SIEMENS

SIMATIC TI505

386/ATM Coprocessor

User Manual

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Third Edition

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Preface

This manual describes installing and using the SIMATIC® TI505™ 386/ATM® Coprocessor Module.

Other Manuals

Refer to the manuals listed below for instructions on installing, programming, and troubleshooting your controller and I/O.

- *SIMATIC TI505 Programming Reference Manual*
- *SIMATIC® TI525™/TI535™ Hardware/Installation Manual*
- *SIMATIC® TI545™ System Manual*
- *SIMATIC® TI555™ System Manual*
- *SIMATIC® TI560T™/TI565T™ System Manual*
- *CVU10000™ Manual Set, Rel. 2.0*
- *CVU100™ Programming Reference Manual*
- *CVU100 Hardware and Installation Manual*
- The *TISOFT™ User Manual* for your release of TISOFT

Agency Approvals

The 386/ATM Coprocessor Module meets the standards of the following agencies:

- Underwriters Laboratories: UL® Listed (Industrial Control Equipment)
- Canadian Standards Association: CSA Certified (Process Control Equipment)
- Factory Mutual Approved; Class I, Div. 2 Hazardous Locations
- Verband Deutscher Elektrotechniker (VDE) 0160 Clearance/Creepage for Electrical Equipment (Self-Compliance)

Series 505™ products have been developed with consideration of the draft standard of the International Electrotechnical Commission Committee proposed standard (IEC-65A/WG6) for programmable controllers.

Telephoning for Assistance

If you need information that is not included in this manual, or if you have problems using the Series 505 386/ATM Coprocessor Module, contact your Siemens Industrial Automation, Inc. distributor or sales office. If you need assistance in contacting your distributor or sales office in the United States, call 1–800–964-4114.

Chapter 1

Module Features

1.1 Overview

Description

The 386/ATM Coprocessor is a general-purpose, high-speed IBM® PC/AT® compatible computer with a real-time interface to the SIMATIC® TI® family of programmable controllers. The 386/ATM integrates into a programmable controller the real-time, high-performance computing of a personal computer for space- and cost-sensitive applications. The 386/ATM runs off-the-shelf PC/AT application and development software. This allows high-speed PLC I/O bus interface for data processing, operator interface, and other high-level PC/AT functions.

The 386/ATM provides an industry-standard open architecture that allows you to combine the features of a programmable controller and a personal computer into one small package without being restricted to a proprietary operating system or to single sources for critical software. This allows you to integrate and use commercially available software packages that meet your requirements for features, function, and speed.

The 386/ATM provides:

- True IBM PC/AT-compatible computer that will run any of a wide variety of commercially available IBM PC/AT-compatible software packages
- Industry-standard Microsoft® MS-DOS® operating system
- Direct PLC I/O bus communication path between a PC/AT application and the control function being performed by the PLC
- Major increase in the survivability of personal-computing equipment in harsh control environments
- Built-in diagnostics to help confirm reliable operation and data integrity
- A small package that fits into the Series 505 base and communicates with any of the Series 505 and Series 500™ (e.g., SIMATIC® TI530C™) controllers and I/O
- Battery-backed real-time clock
- Socket for optional 80C387SX math coprocessor to provide high-speed arithmetic-processing capability

Using the 386/ATM Coprocessor

The 386/ATM Coprocessor is a standard IBM PC/AT computer with one added feature: a hardware interface to the PLC I/O bus which can be utilized by an appropriate application program.

Any IBM PC/AT-compatible software runs on the 386/ATM. If you require communication between the 386/ATM and the PLC, you can use the standard RS-232 capabilities that most vendors supply with their software products. These RS-232 device drivers are unique to each vendor's software product and generally serve to handle the communication between a personal computer (in this case, the 386/ATM) and the PLC.

When a higher speed communication path is required, the 386ATM device driver can be integrated with the application package. Some application packages are configurable to allow the use of a device driver, while others require changes to the application software by the software vendor. See Figure 1-1. Since it operates over the parallel PLC bus, the 386ATM device driver allows the maximum in versatility and speed between the PLC and the 386/ATM. This eliminates the slow serial link which restricts PLC access.

Applications

A wide variety of SIMATIC TI and third-party software packages is available which will run on the 386/ATM. In fact, software product/vendor selection is easy—if the software is IBM PC/AT-compatible, will operate with MS-DOS 5.0 and is compatible with memory and speed characteristics, it will run on the 386/ATM. Applications range from small to large. Examples include the following.

- Operator interface
- TISOFT2™ software
- Supervisor Control and Data Acquisition (SCADA)
- Statistical Quality Control (SQC)
- Statistical Process Control (SPC)
- Batch/Recipe management
- Report generation
- Math processing and data manipulation
- Production reporting and report generation
- Foreign device interface (intelligent sensor, etc., with RS-232 interfaces)
- Communication to third-party controllers
- Loop tuning

As a policy, Siemens Industrial Automation, Inc. does not recommend nor give testimonials for third-party products. However, if none of our software products meets your needs, you can use a third-party software package. IBM compatibility confirms that such software should run on the 386/ATM Coprocessor.

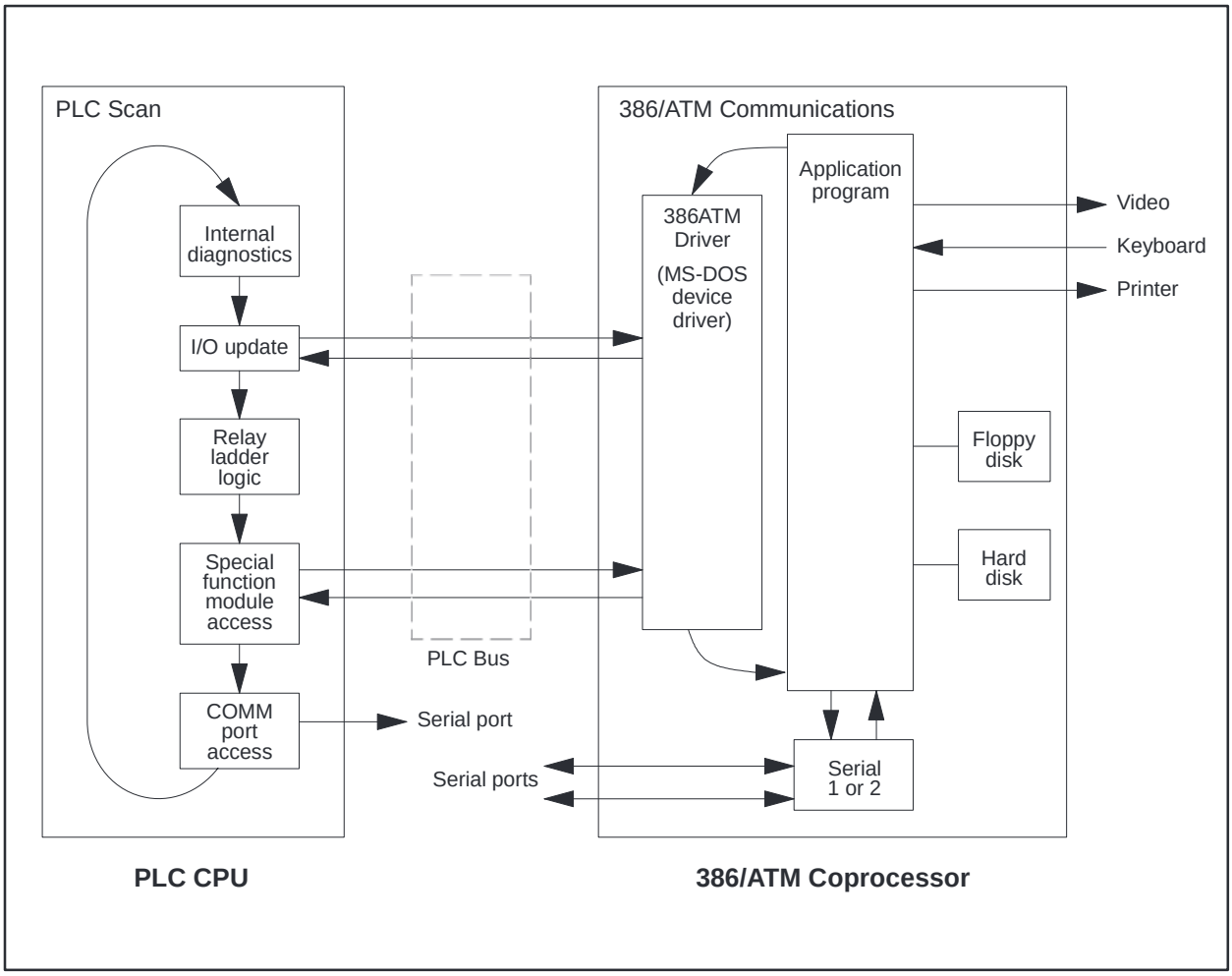

Figure 1-1 Interaction—386/ATM Coprocessor and PLC

1.2 Features

Three versions of the 386/ATM module are available. See Figure 1-2 for the standard configuration.

