate a report of any failed assemblies.



CAUTION: Diagnostics and MS-DOS software are licensed and configured for the T35 Series D and E terminals and should not be used on other systems.

Power-up diagnostics

Your T35 terminal tests the following sub-assemblies using internal diagnostic tests at power-up and after each system reset:

- Processor CPU
- DMA controllers
- Floppy disk drive controllers
- Hard disk drive controller
- Hard disk drive configuration
- Real time clock
- Interrupt controller
- Keyboard
- Time-of-day clock (CMOS RAM)
- Video controllers
- RAM memory
- BIOS ROM

On-demand diagnostics

You can also test the individual components on-demand using the menu driven diagnostics system on the floppy diskette shipped with your system. The diskette contains software procedures for testing the following components:

- hard and floppy disk drive controller
- clock/calendar
- video (CRT)
- keyboard
- serial port
- parallel port

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Troubleshooting

The diskette-based tests contain comprehensive routines to check both the system circuits and the interfaces required to operate peripheral devices. Use the following procedure for troubleshooting your system.

Diagnostics/Troubleshooting Procedures

Important: If you configured your T35 hardware yourself, perform a visual inspection before running any diagnostics. Inspect the T35 workstation to see that:

- Circuit cards are properly seated in their connectors
- All cables are properly oriented and completely seated in their connectors

Errors not connected to the diagnostics may also occur any time during the diagnostic testing. Follow Table 6.A to correct such errors.

Table 6.A
Diagnostics Error Messages

Error Message:	Description:	What You Should Do:
The T35 is not receiving power.	Power cable is disconnected, or you have a power failure.	Check power cable for proper connection. If cable is properly connected, call your Allen-Bradley sales representative for assistance.
Heavy use of drive A produces error message "`Drive not ready`".	The default drive is set incorrectly.	Change the default drive setting. If the error still appears, call your Allen-Bradley representative for more information.
Unit has power but screen is dark.	Brightness adjustment is turned down, mode incorrectly set for external monitor, or connector next to floppy drive disconnected.	Adjust brightness control, type command "`mode mono`" on keyboard, and check for proper connection of cable.
	The monitor is not connected to the AT2 module.	Connect the monitor cable to the proper pinout on the AT2 module as shown on page 5-6.
`1782 disk controller failure.`	Setup information in battery-backed CMOS RAM is corrupted.	Make sure to enter 0 when prompted "`How many hard disks do you have?`" Boot the T35 from drive A. Run the setup procedure to reinitialize the CMOS RAM. Check voltage levels of 3V batteries. Replace as necessary.

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You may have corrected the problem simply by moving a cable or connector. If not, proceed to Step 1.

1. Turn on system power and correct any faults that the terminal detects at bootup.

2. Insert you diagnostics diskette into the floppy disk drive.

3. Type `a:` `[RETURN]` to change to the floppy disk drive.

4. Type `T35.bat` `[RETURN]` to call up the diagnostics menu as shown below.

```
Part number 532045301 must have the following hardware configuration:


1)  Model:                  T35
2)  Phosphor:               Color
3)  Board(s)                4100-AT2
4)  Floppy Drive a:         3.5"  1.44M
5)  Hard Drive:             40MB
6)  Ext. Floppy Port:       No
7)  COM2 Port:              Yes
8)  Printer Port:           Yes



Is this correct (Y/N) or (+/-)?
```

5. See the table below:

If the above information is	Type
correct	`Y` or `+` to continue with the final system test menu on the next page
not correct	`N` or `-` (see below)

