AutoMax®
Run-Time Programming Executive
Version 3.3

M/N 57C341

Instruction Manual J2-3060

RELIANCE ELECTRIC

The information in this user's manual is subject to change without notice.

WARNING

THE ReSource AutoMax EXECUTIVE SOFTWARE MUST BE USED AND MAINTAINED ONLY BY QUALIFIED PERSONNEL WHO ARE FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF ALL EQUIPMENT IN THE SYSTEM AND THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY OR DAMAGE TO EQUIPMENT.

WARNING

QUALIFIED PERSONNEL MUST READ AND UNDERSTAND THE APPLICABLE AutoMax AND DCS 5000 INSTRUCTION MANUALS IN THEIR ENTIRETY PRIOR TO INSTALLING, ADJUSTING, OPERATING, AND SERVICING THE AutoMax EXECUTIVE SOFTWARE AND THE MACHINERY THAT IT OPERATES. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY OR DAMAGE TO EQUIPMENT.

WARNING

THE USER MUST PROVIDE AN EXTERNAL, HARDWIRED EMERGENCY STOP CIRCUIT OUTSIDE THE CONTROLLER CIRCUITRY. THIS CIRCUIT MUST DISABLE THE SYSTEM IN CASE OF IMPROPER OPERATION. UNCONTROLLED MACHINE OPERATION MAY RESULT IF THIS PROCEDURE IS NOT FOLLOWED. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY.

Table of Contents

Appendices

List of Figures

1.0 INTRODUCTION

The products described in this manual are manufactured or distributed by Reliance Electric Industrial Company.

This manual describes the operation of the AutoMax Run-Time Programming Executive Version 3.8 software, a modified version of the full AutoMax Programming Executive software. The Run-Time Executive software allows you to perform on-line operations such as loading files and tasks to the rack, running and stopping tasks, and monitoring tasks. It does not provide the ability to configure applications or to create and compile application tasks. These functions are supported only in the full AutoMax Programming Executive software. It is assumed that your application software supplier, using the full Programming Executive software, has configured your AutoMax system and created and compiled the application tasks required to control the machine or process.

The Run Time Executive software is usually used by manufacturing plant personnel for starting, monitoring, and stopping application tasks running in the AutoMax rack. These operations are described in sections 6 - 16 of this instruction manual.

Sections 1 - 5 of this instruction manual describe procedures for loading application tasks and other files to the rack. You may be required to perform these operations if changes are made to hardware in the rack, or to an application task. Because the RunTime Executive software itself cannot be used to modify or create application tasks, it is assumed that new or modified application tasks are provided by your application software supplier.

Section 1.3, Getting Started: Loading Files and Tasks, provides a brief description of the procedures you need to follow to load files to the rack under numerous conditions. If you are familiar with the AutoMax hardware and software, you may wish to turn to section 1.3 first. Otherwise, you should read through sections 1 - 5 in their entirety.

The remainder of this chapter contains introductory information about the AutoMax Distributed Control System. If you are familiar with the AutoMax hardware and software and already know what information you are looking for, you can go directly to the sections that describe these operations.

Operation	Section
• **Loading the AutoMax operating system (OS) to the rack for the first time**	4.0 - 4.1
• **Re-loading the AutoMax operating system to the rack**	4.0 - 4.1
• **Loading the rack configuration file, parameter object files*, and all application tasks to the rack**	5.0
• **Loading the operating system to the Universal Drive Controller (UDC) module***	4.0 - 4.1

* Applicable only if your application is a Distributed Power (DPS) drive control system, that is, there is a Universal Drive Controller module in the rack.

1.1 Important Terms

The following terms will be used throughout this instruction manual. You should review these terms before proceeding.

adding a task: to designate a task for a particular rack when the task is created. Tasks cannot be added using the Run-Time Executive software.

application: the equipment, machine/process, or electrical drive being controlled by the AutoMax system.

application task or task: a type of file that contains instructions required to control a process. There are two types, AutoMax tasks and UDC tasks.

AUTO-RUN: a software switch that defines whether tasks that were running when power went off will be re-started automatically when power is turned on to the system. See section 6.16 for more information.

configuration file: an AutoMax system file that defines both the hardware and software in the system. The configuration file assigns meaningful symbolic names to the physical points in a system, which allows application tasks to be constructed using names instead of actual physical locations.

drop: a rack on a network connected through Network Communication modules (M/N 57C454).

file: a set of related information treated as a unit.

Ladder Logic task or PC task: a task written using conventional relay logic to show the sequence of power flow.

library: a subdirectory of the hard disk root directory (C:\) which is used to group together a number of systems.

load: to copy from one host on to another; in the AutoMax Executive, to copy a task or file from the personal computer to the rack.

non-volatile memory: data storage area in a personal computer or other microprocessor-based device that is maintained without power.

on-line: in the AutoMax Executive, to be communicating with an AutoMax rack by way of an RS-232 cable connected directly to the rack or via the DCS-NET network.

operating system (OS): in AutoMax, specialized system file that enables the AutoMax Processor, UDC module, and PMI Processor to control the physical resources of the AutoMax hardware. There is a separate OS for each. The UDC OS contains the PMI OS. All of these are contained in the AutoMax Executive software.

parameter object file (.POB) or drive parameter file: a file that contains information about drive and motor characteristics, such as "maximum motor RPM" or "current transformer turns ratio". This file is required only for applications that contain a Universal Drive Controller module in the rack.

path: the drive, directory, and subdirectory on the personal computer that contains files that can be loaded to the rack, or to which files can be saved from the rack; also, a DOS command that can be used to describe where the personal computer's OS should look for files.

save: in the AutoMax executive, to copy a task or file from the rack to the personal computer.

UDC: Universal Drive Controller module (S/M C-57552).

utility task: a task designed to be used for start-up or testing purposes; not used for control of the application. Utility tasks can be created only with the full AutoMax Programming Executive.

1.2 Introduction to the AutoMax Distributed Control System

The AutoMax Distributed Control System (DCS) is a programmable, microprocessor-based control system. It is capable of performing real-time control with millisecond response time and is adaptable to many industrial and process control applications.

A typical AutoMax system consists of a number of racks, each containing various modules. The racks may be connected to each other through a communication network. The Processor module or modules in each rack control the system. The system supports the sharing of data between AutoMax Processors within a rack. It supports the coordination of application programs, or tasks, on the same Processor and on different Processors within a rack. It also supports the sharing of data between racks.

The AutoMax Processor module is a solid-state control device that executes instructions to control machines and processes. Other hardware modules in the rack are dedicated for special purposes: communications, digital input, digital output, analog input, analog output, and drive control.

The Variable Configurator application within the full AutoMax Programming Executive software is used to configure I/O points and common memory variables in the rack. The Variable Configurator allows the programmer to "map" names to bits and registers on I/O modules and interface modules in the rack, as well as to common memory variables on Processor and Common Memory modules in the rack.

Variables are configured using "forms" (screens) that are specific to each module. Mapping variables to physical locations on individual modules and to common memory locations allows the programmer to create application tasks referencing variable names instead of actual physical locations. All variable configuration data must be downloaded to the Processors in the rack via a configuration file before application tasks can be put into run.

Most application tasks run on the AutoMax Processor(s) and perform the functions required by the application. In addition to the application tasks that run on the AutoMax Processors, Distributed Power (DPS) drive control applications use Universal Drive Controller (UDC) modules to execute specialized drive control tasks called UDC tasks.

Before any application tasks can be run on the AutoMax Processors or UDC modules in a rack, the Processor's operating system file and the rack configuration file must be loaded to the Processors. In addition, if the rack contains a UDC module, the UDC operating system and drive parameter files must be loaded to the UDC module(s) before application tasks can be run. The procedures for loading all of these files are described in chapters 4 and 5.

1.3 Getting Started: Loading Files and Tasks

This section briefly describes important concepts about the AutoMax Run-Time Executive software and how to start using the Run-Time Executive software to load tasks and files to the rack. This section does not cover other on-line operations such as starting tasks or monitoring I/O. Refer to sections 6 - 16 in this instruction manual for information about on-line operations. Refer to Appendix H for information about what can go wrong when loading tasks and files.

1.3.1 Files and Tasks Required for the Rack

There are four types of files that must be loaded to the rack (recall that a task is a type of file). You may find other files either on your hard drive or on floppy disks supplied by your application software supplier. In general, you will only be concerned with the file types listed below for purposes of loading to the rack.

1. Operating system (OS) file
   Each Processor module and UDC module must have an operating system file. The operating system for each Processor module in a rack is usually the same. Processor and UDC operating systems are included in the Run-Time Executive software. To learn more, refer to J-3650, the AutoMax Processor module instruction manual.

2. Configuration file
   One configuration file is required for each rack. This file is stored on the Processor module. If there is more than one Processor module in the rack, the file is stored on the Common Memory module. Configuration files are identified by the extension ".CNF" in the file name. After they have been prepared for loading to the rack, the configuration files will have extension .OBJ. Configuration files can be created only by using the full version of the AutoMax Programming Executive software.

3. Application task files
   Application tasks are stored and executed on Processor modules and Universal Drive Controller modules in the rack. Each Processor module may store/execute more than one task. Each Universal Drive Controller module may store/execute one or two tasks. Application tasks are identified by the one of the following extensions in the file name: .SEQ, .PC, or .BAS. After the files have been prepared for loading to the rack, however, they will have extensions .OBJ, .PC, and .OBJ respectively. Application task files can be created only by using the full version of the AutoMax Programming Executive software.

4. Parameter object file
   Each Universal Drive Controller module must have one parameter object file. Parameter object files are identified by the extension ".POB" in the file name. Parameter object files can be created only by using the full version of the AutoMax Programming Executive software.

1.3.2 When Files and Tasks Need to be Loaded to the Rack

Before you can load any files or tasks to the rack, you must install the Run-Time Executive software itself onto your personal computer using the procedure described in section 2 of this instruction manual. This section also assumes that your application tasks, configuration files, and parameter object files exist on the personal computer. See chapter 3 for the suggested procedure for copying these files to the personal computer if they are not already stored there.

Listed below are a number of common situations that would require you to load application tasks or files to the rack (or racks) in your system. Each case is followed by a brief description of the steps you need to take and a reference to the section in this instruction manual where the procedure is described in detail.

Note that you do NOT need to re-load any files or tasks to the rack simply because a power outage occurs, or you decide to shut off power to the rack. The Universal Drive Controller module stores files and tasks in non-volatile memory. The AutoMax Processor module and Common Memory module (M/N 57C413 or 57C423) are protected by on-board battery back-up. It is also possible that there is a Battery Back-Up module connected to the rack Power Supply module. This module provides battery back-up when Common Memory module (M/N 57C413 or 57C413A only) is used in the rack. Battery back-up maintains the contents of memory through a power outage so that all files and tasks are present in memory when power is restored. Specifications for how long the memory is maintained are found in Instruction manual J-3650 for the AutoMax Processor and J-3636 for the Common Memory module.

- **First-Time Installation**

  Step 1. If you have not already done so, copy the new application tasks to the appropriate subdirectory on the personal computer's hard drive. See section 3.0 for the procedure.

  Step 2. Load the operating systems to the AutoMax Processors in the rack using the procedure in section 4.1. If your system contains a UDC module, use the procedure in section 4.3 of this instruction manual instead*.

  Step 3. Load the configuration file, application task (or tasks), and the parameter object file (or files)* as described in section 5.0 of this instruction manual.

  Step 4. Tasks may be put into RUN status assuming all conditions described in section 11 of this instruction manual have been met.

- **You Receive New or Modified Application Tasks from your Supplier**

  Step 1. If you have not already done so, copy the new application tasks to the appropriate subdirectory on the personal computer's hard drive. See section 3.0 for the procedure.

  Step 2. Re-load the rack configuration, parameter object file (if UDC is used), and all application tasks to the rack. See section 5.0 for the Load/All procedure.

Step 3. Tasks may be put into RUN status assuming all conditions described in section 11 of this manual have been met.

- **You Replace an AutoMax Processor**

  Step 1. Re-load the operating system(s) to the AutoMax Processors. See section 4.4 for the procedure.

  Step 2. Re-load the rack configuration and all application tasks to the rack. See section 10.3 for the Load/All procedure.

  Step 3. Tasks may be put into RUN status assuming all conditions described in section 11 of this manual have been met.

- **You Replace a UDC Module**

  Step 1. Re-load the operating system to the new UDC module. See section 4.4 for the procedure.

  Step 2. Re-load the rack configuration to the AutoMax Processor, and parameter object file (.POB) and UDC tasks to the new UDC module. See section 5.0 for the Load/All procedure.

  Step 3. Tasks may be put into RUN status assuming all conditions described in section 11 of this manual have been met.

- **Serious Error in the Rack**

  Serious errors are usually annunciated by error codes F0 - F9, FA - FF, and 50 - 62 on the Processor module LEDs. These errors will require you to re-load configuration files, application tasks, and parameter object files to the rack.

  Step 1. Examine the task list displayed on the ON-LINE menu display screen. If the task list shows no tasks in the rack, or if the field titled "Config" does not display the word "NORMAL", you will need to re-load the configuration file, application tasks, and parameter object file (or files) to the rack. See section 5.3 for the Load/All procedure.

  Refer to the AutoMax Pocket Reference, J-3669, included in binder J2-3052, for troubleshooting instructions. It is important to try to isolate the problem before re-loading files to the rack so that the same error does not occur again.

* The UDC operating system, tasks, and parameter object files are required only if there are Universal Drive Controller modules in the rack. Each UDC (Universal Drive Controller) module requires its own parameter object file.

1.4 Network Communication

AutoMax racks can communicate with each other over a network called DCS-NET. Each rack must contain a Network Communication module (M/N 57C404 or later) in order to communicate on the network. The module is connected to the network via coaxial cable.

Note that to fully use the network communication capability of the AutoMax Executive software, all Network Communication modules on a given network must be M/N 57C404A (or later). An earlier version of the module (M/N 57C404) can be used in the system, but the user will need to connect directly to the rack containing the Network module in order to communicate with that rack with a personal computer. M/N 57404 cannot be used with the AutoMax RunTime Programming Executive software. If network module versions on a particular network are mixed, the communication capability of the network will be that of the earliest version Network Communication module.

1.5 Manual Contents

Listed below is a brief section-by-section summary of the remainder of this instruction manual. Because this instruction manual covers a wide range of information that applies specifically to the AutoMax Run-Time Programming Executive and to the AutoMax distributed control system in general, you may want to go over this summary carefully to decide which sections are of specific interest to you depending upon your prior knowledge of the AutoMax distributed control system.

- Section 2.0 - Installing the AutoMax Run Time Executive Software on the Personal Computer - Provides instructions for installing the AutoMax Run Time Executive software and connecting an AutoMax Processor to the personal computer.
- Section 3.0 - Copying Application Files onto the Personal Computer
- Section 4.0 - Loading Operating Systems to the Rack
- Section 5.0 - Quick Procedure for Loading the Rack Configuration File, Drive Parameter Files, and Tasks to the Rack (Load All) - This section describes the procedure most commonly used to load all files and tasks (except the OSs) to the rack.
- Section 6.0 - On-Line Operation - Describes the AutoMax Processor module and on-line operation of the AutoMax distributed control system.
- Section 7.0 AutoMax ON-LINE Menu - Lists the ON-LINE menu options and how to select an option. Also describes the fields in the task display.
- Section 8.0 - ON-_INE Menu: Connect - Describes how to change the baud rate, enter/release the password, and enable and disable AUTO RUN of application tasks.
- Section 9.0 - ON-_INE Menu: Info/Log - Describes how to display information about the system software on any Processor in the rack and how to view the status and error log for tasks.