- Industrially hardened IBM PC/AT-compatible computer:

  Intel® 80C386SX CPU
  16 MHz, zero wait-state analog
  Socket for optional 80C387SX math coprocessor

  Microsoft MS-DOS 5.0 with QBasic™ (QuickBASIC)

  DRAM Memory: . . . . . 2M byte (505-ATM–0220)
  4M byte (505-ATM–0440)
  4M byte (505-ATM–4120)

  Diskette drive: . . . . . 3-1/2″ 720K byte/1.44M byte

  Hard disk drive: . . . . . 20M byte (505-ATM–0220)
  40M byte (505-ATM–0440)
  120 M byte (505-ATM–4120)

- Triple-wide Series 505 module
- Direct PLC I/O bus interface to PLC
- 2 serial ports, 110 – 57600 baud; (non-standard driving voltage)
- Limited mouse support (see section 2.4)
- 1 Centronics®-style parallel port
- Keyboard port (for PC/AT-compatible keyboard)
- TISOFT2 PLC I/O bus communications for high-speed PLC interface
- 386ATM language-independent device driver (can be used by any PC/AT language)
- No external power required
- Analog VGA monitor port (adapter cable from 9-pin to standard 15-pin VGA included)
- Built-in diagnostics

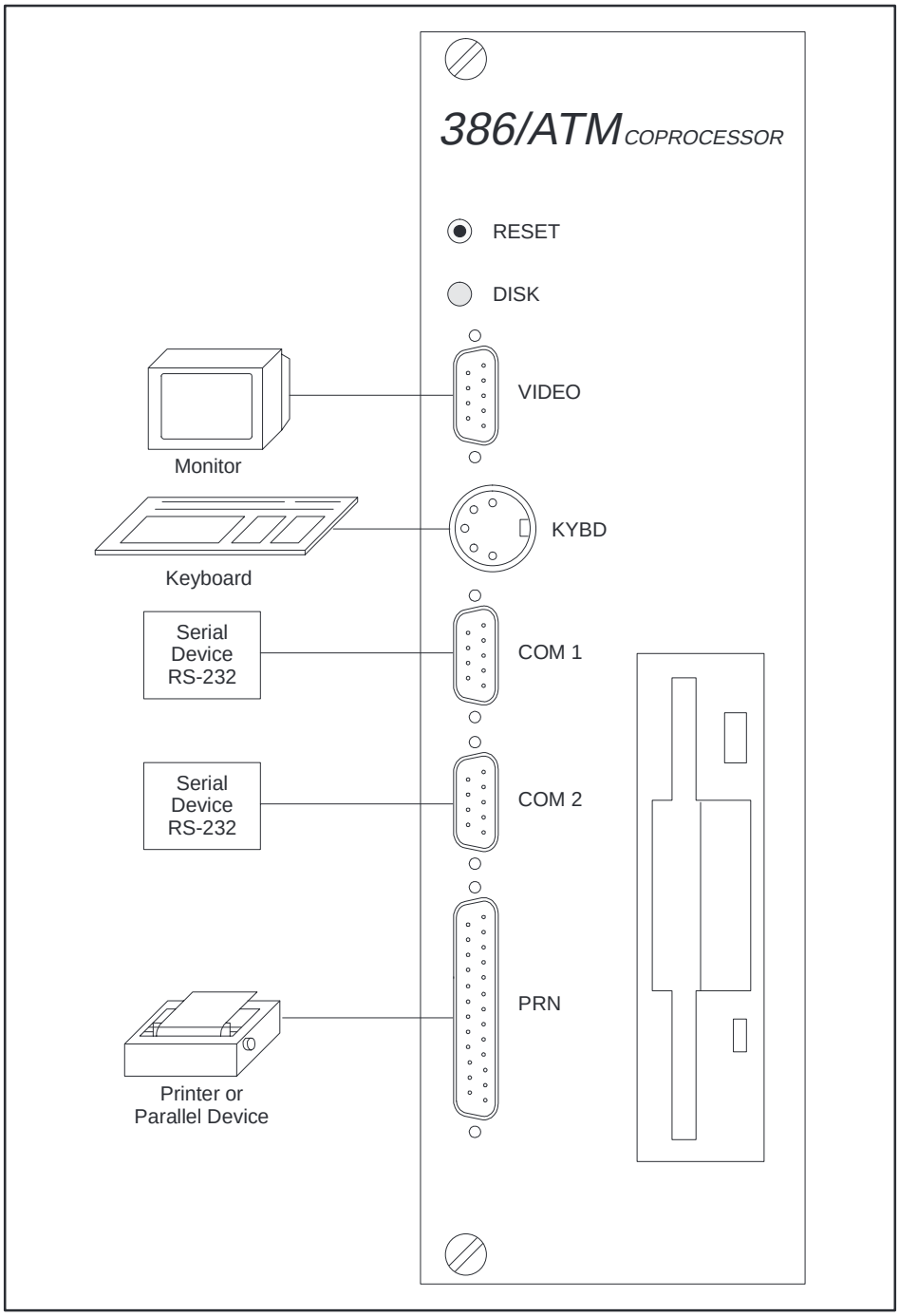

Figure 1-2 Typical Configuration

1.3 Standard Kit Part Lists

PPX:505–ATM–0220 Includes:

- ☐ Intel 80C386SX CPU
- ☐ Socket for optional 80C387SX math coprocessor
- ☐ DRAM Memory: 2M byte
  Diskette drive: 3-1/2″ 720K byte/1.44M byte
  Hard disk drive: 20M byte
- ☐ 2 serial ports (110 – 57600 baud)
- ☐ 1 Centronics-style parallel port
- ☐ Keyboard port (for PC/AT-compatible keyboard)
- ☐ Analog VGA monitor port
- ☐ 386ATM video cable adapter
- ☐ Microsoft MS-DOS 5.0 with QBasic and manual
- ☐ Floppy disk containing the following software:
  - 386ATM.DVR
  - INSTALL.BAT
  - AUTOEXEC.BAT
  - CONFIG.SYS
  - Example PCCOMM software (source code)
- ☐ *SIMATIC TI505 386/ATM Coprocessor User Manual*

PPX:505–ATM–0440 Same as PPX:505-ATM–0220, except:

- ☐ DRAM Memory: 4M byte
- ☐ Hard disk drive: 40M byte

PPX:505–ATM–4120 Same as PPX:505-ATM–0220, except:

- ☐ DRAM Memory: 4M byte
- ☐ Hard disk drive: 120M byte

Spare Parts The following components can be ordered as spare parts.

- 386ATM video cable adapter (PPX:2587716–8034)
- MS-DOS 5.0, 3.5″ disks, and manual (PPX:2587716–8037)
- 386ATM Backplane Communications Driver (PPX:2587716–8038)
- 14″ VGA color monitor, industrial black (6AP1–705–0BG00)

- 101-key PC/AT keyboard, industrial black (6AC1–015–7FG)

1.4 Recommended Order of Tasks

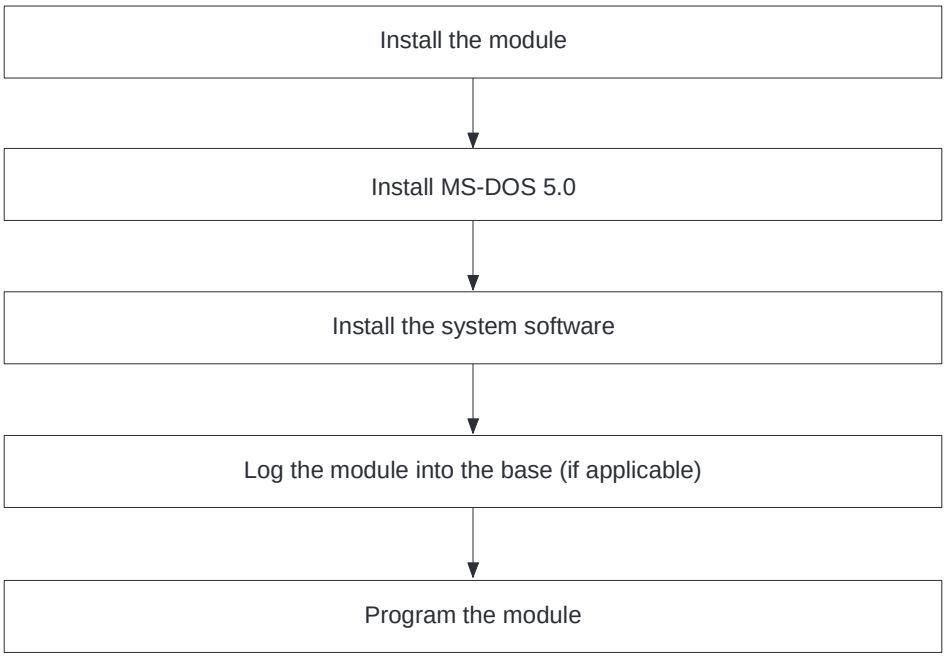

Figure 1-3 Lists of Tasks for Installing and Using the 386/ATM

Chapter 2

Installing the Module

2.1 Overview of Installation

Handling the Module

Many integrated circuit (IC) devices are susceptible to damage by the discharge of static electricity. Follow the suggestions listed below to reduce the probability of damage to these devices when you are handling a controller, a base controller, or any of the I/O modules.

Both the module and the person handling the module should be at the same ground potential. To accomplish this, fulfill the following conditions.

- Transport the module in an anti-static container or antistatic material.
- Ensure that the work area has a conductive pad with a lead connecting the work area to a common ground.
- Ground yourself by making contact with the conductive pad or by wearing a grounded wrist strap.

Visual Inspection

If there is any visible damage to the module, contact your vendor for a replacement.

Technical Assistance

If you need information that is not included in this manual, or if you have problems using the module, call your Siemens Industrial Automation, Inc. distributor or sales office. If you need assistance in contacting your U.S. distributor or sales office, call 1–800–964-4114.

Flow of Tasks

Figure 2-1 shows the organization of the tasks described in this chapter.

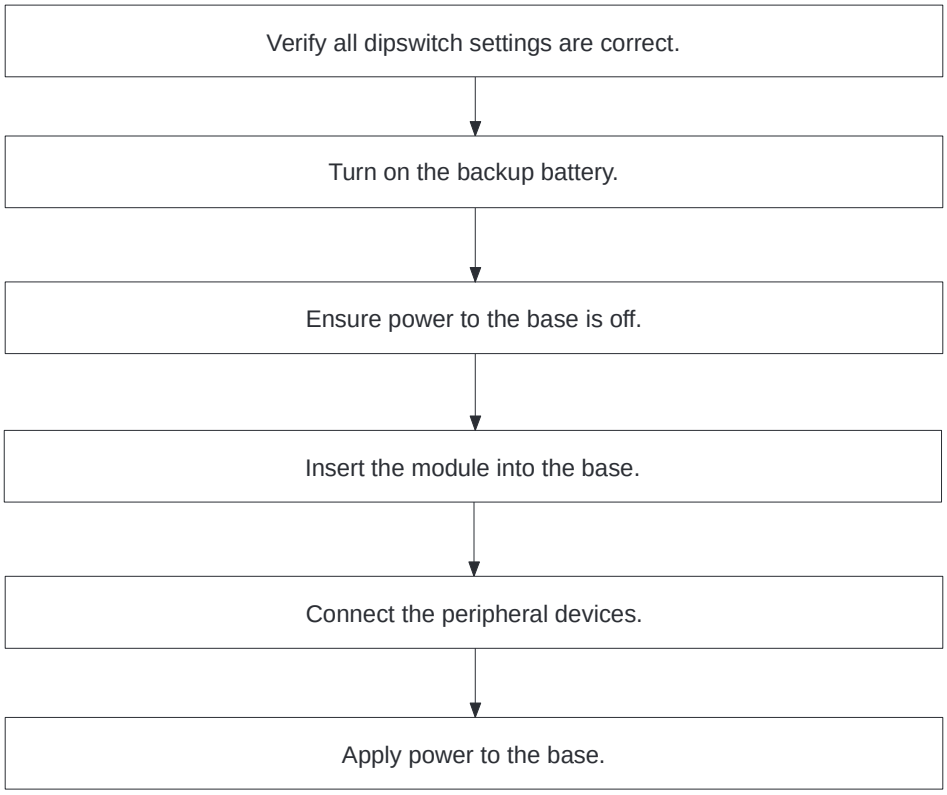

Figure 2-1 Flowchart of Installation

2.2 Configuring the Module

Before you install the 386/ATM Coprocessor, turn on the backup battery, and verify dipswitch settings.