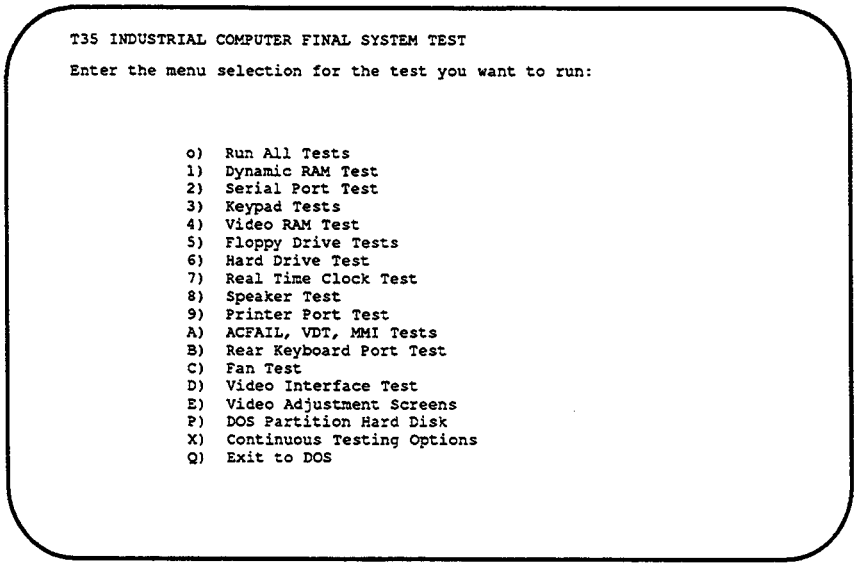
If you type `N` or `-`, you see the prompt:

```
Press any key to continue. <ESC> exits to DOS
```

Press:

- any key and you see the final system test menu on the next page
- `[ECSAPE]` and you return to the DOS prompt

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6. Select the number of the desired diagnostic test to continue with the testing procedures.

   Select the number of the test you want to run. Press any key to stop testing.

Refer to the following sections for information on each diagnostic test.

Run All Tests

This test runs continuously (some tests require user input) through each of the 17 diagnostic tests until an error is found. If no errors occur, the diagnostics screen appears again to allow you to exit to DOS.

Dynamic Ram Test

This tests the address range 40000-9ffffH (640KB-256KB).

1. A checkerboard read/write test is done on each memory byte location. A pattern of "...55H, AAH, 55H, AAh, 55H,..." is written to all of the bytes. Then, each byte is read and the received data is compared to the expected data. Two checkerboard patterns are written and then read back (the first 55H, the second AAH). If an error occurs, an error message displays which includes:

   - the failing address
   - the expected data
   - the received data

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2. An incrementing Pattern RAM test for large RAMS (64KB and up) is done where address 0 and the 2*n boundaries `(0, 1, 2, 4, 8, 10H...)` are filled with an incrementing pattern and read back. For any error found:

   - the failing address
   - the expected data
   - the received data

   are printed (along with the message '`Addressing error`'), as well as all addresses and data written to all boundary locations, for use in debugging address decoding problems.

3. If selected, a Refresh test is done, where addresses 0 and the 2*n boundaries `(0, 1, 2, 4, 8, 10H...)` are filled with an incrementing pattern. Wait 30 seconds and read the data. If Tests 1 and 2 pass, and a failure is received here, it is probably due to a refresh problem.

Serial Port Test

This test requires loopback plugs, and has 3 sections.

1. The modem control handshaking lines test identifies a failed loop.

2. The transmit/receive data lines are tested as 3 different baud rates and 3 different data sizes. Timeout or expected and received data failures are displayed as error messages.

3. If selected, the serial receive interrupt is enabled and a known character is transmitted. When the character is received a receive interrupt occurs. If the wrong data, interrupt, or no interrupt occurs, then the appropriate error message displays.

Keypad Tests

Any key pressed (that returns a valid IBM keyboard key code) is shown as the key's name and a beep sounded. This includes the function keys and control keys. Also:

- the test uses BIOS INT 16H
- a specific key sequence exits the test
- a message directs that ALL keys on ALL keypads be pressed and a minimum of 31 keys must be pressed to pass test

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Video RAM Test

Bankswitches 4 64K planes (256K total) into the 64K address range a0000-affffH, one at a time.

1. A checkerboard read/write test is done on each memory byte location: write 55H, read 55H, write aaH, read aaH. For any error, the message `Read/Write error` is printed along with the failing address, expected, and received data.