- Section 10.0 - ON-LINE Menu: Transfer - Describes procedures for changing the default path or viewing the contents of the default system. Also contains a description of loading individual tasks onto the rack and saving application tasks from the rack.
- Section 11.0 - ON-LINE Menu: Running Tasks - Describes how to run tasks.
- Section 12.0 - ON-LINE Menu: Stopping Tasks - Describes how to stop tasks.
- Section 13.0 - ON-LINE Menu: Deleting Tasks - Describes how to delete tasks from the rack.
- Section 14.0 - ON-LINE Menu: Monitoring and Editing Tasks - Describes how to monitor and change the status of variables and I/O points, display and modify Ladder Logic sequences in real time, and force and un-force variables.
- Section 15.0 - ON-LINE Menu: Error Clear - Describes how to clear the Processor error log, UDC error log, or errors displayed on the Processor LEDs.
- Section 16.0 - Software Troubleshooting - Describes typical errors that can occur in the rack and procedures for correcting these errors.

Appendix A AutoMax File Types
Appendix B Processor Module Error and Status Codes
Appendix C PC Task Variable Names and Types
Appendix D System Security
Appendix E AutoMax Operating System Part Numbers
Appendix F AutoMax Task Execution
Appendix G Limitations on Object File Size
Appendix H What Can Go Wrong When Loading Tasks and Files
Appendix I Using an AutoMax PC Link Module for On-Line Communication

2.0 INSTALLING THE AutoMax RUN-TIME EXECUTIVE SOFTWARE ONTO THE PERSONAL COMPUTER

You must install the AutoMax Run-Time Executive software onto the personal computer before you can load files to the rack or start, stop, or monitor tasks in the rack. The AutoMax Run-Time Executive software contains the operating systems required for the Processors and UDC modules in the rack. Configuration files, application tasks, and parameter object files can be created only by using the full version of the AutoMax Programming Executive software, but they can be loaded onto the rack using the Run-Time version of the AutoMax Executive software.

Your personal computer must meet the following requirements to run the AutoMax Run-Time Programming Executive software:

1. Your computer must be an IBM ®-compatible 8086-based (or higher) system with at least 640KB of RAM and a 40MB hard drive.
2. A COM port (COM1 or COM2) must be available for communication with the AutoMax Processor.
3. The operating system on your computer must be version 3.1, 3.2, 3.3, 4.01, or 5.0 of PC-DOS ™ or MS-DOS ®.

2.1 Procedure for Installing the AutoMax Run-Time Executive Software onto the Personal Computer

Use the procedure below to install the ReSource AutoMax Run-Time Executive software onto the personal computer.

During the installation procedure, subdirectory C:\AMX3RUN will be created on the hard disk if it does not already exist (i.e., you are re-installing the AutoMax Run-Time Executive software). The AutoMax Executive will be copied from the floppy disks to the hard disk. The software will occupy approximately 1.6 megabytes of memory on the hard disk when installed.

Step 1. Insert the AutoMax Run-Time Executive disk (M/N 57C834) labeled "1" into the floppy drive A: or B:. Type:

A:\INSTALL <CR> if installing from drive A:

or

B:\INSTALL B: <CR> if installing from drive B:

Note that <CR> indicates that you should press the ENTER key.

Step 2. If you are installing from 5.5 inch disks, you will be prompted to insert the disk labeled "2". Press any key on the keyboard when you see the prompt asking you to "Strike any key when ready."

When the installation of the AutoMax Run-Time Executive software is complete, the Run-Time Executive README help file (README.HLP) will automatically be displayed. The README file contains information about compatibility with previous versions of the AutoMax Executive, description of any major changes or enhancements and a list of problems that have been fixed in this release of the AutoMax Executive software.

2.1.1 Making a Backup Copy

Before you use the AutoMax Run-Time Executive software, you should make a backup copy of your original disks in case the original is lost or destroyed. You must use the DOS DISKCOPY command for backup. Therefore, you will need as many formatted diskettes for the backup procedure as you used to load the AutoMax Run-Time Executive software onto your hard disk (one for 5.25 inch disks or two for 3.5 inch disks). Follow the steps below.

Step 1. Log on to the C: drive by typing C: at the DOS prompt and then type:

DISKCOPY A: A: if you are copying the 5.25 inch diskette

or

DISKCOPY B: B: if you are copying the 3.5 inch diskettes

Step 2. The operating system will prompt you to insert the source diskette into drive A: or B:. Insert the first AutoMax Executive diskette and strike any key. This will copy data from the source diskette into the personal computer's memory.

Step 3. The system will then prompt you to enter the target diskette. Replace the source (AutoMax Executive) diskette with the target (blank) diskette and strike any key. This will copy the data from the computer's memory to the target diskette. The system may prompt you to exchange the source diskette and target diskette several times until all of the data on the source diskette has been copied to the target diskette.

The display will indicate when the procedure is complete and will allow you to copy the remaining diskette (if your original software was supplied on 3.5" disks) without typing the DISKCOPY command again. Simply answer yes (y) to the following prompt:

Copy another (Y/N)?

2.1.2 Running the AutoMax Run-Time Executive Software

To run the AutoMax Run-Time Programming Executive software, type C:\AMX3RUN from any drive or directory. The Run-Time menu screen will be displayed (see figure 2.1). You can modify the DOS command PATH to include the root directory of the hard disk C: so that you can run the AutoMax Run-Time Executive software simply by typing AMX3RUN from any drive or directory. Refer to your DOS instruction manual for more information.

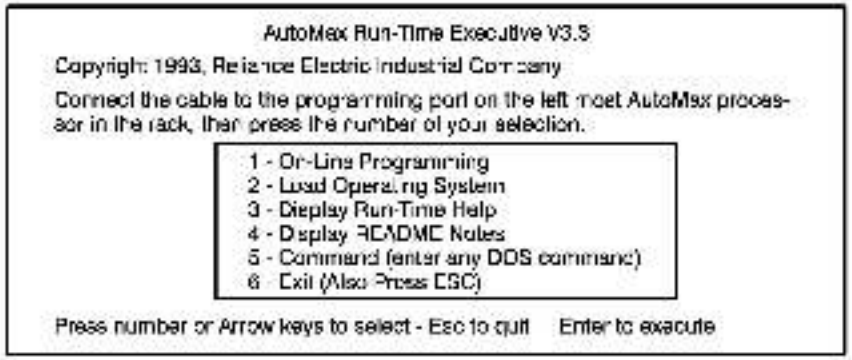


Figure 2.1 - AutoMax Run-Time Menu Screen

The Run-Time menu screen lists the following options:

1 - On-Line Programming: Select this option to display the On-Line menu for on-line programming or monitoring.

2 - Load Operating System: Select this option to load the operating system to the AutoMax Processors and UDC modules (if used) in the rack.

3 - Display Run-Time Help: Select this option to display the Run-Time help file on the personal computer screen.

4 - Display README Notes: Select this option to display the README file on the personal computer screen. This file contains information about compatibility with previous versions of the AutoMax Executive software, descriptions of major changes or enhancements to the AutoMax Executive software, and a list of problems that have been fixed in this version of the AutoMax Executive software.

5 - Command (enter any DOS command): Select this option to execute any DOS command without exiting the AutoMax Executive.

6 - Exit (or press ESC): Select this command to exit the AutoMax Executive software and return to the DOS prompt.

2.2 Connecting the Personal Computer to the AutoMax Processor

For all on-line operations, such as running or monitoring application tasks, the personal computer must be connected with a serial cable (M/N 61C127) to an AutoMax Processor module (M/N 57C430A, 57C431, or 57C435) in the rack or via the AutoMax Network using an AutoMax PC Link Interface module. The remainder of this section describes serial connection. See Appendix I for information about using a PC Link module for on-line communication.

The cable connection is usually made between the COM1 port on the personal computer and the upper port, labeled "Programmer/Port B", on the Processor module in the rack. Your system can also be configured to access the Processor through COM2 (set Com_Port = 2 in the AutoMax.INI file) or via modem. See Appendix F in the AutoMax Processor module instruction manual (J-3662) for information on using a modem with an AutoMax system. If there are multiple AutoMax Processor modules in the rack, you must connect your personal computer to the upper port of the leftmost Processor module. Through the single connection at the leftmost Processor, the personal computer can communicate with any Processor in the rack, with all I/O modules located in this rack, with all Network Communication modules and their associated drops, and with all remote I/O modules connected through a Remote Communication module (M/N 57C416) to this rack. Refer to Appendix A in the AutoMax Processor instruction manual (J-3662) for a description of the pins on the Programmer/Port B port when it is used to communicate with the personal computer. This appendix is useful if you will build a cable to communicate with the AutoMax Processor.

The default baud rate for communication between the personal computer and the Processor is 9600 (19200 for M/N 57C435 Processor). You can change the baud rate by editing the Baud Rate parameter in the AutoMax.INI file. Refer to the README notes ("1" on the Run-Time Executive menu screen) for more information. The allowable baud rates are 1200, 2400, 4800, 9600 and 19200 baud. You can override the baud rate settings at any time through the BAUD RATE option available when you are on line with the Processor(s) (see 8.1).

You will need to purchase cable M/N 61C127 or manufacture a serial cable with a 9-pin connector on one end for the personal computer and a 25-pin connector on the other end for the Processor module. Use the cable to connect the serial port on the personal computer to the upper connection, labeled "PROGRAMMER/PORT B", on the leftmost Processor module in the rack.

2.3 User Ports

All AutoMax Processor communication ports in the rack, other than the port used to connect the Processor to the personal computer, are available for use by the application tasks running on the respective AutoMax Processor modules. See 6.6 for more information on user ports.

The ports are accessed using the OPEN statement (OPEN "PORTA" or OPEN "PORTB"), in BASIC tasks. Refer to J-3675, the Enhanced BASIC Language Instruction Manual, for more information on the OPEN statement. Refer to the AutoMax Processor Instruction Manual (J-3650) for a description of the pins on user ports.

3.0 COPYING FILES ONTO THE PERSONAL COMPUTER

Since you cannot create configuration files, parameter object files, and application tasks using the AutoMax Run-Time Executive software, it is assumed that you will be provided with one or more floppy diskettes that contain files to be loaded onto your rack. These files should first be copied to the hard disk of the personal computer. The AutoMax Executive allows you to organize your files on three levels: library, system, and rack. Library, system, and rack operate exactly like DOS subdirectories.

A library is a subdirectory of the hard disk root directory (typically C:\). Libraries are used to group together a number of systems. A system usually represents a complete set of machine control software, for example, a paling line. A rack is a further subdirectory of a system. It represents an actual rack in a system, and contains the configuration file, drive parameter files (if applicable), and all of the application tasks for the rack. In smaller applications, there may be only one library, one system within that library, and one rack within that system. Even applications with only one rack must have their files organized in this manner.

Use the following procedure to copy the files from your supplier onto the personal computer. Refer to your DOS manual for more information about executing DOS commands.

It is assumed that the library, system, and rack subdirectories already exist on your personal computer's hard disk. If not, you will have to create them.

To copy the files from the floppy disk onto your personal computer, insert the disk containing your AutoMax application files into floppy drive A: or B: of the personal computer. For each rack in the system, copy the files for that rack to its respective rack subdirectory on the hard disk. The rack subdirectory normally contains tasks, the rack configuration file, and the parameter object file(s).

A table like the following can be used to record the directory path for each of the racks in your system. An example is shown on the first line.

Directory Information for Application Files

Library Name	System Name	Rack Name	Directory Path <hard disk>: <library> \ <system> \ <rack>
AMXLIB	MY_SYS	RACK_1	C:\AMXLIB\MY_SYS\RACK_1

Note that you can run the AutoMax Run-Time Executive software and at the same time specify the default drive and subdirectory for application tasks. When you go on-line, the path you have specified will appear as the default path on the On-line menu screen. For example, the following command would run the AutoMax Run-Time Executive software and specify drive C: subdirectory RACK9 as the default for loading or saving any application tasks. At the C:\ prompt type:

AMX3RUN C:\<LIBRARY>\<SYS_NAME>\RACK9

If you do not specify the default drive and subdirectory structure using this command, you may need to use the Path command on the On-line Transfer menu to set up the Processor for loading or saving files to or from the correct subdirectory on the personal computer. This command is described in section 10.1.

4.0 PROCEDURES FOR LOADING OPERATING SYSTEMS TO THE RACK

Introduction

Recall that the AutoMax Run-Time Executive software includes the operating systems for the AutoMax Processors and the Universal Drive Controller (UDC) modules. The Universal Drive Controller operating system is not loaded to the rack if there is no Universal Drive Controller module in the rack. The UDC operating system file also contains the operating system for the Power Module Interface (PMI) Processor in the PMI rack. Once the UDC operating system has been loaded to the UDC module, the PMI operating system is automatically loaded to the PMI Processor(s) upon power-up.

Before you can go on-line with any rack in the system, the operating system for the AutoMax Processor(s) must be loaded to the local rack from the personal computer on which you have installed the AutoMax Run-Time Executive software.

Precautions in Loading the AutoMax Processor Operating System

Normally, when the operating system is loaded to the AutoMax Processors in a rack, the AutoMax operating system currently on the Processors (if any) is written over. However, it is possible that the operating system already loaded to the rack is a later version than the operating system contained in the AutoMax Executive software you are using. In this case, the AutoMax Executive will be unable to establish communication with the rack in order to re-load the AutoMax operating system until you erase the existing operating system. The procedure for erasing the operating system for all of the AutoMax Processors in a rack is described in section 6.13.

The situation described above cannot occur when loading the operating system to UDC modules (if used) since communication is established with the AutoMax Processor in the rack first and then with the UDC module rather than with the UDC module directly. The operating system on a UDC module (if any) will be written over when you load any UDC operating system to that module.

AutoMax Processor modules have on-board battery backup, so you will need to re-load the AutoMax operating system only when enhancements become available or when an AutoMax Processor module in the rack is replaced. Note carefully that **all tasks in the rack will be deleted** when you load the AutoMax operating system to the Processor(s) in the rack. **To ensure that the values of any tunable variables in application tasks in the rack will be maintained in their respective tasks, you should save all application tasks that contain tunable variables back to the personal computer from the rack (see section 10.4) after you have finished tuning variables, and before you load the new operating system. You should also save any PC/Ladder Logic tasks that were modified on-line back to the personal computer.**

UDC modules use non-volatile memory to store their operating systems and UDC application tasks, so you will need to re-load the UDC operating system only when enhancements become available or when a UDC module in the rack is replaced. Note carefully that all **tasks in the UDC module will be deleted** when you load a new UDC operating system to that particular UDC module.

Types of AutoMax Operating Systems

The AutoMax operating system, which oversees the operation of the AutoMax Processors and the execution of application tasks, is provided in three versions: 6010/6011-Standard, 6010/6011-Ethernet, and 7010-Standard. All three types are included in the AutoMax Run-Time Executive software. The 6010/6011 Standard and 6010/6011 Ethernet operating system can be used with M/N 57C430A or 57C431 Processors. In order to use the Ethernet™ communication functions, which allow communication over Ethernet using the TCP/IP protocol, an Ethernet Interface module (M/N 57C440) must be installed in the rack. The 7010 Standard operating system must be used with the M/N 57C435 Processor. This operating system includes support for Ethernet functions.

When you load the AutoMax operating system to the Processor modules in the rack, you will be prompted for which operating system you want to load for the M/N 57C430A and M/N 57C431 Processors. The 7010-Standard operating system will be loaded to all M/N 57C435 Processors in all cases. Note that if you have loaded the 6010/6011-Standard operating system to the M/N 57C430A and M/N 57C431 Processors and then use the Ethernet communication functions in an application task on a M/N 47C430A or M/N 57C431 Processor, the Processor will display error code 4A on its LEDs when you try to put the task into run.