To accomplish these tasks, locate the dipswitches shown in Figure 2-2 and set them according to Figure 2-3.

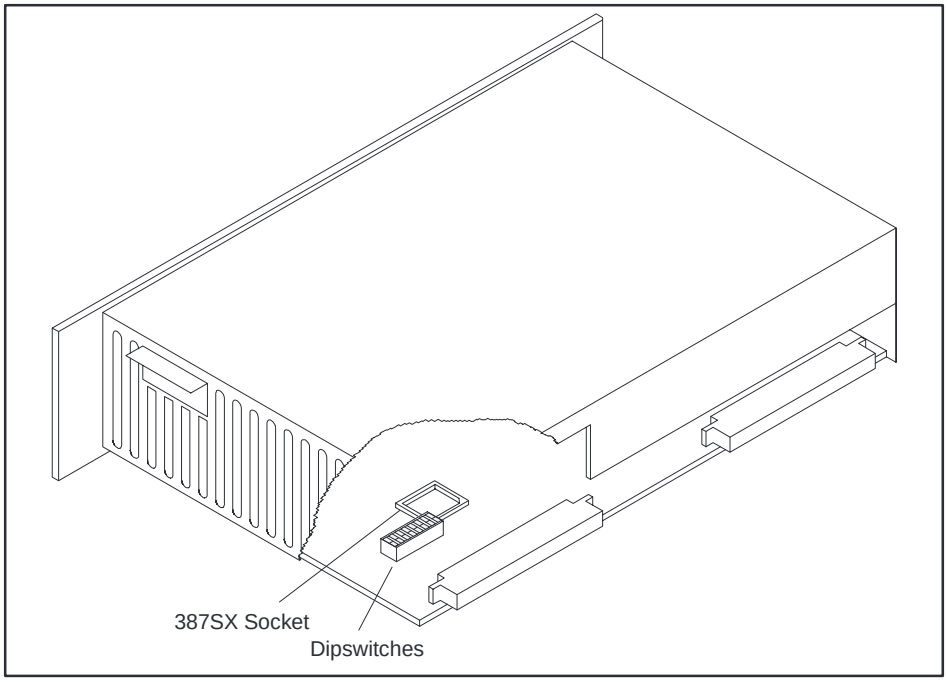

Figure 2-2 Location of Dipswitches

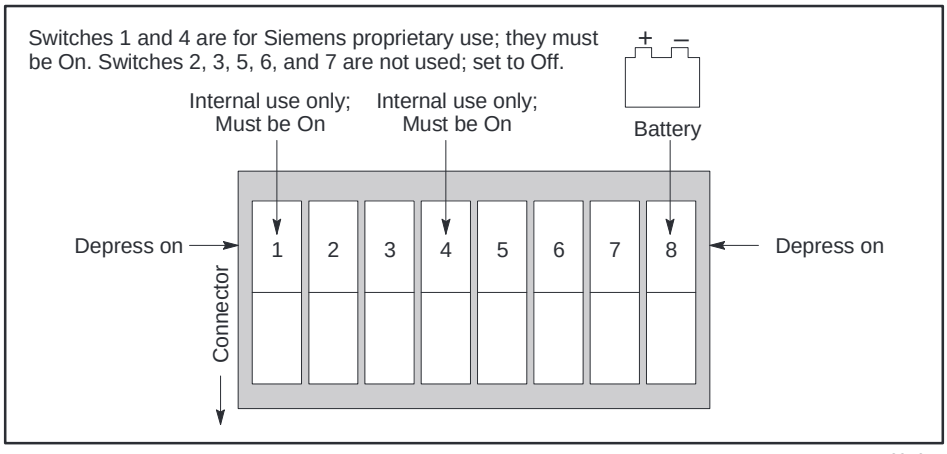

Figure 2-3 Dipswitch

2.3 Inserting the Module into the Base

⚠WARNING

To minimize potential shock, turn off power to the I/O base and to any modules installed in the base before you insert or remove a module or install a terminal block. Failure to do so may result in potential injury to personnel or damage to equipment.

Refer to the *Safety Considerations* sheet (part # 2588015–0002) included with your module for a complete list of safety guidelines and recommendations.

Inserting the Module

This is a triple-wide module. Insert it into any available I/O slot on any Series 505 base. Insert the module as shown in Figure 2-4. Note the minimum torque required to ground the module.

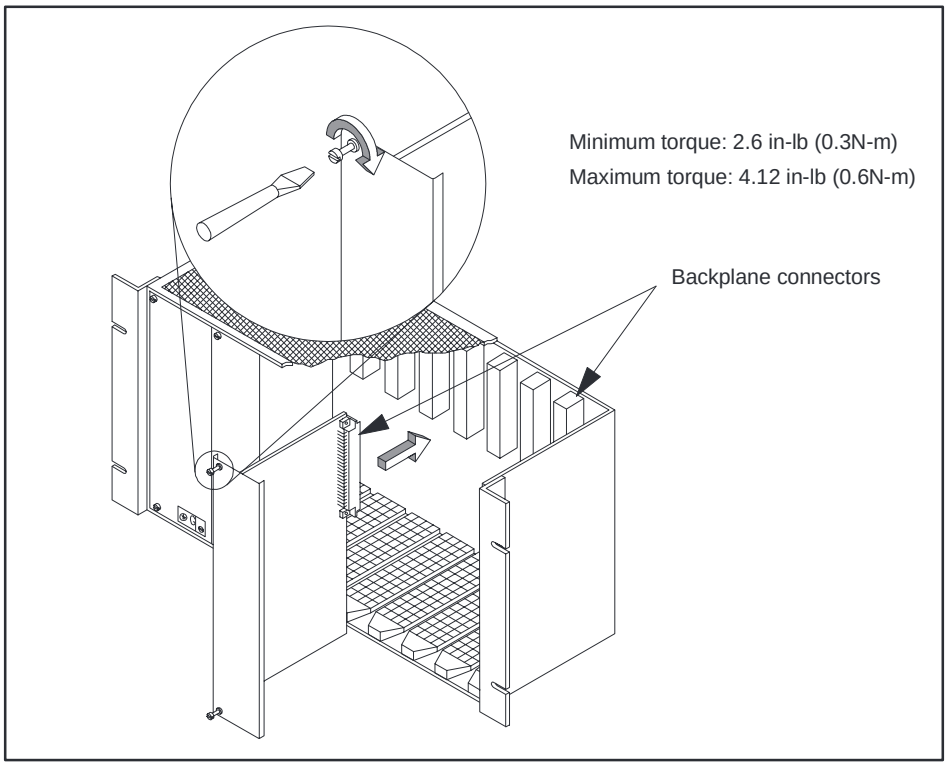

Figure 2-4 Inserting the Module into the Base

Power Requirements

This module requires 11.0 W of +5 V and 0.2 W of –5 V power from the Series 505 base. No additional power is required.

2.4 Connecting Peripherals

Monitor

The monitor connector is a 9-pin female connector (using the special adapter cable included) that supports high-resolution graphics modes of analog VGA-compatible monitors.

Keyboard

The module has a standard 5-pin DIN keyboard connector. Your keyboard must be designed for use with IBM PC/AT or compatible computers.

Communications

The module contains two non-standard 9-pin RS-232 serial ports. These ports are configured as COM1 and COM2. Use these ports to connect to PLCs, sensors, printers, modems, or other RS-232-compatible devices. Note, however, that these devices must be capable of running on 5 VDC rather than the 12 VDC normally provided by an IBM PC-compatible serial port. This precludes the use of most mechanical mouse devices except certain models manufactured by Microsoft.

Printer

The printer port supports any Centronics-style parallel printer or similar peripheral. Use a standard 25-pin IBM PC/AT-style connector.

See Appendix C for all cable pinouts.

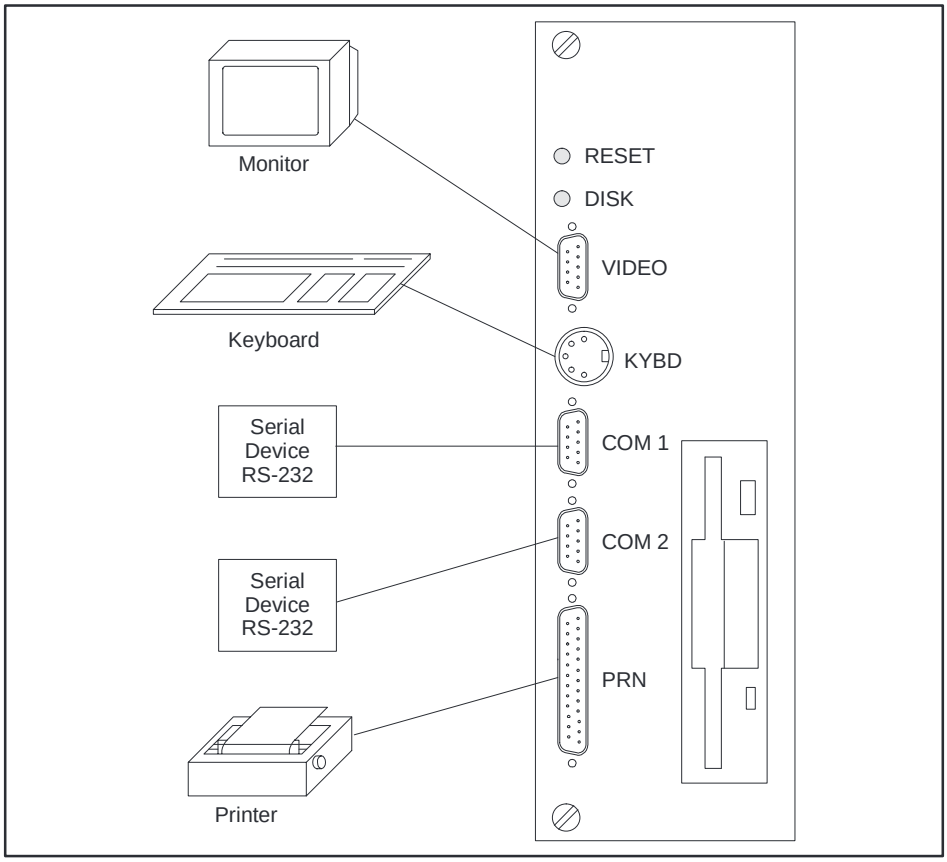

Figure 2-5 Peripheral Connection

Chapter 3

Loading System Software

3.1 Overview

Figure 3-1 shows the organization of software installation tasks as they are presented in this chapter. Perform these tasks in sequence.