2. An incrementing Pattern RAM test is done, where the address range is filled with an incrementing pattern and read back. For any error found, the message `Addressing error` is printed along with the failing address, expected, and received data .

Floppy Drive Test

Important: You must use 1.44Mb high density floppy diskette. Using any other diskette causes the diagnostic testing to fail.

The floppy drive test mimics tests in the IBM AT DIAGNOSTICS. Each floppy test requires a formatted, scratch diskette.

Testing the drive INTERFACE

- The controller registers are exercised (tracks in the seek test, heads in the read/write test)
- DMA transfers are tested during the read/write test

Testing the drive

The drive is tested by stepping to all tracks during seek, and exercising all heads during the read/write test.

The test for the a: drive was designed to test the interface circuitry to a PRIMARY floppy drive. It has 2 sections:

1. A converging **SEEK** test on 1 head (uses the track verify command to force controller to checksum fields on the disk.) No data is transferred to RAM during this test.

2. A **READ/WRITE** test, which destructively writes a track, reads back the data, and compares it to the expected data: 6 tracks (2 each, near outside, middle, and inside of disk) are tested, all heads for each track.

The test for the b: drive was designed to test the interface circuitry to a SECOND floppy drive. The control and data lines were tested thoroughly for the first drive and are shared by the 2 drives. Test the Drive Select line to the second drive with a single track verify command (1 head).

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The floppy drive test will erase the diskette contents, but not deformat the diskette. Use INT 13H calls for all disk accesses. A structure array can be modified to support new drive parameters.

Hard Drive Test

The hard drive test mimics tests in the IBM AT DIAGNOSTICS. Each hard drive must be low-level formatted, as a minimum.

Testing the drive INTERFACE

- The controller registers are exercised (tracks in the seek test, heads in the read/write test)

Testing the drive

The drive is tested by stepping to all tracks during seek, and exercising all heads during the read/write test.

The test for the c: drive tests the interface circuitry to a PRIMARY hard drive. It has 2 sections:

1. A converging **SEEK** test on 1 head (uses the track verify command to force controller to checksum fields on the disk.) No data is transferred to RAM during this test.

2. A **READ/WRITE** test, which non-destructively writes a track, reads back the data, and compares it to the expected data: 1 track, all heads are tested.

The test for the d: drive tests the interface circuitry to a SECOND hard drive. The control and data lines were tested thoroughly for the first drive. Test the Drive Select line and data lines to the second drive with a single track Non-destructive read/write test (all heads).

Use INT 13H calls for all disk accesses. A structure array can be modified to support new drive parameters.

Real Time Clock Test

1. A **non-destructive read/write test** of the registers is done: write 55h, read 55h, write aah, read aah, to clock register 1-9, and CMOS RAM locations 0eh-3fh. Clock control register a-d hexidecimals are not changed and assumed programmed correctly by the BIOS.

2. A **rollover test** is performed. The clock registers are set for Saturday, 12-31-99, 23-59-59. Wait for the rollover. The expected rollover values are checked against the received ones.

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3. The time between 2 1-second rollovers is measured, and must be between .89 and 1.1 seconds to pass. The system clock (55msec period) is used as a time base.

Speaker Port Test

The speaker port is tested by sending waveforms out the speaker port, and having the technician listen for the audio on a speaker fixture.

Printer Port Test

The parallel port is tested by sending a small message out to an attached parallel printer, and having the technician inspect the printed message.

ACFAIL, WDT, NMI Tests

This circuitry is only present on the 4100-AT2 board, and the test only called for units with this board.

1. **Watchdog Timer test.** Reset and restart the WDT, and measure the timeout using several routines which use the System 55msec Timer. The WDT chip specs say 1.2-2.0 secs. On the measurement slope, the test will go 0.98 to 2.22 seconds. If over 2.5 seconds expire, the test times out.

2. **NMI test.** Initialize the NMI ISR vector to point to a simple routine which sets a flag. Clear the flag, reset and restart the WDT, and wait 2 seconds. See if an NMI occurred.

Rear Keyboard Port Test

You are instructed midway through testing to plug the keyboard into the keyboard port at the rear of the unit to check if it is operating properly. Press any key to recognize the test. If running properly, the character is recognized and the test returns to the main menu.