There is only one version of the UDC operating system for the Version 3.3 Run-Time Executive. You will not need to specify the operating system type when loading a UDC Operating system. In addition, because the UDC task size is limited to 20K for each UDC task, the UDC operating system size is irrelevant.

Size of Operating Systems

The 6010/6011-Ethernet operating system will occupy approximately 134K of RAM on the M/N 57C310A Processor, leaving 122K available for application tasks. The 6010/6011-Standard operating system will occupy approximately 119K of RAM on the M/N 57C430A Processor, leaving 137K available for application tasks. The M/N 57C431 leaves 300K available for application tasks, regardless of which operating system is used. The M/N 57C435 also leaves 300K available for application tasks.

Time Required to Load Operating Systems

The operating system(s) will be loaded at the maximum baud rate available for the Processor being used. If you are using 6010/6011 and 7010 Processors in the same rack, make sure that the leftmost Processor is a 7010 (M/N 57C435) Processor. This will allow the operating system(s) to be loaded at 19200 baud. If the leftmost Processor in the rack is a M/N 57C430A or M/N 57C431, the operating system(s) will be loaded at 9600 baud. At 9600 baud, it will require approximately two minutes to load each operating system to the Processors in the rack. The UDC operating system requires approximately four minutes to load to each UDC module in the rack.

4.1 Loading Operating Systems

The flowchart in figure 4.1 illustrates the options you have when loading the AutoMax operating system and UDC operating system for various system configurations. Before loading the operating system(s), review this flowchart carefully. See Appendix H for a description of problems that can occur when loading operating system files to the rack.

Use the steps that follow to initiate the Load Operating Systems procedure.

Step 1. If you have not already done so, turn on the personal computer and run the AutoMax Run Time Programming Executive by typing

AMX3RUN

Step 2. Turn on power to the rack. Note that if the AutoMax Processors in the rack do not already have an operating system, the leftmost AutoMax Processor module in the rack will display the letters "L" and "O" (reading top to bottom). This code prompts you to load the operating system.

Step 3. Connect the personal computer to the leftmost AutoMax Processor in the rack, following the directions in section 2.2.

Step 4. Select "2" (Load operating systems) at the opening menu screen display. The following message will be displayed on the screen:

Connect cable to processor.
Depress ENTER key when ready. ESC key to abort.

Step 5. Press ENTER.

The Programming Executive will establish communication with the local rack and will determine the type(s) of AutoMax Processors in the rack. It will also determine whether operating systems are currently loaded to the Processors in the rack.

The prompts displayed on the screen will depend on your system configuration and the options you choose as you progress through the Load Operating System procedure.

Note: If you are loading an operating system to a rack that already contains one, you will be required to enter the rack password before the new operating system can be loaded. **Loading the operating system to an AutoMax Processor or UDC module that already has one will cause all application tasks in the rack or the UDC module to be stopped and deleted.**

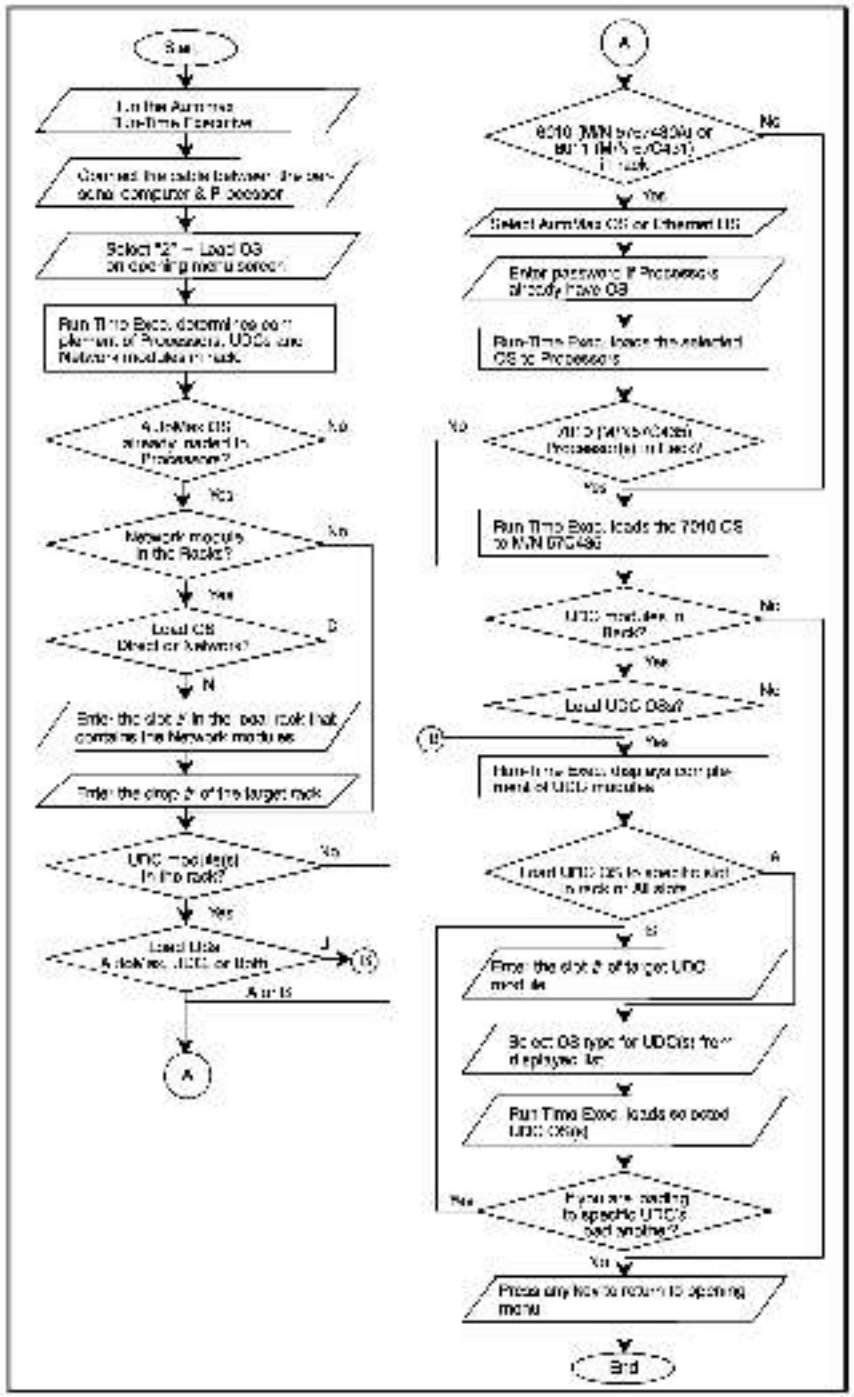


Figure 4.1 - Load Operating System

5.0 QUICK PROCEDURE FOR LOADING THE RACK CONFIGURATION FILE, DRIVE PARAMETER FILES, AND TASKS TO THE RACK (LOAD ALL)

Use the procedure that follows to load the rack configuration, drive parameter files, and application tasks to the rack. See section 10.3 if you want to load individual files to the rack. More specific information about the On-Line menus and the options used in this procedure can be found in the following sections of this manual:

Section 8.0 - Connect menu
Section 10.3 - Transfer menu

Remember that if you are loading new copies of existing files to the rack, the new copies will write over any old copies that have the same name.

Note that the AutoMax OS (and UDC OS, if applicable) must already have been loaded to the rack (see section 4.0) before you can execute this procedure.

Step 1. Enter "1" (On-line programming) from the initial menu screen (see figure 2.1). The ON-LINE menu will be displayed.

Step 2. Enter "C" to access the Connect menu.

If the personal computer is directly connected to the target rack (the rack you want to load to), enter "D" for "Direct."

If the target rack is a network rack (drop), enter "N" for "Network." The slot numbers in the local rack that contain Network Communication modules will be displayed.

a. Enter the number of the slot in the local rack that contains the Network Communications module which is on the network that contains the rack with which you want to communicate.

b. Enter the drop number of the target rack.

Step 3. Press <ESC> to return to the ON-LINE menu. Enter "T" to access the Transfer menu.

a. Verify that the directory path displayed at the upper right of the screen is the location (on the personal computer) of the files that need to be copied to the rack to which you are connected. If not, use the Path option (refer to section 10.1) to change to the desired path.

b. Enter "L" for Load. Then select the "A" (All) option. The rack configuration, drive parameters (if applicable), and all of the application tasks (except utility tasks) will be loaded to the rack.

The procedure is now complete. See Appendix H for a description of problems that can occur when loading tasks and files to the rack.

6.0 AutoMax PROCESSOR OVERVIEW

The AutoMax Processor module plugs into the backplane of an AutoMax rack and executes application tasks which, in turn, control other AutoMax or DCS modules in the system. The Processor modules have the following memory/speed configurations:

Model	CPU Speed	Memory
M/N 57C430A AutoMax 6010 Processor Module	8 mHz	256K Parity RAM
M/N 57C431 AutoMax 6011 Processor Module	8 mHz	512K Parity RAM
M/N 57C435 AutoMax 7010 Processor Module	25 mHz	512K Parity RAM

Each Processor contains 32K of EPROM for board level diagnostics and boot software. The operating system, which oversees the operation of the CPU and the execution of application tasks, is provided in two versions. The version that includes the Ethernet functions will occupy approximately 184K of RAM, leaving 128K available for application tasks on the M/N 57C430A Processor. The standard operating system will occupy approximately 119K of RAM, leaving 137K available for application tasks on the M/N 57C430A Processor. The M/N 57C431 and M/N 57C435 Processors have 300K available for application tasks regardless of which operating system is being used. Both versions of the operating system are included with the AutoMax Executive software (see section 4 for loading the operating system).

Processor modules come equipped with on-board battery back-up to protect against power failures. External battery back-up is therefore not required for racks containing a single Processor module. For racks containing multiple Processor modules, however, external battery back-up may be required to protect the Common Memory module against power failures. If you are using Common Memory module M/N 57C410 or earlier, external battery back-up is required. M/N 57C413D and later have on-board battery back up. Although this section describes the Processor module in some detail, for more specific information, refer to instruction manual I-3650.

6.1 Single Processor Module in a Rack

A Processor can occupy any slot in the rack from 0-4 (refer to figure 6.1). With the standard operating system loaded, a single M/N 57C430A Processor module in a rack makes available approximately 137K of memory for application tasks. A single M/N 57C431 or 57C435 Processor module makes 300K available for application tasks.

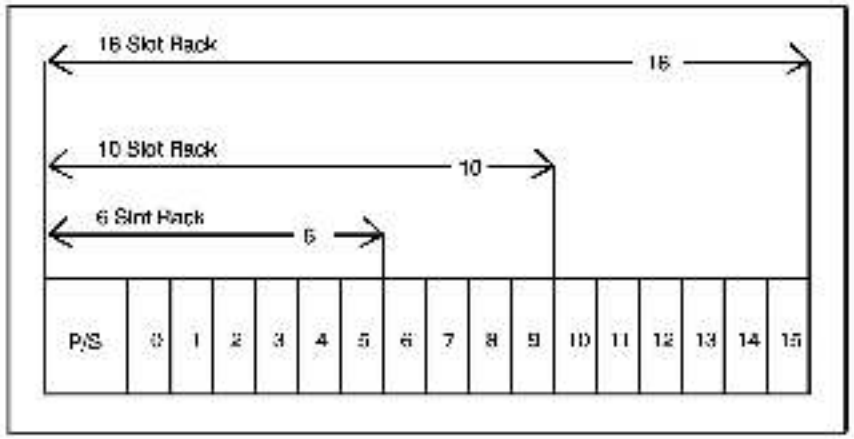


Figure 6.1 Rack Slot Numbers

6.2 Additional Data Storage in a Rack Containing a Single Processor Module

A Common Memory module M/N 57C413A or 57C423 can be used to extend the amount of data storage available in a rack containing a single Processor module. In this configuration, the M/N 57C413 or 57C423 Common Memory module makes available an additional 128K of memory to use for storing common variables. You cannot use the Common Memory module to store application tasks or local variables. See instruction manual J-3675 for more information on common and local variables.

6.3 Multiple Processor Modules in a Rack

Additional Processor modules increase the processing capability and the total memory available in any one rack for application tasks. Multiple Processor modules in a rack require the use of a Common Memory module in slot 0, where it serves as a bus arbiter and stores data common to all the Processor modules. The Common Memory module can be used to oversee communications for up to four Processor modules, the maximum per rack. The Processor modules can occupy slots 1-4 only. In a rack containing multiple Processors, slot 1 must either contain a Processor module or be empty.

In this configuration, the Common Memory module, rather than a Processor module, also stores the configuration data. See J-3636 for more information about the Common Memory module.

If you are using M/N 57C430A or 57C431 and M/N 57C435 Processors in the same rack, make sure the left-most Processor is a M/N 57C435 Processor. This will allow all communication between the AutoMax rack and the personal computer to occur at 19200 baud.

6.4 Battery Back-Up

The contents of AutoMax Processor RAM (read/write memory) are preserved through power failures by the on-board battery back-up. As long as the LED labeled "BAT. OK" on the front of the Processor module is on, the battery is functional and 115 VAC is available to the power supply in the rack. Should the system lose power, the on-board battery can supply power to the Processor module for a minimum of 42 days. Note that the battery backup is designed to maintain the contents of RAM only. It is not a source of uninterruptible power.

If you expect power to be off for long intervals during initial start-up and debugging, you should disconnect the battery backup on the Processor module and make use of the super-capacitor also on board each Processor module. Typically, the super-capacitor is capable of retaining memory for 10 hours at a time with no battery present. This procedure will avoid draining the Processor's battery back-up.

Five pre-assigned variables are available for use in all application tasks to test the status of the on-board battery of AutoMax Processor and Common Memory modules. These common boolean variables will have the value 1 if the battery is functional and 0 if the battery is not functional. The variables are named according to the Processor whose battery is being tested. BATTERYSTATUS0@ is used for the Processor in slot 0, BATTERYSTATUS1@ is used for the Processor in slot 1, etc. up to slot 4.

6.5 Module Watchdog Circuitry

Each Processor module has a local watchdog timer which must be reset by the operating system within a specified interval or the Processor will execute a STOP ALL and all I/O modules in the local rack will be reset (initialized to 0, FALSE, or OFF). The I/O modules in the rack will also be reset if you remove a Processor module from a single-Processor configuration. All UDC tasks in the rack will also be stopped, and most UDC registers will be reset. See 6.12 for more information.

In a multi-Processor configuration, there is a system watchdog timer located on the Common Memory module in slot 0. In addition to the watchdog on each individual Processor module. If the system watchdog is allowed to expire, the Common Memory module will generate an interrupt, and one of the Processors in the rack will issue a STOP ALL and reset the I/O modules in the rack. All Processor modules in the rack will then shut down.

Each UDC module also has a local watchdog timer. If the watchdog timer on a UDC module expires, the UDC module will generate an interrupt, and one of the Processors in the rack will issue a STOP ALL.

6.6 Processor Module Serial Ports

There are two RS-232 serial ports on the front of each Processor module. They are accessed through DB-25 connectors on the faceplate. The upper port, labeled "PROGRAMMER/PORT B", is reserved for connection to the personal computer only. When there

are multiple Processor modules in a rack, only the leftmost "PROGRAMMER/PORT B" slot is reserved. All remaining ports on all Processor modules in the rack can be used by application tasks running on the respective Processor modules.