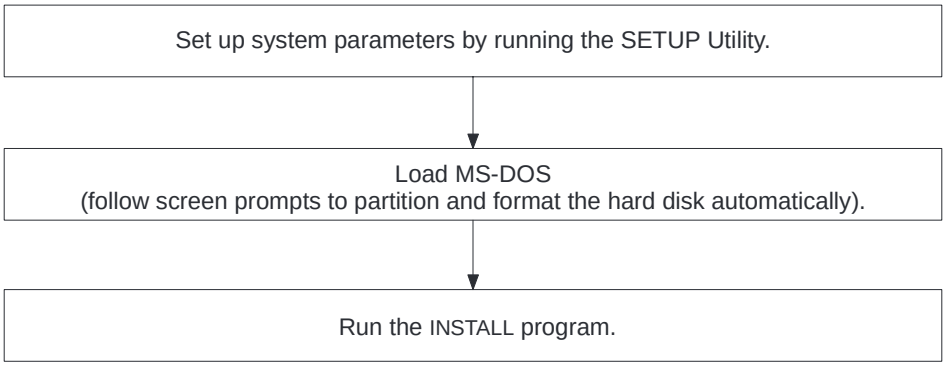

Figure 3-1 Software Installation Flowchart

NOTE: To extend battery life, the 386/ATM Coprocessor is shipped from the factory with the battery switch in the OFF position. Since the system parameters are stored in battery-backed CMOS RAM, you must run the SETUP Utility during initial module installation or after a battery failure.

Potential for Errors During Diskette Access

During periods of high conducted or radiated electrical noise conditions, diskette access may cause seek and/or read/write errors. These errors do not affect the operation of other parts of either the 386/ATM or the programmable controller system.

It is recommended that you start up with the diskette and then switch to the hard drive for operation. If you experience a seek or read/write error during a diskette access, please try the operation a second time. If the problem continues, wait for quiescent periods before performing diskette operations.

⚠WARNING

As in any electrical installation, the potential for live circuits may be present at the PLC and/or adjacent devices when the ultimate protective enclosure is opened for routine service, maintenance or programming. Accidental contact with live circuits may result in personal injury or damage to equipment. Installation, maintenance and programming must only be performed by qualified and authorized personnel familiar with recognized electrical practices and procedures in working with high voltage.

After initial installation, after a battery failure, or if the battery is disabled, you must run the SETUP Utility to set the real-time clock date and time, to identify the number and type of hard disks and to identify the number and size of floppy diskettes. Setup parameters are saved in battery-backed CMOS RAM. Follow the steps shown in Figure 3-2.

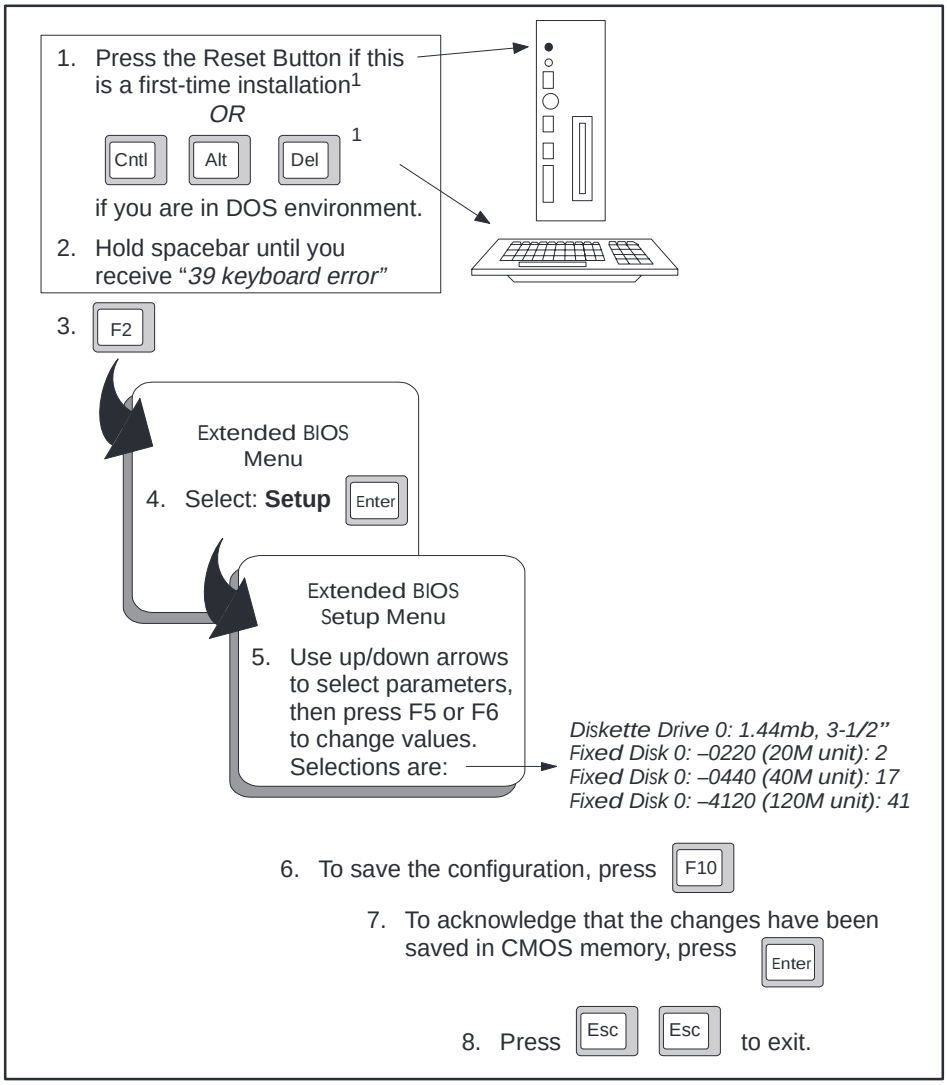

Figure 3-2 System Configuration

[1]You can speed up the boot process by pressing Esc at the prompt to skip the RAM diagnostics. Then, if you want to access the Setup utility, hold down the spacebar as described in step 2 above and continue when prompted by pressing F2 to access the Extended BIOS Menu and the Setup Utility option.

3.3 Preparing the Hard Disk and Loading MS-DOS

Booting the Module from the Diskette

Before you boot the module from the diskette the first time, make a backup copy of all the diskettes on another computer. Store the copy in a safe place.

You must boot the module from the MS-DOS diskette in order to start the automatic process that partitions and formats the hard disk and loads MS-DOS on the hard disk. Follow the steps shown in Figure 3-3. This creates a C: drive with total capacity in one partition. (For additional information or customizing options, refer to the MS-DOS manual.)

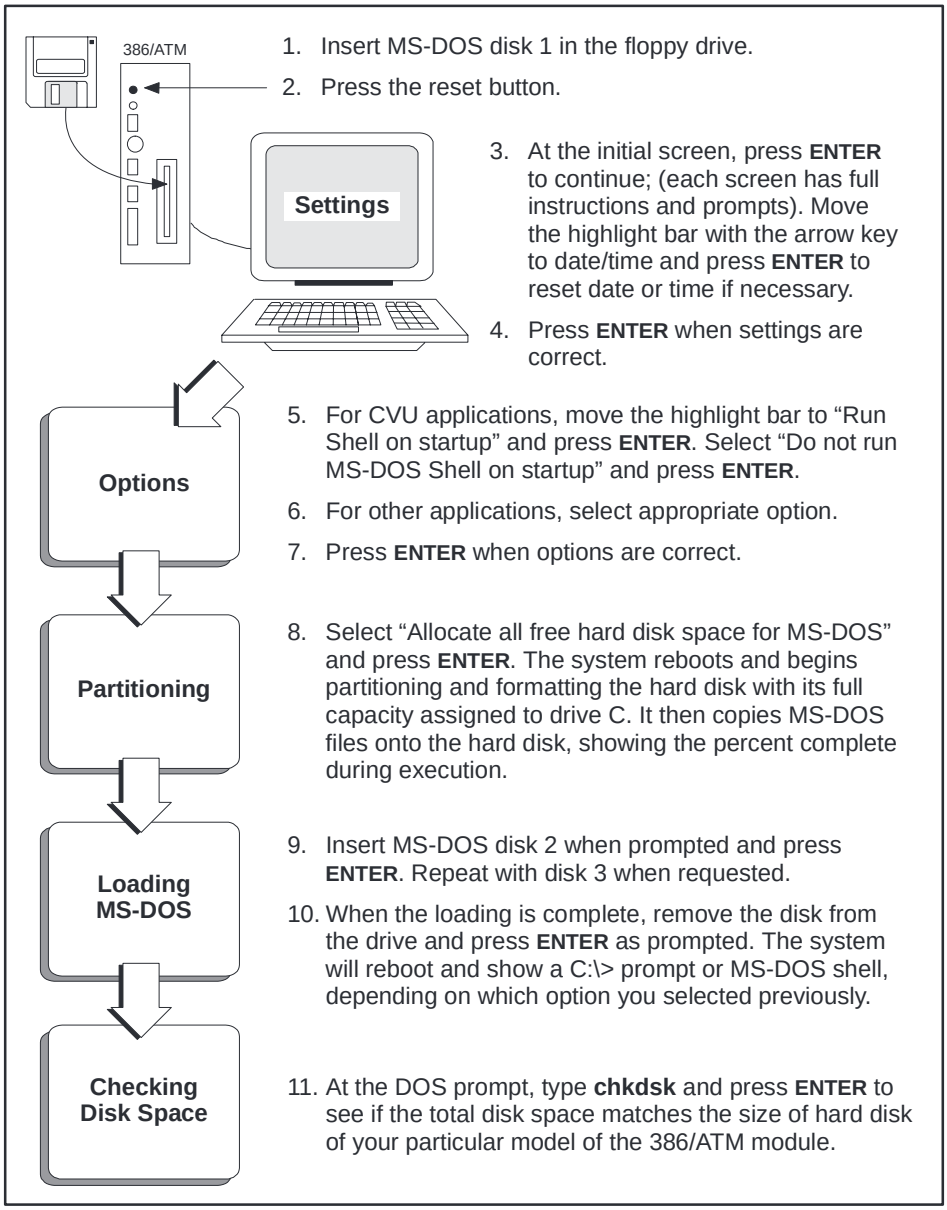

Figure 3-3 Installing MS-DOS on the 386/ATM Hard Disk

Copying Software to the Hard Disk

To install a working copy of the ATM backplane driver and other software that is supplied with the 386/ATM, run the INSTALL program with the diskette installed. Follow the steps shown in Figure 3-4.