Fan Test

You are instructed to check if the fan is operating properly.

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Video Interface Test

A variety of VGA/EGA/CGA modes are selected, and for each mode, the character generator is set and the attributes that apply to that mode are displayed. BIOS INT 10H is used.

Video Adjustment Screens

A variety of crosshatch patterns, color screens (for color units), and reverse video patterns are displayed for adjusting the monitor for brightness, clarity, convergence etc. Separate written procedures for each monitor type describe in detail the adjustment procedure for each monitor.

Hard Disk Media Test

This non-destructive test scans for hard disk tracks marked BAD at low-level format, as well as a variety of read errors that can occur on a damaged disk.

At the end of the test, compare the tracks listed on the CRT with the tracks listed on either the label of the drive or on the Configuration sheet supplied with the unit.

DOS Partition Hard Disk

The Disk Manager Program is used to create the partition(s), depending on 20MB or 40MB Hard disk. Leaving the partition program resets the unit, and you are instructed to enter the Set-up Configuration during reset and check the timedate. Remember to install MS-DOS files on the hard disk, using the proper Floppy Disks.

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Continuous Testing Options

This test continuously runs all the diagnostics until either an error is found or the job is terminated by the user. Press [ENTER] to terminate the job. If you press x for continuous testing, you see the following screen:

```
Continuous Test Menu
This test WILL stop an error
Press ANY KEY to stop continuous testing

0)  Toggle the state of whether the test stops on an error.
1)  Dynamic RAM tests
2)  Serial Port Tests
4)  Video RAM Tests
5)  Floppy Drive Tests
6)  Hard Drive Test
7)  Real Time Clock Test
9)  Printer Port Test
A)  ACFAIL, WDT, NMI Tests
Q)  Exit to Main Menu
```

Exit to DOS

Use Exit to DOS to return to the main menu.

Battery Down Procedure

You may need to replace the 3.5V lithium battery located on the AT2 Module if:

- the battery runs down with system power off
- your terminal is over five years old
- you have configuration or clock related problems

If the battery needs to be replaced, refer to page 5-8 under "Installing the CMOS RAM Battery" for more information.

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Setting Loopback Test Connectors

To completely test an Input/Output (I/O) port, your must perform a "loopback" test, in which you transmit known data and then return the same data to the receive circuits. To do this, you must first install a test plug in the applicable I/O connector on the rear of the T35 workstation. Table 6.B and Table 6.C show the pin assignments for 2 loopback connectors you can build.

Table 6.B
25-Pin Parallel Loopback Connector Pin Out
25-pin Make "D" connector

From	To
1	13
2	15
10	16
11	17
12	14

Table 6.C
9-Pin Serial Loopback Connector Pin Out
9-pin Female "D" connector

From	To
2	3
1	4, 6
7	8, 9

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Chapter 7

Peripherals and Optional Devices

Chapter Objectives

This chapter describes the following peripherals and optional devices to your T35 Plant Floor Terminal:

- CMOS RAM Battery (page 7-1)
- math coprocessor (page 7-2)
- external speaker (page 7-2)
- video switches (page 7-4)
- memory maps (page 7-6)
- interrupts (page 7-8)

Installing the CMOS RAM Battery

You have two options with your CMOS RAM battery, as shown in Table 7.A.