The user ports are accessed using the OPEN statement (OPEN "PORTA:" or OPEN "PORTB:") in BASIC tasks. Refer to J-3675 for more information on the OPEN statement. Refer to Appendix C in the AutoMax Processor module instruction manual (J-3650) for a description of the pins on user ports. Unless otherwise programmed by an application task, the default characteristics of the user ports are:

9600 baud
8 bit characters
1 stop bit
no parity
echo off
Xon/Xoff handshake enabled
ignore modem control
not hardcopy device

6.7 Status Indicators

The Processor module has four status indicators on the faceplate: a green LED labeled "OK", an indicator light labeled "BAT. OK" for the on-board battery back-up and presence of 115 VAC power, and two seven-segment LEDs used to display status and error codes. See 6.4 for more information on the on-board battery back-up.

The "OK" indicator is controlled by the local hardware watchdog timer on the Processor. It is on when the timer has been reset within the timer interval and the Processor module is operating normally. See 6.5 for more information about the watchdog timer.

See 6.10-6.12 for more information on status and error codes that may be displayed on the seven-segment LEDs.

6.8 Power-Up Initialization

Whenever power is cycled, each Processor and UDC module performs diagnostics to detect any malfunctions on the module. In a rack with multiple Processors, the leftmost Processor will perform diagnostics on the Common Memory module.

While the diagnostics are being performed, various status codes are displayed on the Processor, indicating the particular diagnostic in progress. Most of these codes are displayed so briefly that they are not actually visible. Should a failure be detected on a Processor or Common Memory module, the Processor will be shut down and the "OK" indicator turned off. The status code indicating which diagnostic failed will remain on the Processor's display. See Appendix B for a list of status and error codes. A failure on a UDC module will cause the "OK" indicator to be turned off.

After the diagnostics are complete, a checksum of a portion of the contents of memory is verified against a checksum which was stored in memory when a loss of AC power was detected. This determines whether the system performs a re-start or a cold start when power is turned on. See 6.13 and 6.14 for more information on cold starts and system re-starts.

6.9 Run-Time Diagnostics

The Processor module performs real-time checking of all data paths on the module by means of a parity test. The Processor contains a memory management unit (MMU) that prevents errors such as writing to locations that are read-only.

Should a failure be detected, a fault code will be displayed and the Processor shut down. See Instruction manual J-3650 for more information on run-time diagnostics.

6.10 Status Codes

Status Codes are those codes displayed on the seven-segment LEDs on the Processor module faceplate while the "OK" indicator is on.

Status codes simply indicate that a particular operation is occurring or that a particular condition exists. They do not cause the Processor to shut down. Status codes may or may not be cleared when the condition they indicated no longer exists. See Appendix B for a list of status codes.

6.11 Shut-Down Faults

Serious hardware malfunctions that cause the Processor to shut down and the "OK" indicator to be turned off are called shut-down faults. When possible, the cause of the shut-down is indicated by an error code on the seven-segment LEDs. See Appendix B for a list of status and error codes.

Once a Processor module has shut down, it will not execute any instructions or respond to commands from the personal computer until it is reset by cycling power.

6.12 Stop-All Faults and Commands

In AutoMax systems, both a Stop-All command and a Stop-All fault have the same result. A Stop-All command can be issued from the on-line menu of the Programming Executive software. A Stop-All fault occurs when there is a serious error either in an application task in the rack (e.g., invalid BASIC language EVENT statement), or when there is a serious error in an AutoMax Processor or Universal Drive Controller module.

Both a Stop-All fault and a Stop-All command will result in all application tasks in the rack being stopped. The common clock signal on the rack backplane (CCLK) will also be disabled. A Stop-All fault will result in an error code display on the faceplate of the AutoMax Processor that was running the tasks that caused the Stop-All. Neither the operating systems nor the application tasks on AutoMax Processors and UDC modules will be deleted by Stop-All faults or commands.

The effect of a Stop All on data in the rack depends on the data type. Local tunable data in both AutoMax and UDC application tasks is always retained. Local data is retained for AutoMax tasks, but not for UDC tasks. Common memory data, which can be defined for AutoMax Processors only, is maintained when it is configured as non-volatile. Otherwise, it is reset to 0. For I/O data, inputs are

retained and continue to be updated, while outputs are reset (set to 0 or off). Note that the UDC dual port memory is treated like I/O data in the system.

AutoMax Processors will retain the last values of all local variables and non volatile common memory variables. All I/O input values are retained and continue to be updated. All I/O outputs in the rack and in any remote I/O racks will be reset.

UDC modules will retain their parameter configuration data, UDC test switch information, D/A setup configuration, local tunable variables, and the following input data: feedback registers, UDC- PMI communication status registers, and UDC task error log information.

UDC modules will NOT retain local variables and data found in the following registers, which are considered outputs: command registers, application registers, the ISCR (interrupt status and control register), scans per interrupt register, and scans per interrupt counter register.

For Distributed Power DC Drive applications, the PMI Processor connected to UDC modules will react to a Stop All as follows. All I/O in the PMI rack, including the rail I/O and I/O connected to the Resolver and Drive I/O module, is reset. Because a Stop All causes the CCLK signal being used to synchronize UDC and PMI Processor communication to be turned off, the UDC and PMI will become unsynchronized. The PMI Processor reacts to all serious synchronization problems in the same way: armature and field current reference will be set to 0, and the PMI Processor will continue commanding 0 current until it senses discontinuous conduction. At this point, the PMI Processor will turn off the M- contactor output signal on the Resolver and Drive I/O module in the PMI rack.

6.13 Forcing a Cold Start/Deleting Operating Systems

At times it may be necessary to cold start the Processor(s) to erase the contents of RAM. Because of the on-board battery back-up, you cannot erase the contents of RAM simply by cycling power. To force a cold start, perform the steps below. Note that the operating system on UDC modules cannot be deleted. To change a UDC OS, simply load the new operating system.

Before proceeding, note carefully that this operation will erase the contents of RAM for all Processors in the rack and that it will require re-loading the AutoMax OS, the rack configuration file, drive parameter file, and all application tasks. Make certain that you have an accurate backup of all tasks in the rack, including utility tasks. See 12.3.1 for more information on utility tasks.

Read all directions carefully before starting the procedure.

1. Turn off power to the system. All power to the rack, as well as all power leading to modules in the rack, must be off.
2. Take any Processor module in the rack out of its current slot and insert it into slot 5, 6 or 7. If there are modules in these slots already, take one out and set aside for the moment. Then insert the Processor into the empty slot.
3. Turn on power to the rack.
4. Turn off power to the rack.

5. Move the Processor back to its original slot and re-insert any other module taken out in step 2 above.
6. Turn on power to the rack. The leftmost Processor will execute its power-up diagnostics and then display "1" "0" on its LEDs.
7. Re-load the AutoMax OS, rack configuration file, drive parameter file, and all application tasks.

6.14 Stopping and Re-Starting AutoMax and UDC Tasks in the Rack

WARNING

DEPENDING ON THE APPLICATION, STOPPING AN INDIVIDUAL TASK MAY RESULT IN LOSS OF CONTROL OF THE APPLICATION PROCESS. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. IT IS RECOMMENDED THAT STOP-ALL BE USED TO STOP TASKS NORMALLY. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

WARNING

THE STOP-ALL FUNCTION STOPS THE APPLICATION PROGRAMS IN A RACK. IT IS THE RESPONSIBILITY OF THE USER TO ENSURE THAT THE APPLICATION PROCESS STOPS IN A SAFE MANNER WHEN THE APPLICATION PROGRAMS STOP. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

WARNING

THE STOP-ALL FUNCTION MAY CAUSE THE OUTPUTS TO CHANGE STATE, RESULTING IN MACHINE MOVEMENT. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

The following is a description of what happens to a rack when tasks are stopped under different circumstances. It also describes how tasks can be re-started under those circumstances. Refer to section 10.15 and 10.16 for more information.

1. You stop a task from the personal computer using the STOP command described in 12.1. The outputs controlled by this task will remain at their last state.

   The task is stopped and will not go into run again until you put it into run using the RUN command described in 11.1.

2. You stop all tasks in the rack to which you are connected, either directly or over a network, using the STOP-ALL command described in 12.2.

   All tasks in the rack are stopped and all I/O modules are cleared, i.e., set to 0, false, or off.

   Application tasks will not go into run again until you put them all into run using the RUN-ALL command described in 11.2. You can also put the tasks into run individually using the RUN command described in 11.1.

3. A Stop-All fault occurs.

   All tasks in the rack are stopped and all I/O modules are cleared. The Processor module detecting the fault will display an error code. See 6.12 for more information about stop-all faults.

   Before you run tasks again, you should first clear the error log described in 15.0. Application tasks will not go into run again until you use the RUN or RUN-ALL commands described in 11.1 and 11.2, respectively.

4. You cycle power or a power failure occurs.

   All tasks in the rack are stopped and all I/O modules are cleared. When power is returned to the system, a re-initialization occurs.

   Application tasks in the rack can be put into run in two ways after power comes back on: manually, using the RUN or RUN-ALL commands described in 11.1 and 11.2, respectively; or automatically by the system if AUTO RUN was enabled at the time power went off.

   AUTO RUN puts into run only those application tasks that were running when power went off. It will not put any tasks into run if any errors occurred prior to power going off, or if any errors occur during the system re-start.

6.15 System Re-Initialization

System re-initialization refers to a condition that occurs in a rack that contains at least one Processor module. It does not necessarily affect other racks on networks connected to the rack through S7C404, S7C404A, or S7C404B modules.

A system re-initialization will occur under the following conditions:

- when the system powers-up after power to the system is turned off either by cycling power or through a power failure,
- after the occurrence of a STOP-ALL fault,
- after you issue a STOP-ALL command

The following steps occur on a Processor module during a system re-initialization:

1. The following codes are cleared:

   drive fault codes "81" through "86"
   status codes "c0" through "dF"
   configurator task error codes "E0" through "EF"

   Any other fault codes are re-displayed.

2. An application configuration check is performed. If the application configuration check determines that an I/O module is missing or not functioning, an error code is displayed.
3. Forced outputs are set to their forced values.

WARNING

VARIABLES AND OUTPUTS WHICH ARE FORCED BEFORE A-C POWER IS LOST WILL REMAIN FORCED WHEN A-C POWER IS RESTORED. SHOULD A-C POWER BE LOST WHILE VARIABLES ARE FORCED, THE USER MUST ENSURE THAT UNEXPECTED MACHINE MOVEMENT DOES NOT OCCUR WHEN A-C POWER IS RESTORED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

4. Volatile common variables are cleared, i.e., initialized to 0, false, or off, if they are not forced. The values of local variables, non-volatile common variables, and forced volatile common variables are retained. All I/O points are cleared.
5. The application tasks are "built," i.e., the system data structures are created.
6. The application tasks are installed. The status code "d0" is displayed during the installation because this may take a significant amount of time, depending on the size and number of tasks to be installed. The Processor attempts to read all I/O locations to verify that they are still there.
7. Application tasks may be re-started if the re-initialization was the result of power being turned off and AUTO-RUN is enabled. Otherwise, application tasks are not automatically re-started. See 9.4 for more information on AUTO-RUN.

7.0 AutoMax ON LINE Menu

Option "1" on the AutoMax Run-Time Executive menu screen allows you to select the ON LINE menu shown in figure 7.1. Options on this menu are used to load, run, stop, monitor, and modify application tasks in the rack and to connect to other racks on the network(s). In addition, this menu provides access to the error log kept for each AutoMax Processor or UDC module running tasks.

Before attempting to use any of the options in the ON LINE menu, you must load the operating system into the Processor modules in the rack if you have not already done so. Refer to Section 4 for directions on loading the operating system.

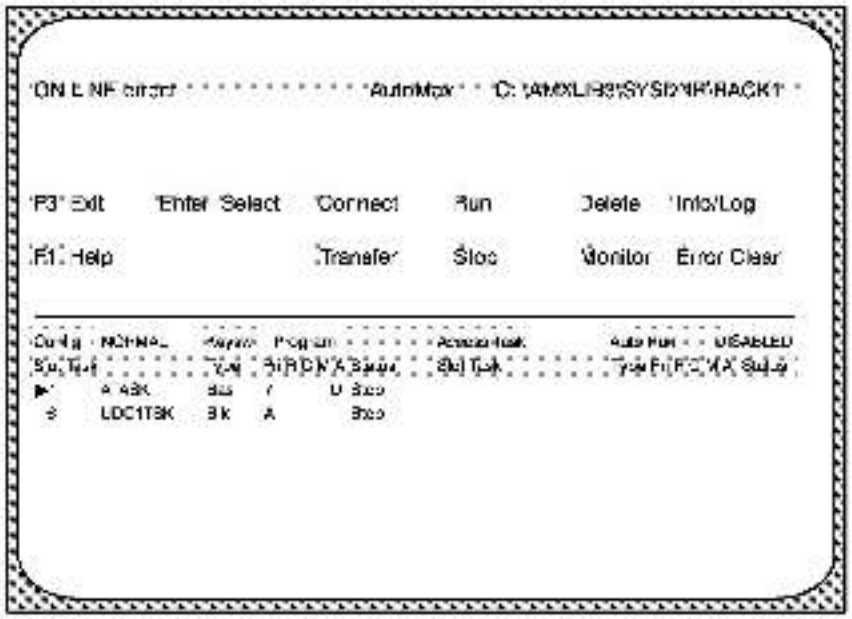


Figure 7.1 ON LINE Menu

When you select on line, you will be prompted to connect the cable to the leftmost Processor in the rack and then type "Enter" or <CR> if the cable is not already connected. If you have already connected the cable, simply enter a <CR> to go on line. If you have not connected the cable, refer to the directions in 2.2. Once you are on line, you will see the menu shown in figure 7.1.

When you first go into the ON LINE menu, the fields in the status line displayed on the screen directly below the horizontal line will be empty if there are no tasks loaded on the rack at this time. A sample display when there is one task running in the rack is described in 7.3 and shown in figure 7.2.

Use F3 to exit the ON LINE menu and return to the Run-Time Executive menu screen.

7.1 ON LINE Menu Options

Menu selections are made using the keyboard exclusively. You use the first letter of each option (shown in reverse video) instead of function keys to select the option. The default DISK:\LIBRARY\SYSTEM\RACK, i.e., the path, is displayed in the upper right-hand corner of the screen.

The "Enter (Select)" option stands for the ENTER key. Certain options will require that an application task be selected before you can choose the option. The Enter key will select the task on the screen preceded by a ">" symbol. This symbol, in turn, is controlled by the arrow keys.

In addition, the "Enter" key is often used to terminate entry of required information in fields and move to the next field.

ON-LINE menu options are described in the sections below as follows:

Connect	(8.0)
Info/Log	(9.0)
Transfer	(10.0)
Run	(11.0)
Stop	(12.0)
Delete	(13.0)
Monitor	(14.0)
Error Clear	(15.0)

7.2 ON LINE Menu Security

The options available to you when you are on-line depend on the position of the keyswitch and whether you enter the correct password. See 8.2 for directions on entering the password. See Appendix D for more information about the keyswitch and system security.

7.3 ON LINE Menu Display

The AutoMax Executive maintains a real-time display of the status of up to 32 tasks in the rack when you are ON LINE. Figure 7.2 shows the ON LINE menu as it appears when there is one task running in the rack. The status of the configuration file is also displayed. Parameter object files, although required for UDC modules in the rack, will not be listed on the screen.