NOTE: If you are setting up your system to run CVU10000 software on the 386/ATM, you must perform this procedure after installing CVU software. Refer to your CVU manual for details.

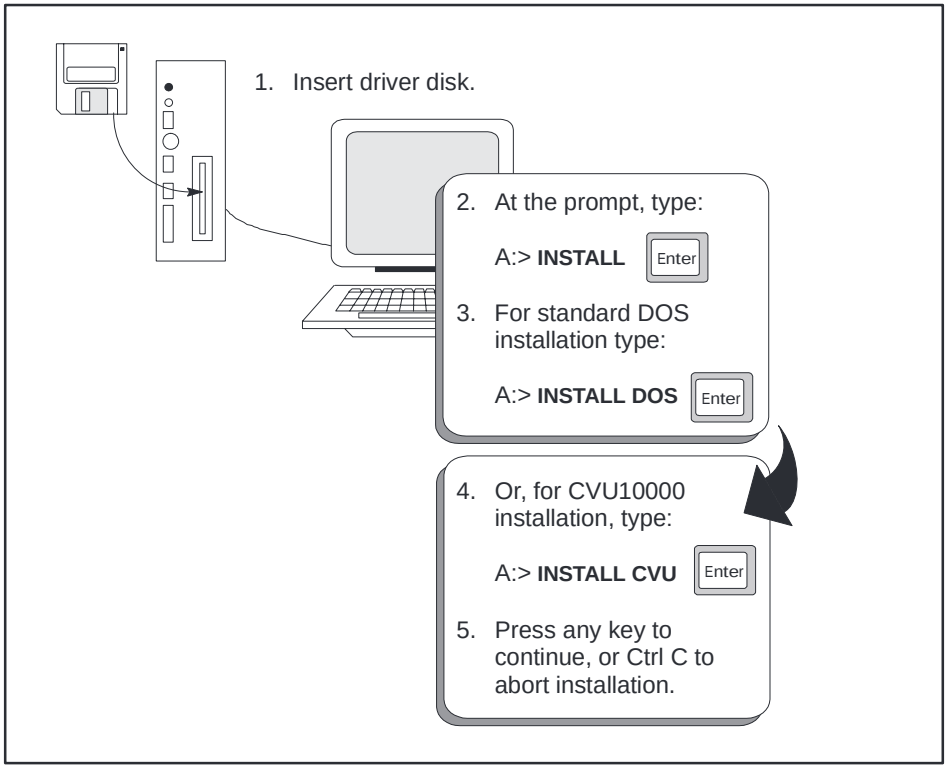

Figure 3-4 Software Copy Procedure

After approximately 90 seconds, you receive the "*Installations complete*" message.

Typical ATM Driver Files

After the automatic installation of the ATM driver is complete, your AUTOEXEC.BAT and CONFIG.SYS files will look like the following.

AUTOEXEC.BAT file for standard DOS installation.

```
@ECHO OFF
PROMPT $P$G
PATH=C:\;C:\DOS;C:\TI
```

CONFIG.SYS file for standard DOS installation.

```
FILES=30
BUFFERS=20
SHELL=C:\DOS\COMMAND.COM C:\DOS\ /P
DEVICE=C:\DOS\HIMEM.SYS
DOS=HIGH,umb
DEVICE=C:\DOS\EMM386.EXE X=C800-C900 NOEMS
DEVICEHIGH=C:\386ATM.EXE
```

AUTOEXEC.BAT file for CVU10000 installation.

```
@ECHO OFF
PROMPT $P$G
PATH=C:\CVU10;C:\;C:\DOS;C:\TI
CVU10000.BAT
```

CONFIG.SYS file for CVU10000 installation.

```
FILES=30
BUFFERS=20
SHELL=C:\DOS\COMMAND.COM C:\DOS\ /P
DEVICE=C:\DOS\HIMEM.SYS
DOS=HIGH,umb
DEVICE=C:\DOS\EMM386.EXE X=C800-C900 NOEMS
DEVICEHIGH=C:\386ATM.EXE
DEVICEHIGH=C:\CVU10\PRINTER.DEV
```

Installing Sample Programs

If you want to install sample programs to your hard disk, follow the steps shown in Figure 3-5.

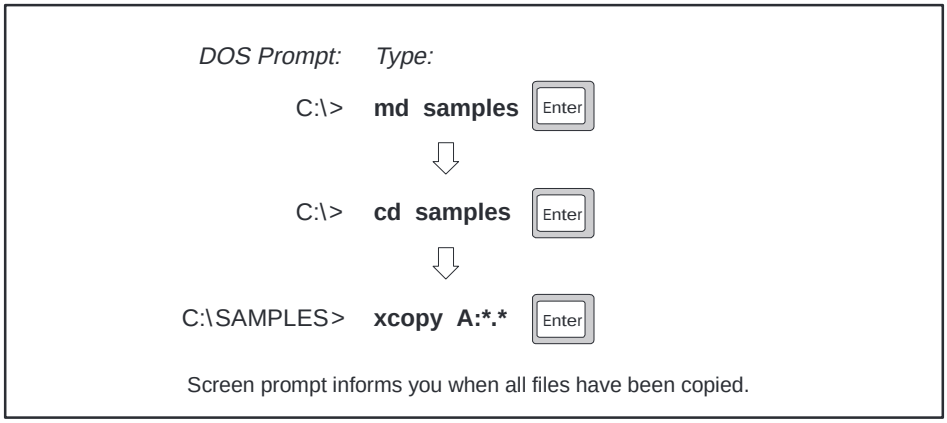

Figure 3-5 Sample Program Installation

Loading System Device Drivers

To load the system device drivers into memory, you must reboot the module. Follow the steps shown in Figure 3-6.

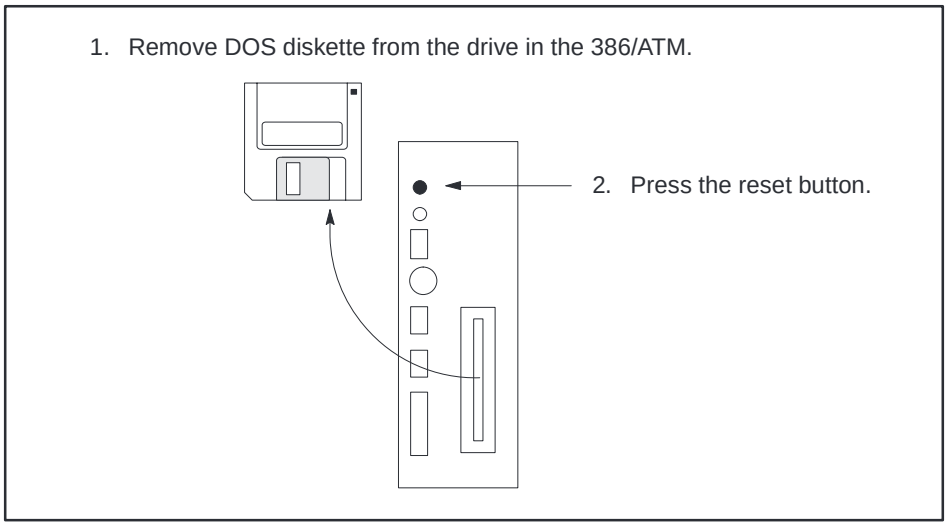

Figure 3-6 Module Boot Procedure

3.5 What Next?

After booting the system, you can either load development tools and begin application development or load and run your application software.

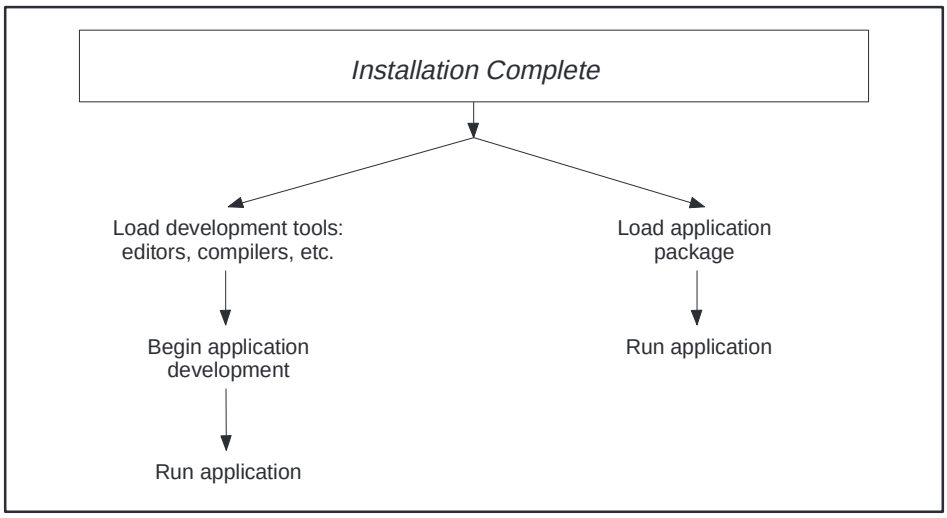

Figure 3-7 Decision Tree

Running the 386/ATM with Third-party Device Drivers and Memory Managers

Before installing third-party system software, read the following guidelines.

When interface circuitry (for example, a communications card) is added to a computer, it uses certain resources, such as memory ranges and interrupts, to operate. In general, these resources may not be shared by multiple devices.

System software, such as device drivers and memory managers, often need to know exactly which resources are in use in the machine, or at least which resources they may take for themselves.

The 386/ATM backplane interface uses the following resources:

- Memory range C818:0000—C818:007F (128 bytes)
- IRQ 10 (which in turn uses INT 72 hex)

Make sure that any third-party system software that you install on the 386/ATM does not try to use these addresses. Most such software can be configured to avoid conflicts by adding command line variables to exclude the use of the memory address range and software interrupts listed above. Refer to your third-party software manual for details.

See the example CONFIG.SYS file for DOS installation on page 3-7 for loading the 386EMM.SYS memory manager furnished with MS-DOS 5.0.