Table 7.A
CMOS RAM Battery Options

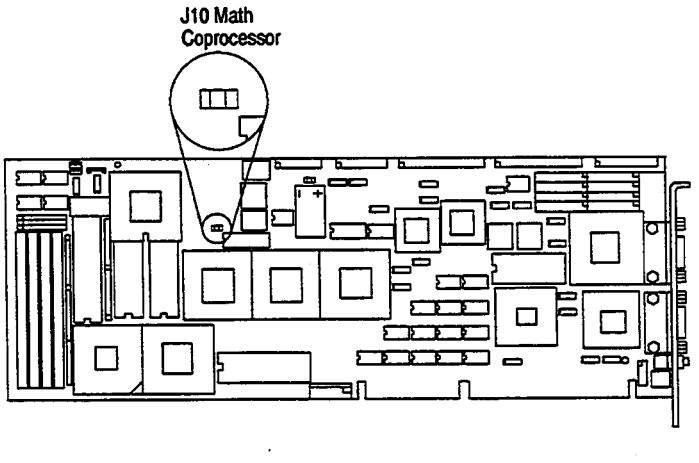
Type of battery:	Jumper J2 setting:	Do this if the battery needs replacement:
Onboard	ON	Return the 4001-AT2 module to Allen-Bradley for battery replacement
External	OFF	Refer to the "Installing the CMOS RAM Battery" on page 5-8.

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Setting the Math Coprocessor

Jumper J10 sets the speed of the math coprocessor. If jumper J10 is on, the speed will be 8MHz. If it is left off, the speed will be 10MHz. The coprocessor is set at the factory with jumper J10 on.

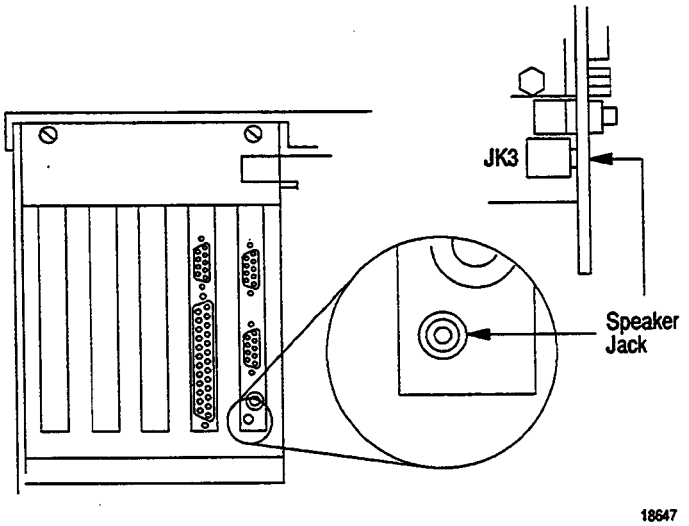
Figure 7.1
Jumper J10



Installing an External Speaker

The T35 workstation has no internal speaker, but you can install an external speaker.

Important: You must supply the speaker device and two conductor wire (minimum size 22AWG; 01643mm in diameter).



You supply the speaker device and wire to attach it. We supply the speaker connector in the accessories bag that comes with your T35 workstation. The speaker output is matched for an 8 OHM speaker.

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Follow these steps to install an external speaker:

1. Determine the desired location of the speaker.

2. Determine the length of the wire needed for the connection.

3. Gather the following items:

   - speaker device
   - two conductor wire (minimum size 22AWG, 0.643mm in diameter)
   - speaker connector
   - soldering equipment

4. Solder your wire to the wires attached to the piezo (or directly to the piezo if no wires exist).

5. Solder the free end of your wire to the speaker connector connections 1 and 2 according to the following pinout:

Pin Number:	Signal:
Center	POS
Outside	GND

6. Turn system power off.

7. Plug the speaker connector into the external speaker jack on the back of the workstation.

8. Test the speaker by applying power. Speaker should beep during power up. If it does not beep, check your wiring. If it still does not work, call your Allen-Bradley service representative.

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Setting the Video Switches

There are two switches on the AT2 module. One is a hardware reset switch located on the option retaining bracket (ORB). This is a push-button switch that causes a hardware reset when pressed. It has a recessed design to avoid an accidental resetting.

The second switch is the video switch. It consists of four individual switches, each set to either ON or OFF. The relative position of all four will determine in what mode the video is displayed. Table 7.B shows display configurations.