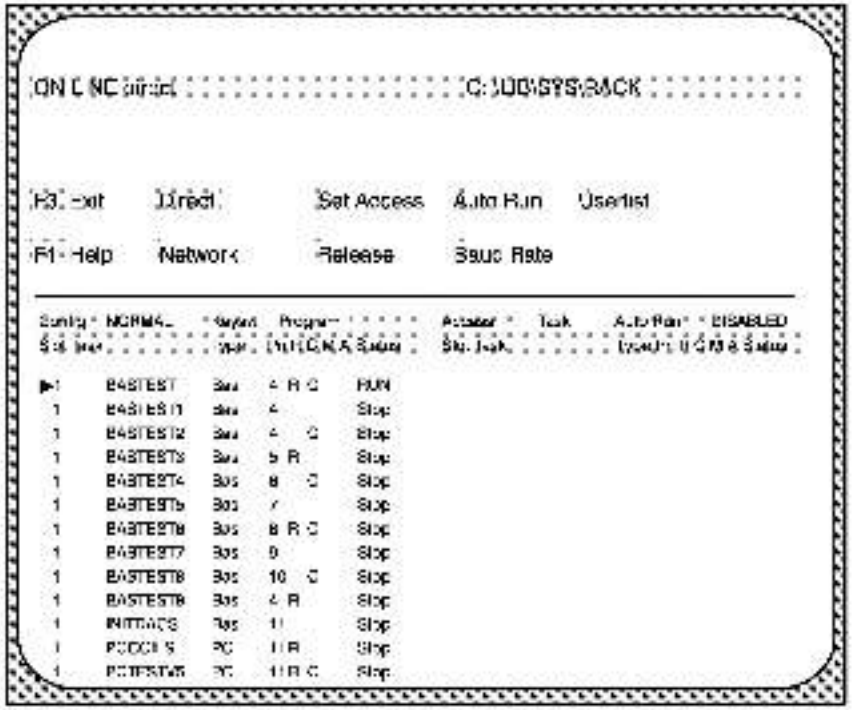


Figure 7.2 - ON LINE Menu Display with Task Running

The top status line displays general information about the rack. The "Config" field shows whether the NORMAL or DEBUG version of the rack configuration file has been loaded to the rack. If the rack configuration has not been loaded, "NONE" will be displayed. The keyswitch position, Program in this case, is shown in the "Keysw" field. The "Forced" field, when shown, indicates whether there are any forced variables in the rack. See 14.5 for more information on forcing.

The user's access level is displayed in the field "Access" as None, Data, Rack, Locked, or, as shown here, "Task". "Auto Run" is either "enabled" or as shown here, "Disabled". See 6.16 and B.4 for more information about AUTO RUN.

The second status line displays specific information about tasks in the rack. "Slot" denotes the AutoMax Processor or UDC module on which the task is running. "Task" is the name of the task and "Type" denotes the programming language (.BLK, .BAS, or .PC).

"Pri" is the task's priority as defined in the configuration for the rack. The priority ranges from 1 (highest) to 11 (lowest). UDC tasks do not display a priority. "A" is displayed for Drive A tasks; "B" is displayed for Drive B tasks. See Appendix C for more information on task priority. The field "R" will show an R if the task is reconstructible. If the task is not reconstructible, it cannot be saved back from the rack.

Field "C" will show a C if the task has been designated as CRITICAL in the configuration for the rack. CRITICAL tasks are those that cannot be stopped individually, i.e., all tasks must be stopped in order for the task in question to be stopped.

An M in field 'M' indicates that the task has been modified through the ON LINE menu, but has not been saved from the Processor module. This field is used only when tunable variables have been changed, or when Ladder Logic tasks have been modified. For more information about saving tasks from the Processor module, see section 10.4.

Field 'A' will show a "U" if the user has task access, or "O" if another user has task access to the task. For single user (non-network) applications, this field will be blank or will display "U" if the user has edited the task.

Finally, "Status" shows whether each task loaded in the rack is currently running (RUN) or stopped (STOP), and whether there has been an error (ERROR) in each task.

8.0 ON LINE MENU: CONNECT

The Connect menu is used to change the baud rate, enter the password, release the password, set or release access, and enable/o sable AUTO RUN o' application task. You can also display a list of users. These options are described be ow. To se ect the Connect menu, enter "C" for c the ON LINE menu shown in figure 7.1. The resulting menu is shown in figure 8.1.

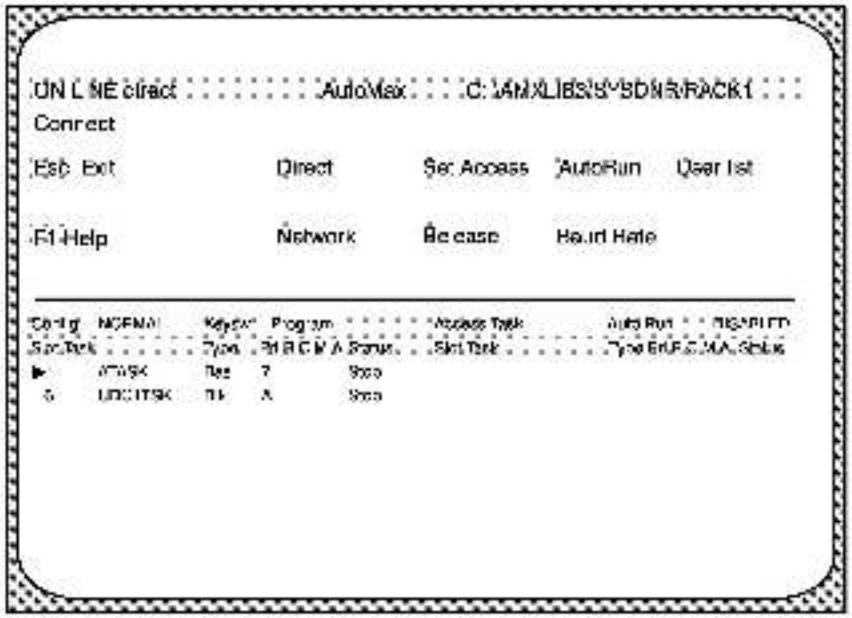


Figure 8.1 - CONNECT Menu

8.1 Changing the Baud Rate

Typing "B" for "Baud Rate" from the Connect menu shown in figure 8.1 allows you to increment or decrement the default baud rate used for communication with the rack. For the M/N 57C435 Processor, the default s 19200 baud. For the M/N 57C430A and 57C431, the default is 9600 baud. Use the up and down arrow keys to increment and decrement the baud rate displayed. The allowable baud rates are 1200, 2400, 4800, 9600, and 19200 baud.

8.2 Setting Access

Typing "S" for Set Access from the Connect menu shown in figure 8.1 allows you to set various levels of access to the tasks in the rack. If the keyswitch on the rack power supply is in any position other than PROGRAM, setting any level of access has no effect because the keyswitch has already set a lower level of privileged access. See Appendix D for more information on security access levels.

If the keyswitch in not in the PROGRAM position, or if you do not have the required access level, the options available to you from the ON LINE menu shown in figure 7.1 are limited to monitoring variables.

If the keyswitch is in the PROGRAM position and you try to load, run or alter tasks, set or force variables, or do on-line editing of tasks without first entering the password, you will be prompted for the password. If you do not enter the password, you will be unable to execute these functions.

Entering the password gives you DATA access, which limits you to modifying COMMON variables. When you try to execute a function which requires a higher level of access, AutoMax will automatically grant the required level of access if it is available. Table 8.1 shows the levels of access available to you based on your current level of access and the access levels of other users connected to the rack. DATA access and RACK access are set by selecting the Set Access command with no task selected. TASK access is set by selecting the Set Access command with a specific task selected. For example, if you have no access when you select the Set Access command, and you have no task selected, AutoMax will request the password. If you enter the password and no other user has access to the rack, you will be asked if you want RACK access. If you response "Y" (Yes), no other user will be able to obtain access to the tasks in the rack. If you respond "N" (No), a screen prompt will ask you if you want access to all tasks.

Table 8.1 - Setting Access

User's Present Access Level	Other Users' Access Level	Access Levels Available to User
None	None	DATA, single task, all tasks, RACK
	DATA	DATA, single task
	TASK	DATA, single task
	RACK	None
DATA	None	single task, all tasks, RACK
	DATA	single task, all tasks
	TASK	single task
TASK	None	single task, all tasks, RACK
	DATA	single task, all tasks
	TASK	single task

The Programming Executive software is shipped from the factory with the password "AUTOMAX". The password can be changed only by your application software supplier, using the full version of the AutoMax Programming Executive software.

Note that when you enter the password, AUTO-RUN is automatically disabled. See section 8.4 for more information about AUTO-RUN.

8.3 Releasing Access

Typing "R" for Release Access from the Connect menu shown in figure 8.1 allows you to release various levels of access to the rack. If you have either TASK or RACK access, and you select Release Access without first selecting a task, a screen prompt will ask you if you want to release your present access level as well as DATA access. If you presently have DATA access, it will be released without a prompt from AutoMax. If you selected a task before selecting Release Access, access will be released for the selected task only.

When all levels of access have been released, PROGRAM mode is effectively disabled even though the keyswitch on the rack power supply is still in the PROGRAM position.

8.4 Setting AUTO-RUN

WARNING

BEFORE TURNING ON POWER TO THE SYSTEM, YOU MUST MAKE CERTAIN YOU UNDERSTAND THE RESULTS OF ALL APPLICATION TASKS. OUTPUTS MAY CHANGE STATE, RESULTING IN MACHINE MOVEMENT. FAILURE TO OBSERVE THIS PRECAUTION MAY RESULT IN BODILY INJURY OR DAMAGE TO EQUIPMENT.

Entering "A" for "AUTO-RUN" at the Connect menu allows you to enable/disable AUTO-RUN as long as the password is entered and the keyswitch is in PROGRAM. When AUTO-RUN is disabled, all tasks will be in STOP mode on power up. When AUTO-RUN is enabled, all tasks in the rack that were in RUN mode before power to the rack was turned off will go back into RUN when power is turned back on.

By default, AUTO-RUN will be disabled when the AutoMax operating system is loaded to the racks. It will remain disabled until you enable it. After AUTO-RUN is enabled, it will remain enabled until you disable it. It will not be disabled when you enter the password, change access levels, or set or force variables.

The following conditions must be met for AUTO-RUN to be initiated:

1. AUTO-RUN must be enabled through the ON-LINE PROGRAMMING option on the AutoMax MAIN menu.
2. The system re-start described in 8.1.7 must occur with no errors.
3. Each task specified in the configuration for the rack except for utility tasks is present and installed on the correct AutoMax Processor or UDC module, and was running when power was cycled.

See 8.4.1 for more information about tasks that will not be put into run with AUTO-RUN even if conditions 1-3 above are met.

If there is any discrepancy between the information in the configuration for the rack and an actual application task, the fault code "E" "0" is displayed on the AutoMax Processor and no application tasks are re-started. In a multiple Processor configuration, this check is performed by one Processor only. The particular Processor on which the fault code appears bears no relation to the location of the problem.

Tasks are re-started in order of priority from highest to lowest on each Processor module. Tasks on different Processors are not synchronized. In addition, unless the programmer uses interrupts to synchronize them, tasks on UDC modules are not synchronized with tasks on AutoMax Processors. Tasks with the same priority are started in alphabetical order. Tasks execution always begins from the first statement in the task, regardless of the point at which the task stopped. Tasks on different UDC modules will be re-started independently of each other. The drive A task is always executed first, followed by the drive B task. UDC task execution always begins from the first statement in the task, regardless of the point at which the task may have been stopped. After CCLK is enabled, execution of tasks on all UDC modules in the rack will be coordinated.

8.4.1 Application Tasks Not Re-Started with AUTO-RUN

The following tasks are not re-started automatically when the system powers up and AUTO-RUN is enabled.

1. Any task that was was not in run when power was turned off. You must put the task into run manually. See 11.0 for more information about running tasks.
2. Any task that was stopped by a STOP or STOP-ALL command issued from the personal computer. You must put the task(s) into run manually. See 11.0 for more information about running tasks.
3. Any task that was stopped by the occurrence of a STOP-ALL fault described in 8.12. You should first clear any error codes from the error log or from Processor LEDs and then put the task into run manually. See 15.0 for more information about clearing the error log or LEDs and 11.0 for more information about running tasks.

8.4.2 Application Task AUTO-RUN and Memory Fragmentation

Occasionally, there may be insufficient memory in the Processor(s) after a system re-start to accommodate application tasks that were initially loaded (recall that the tasks must be "built" again) due to memory fragmentation. Since system re-starts are inevitable, after loading the rack configuration and application tasks, you should verify that there will be sufficient memory should a re-start occur. You can do this by issuing a STOP-ALL command from the personal computer or by cycling power and then checking that all application tasks are present and installed.

8.5 Connecting to a Network or a Local Rack

You can communicate with an AutoMax rack by using either an RS-232 serial connection to a Processor in the rack or by using a PC Link module (M/N 57C446). You can choose which one of these methods you want to use for communication to AutoMax racks.

When using a serial connection, communication between the personal computer running the AutoMax Executive software and a given rack in the system can take place either directly with the local rack or over a network through the Network Communication module (M/N 57C404A). The default status is direct communication with the rack that is physically connected to the personal computer. See 8.5.1 and 8.5.2 for more information on direct and network communication.

When using a PC Link module, communication can be established with any rack on the network through the coaxial cable that is used by the network. Direct communication with the local rack is not an option when using the PC Link module. See 8.5.2 for more information on network communication.

Note that you do not need to establish a network connection through the ON-LINE menu to load an operating system over a network. The loading procedure is always performed through the Load Operating System command on the opening menu screen.

8.5.1 Direct Communication with the Local Rack

Selecting "D" for "Direct" from the ON LINE CONNECT menu will cause the AutoMax Executive to direct all communication to the rack to which the personal computer is directly connected. The word "direct" will be visible on the top line of most ON-LINE menu screens. Direct connection is the default status.

8.5.2 Network Communication

Selecting "N" for "Network" from the ON-LINE CONNECT menu will cause the Executive software to send all communication to the network rack (drop) specified. Until you change the type of connection, either by using "N" for "Network" to connect to another network rack or by using "D" for "Direct," all communication will take place with the specified rack.

If you are using a PC Link module, AutoMax will display the screen shown in figure 8.3. You can skip to the description that follows figure 8.3.

If you are using serial communication, AutoMax will display the screen shown in figure 8.2

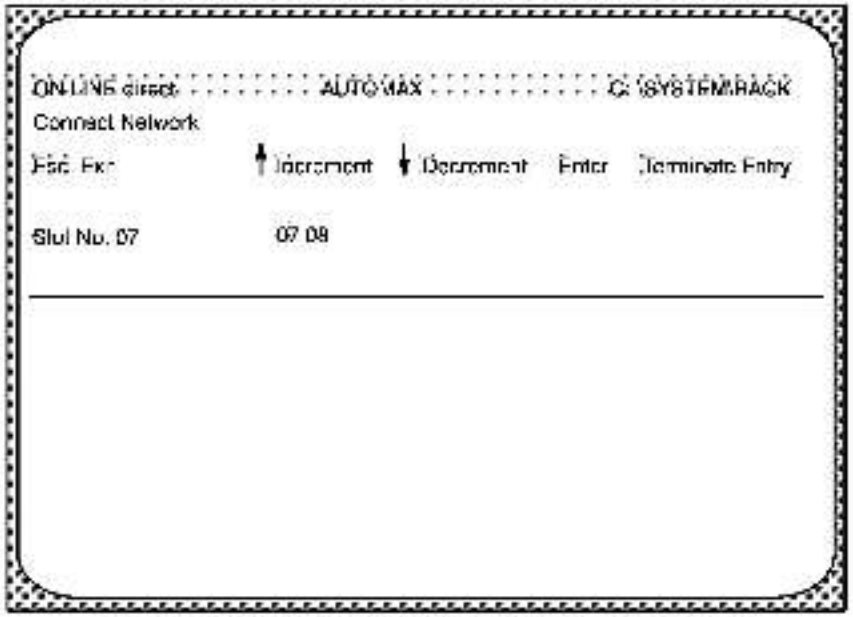


Figure 8.2 - ON-LINE CONNECT NETWORK Menu (Select Network)

If you are using serial communication, you must select the slot in the local rack that contains the Network Communications module (M/N 57C404A and later) which is on the network that contains the rack you want to communicate with. Use the up and down arrows to scroll through the available slots, which are displayed on the screen, or type the number of the slot. When you have selected a slot, enter <CR>. AutoMax will display the screen shown in figure 8.3.