Chapter 4

Running TISOFT on the 386/ATM

4.1 Logging the 386/ATM into the PLC I/O Configuration Table

Overview

Log the 386/ATM into the PLC I/O configuration memory for maximum communication speed with the PLC over the I/O bus. The procedure required for logging modules varies with the type of PLC. (See Figure 4-1.)

- SIMATIC TI545/TI555 and TI560/TI565 PLCs require you to configure the I/O manually.
- All other Series 505/Series 500 PLCs automatically configure the I/O.

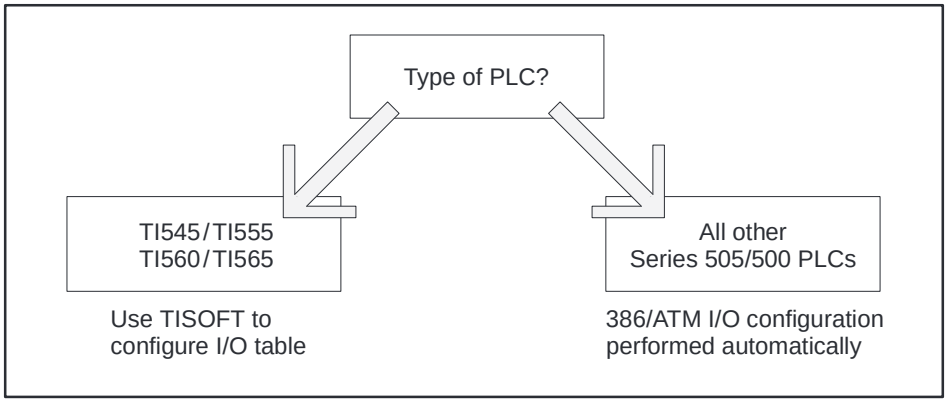

Figure 4-1 I/O Configuration Decision Tree

NOTE: The 386/ATM does not have to be logged into the I/O configuration table to run TISOFT2. Logging the module into the configuration table improves TISOFT2 communication performance.

Loading TISOFT2

Refer to the TISOFT2 manual for specific instructions on loading and running TISOFT2 software.

Verifying 386ATM.EXE in your Root Directory

The config.sys file must include an instruction to load 386ATM.EXE during the module's boot procedure. The INSTALL batch file included as part of the installation procedure does this automatically for both the standard DOS and CUV10000 options. (See page 3-7 for the listing of files created by the INSTALL procedure.)

Communicating with the PLC

You can communicate with the PLC via the I/O bus (Figure 4-2) or via the serial ports (Figure 4-3). Communicating via the serial port requires a cable and does not realize the improved speed offered by the I/O bus.

Running TISOFT2

To run TISOFT2, enter the command appropriate to the PLC and version of TISOFT2 you are using.

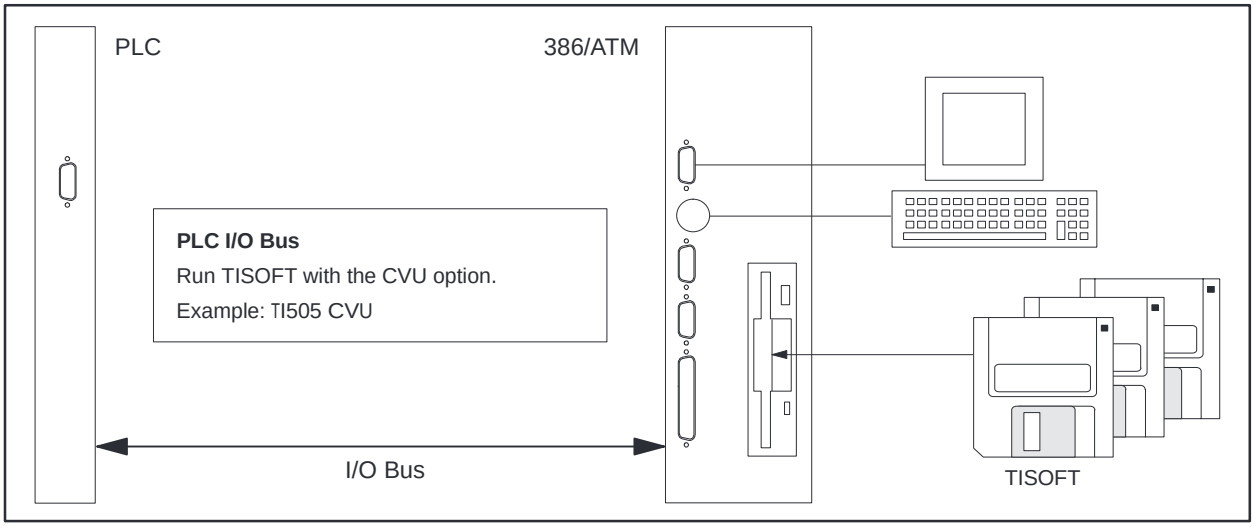

Figure 4-2 Running TISOFT2 via I/O Bus

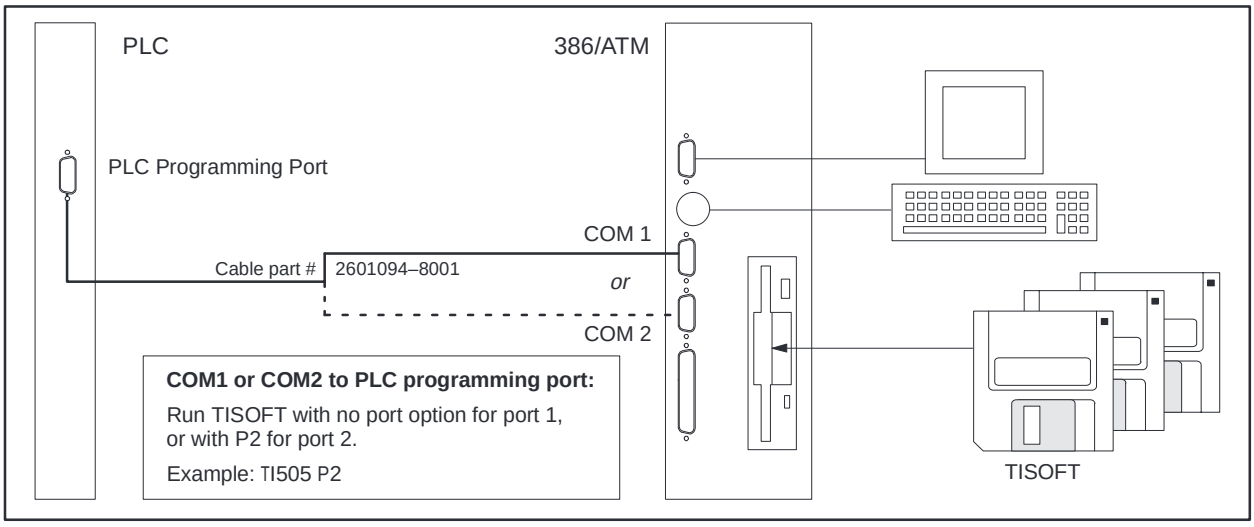

Figure 4-3 Running TISOFT2 via Serial Port

Selecting the I/O Definition Chart

Figure 4-4 shows a sample I/O definition chart with the 386/ATM installed in slot 1. Refer to your TISOFT2 manual for detailed instructions.

I/O MODULE DEFINITION FOR: CHANNEL 1 BASE 00

SLOT	I/O ADDRESS	NUMBER OF BIT AND WORD I/O X	Y	WX	WY	SPECIAL FUNCTION
1	0001	00	00	04	04	YES
2	0000	00	00	00	00	NO
3	0000	00	00	00	00	NO
4	0000	00	00	00	00	NO
5	0000	00	00	00	00	NO
6	0000	00	00	00	00	NO

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Figure 4-4 Sample I/O Definition Chart

Viewing the I/O Configuration Chart

Use SHOW or a similar menu selection to display the I/O Configuration Chart. The configurations in Figure 4-4 appear as shown in Figure 4-5.

I/O CONFIGURATION CHART FOR CHANNEL . . . 1 BASE 00

	I/O POINTS 1	2	3	4	5	6	7	8
SLOT 1	WX0001	WX0002	WX0003	WX0004	WY0005	WY0006	WY0007	WY0008
SLOT 2								
SLOT 3								
SLOT 4								
SLOT 5								
SLOT 6								

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Figure 4-5 I/O Configuration Chart

Chapter 5
PLC Communications

5.1 Overview

Communicating with the PLC

An application program in the 386/ATM communicates with the PLC using the PCCOMM service of the MS-DOS character device driver 386ATM.EXE. Figure 5-1 shows the sequence of communication used.

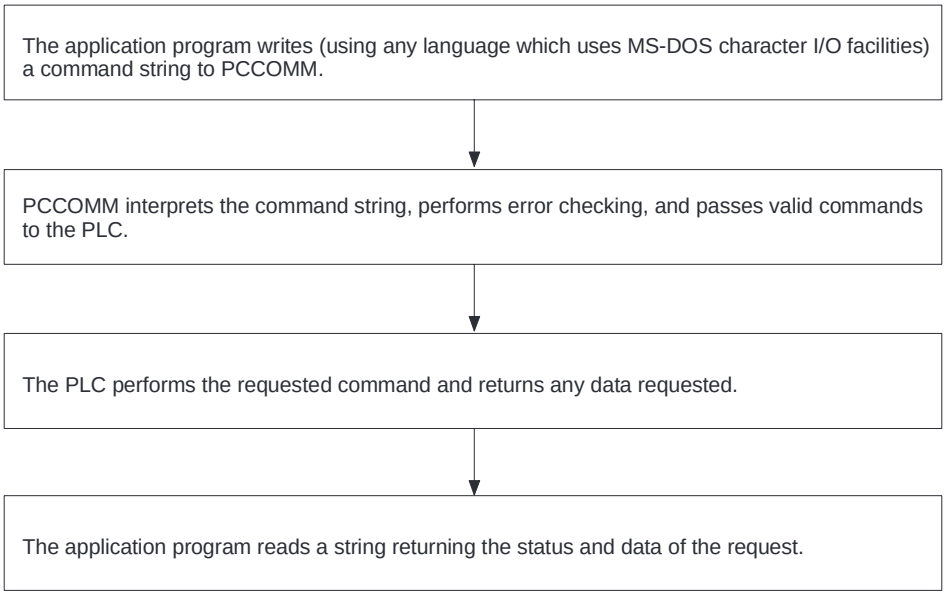

Figure 5-1 Communication Sequence

Verifying the CONFIG.SYS File in your Root Directory

The CONFIG.SYS file must contain the correct instructions for loading the 386ATM driver during the module's boot procedure in order to activate the PCCOMM service. The INSTALL batch file included as part of the installation procedure makes these modifications automatically. Make sure that the following lines are included in a file called CONFIG.SYS in the root directory.

```
FILES 30
BUFFERS 20
device=C:\HIMEM.SYS
device=C:\386ATM.EXE
```

See the example CONFIG.SYS file on page 3-7 if you want to load the ATM driver in high memory.