Table 7.B
4100-AT2 Switch Configurations

Switch Settings Switch Down=ON Switch Up=OFF	Type of Display Used as Primary With Other Display Card:	Description:	Type of Display Used as Secondary With 4100-AT Card:	Description:
1-ON 2-ON 3-ON 4-ON	Monochrome	standard monochrome or HGC	40 x 25 Color Display or Enhanced Display	Mode 1 40 column text (8 scan lines/char)
1-OFF 2-ON 3-ON 4-ON	Monochrome	standard monochrome or HGC	80 x 25 Color Display or Enhanced Display	Mode 3 80 column text (8 scan lines/char)
1-ON 2-OFF 3-ON 4-ON	Monochrome	standard monochrome or HGC	Enhanced Display	Mode 3 80 column text (8 scan lines/char)
1-OFF 2-OFF 3-ON 4-ON	Monochrome	standard monochrome or HGC	Enhanced Display	Mode 3 80 column text (14 scan lines/char)
1-ON 2-ON 3-OFF 4-ON	40 x 25 Color Display	Mode 1 40 column text (8 scan lines/char)	Monochrome	Mode 7 standard monochrome 80 column (14 scan line/char)
1-OFF 2-ON 3-OFF 4-ON	80 x 25 Color Display	Mode 3 80 column text (8 scan lines/char)	Monochrome	Mode 7 standard monochrome 80 column (14 scan line/char)
1-ON 2-OFF 3-OFF 4-ON	40 x 25 Color Display or Enhanced Display	Mode 1 40 column text (8 scan lines/char)	Monochrome	Mode 7 standard monochrome (14 scan lines/char)
1-OFF 2-OFF 3-OFF 4-ON	80 x 25 Color Display or Enhanced Display	Mode 3 80 column text (8 scan lines/char)	Monochrome	Mode 7 standard monochrome (14 scan lines/char)

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Switch Settings Switch Down=ON Switch Up=OFF	Type of Display Used as Primary With Other Display Card:	Description:	Type of Display Used as Secondary With 4100-AT Card:	Description:
1-OFF 2-ON 3-OFF 4-OFF	Color Display or Enhanced Display	Mode 1 hardware emulation of 40 col CGA (8 scan lines/char)	Monochrome	Mode 7 standard monochrome (14 scan lines/char)
1-ON 2-OFF 3-OFF 4-OFF	Color Display or Enhanced Display	Mode 3 hardware emulation of 80 col CGA (8 scan lines/char)	Monochrome	Mode 7 standard monochrome (14 scan lines/char)
1-ON 2-ON 3-ON 4-OFF	Enhanced Display	Mode 3 80 column text (8 scan lines/char)	Monochrome	Mode 7 standard monochrome (14 scan lines/char)
1-OFF 2-ON 3-ON 4-OFF	Enhanced Display	Mode 3 80 column text (14 scan lines/char)	Monochrome	Mode 7 standard monochrome (14 scan lines/char)
1-OFF 2-OFF 3-ON 4-OFF	Monochrome	Mode 7 80 column (14 scan lines/char)	80 x 25 Color Display	Mode 3 80 column text (8 scan lines/char)
1-ON 2-OFF 3-ON 4-OFF	Monochrome	Mode 7 80 column (14 scan lines/char)	40 x 25 Color Display	Mode 1 40 column text (8 scan lines/char)
1-ON 2-ON 3-OFF 4-OFF	Monochrome	Mode 7 hardware emulation of HGC/MDA 80 column (14 scan lines/char)	80 x 25 Color Display	Mode 3 80 column text (8 scan lines/char)

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Setting the Memory Maps

The system memory map has a minimum of 640K of user RAM when the shadow option is enabled. If the shadow option is not enabled, the system relocates the 384K to the 100000-15FFFF address location. All of this memory appears as one continuous block. Any memory space above the 1 megabyte limit cannot be accessed in the real mode of operation. It is reserved for the protected mode.

The portion of the memory reserved for video provides 256K DRAM, but only occupies the space of 128K. This is done through bank switching as shown in the tables below.