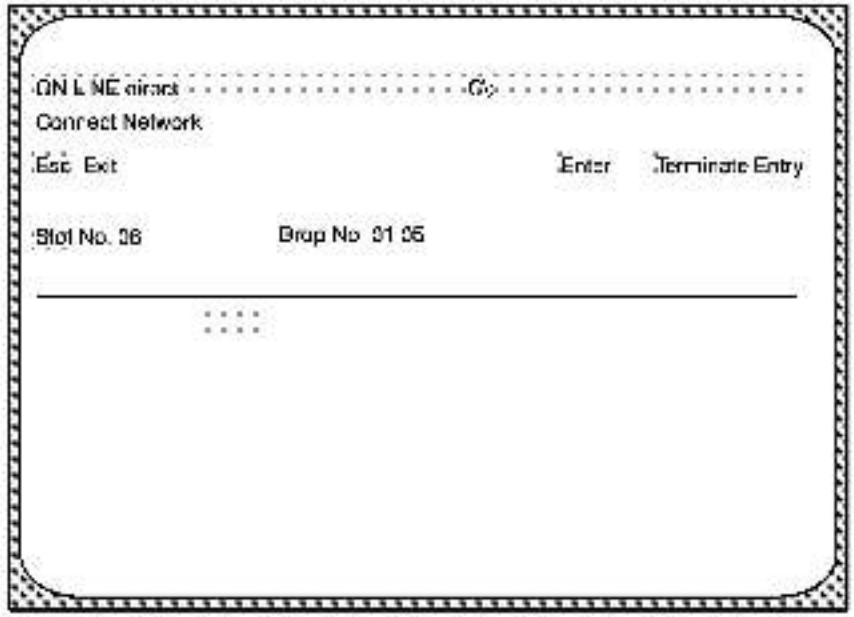


Figure 8.3 ON LINE CONNECT NETWORK Menu (Select Network Rack)

From the screen shown in figure 8.3, select the rack (drop) number on the network. The drop numbers available are shown in blocks of 16. You can use the PgUp and PgDn keys to see other blocks of drops, if applicable. Enter the drop number you wish to connect to and <CR>. From this point until you change your connection through the ON-LINE CONNECT menu again, all communications will take place with the network drop chosen. The top line of most ON-LINE screens will display the drop number of the rack with which the personal computer is communicating.

8.6 Displaying the Network Connection Table

Up to four users can be connected to the same AutoMax rack over the network. Typing "U" for "Userlist" from the Connect menu shown in figure 8.1 allows you to display the Network User List. The Network User List displays users who are connected to the network. See figure 8.4.

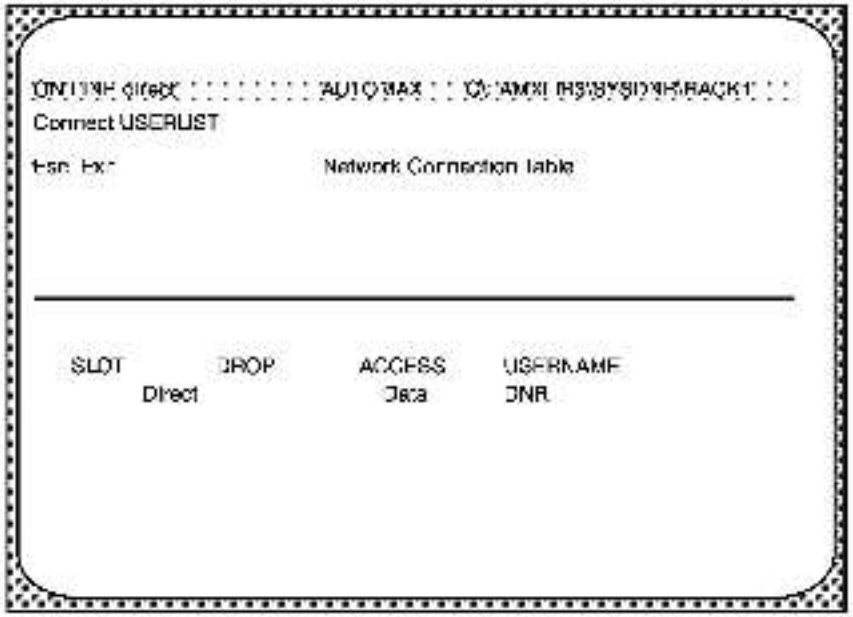


Figure 8.4 - Network Connection Table

The SLOT column shows the number of the rack slot that contains the Network module that is being used to communicate with the rack (drop). If the user has selected direct communication with the local rack, this field will display DIRECT.

The DROP column shows the number of the network drop to which the user is connected. If the user has selected direct communication with the local rack, this field will display DIRECT.

The ACCESS column shows the user's access level (None, Data, Task, or Rack). See Appendix D for a description of access levels.

The USERNAME column shows the name that was entered in the AUTOMAX.IN file. If no name was entered, this field will be blank.

9.0 ON LINE MENU: INFO/LOG

Entering "I" for Info/Log from the ON LINE menu allows you to display information about the system software on any AutoMax Processor or UDC module in the rack or to view the status and error log, if any, for a selected task.

9.1 Info/Log Processor and UDC Information Display

If you select Info/Log without having selected a task by using the Enter key or <CR>, AutoMax will assume you want to display information about an AutoMax Processor and the Common Memory module (M/N 57C413R or 57C423) or a UDC module. You will be prompted for the slot number of the AutoMax Processor or UDC module of interest.

AutoMax Processor

Figure 9.1 shows a sample display for an AutoMax Processor in slot 1 with no Common Memory module.

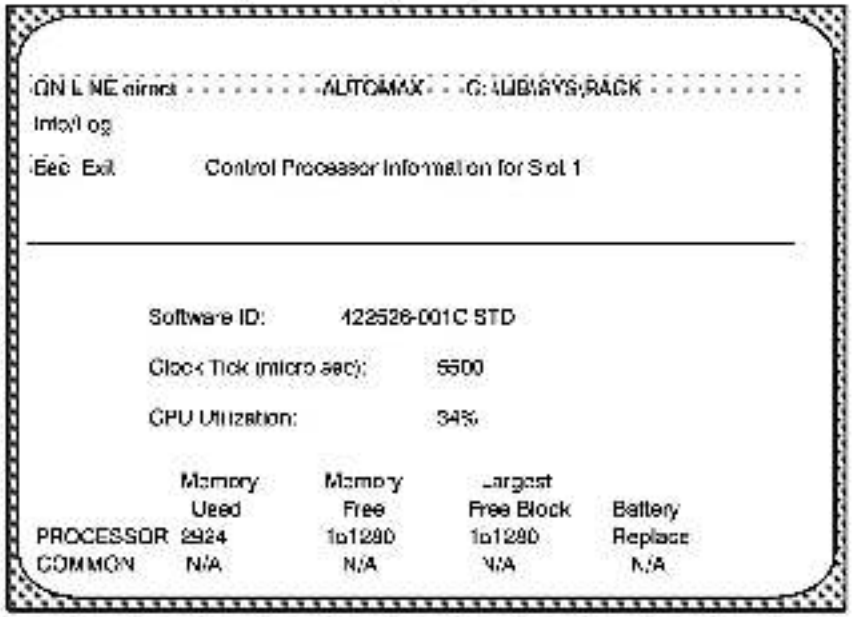


Figure 9.1 Info/Log Processor Information Display

The "Software ID" depends on the version of the operating system that has been loaded to the AutoMax Processor. (Refer to section Appendix F for a list of the software part numbers for operating systems in the Run-Time Executive software.) If the Ethernet version of the operating system is loaded, "ENET" will be displayed on the line as well. "STD" will be displayed for the standard operating system. "Clock Tick" refers to the speed of the real time clock. "CPU

Utilization" shows the percentage of the AutoMax Processor CPU currently being used to run application tasks. Note that the CPU Utilization percentage is measured over a two second time window. This value should be kept under 80% to ensure that there are no overlaps in AutoMax task execution.

Memory statistics for the AutoMax Processor and Common Memory module are given in bytes. The field "Largest Free block" refers to the largest continuous block of memory available. The "Battery" field refers to the status of the battery on the module in the rack.

UDC Module

Figure 9.2 shows a sample display for a UDC module in slot 6.

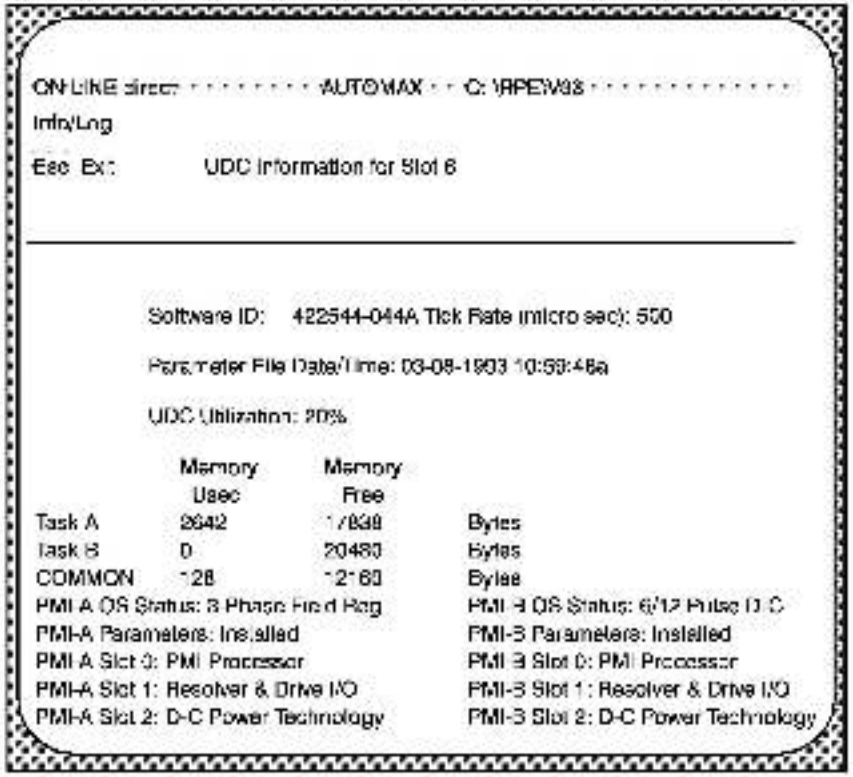


Figure 9.2 - Info/Log UDC Information Display

The "Software ID" depends on the software (operating system) and hardware version of the UDC module. "Tick Rate" refers to the speed of the real-time clock in the UDC module. The "Parameter File Date/Time" will display the most recent date and time that the parameter object file was generated. "UDC Utilization" shows the percentage of the UDC CPU's resources being used to run UDC tasks. The UDC Utilization percentage is measured over a two second time window. This value should be kept under 80% to ensure that there are no overlaps in UDC task execution. Memory statistics displayed for the UDC module are given in bytes.

The "PMI OS Status" fields show whether the PMI operating system has been loaded to the PMI Processors in drive A and B (Not Loaded or the OS type (e.g., 6/12 Pulse DC)). If no PMI Processor is connected to the UDC module, this field will display "Not Connected". The "PMI Parameters" fields show whether the drive parameters have been loaded to the PMI Processors (Installed or Not Installed). If the PMI OS Status field is displaying "Not Connected", the PMI Paramsters fields will be blank. If PMI Processor s connected to the UDC module, the modules contained in the corresponding PMI rack(s) will be listed.

9.2 Info/Log Task Information Display

If you select a task using the Enter or <CR> before selecting Info/Log, AutoMax will display the task status and the error log, if any, for the AutoMax or UDC task. A sample display is shown in figure 9.3.

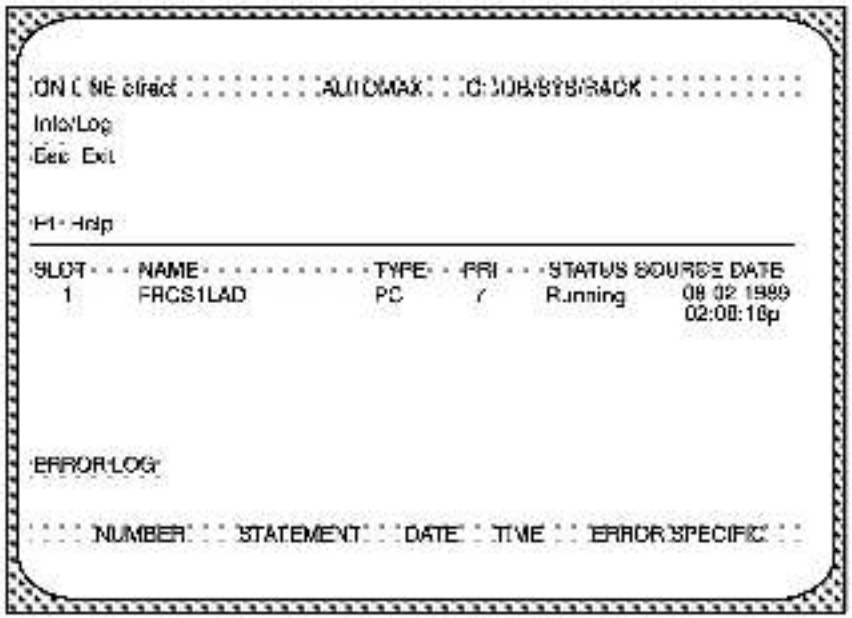


Figure 9.3 - Info/Log Task Information Display

The status line for the task displays the slot of the Processor or UDC module on which the task is loaded in the SLOT field. The task name is shown in the NAME field. The task type (.BAS, .BLK, or .PCI) is shown in the TYPE field. The priority of the task, assigned when the task was added to the rack by the application software supplier, is shown in the PRI field. For UDC tasks, the drive (A or B) the task is assigned to will be shown. The status of the task, either Running, Stopped or in Error, is shown in the STATUS field. The date that the source file was last edited is shown in the SOURCE DATE field. In the sample display, the .PCI task FRCS1LAD loaded on the Processor in slot 1 is designated as priority 7 and is currently running.

If any errors occurred while the task was running, the STATUS field will display "ERROR". An error log is generated and shown on the

screen along with the task information. A maximum of three error log entries are saved, in the order of occurrence, for each task. Only the first, second, and last errors that occur will be stored. Any other errors will not be stored.

For each error, the error log displays the statement number where the error occurred (STATEMENT) if it is relevant and can be determined. The DATE and TIME fields will be blank; these functions are not currently supported. There may be other information supplied for certain errors in the ERROR SPECIFIC field. Note that the error log for AutoMax tasks is retained through a power cycle; the error log for UDC Control Block tasks is not retained through a power cycle. The UDC error log is cleared when power is removed from the rack. For more information about clearing the error log, see 15.0.

10.0 ON LINE MENU: TRANSFER

Entering "T" for "Transfer" from the ON LINE menu allows you to change the default path, view the contents of the default path, load application tasks onto the rack, and save application tasks from the rack. Sections 10.1-10.4 describe these options in more detail. See figure 10.1 for the Transfer menu.