Using PCCOMM

The PCCOMM service provides two types of functions:

- IOREAD and IOWRITE access the 4 WX and 4 WY I/O points during the I/O cycle of the PLC scan
- PCREAD and PCWRITE access PLC memory during the Special Function Module cycle of the PLC scan

The following sequence of events is an outline for using the PCCOMM service to communicate to the local I/O points in the 386/ATM.

1. Make sure that the 386ATM device driver is loaded when the 386/ATM boots up.
2. Write an application program that communicates with the PCCOMM service.

Application Program I/O Bus Communication

Appendix B provides examples of application programs. The sequence of events in the program are as follows.

1. Open an unbuffered file stream with the name of PCCOMM.
2. Build a command string to perform the function required.
3. Send the command string to the open file stream.
4. Read the response string from the file stream.
5. Get the information from the response string.

Table 5-1 Maximum Words or Bits Transferred per PCCOMM Transaction

PCCOMM Operation	Maximum Transfer
IOREAD	4 words
IOWRITE	4 words
PCREAD/PCWRITE (V-mem, WX, etc.)	120 words
PCREAD/PCWRITE (CR, X, Y, etc.)	480 bits

The naming conventions used for the I/O points in the module are from the PLC perspective. For instance, 4 WX describes four analog words that will be read into the PLC, while 4 WY are analog words that are an output from the PLC. In other words, the points labeled as 4 WX are points that the 386/ATM writes to (remember, the PLC reads these points), and the 4 WY points are read into the 386/ATM. See Figure 5-2.

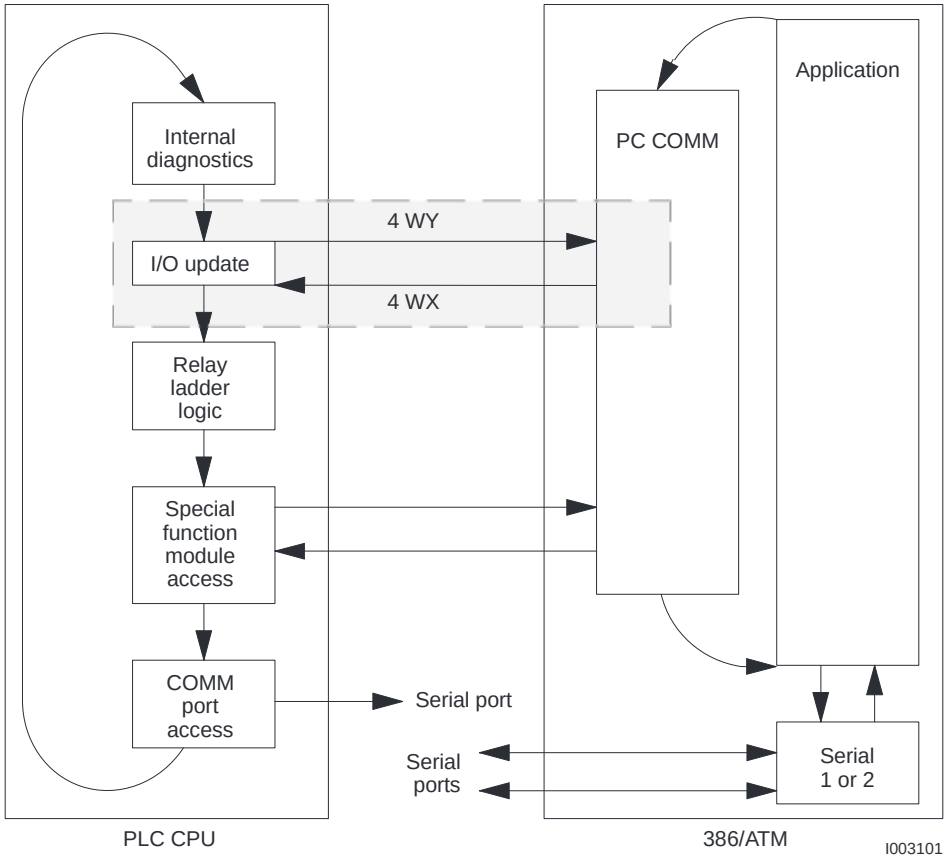

Figure 5-2 PLC Scan: I/O Cycle

Accessing I/O Points

The IOREAD and IOWRITE commands allow you to gain access to the eight local I/O points in the 386/ATM. The I/O points are configured locally in the 386/ATM as shown in Figure 5-3. You can configure the local I/O in your PLC as a set of eight analog points.

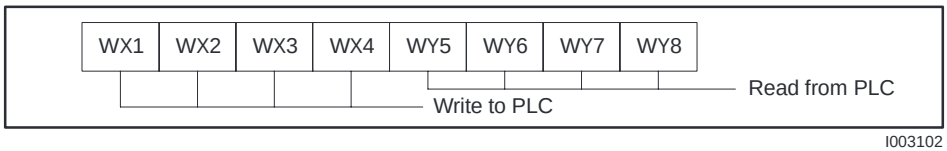

Figure 5-3 I/O Word Configuration

Command Syntax: IOREAD

The command syntax for performing an IOREAD operation is:

:ir:a:b::<cr>

where:

:	is a required delimiter for the command string.
ir	is the command for IOREAD (lower or upper case).
a	is the local point number for the 4 local WY points in the 386/ATM. The 386/ATM start point is from 5 through 8, inclusive.
b	is the number of IO points to read. Valid numbers for b are 1, 2, 3, and 4. You cannot read beyond the boundary of the 4 WY points, and the count b is limited by the start point (value of a). For example, if you use address 5 for a, you can obtain up to 4 points of WY information. If you use address 6 as the start point for a, then you can read only up to a total of 3 points from the local WYs.
::	is the terminating delimiter for the command string; these characters must be present for the command to operate.
<cr>	represents the ASCII character 0D HEX; this character must be present in order to tell PCCOMM that the command string is complete.

Response Syntax: IOREAD

After receiving an IOREAD, PCCOMM responds in the following format.

:ir:e:f:g:h:i::<cr>

where:

:	is the delimiter for the response.
ir	indicates the response is from an IOREAD operation.
e	is the error code returned from the operation. if positive, the number represents the number of data items read. if zero, the number represents an error indicating a bad start point or a bad count, and no words were read.
f–i	are the data values in ASCII/decimal that are returned as the result of the operation.
::	is the end delimiter of the response string.
<cr>	is the ASCII character 0D HEX denoting the end of the response transaction.

Command Syntax: IOWRITE

The command syntax for performing an IOWRITE operation is:

:iw:a:b:f:g:h:i::<cr>

where:

:	is a required delimiter for the command string.
iw	is the command for IOWRITE (lower or upper case).
a	is the starting point number for the four WX points in the 386/ATM. Possible entries in this field are WX1 through WX4.
b	is the number of I/O points to write. Valid numbers are 1, 2, 3, and 4.
f–i	are the data to write into the points selected.
::	is the terminating delimiter for the command string; these characters must be present for the command to operate.
<cr>	represents the ASCII character 0D HEX; this character must be present in order to tell PCCOMM that the command string is complete.

Response Syntax: IOWRITE

After receiving an IOWRITE, PCCOMM responds in the following format.

:iw:e::<cr>

where

:	is the delimiter for the response.
iw	indicates the response is from an IOWRITE operation.
e	is the response code where: if the number is positive, it represents the count of items written. if zero, the number represents a bad start address or a bad count, and no words were written.
::	is the end delimiter of the response string.
<cr>	is the ASCII character 0D HEX denoting the end of the response transaction.

5.3 Communicating with the PLC Scan: Special Function Cycle

Description

The PCREAD and PCWRITE commands allow you to gain access to various types of memory in your PLC. The naming conventions used are from the PLC perspective. (See Figure 5-4.) For instance, PCWRITE passes information to the PLC, while PCREAD requests information from the PLC.

The memory types are categorized as:

- Word access: VMEM, WX, WY, TCC, TCP, DSC, DCP, STW, DCP, KMEM
- Discrete access: XREG, YREG, CREG

Consult your PLC programming manual for descriptions of each of the above memory types.

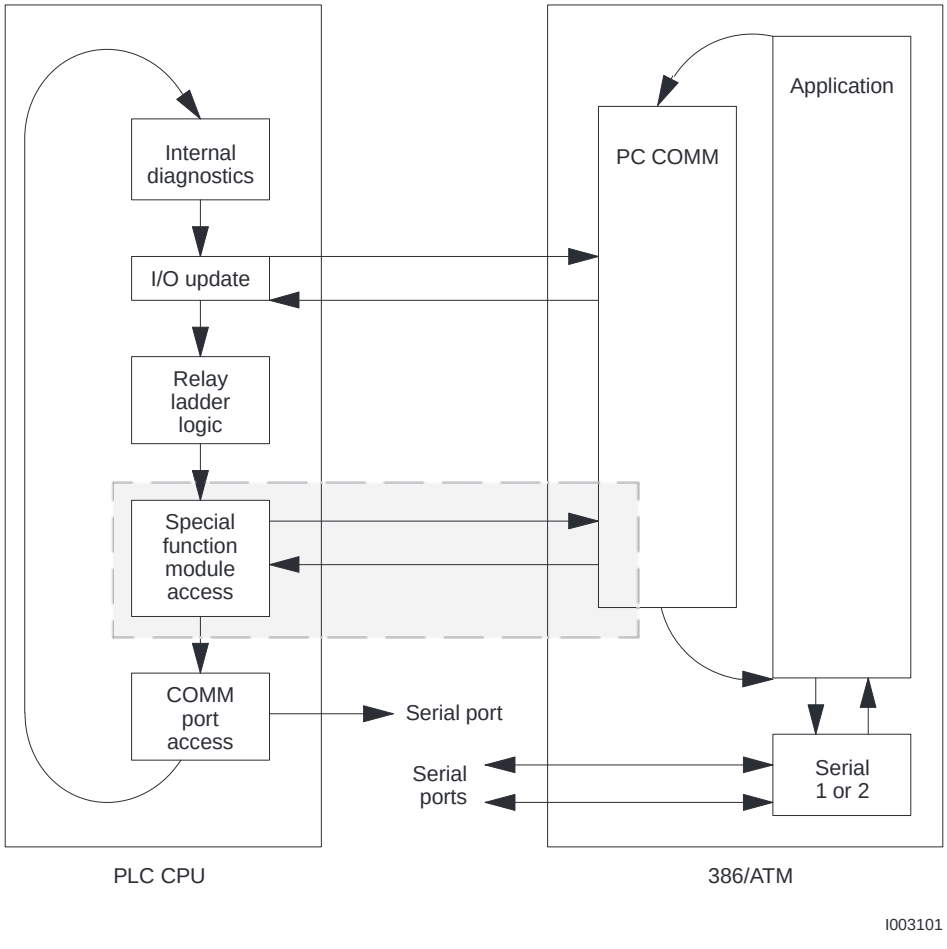

Figure 5-4 PLC Scan: Special Function Cycle

Command Syntax: PCREAD

PCREAD allows you to read PLC memory. The syntax of a PCREAD command is as follows.