Table 7.C
Memory Map 1 Meg DRAM (No Shadow RAM) version for T35/D

Address:	Description:
100000-15FFFF	DRAM (384K)
0F0000-0FFFFF	SYSTEM BIOS (64K)
0C4000-0EFFFF	ROM EXPANSION (available)
0C0000-0C3FFF	EGA BIOS (16K)
0A0000-0BFFFF	VIDEO RAM (128K)
000000-09FFFF	DRAM (640K)

Table 7.D
Memory Map 4 Meg DRAM (No Shadow RAM) version for T35/E

Address:	Description:
100000-3FFFFF	DRAM (384K)
0F0000-0FFFFF	SYSTEM BIOS (64K)
0C4000-0EFFFF	ROM EXPANSION (available)
0C0000-0C3FFF	EGA BIOS (16K)
0A0000-0BFFFF	VIDEO RAM (128K)
000000-09FFFF	DRAM (640K)



CAUTION: When the board is in SHADOW mode, 16K that was available for ROM expansion is allocated to the EGA BIOS. This is shown in the address changes to the two areas.

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Table 7.E
Memory Map 1 Meg DRAM "Shadowed" Version for T35/D

Address:	Description:
100000-15FFFF	DRAM (384K)
0F0000-0FFFFF	SYSTEM BIOS "SHADOW" (64K)
0C8000-0EFFFF	ROM EXPANSION (available)
0C0000-0C7FFF	EGA BIOS "SHADOW" (32K)
0A0000-0BFFFF	VIDEO RAM (128K)
000000-09FFFF	DRAM (640K)

Table 7.F
Memory Map 4 Meg DRAM "Shadowed" Version for T35/E

Address:	Description:
100000-3FFFFF	DRAM (384K)
0F0000-0FFFFF	SYSTEM BIOS "SHADOW" (64K)
0C8000-0EFFFF	ROM EXPANSION (available)
0C0000-0C7FFF	EGA BIOS "SHADOW" (32K)
0A0000-0BFFFF	VIDEO RAM (128K)
000000-09FFFF	DRAM (640K)

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Setting the Interrupts

The 80286 microprocessor Non-Maskable Interrupt (NMI) and the Chips and Technology 82C206 (containing the functional equivalent of two Intel 8259A controller chips) provide 16 levels of system interrupts. Any or all interrupts may be masked, including the microprocessor NMI. Table 7.G gives the interrupt level assignments in decreasing priority.

Table 7.G
Hardware Interrupt Listing

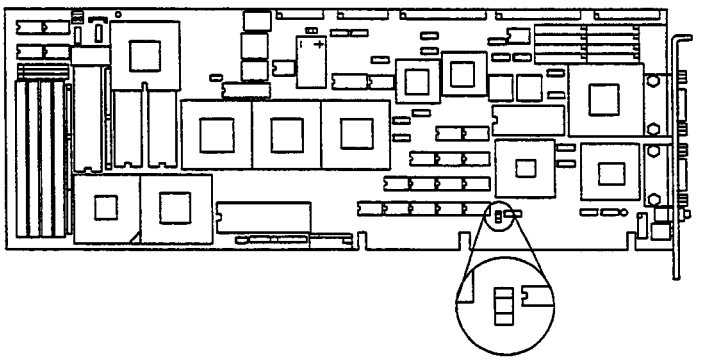
Level:		Function:
Microprocessor NMI		Parity or I/O Channel Check, WDT, and ACFAIL
CTRL 1	**CTRL 2**	
IRQ 0		Timer Output 0
IRQ 1		Keyboard (Output Buffer Full)
IRQ 2		Interrupt from CTRL 2
	IRQ 8	Real Time Clock Interrupt
	IRQ 9	EGA
	IRQ 10	Available
	IRQ 11	Available
	IRQ 12	Available
	IRQ 13	Coprocessor
	IRQ 14	Fixed Disk Controller
	IRQ 15	Available
IRQ 3		Serial Port 2 Default Enabled
IRQ 4		Serial Port 1 Default Enabled
IRQ 5		Default Disabled
IRQ 6		Diskette Controller
IRQ 7		Parallel Port 1 Default Enabled

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Jumper J32 also disables serial port 2 (COM2)/IRQ 3. Setting this jumper overrides the software setting for the port/interrupt. J32 placed on enables the port/interrupt, and off disables it. The serial port 2 is set at the factory with jumper J32 on. If jumper J32 is off, the program cannot enable the interrupt. This jumper is only available on later versions of the board.