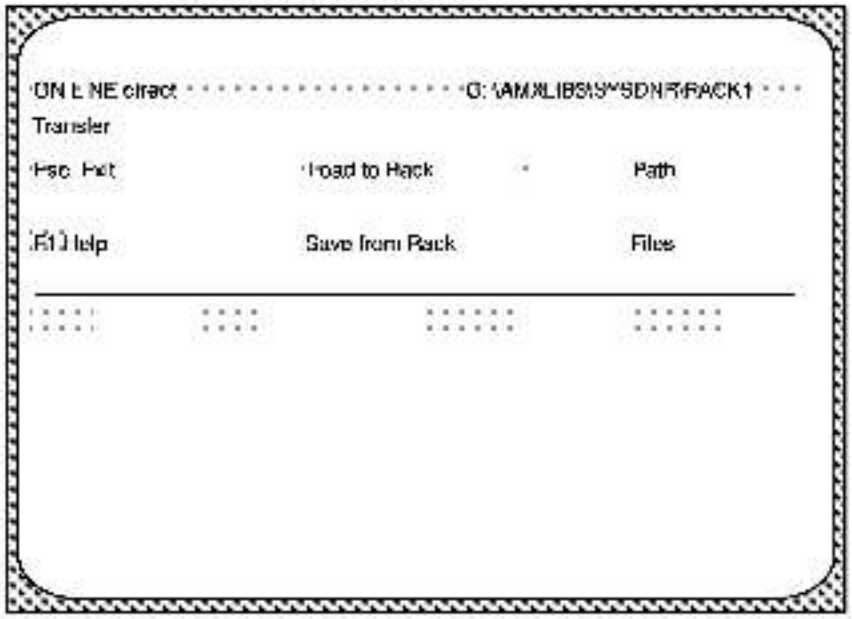


Figure 10.1 - TRANSFER Menu

10.1 Changing the Default Path

You can change the default DISK:_IBRARY\SYSTEM\RACK. or path, by selecting "P" from the TRANSFER Menu. The default path is shown in the upper right hand corner of the screen. The current default determines the location to which you save tasks from an AutoMax Processor or UDC module and from which you load tasks to a Processor or UDC module.

Note carefully that your path must be the path in which the configuration, drive parameter and application task files for the rack to which you are connected are stored. If the path is incorrect, you may load the wrong configuration and application task files to the rack. What's more, if you save back application tasks and configuration files from the rack, you will write over the configuration object file in the current path. You may also write over application tasks on the personal computer that have the same name.

10.2 Directory of the Default Path

Selecting "F" for "Files" from the TRANSFER menu displays the directory of the current default path. To change the default, see section 10.1.

10.3 Loading the Rack Configuration File, Drive Parameter File, and Tasks onto the Rack

The Load option from the Transfer menu allows you to load the rack configuration, drive parameter file, and application tasks onto all AutoMax Processor and UDC modules in the rack and all Processor modules on the network(s) through the connection at the leftmost Processor module. Note that a maximum of 32 tasks can be loaded to an AutoMax rack. The keyswitch must be in the PROGRAM position and the password must be entered to load any tasks. All tasks will be loaded onto the Processor specified when the task was added to the rack by the application software supplier. Utility tasks must be loaded separately even though they are added to the rack like other tasks. See 10.3.1 for more information. It is recommended that you use the All option described at the end of this section instead of loading tasks and files individually. This ensures that files are loaded in the correct manner. This is especially important if you have re-loaded a UDC operating system.

After tasks are loaded onto the rack, they are installed by the operating system. This procedure involves verifying that all physical I/O points in the system are defined and consistent with the information in the configuration.

When you select "L" for "Load" from the Transfer menu, the screen will display the following choices:

- Normal Rack Configuration
- Debug Rack Configuration
- Every Parameter File
- Single Parameter File
- Tasks
- All

You have two options when loading the **rack configuration**. You can load the complete configuration file (normal) or you can load a test configuration file with all I/O mapped to memory (debug). The debug configuration is not usable for any other purpose but testing. The normal configuration file must be loaded for normal operation. The rack configuration must be loaded before any AutoMax tasks can be loaded to the rack.

You also have two options when loading the **drive parameter file(s)** to the UDC module(s). You can load the drive parameter file to a UDC module in a specific slot in the rack, or a file to all UDC modules in the rack. The drive parameter file must be loaded to a UDC before the UDC tasks are loaded to that UDC. Note that drive parameter file cannot be loaded to a UDC module if UDC tasks are running on the target UDC module.

Drive parameters are maintained through a power cycle. If changes to the PMI D/A port parameters are made on line, these parameters will revert to those originally saved in the UDC's memory after power is cycled.

If you select **Tasks**, the screen will display a list of all the AutoMax and UDC application tasks for the racks. The task files listed on the screen are either AutoMax Ladder Logic tasks, which do not need to be compiled, or the object code files that were created when your application software supplier compiled AutoMax BASIC and Control Block tasks or UDC Control Block tasks. Select the task you want to load from the list. A log file will automatically be created that will list any errors that occurred while the task was being loaded. The log file will have the same name as the task, and the extension .LOG. Remember that you must load the rack configuration before you can load any AutoMax tasks to the rack. You must load the rack configuration and the drive parameters before loading UDC tasks to the UDC module.

It is permissible to load tasks onto a rack that is currently running tasks. If the task is new, i.e., has a unique name, you can load the task without stopping tasks already running. The AutoMax Executive software will prompt for the slot and priority of the task. Note that a task designated as CRITICAL cannot be loaded until all tasks currently in RUN are stopped.

If you wish to load a task with the same name as one currently running in the rack (a newer version of the same task), you must stop the task before you will be permitted to load the new task. Note that any task you load will not go into RUN unless you put it into RUN.

It is possible to load a UDC task to a UDC module that has one task already running. For example, if the task for drive A is running and drive B either does not have a task or its task is not running, you can load a task for drive B without stopping the drive A task. You cannot, however, load another task for drive A without stopping the task that is currently running on drive A.

If you select **All**, the normal rack configuration file, the drive parameters for all the UDCs in the rack, all the AutoMax application tasks (except utility tasks), and all UDC tasks will be loaded automatically. A log file will automatically be created that will list any errors that occurred while the tasks were being loaded. The log file will be named _CONF.LOG. The current rack configuration and drive parameters (if any) will be written over. Any application tasks whose names are the same as the ones being loaded to the AutoMax Processors or UDC modules will be written over. Refer to Section 5.0 for more information.

10.3.1 Utility Tasks

Tasks designated as utility tasks when added to the rack by your application software supplier, are usually used for testing purposes and not for application control. Utility tasks can only be loaded into AutoMax Processor modules. They cannot be loaded onto UDC modules. Utility tasks must be loaded individually.

To load a utility task, enter the name of the task at the filename prompt. You will then be prompted for the slot number of the Processor on which the task is to be loaded (0-4), and the task priority (1-11). Note that this information was already entered when the task was added by your application software supplier. It is required here as well.

10.4 Saving Tasks from the Rack

You can save tasks from any AutoMax Processor or UDC module in the network to the default path through the single connection at the lowest Processor. You must obtain task access for the tasks you want to save from the rack.

Entering "S" for Save at the Transfer menu brings up a list of tasks that may be saved from the rack. This list contains all tasks in the rack, whether they are running or stopped, including utility tasks. Tasks can be saved either individually by entering the task name, or all (all tasks listed on the screen) at one time by entering the name of the rack configuration file and the /All option described in section 10.4.1.

You have three other options when saving tasks from the rack: /Tunable, /Include and /Log. These options, as well as /All, are described below in more detail.

Note that you can only save tasks from the rack if they were designated as reconstructible when they were created and compiled by your application software supplier. Ladder Logic tasks are always reconstructible. Note carefully that your path must be the path in which the configuration and application task files for the rack to which you are connected are stored. Otherwise, it is possible to write over files in the current path.

10.4.1 Save Option: /All

You can save all the reconstructible tasks in the rack, including utility tasks, using the /All option. Enter the name of the configuration task (_CONF.CNF) at the filename prompt and then /All at the option prompt.

10.4.2 Save Option: /Tunable

You can save only the tunable variable values in a particular task using the /Tunable option. Enter the name of the task at the filename prompt and /Tunable at the option prompt. The list of values will be saved to the default path with the same filename as the task, but with the extension .TUN. If you specify the /All option as well as the /Tunable option, the tunable values will be written to separate .TUN files. The task does not need to be reconstructible to save tunable variables.

10.4.3 Save Option: /Include

You can save only the tunable variable values in a particular task using the /Include option. Enter the name of the task at the filename prompt and /Include at the option prompt. The list of values will be saved to the default path with the same filename as the task, but with extension .INC. If you specify the /All option as well as the /Include option, the tunable values will be written to separate .INC files. The task does not need to be reconstructible to save tunable values using this option. Note, however, that the .INC file being created will contain ONLY the tunable variable values. If a .INC file with the same name already exists on the personal computer, it will be written over. If the original .INC file contained information other than tunable variable values, this information will be lost.

10.4.4 Save Option: /Log

The /Log option is used to generate a log file of any errors that occurred while tasks were being saved from the AutoMax Processor or UDC module. If you enter the configuration file name at the filename prompt and specify the /All option as well as the /Log option, the log file will have the same name as the configuration file, but with the extension .LOG. If you entered a specific filename at the prompt, then the .LOG file will have the same name as that file, and the extension .LOG.

11.0 ON LINE MENU: RUNNING TASKS

WARNING

UNDERSTAND THE APPLICATION BEFORE STARTING A TASK. OUTPUTS MAY CHANGE STATE, RESULTING IN MACHINE MOVEMENT. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

WARNING

IT IS THE RESPONSIBILITY OF THE USER TO ENSURE SAFE OPERATION OF THE APPLICATION PROCESS SHOULD THE APPLICATION TASKS BE STARTED OUT OF SEQUENCE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

WARNING

THE USER MUST PROVIDE AN EXTERNAL, HARDWIRED EMERGENCY STOP CIRCUIT OUTSIDE THE CONTROLLER CIRCUITRY. THIS CIRCUIT MUST DISABLE THE SYSTEM IN CASE OF IMPROPER OPERATION. UNCONTROLLED MACHINE OPERATION MAY RESULT IF THIS PROCEDURE IS NOT FOLLOWED. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY.

Note that a task may need to perform initialization before entering the main loop of the scanned portion of the task. When the task is started, this initialization will pre-empt any task which may be running at a lower priority. Depending on the application, this may result in a STOP-ALL error.

The RUN option from the ON LINE menu is used to put AutoMax and UDC tasks loaded onto the rack into run. You can put tasks into run individually, or you can put all tasks in the rack into run. Utility tasks will also be put into run by running all tasks as described in 11.2. The keyswitch must be in the PROGRAM position and the password must be entered to run any task. You must also obtain either rack access or task access for all the tasks you want to run.

Your first step in running tasks depends on whether you want to run one task only or all the tasks in the rack. Follow the directions in 11.1 for running one task only. Follow the directions in 11.2 for running all tasks specified in the configuration for the rack.

11.1 Running an Individual Task

WARNING

THIS COMMAND OVERRIDES THE NORMAL STARTING SEQUENCE OF THE APPLICATION TASKS, WHICH IS DETERMINED BY THE PRIORITY ASSIGNED WHEN THEY ARE ADDED TO THE RACK. THE RUN ALL OPTION SHOULD NORMALLY BE USED TO START TASKS. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY.

Follow the directions below to put an individual task into run:

1. Select the task to be run from those displayed on the ON LINE menu. To select the task, use the up and down arrow keys to move the ">" pointer to the desired task.
2. Type the "Enter" or <CR> key. The selected task will be shown in reverse video.
3. Type "R" to put the task into run. The task "Status" field on the display will show that the task is in RUN.

11.2 Running All Tasks in the Rack

To run all AutoMax and UDC tasks in the rack, including utility tasks, using the procedure described in this section, all tasks in the rack except utility tasks must be loaded in the rack. If this is not the case, the screen will display an error message and no tasks will be put into run.

Follow the directions below to put all tasks in the rack into run:

1. Do not select an individual task while at the ON LINE menu. Instead, type "R" from the ON LINE menu with no task selected. This results in the display shown in figure 11.1.

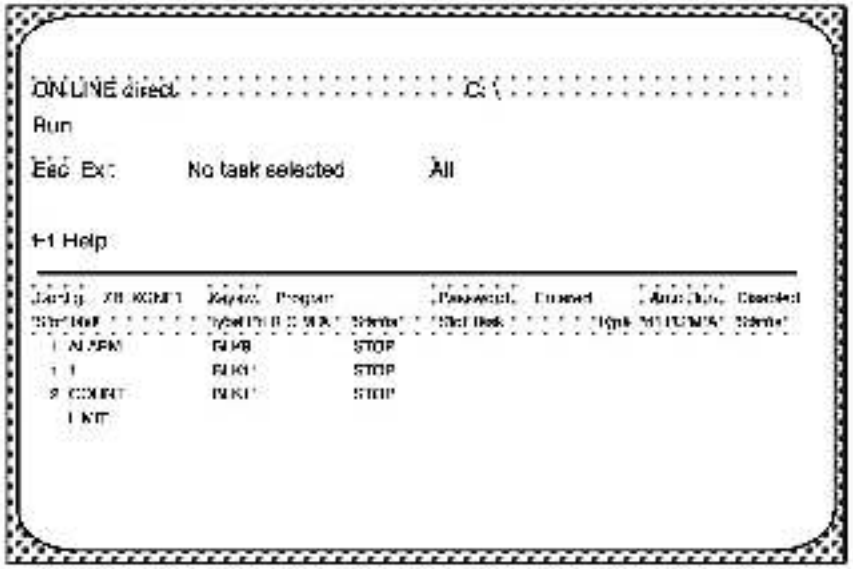


Figure 11.1 - RUN ALL Display

2. To run all the tasks, type "A" for all. The "Status" field will show all tasks in RUN. AutoMax tasks are started in order of priority from the highest priority (4) to the lowest priority (11). Tasks at the same priority level are started in alphacetical order. Tasks on different Processors are started independently of each other. UDC tasks are always run drive A task first, followed by the drive B task.

12.0 ON LINE MENU: STOPPING TASKS

WARNING

IT IS THE RESPONSIBILITY OF THE USER TO ENSURE THAT THE APPLICATION PROCESS STOPS IN A SAFE MANNER WHEN THE APPLICATION PROGRAMS STOP. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

You can stop one or all tasks running in the rack using the stop command from the ON LINE menu. To stop any tasks, the keyswitch must be in the PROGRAM position and the password must have been entered.

Note that you cannot stop individual tasks that were specified as CRITICAL when they were created by your application software supplier. Critical task status display is described in 7.3. If you want to stop a task that is critical, you must stop all tasks in the rack. See 12.1 for stopping an individual task and 12.2 for stopping all tasks in the rack.

12.1 Stopping an Individual Task

WARNING

DEPENDING ON THE APPLICATION, STOPPING AN INDIVIDUAL TASK MAY RESULT IN LOSS OF CONTROL OF THE APPLICATION PROCESS. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. IT IS RECOMMENDED THAT THE STOP-ALL COMMAND BE USED TO STOP TASKS NORMALLY. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

You can stop any individual task that is not designated with a "C" for CRITICAL in the C field of the task status display. Note that outputs controlled by the selected task will retain their last state. To stop an individual task, follow the directions below.

1. Select the task from the ON LINE menu display using the arrow keys to move the ">" pointer.
2. Type "Enter" or <CR> to select the task. The selected task will be shown in reverse video.
3. Type "5" to stop the task. The task "Status" field on the display will show that the task is in STOP.