:pr:memory_type:start_point:count::<cr>

where:

:	is the separating delimiter for the command.
pr	is the command syntax for PCREAD.
memory_type	is the memory type: VMEM, WX, WY, TCC, TCP, DSC, DCP, STW, DCP, KMEM, XREG, YREG, CREG
start_point	is the starting address for the memory type; ASCII/decimal.
count	is the number of data items that you want to read in this transaction; ASCII/decimal.
::	is the ending delimiter for the command.
<cr>	is the ASCII character 0D HEX denoting the end of the response transaction.

Response Syntax: PCREAD

PCCOMM responds to the PCREAD command in the following format.

:pr:error_code:val_1:val_2:val_n::<cr>

where:

:	is the separating delimiter for the command.
pr	is the command response for PCREAD.
error_code	if positive, the number of values read from the PLC
	if zero, a bad memory_type, a bad start_point for the memory_type or a bound count. No words were returned.
	if negative, a communications failure with the PLC.
val_1 to val_n	are the values returned from the device driver.
::	is the ending delimiter for the command.
<cr>	is the ASCII character 0D HEX denoting the end of the response transaction.

Command Syntax: PCWRITE

PCWRITE allows you to write the PLC memory. The syntax of a PCWRITE command is as follows.

:pw:memory_type:start_point:count:val_1:val_2:val_n::<cr>

where:

:	is the separating delimiter for the command.
pw	is the command syntax for PCWRITE.
memory_type	is the memory type: VMEM, WX, WY, TCC, TCP, DSC, DCP, STW, DCP, KMEM, XREG, YREG, CREG.
start_point	is the starting address for the memory type.
count	is the number of data items that you want to read in this transaction.
val_1 to val_n	are the data values you are writing to the PLC.
::	is the ending delimiter for the command.
<cr>	is the ASCII character 0D HEX denoting the end of the response transaction.

Response Syntax: PCWRITE

PCCOMM responds to the PCWRITE command in the following format.

:pw:error_code::<cr>

where:

:	is the separating delimiter for the command.
pw	is the command response for PCWRITE
error_code	if positive, the number of values written to the PLC if zero, a bad memory_type, a bad start_point for the memory_type or a bad count. No words were returned. if negative, a comm failure with the PLC IOWRITE operation
::	is the end delimiter of the response string.
<cr>	is the ASCII character 0D HEX denoting the end of the response transaction.

Executing Commands from a File

Any of these commands can be entered from the keyboard or executed from a file. For instance, to send a message, use echo:[message]::>pccom or

```
c>      copy con: pccomm:
        :pr[message]::
        <ctrl-z>
```

To read a message, use c> copy pccomm: con:

Notes Concerning Writing to Memory Locations

Example programs are included in Appendix B. Source code for the examples is supplied on the 386/ATM device driver diskette.

Consider the following when reading or writing data.

- The PLC input scan, ladder execution, loop execution, or special function logic may overwrite any value written by PCWRITE. Ensure that all systems software and hardware are coordinated so that they work together.

⚠CAUTION

Care should be taken when using PCWRITE to send data to word memory areas. Unlike discrete memory points, word memory areas can be overwritten even if they are forced.

- All data and address values used in communications with PCCOMM are in decimal (i.e., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12).
- When reading or writing a discrete memory type, the data will be either 1 or 0.

  Address for all memory types start with 1, with the exception of DCP, which starts with address 0.

  The format for DCP addressing is:

  <drum_number> <step_number>

  where drum_number is 1 based (1 through n) and step_number is 0 through 15.

  Example:

  Event drum 1, step 1 uses address 16 (base 10).

  Event drum 1, step 2 uses address 17 (base 10).

  Event drum 2, step 1 uses address 32 (base 10).

  Event drum 2, step 2 uses address 33 (base 10).

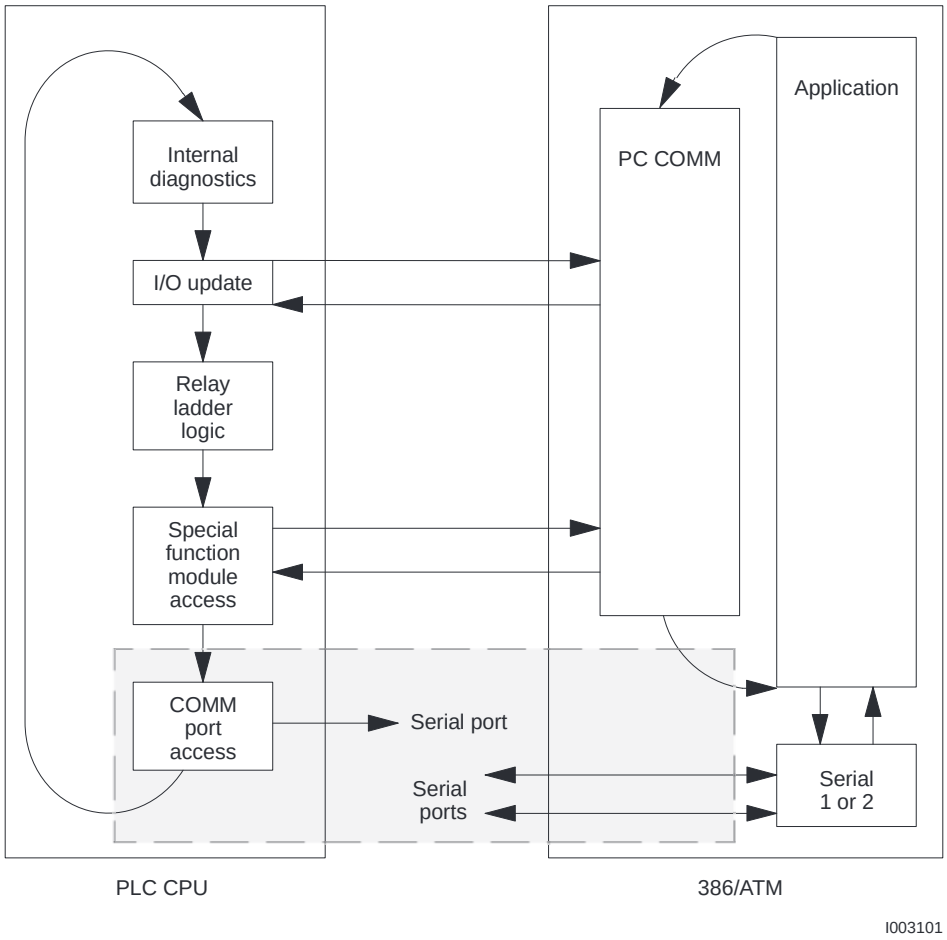

Figure 5-5 PLC Scan: COMM Port Cycle

Serial Port to PLC

All third party software that communicates with Series 505 or Series 500 families of PLCs through the PLC serial port will operate on the 386/ATM. Refer to the installation instructions accompanying the software package.

RS-232 Com1 and Com2

Com1 and Com2 are PC/AT-compatible serial communications ports with standard handshaking. All third party PC/AT-compatible software that is programmed for serial communications will operate on the module.

NOTE: The driving voltage is 5 VDC rather than the 12 VDC standard of IBM-compatible PCs and may not work with all hardware, especially a mouse.

Chapter 6
Troubleshooting

6.1 Diagnostics

Power-up and Run-time Diagnostics

The 386/ATM has an extensive set of ROM-resident hardware diagnostics. Following power-up or a manual reset (using the reset button), the 386/ATM automatically initiates a set of internal diagnostics to verify system memory, CPU, and functionality.

During operation, the 386/ATM generates and tests parity for each access to system DRAM to ensure integrity of the system DRAM memory.

User-Initiated Diagnostic Tests

You can initiate diagnostic testing at any time. Initiating diagnostic testing halts the current operation. To begin, press: CNTL ALT S

Use the arrow keys to highlight DIAGNOSTICS and press Enter. The system prompts you with information on selecting the diagnostic tests available.

The 386/ATM reboots after exiting the diagnostic menu.

NOTE: The Floppy Disk diagnostic requires a "scratch" 3.5″ high-density diskette (1.44M byte). All data on this diskette will be lost during the Floppy Drive test. The diskette will have to be reformatted before it can be used for MS-DOS applications.

NOTE: The Fixed Disk test is non-destructive; no data on the fixed disk will be lost as a result of the test.

To run the External Loop-back test on the serial ports, you must attach a loop-back connector to the serial port. Figure 6-1 shows the wiring diagram for the loop-back connector.

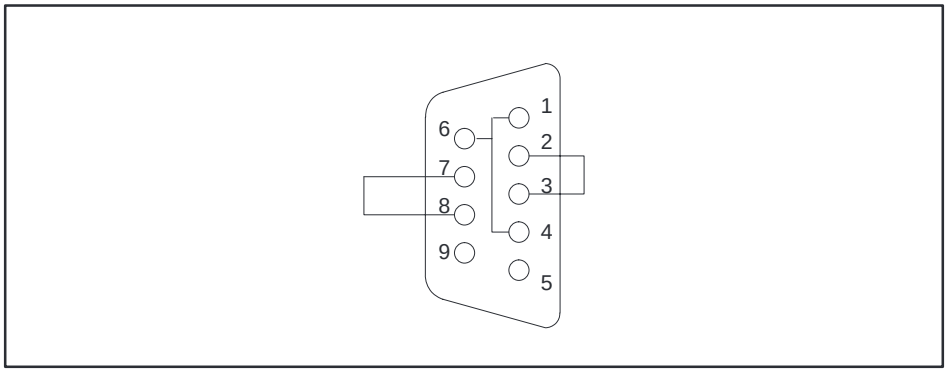

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Figure 6-1 Loop-back Connector for Serial Port Test (Wire-side View)