The UTILITY Diskette contain programs that allow the user to enable or disable the serial port interrupts 1 and 2 and parallel port interrupt 1.

Figure 7.2
Jumper J32



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Appendix A

Specifications

Plant Floor Terminal

Factor:	Specification:
Dimensions	19 in. x 12.2 in. x 16.75 in. (483 mm x 310 mm x 425 mm)
Weight	50lbs net weight, 22.7kg net weight 58lbs shipping weight, 26.3 kg shipping weight
Power requirements	115V ac @ 2.5A 230V ac @ 1.25A
Operating line frequency	50 to 60Hz
Shock	Operating: 15g peak acceleration, 11ms duration Storage: 30g peak acceleration, 11ms duration
Vibration	Operating: 5 to 2000Hz, .006 in. peak-to-peak, 1.0g max Storage: 5 to 2000Hz, .015 in. peak-to-peak, 2.5g max
Fuse	4A, slo-blo
Batteries	Lithium, 3.5V @ 750mA
Environmental conditions	Operating temperature: 41° to 122°F (5° to 50°C) (media exempt) Storage temperature: -40° to 140°F (-40° to 60°C) (media exempt) Relative humidity 10 to 80% operating (media exempt), 10 to 90% storage

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Hard Disk (Formatted)

Factor:	Specification:
Storage capacity	53.4Mb unformatted 42Mb factory formatted
Functional characteristics	recording density: 9383 bits per inch read/write heads: 7 disc platters: 4 cylinders: 733 930 tracks per inch
Data transfer rate	5.0M bits per second
Rotational speed	3600 rpm ±1%
Access time (includes settling time)	track-to-track: 7ms average: 25ms maximum: 17.1ms average latency: 8.33ms



CAUTION: The disk drive used in the T35 Series D and E terminal is **type 46**. Soft disk errors occur if the wrong type of disk drive is used.

Important: When replacing hard drives, use the original screws removed from the drive in the T35 terminal. Tighten the screws to 8 pound-inches. Overtightening can cause warping and premature failure of the disk drive. Also, if possible, format the drive while mated to its disk controller (mounted in the T35).

Floppy Disk Drive

Feature:	Specification:
Data transfer rate	250k bits per second
Tracks	160 tracks (80 per side)
Access time	track-to-track: 3ms settling time: 15ms motor start time: 500ms rotational speed: 300rpm
Floppy diskette	3.5-inch double sided 160 tracks (80 per side) formatted storage capacity: 1.44M operating temperature: 5° to + 50°C (noncondensing) storage temperature: -40° to + 60°C (noncondensing) operating relative humidity: 8 to 80% (noncondensing) storage relative humidity: up to 95% (noncondensing)

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1784-WAB Keyboard

Feature:	Specification:
Mounting	Rack or panel
Keyboard	Membrane type
Dimensions	19.0 in. W x 7.0 in. H x 1.5 in. D (483 mm x 180 mm x 38 mm)

Backplane Power Supply

Feature:	Specification:
Output power	175W
Input voltage	115V ac (90 to 132V ac range) 230V ac (180 to 264V ac range)
Inrush current	230V ac, cold start, peak current 39A maximum
Voltage/Current rating	Output Volts / Minimum Current / Maximum Current / Tolerance +5V / 3.0A / 20.0A / ±1% +12V / 0.0A / 1.5A / ±4% -12V / 0.0A / 1.5A / ±4%
Input frequency	47 to 63Hz, single phase
Input protection	internal ac input line fuse provided, factory replacement only
Overvoltage protection	+5V output: 5.6 to 6.8V dc
Transient response	+5V output, 500 usec typical to recover within 1% of initial voltage for a 50 to 100% load change Maximum excursion: 3% from initial voltage.

CPU Module

Feature:	Specification:
Onboard memory	
Series D	1Mbyte
Series E	4Mbyte
Screen display	25 line and condensed, 43 line, 80 column text 640 x 350 pixels 16 color graphics

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