12.2 Stopping All Tasks In the Rack

When you stop all tasks in the rack by issuing a STOP-ALL command (or the system issues a STOP_ALL due to an error in the rack), all tasks that are running will be stopped, including utility tasks (see 10.3.1). The system will issue a clear command to all Reliance I/O modules in the local and remote chassis, including I/O connected to the PM serial ports. Common variables that represent I/O locations will be cleared (set to 0) for outputs; inputs will retain their actual state. Common memory variables that are defined as volatile in the rack configuration will be cleared. Common memory variables that are defined as non-volatile memory in the configuration will retain their last value. For AutoMax tasks, local variables will retain their last value; for UDC tasks, local variables (except local functions) will be cleared. For all tasks, forced common and local variables will remain forced. All error log entries will remain in the error log. If there is a Network module (MN 57C4DM) in the rack, it will go off line for at least 120 milliseconds.

To stop all tasks in the rack, follow the directions below:

1. From the ON LINE menu, select 'S' for Stop.
2. The screen will display "No task selected" and the option 'All'. Enter 'A' to stop all tasks. The "Status" field for all tasks will then show that the tasks are in STOP.

13.0 ON LINE MENU: DELETING TASKS

You can delete one or all tasks in the rack using Delete function from the ON LINE menu. Note that a task must be stopped before it can be deleted. The keyswitch must be in the PROGRAM position and the password must have been entered. You must have either rack access or task access to all of the tasks you want to delete. See 13.1 for deleting one task from the rack and 13.2 for deleting all tasks from the rack.

13.1 Deleting an Individual Task

To delete one task from the rack, follow the directions below.

1. Use the arrow keys to move the ">" pointer to the desired task.
2. Type "Enter" or <CR> to select the task. The selected task will be shown in reverse video.
3. Delete the task by entering "D" for Delete. The system will prompt you with "are you sure?" before deleting any tasks. Answer "Y" for yes and "N" for no. The deleted task will be erased from the AutoMax Processor or UDC module and will no longer appear on the display.

13.2 Deleting All Tasks from the Rack

To delete all tasks in the rack follow the directions below.

1. Enter "D" for Delete without selecting any tasks first.
2. Enter "A" to delete all tasks in the rack. The system will prompt you with "are you sure?" before deleting any tasks. Answer "Y" for yes and "N" for no. All tasks will be erased from the AutoMax Processors and UDC modules and will disappear from the display.

14.0 ON LINE MENU: MONITORING AND EDITING TASKS

The AutoMax Run-Time Executive allows you to monitor and change the status of variables and I/O points, display and modify Ladder Logic sequences in real time, and force and unforce variables. In order to use any options except monitoring and adjusting tunable variables, the keyswitch must be in PROGRAM and the password must have been entered.

To begin monitoring, enter "M" for Monitor from the ON LINE menu. The resulting **Monitor** menu shown in figure 14.1 in turn allows you to access six other menus which are described below.

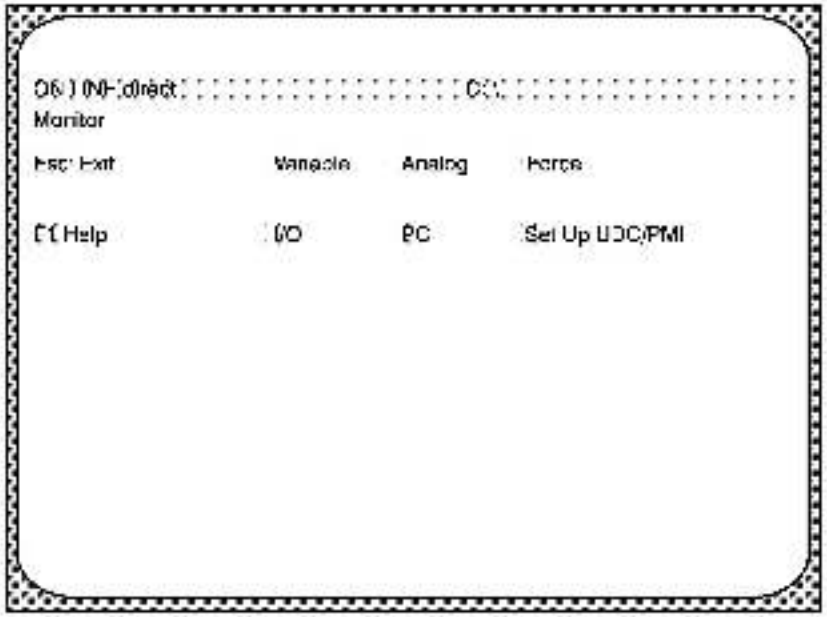


Figure 14.1 -Monitor Menu

Monitor Variable: used to display continuously current variable values and to change, force, and unforce variables. See 14.1 for more information.

Monitor I/O: used to display continuously the state of I/O registers and make changes to those registers. See 14.2 for more information.

Monitor Analog: used to output continuously up to two integer variables through the D/A converters located on a Drive Analog I/O module (B/M 57405). See 14.3 for more information.

Monitor PC: used to display continuously the state of each element in a sequence of a Ladder Logic task and do on-line editing of the task being monitored. See 14.4 for more information.

Monitor Force: used to force variables to a specific value. Once a variable is forced, it will retain the forced value until it is unforced. See 14.5 for more information.

Monitor Set Up UDC/PMI: used to select variables to drive the D/A analog outputs on the UDC and PMI Processors and to enter minimum and maximum values for scaling. See 14.6 for more information.

The six menus are identified in the upper left hand corner of the screen with the word "**Monitor**" followed by the kind of monitor, e.g. "**Variable**". Depending upon the option you choose from the menu, the field may display even more detail, e.g., "**Monitor Variable Modify**". The names of sub-menus available from the Monitor menu will be shown in boldface in this instruction manual to avoid any confusion between menu titles and the functions permitted from those menus.

The steps which describe the operations you can perform in the various **Monitor** menus are given in the order in which AutoMax prompts you for the information needed, such as variable name, register number, etc. In general, you will be prompted to enter the information from left to right into fields displayed on the screen in reverse video with a blinking cursor immediately following.

When you are finished entering the information for a particular field, type "Enter" or <CR> to indicate you are finished and the cursor will immediately move to the next field. You can use the arrow keys to move the cursor within the fields. You can also use the cursor to edit your entry if you have not completed entering all the required information for the option.

At times, certain fields will show a default. This default is usually the information you entered the last time you used the particular option. To select the default, type "Enter" or <CR> and go on to the next field. If you do not wish to select the default, simply type over the default.

In general, when you are finished entering the information required for the operation, you must type "Enter" or <CR> to execute that operation.

14.1 Monitoring and Modifying Variables

The **Monitor Variable** menu allows each user (up to four per rack using a direct connection or over the DCS-Net network) to monitor up to 16 COMMON and/or LOCAL variables in any combination of boolean, single precision integer, double precision integer, and real. For each UDC module in the rack, up to 32 LOCAL variables can be monitored, regardless of the number of users (16 maximum per user).

Entering "V" for Variable from the **Monitor** menu displays the **Monitor Variable** menu, shown in figure 14.2.

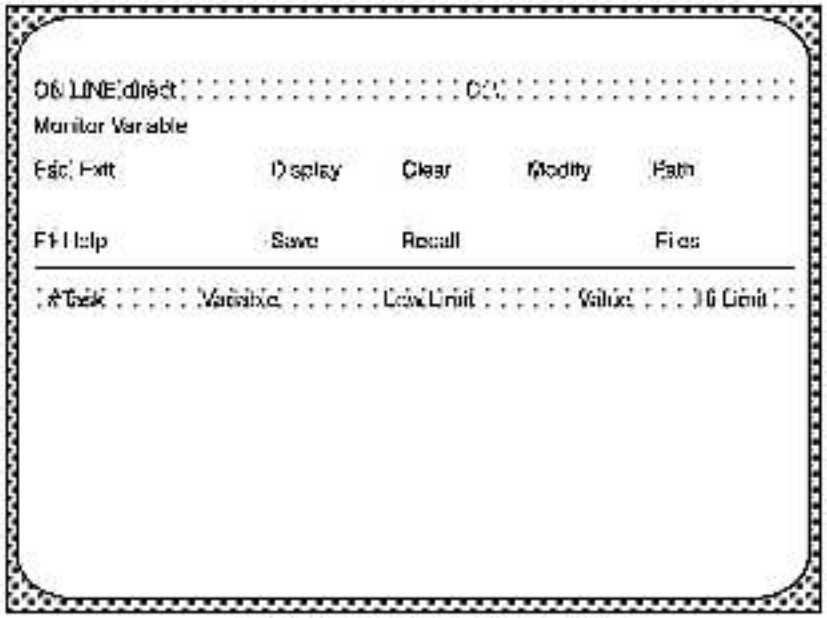


Figure 14.2 -Monitor Variable Sub-Menu

The lower portion of the **Monitor Variable** screen display, which is updated continually, includes the following fields:

(#)	- Display number (screen position).
Task	- Identifies the name of the task in which the variable is defined. This field is blank if the variable is COMMON.
Variable	- Variable name, including type character.
Low Limit	- Low limit for tunable variables. This field is blank for all other variables.
Value	- Current value of the variable. The value is updated in real time.
Hi Limit	- High limit for tunable variables. This field is blank for all other variables.

The **Monitor Variable** menu allows you to choose from the following seven options:

Display: Adds a variable to the display list. See 14.1.1 for more information.

Clear: Removes a variable or all variables from the display list. See 14.1.2 for more information.

Modify: Allows you to modify a variable. See 14.1.3 for more information.

Save: Allows you to save a display list to your default path. See 14.1.3 for more information.

Recall: Allows you to recall a display list from your default path. See 14.1.4 for more information.

Path: Allows you to change the path.

Files: Allows you to display a directory of the files in the current path.

14.1.1 Displaying a Variable

Follow the directions below to display a variable on the screen.

1. Enter "D" for "Display" from the Monitor Variable menu.
2. Enter the name of the task in which the variable in question is defined, followed by "Enter" or <CR>. If the variable is COMMON, use the "Enter" or <CR> key to skip over the field.
3. Enter the name of the variable, complete with any terminating character designating variable type ("@" for boolean, "%" for single precision integers, "!" for double precision integers, or [blank] for reals).
4. Enter the desired format of the display, choosing from the options listed below. The variable will be shown in the display.

"D" for Decimal
"B" for Binary
"H" for Hexadecimal
— see figure 14.3 for more information

Variables can be displayed in the following formats:

Variable Type	Format	Range of Values
Boolean	Boolean	TRUE/FALSE
Single Integer	Decimal	-32767 to 32767
	Hexadecimal	0 to FFFF
	Binary	0000000000000000 to 1111111111111111
Double Integer	Decimal	-2147483648 to -2147483647
Real	Decimal	+5.42101070E-20 to +9.22337177E+18
		-2.71050536E-20 to -9.22337177E+18

Figure 14.3 Variable Display Format

Note that if the display is full (16 variables) and you attempt to add another variable to the list, you will be prompted to first delete an existing variable from the list. The selected variable will be deleted, and the new variable will be added at the end of the list.

14.1.2 Clearing a Variable from the Display

Follow the directions below to clear a variable from the display.

1. Enter "C" for Clear from the **Monitor Variable** menu.
2. To clear one variable from the screen, enter the display position number (1-16) of the variable at the blinking cursor. To clear all variables from the screen, enter "A" for All.
3. Type "Enter" or <CR>. The variable will be cleared from the display.

14.1.3 Saving a Monitor Variable Display List

You can save the variables listed on the **Monitor Variable** display to the default path displayed in the upper right hand corner of the screen. Only the list of variables is saved, not the variable values. If your default destination is a floppy disk, it must not be write protected.

You can give each list a standard 8-character filename. The AutoMax Executive software automatically attaches the file extension SMV. You can later recall the list to the screen using the Recall option described in 14.1.4.

To save the current **Monitor Variable** list, follow the directions below:

1. If you have not already done so, enter "S" for Save from the **Monitor Variable** menu shown in figure 14.2.
2. Enter the filename (up to 8 characters) for the display list. Do not attach a file extension. The file will automatically be given the extension $MV.
3. Type "Enter" or <CR>.
4. You can recall the screen display using the Recall option described in 14.1.4.

14.1.4 Recalling a Monitor Variable Display List

You can recall any previously saved **Monitor Variable** display list. To recall the **Monitor Variable** display list, follow the directions below.

1. From the Monitor Variable menu, select "R" for Recall.
2. Enter the name of the display list to recall.
3. Type "Enter" or <CR>.

14.1.5 Modifying a Variable

WARNING

DEPENDING ON THE APPLICATION, THE USE OF THE TUNE FUNCTION MAY RESULT IN INSTABILITY OF THE APPLICATION PROCESS. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

WARNING

THE SET AND FORCE FUNCTIONS BYPASS CONTROL OF THE APPLICATION PROCESS BY THE APPLICATION TASKS. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

WARNING

VARIABLES AND OUTPUTS WHICH ARE FORCED BEFORE A-C POWER IS LOST WILL REMAIN FORCED WHEN A-C POWER IS RESTORED. SHOULD A-C POWER BE LOST WHILE VARIABLES ARE FORCED, THE USER MUST ENSURE THAT UNEXPECTED MACHINE MOVEMENT DOES NOT OCCUR WHEN A-C POWER IS RESTORED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

Selecting "M" for Modify from the **Monitor Variable** menu allows you to set, tune, force, or unforce a variable. Set allows you to set a variable to a specified value. Note carefully that if application tasks are running, the value that you write may be overwritten by one of those tasks. Tune allows you to increment or decrement a tunable variable (defined as such in the application task) within its limits. Force allows you to force a variable to a value that is unaffected by any other action in application tasks or the state of physical I/O. Unforce returns a variable to the non-forced state.

Recall that to use any of these options, with the exception of tuning a variable, the keyswitch must be in PROGRAM and the password must be entered. See figure 14.4 for the **Monitor Variable Modify** menu.

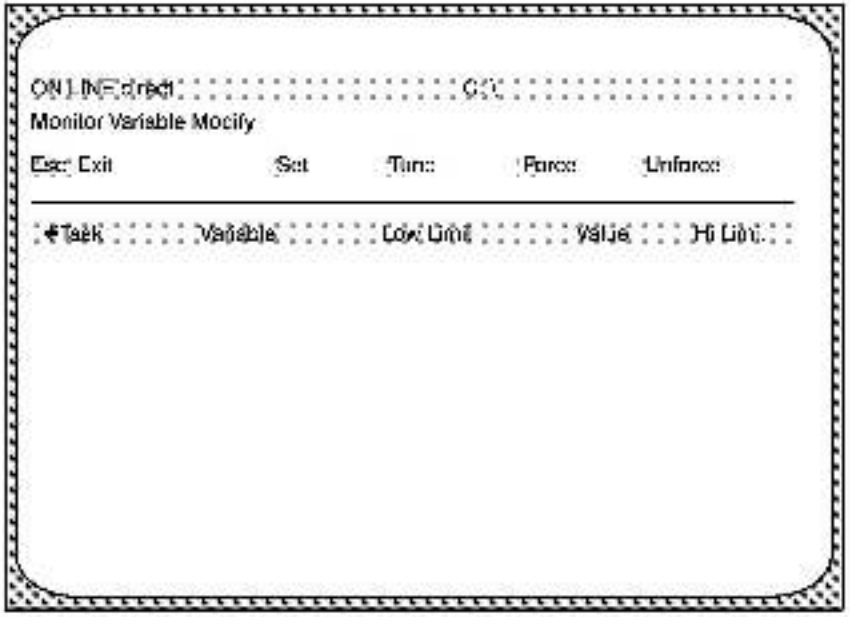


Figure 14.4 -Monitor Variable Modify Menu

14.1.5.1 - 14.1.5.6 below describe the options available from the **Monitor Variable Modify** menu in more detail.

14.1.5.1 Setting a Variable to a Specific Value

You can set variables to specific values using "S" for Set from the **Monitor Variable Modify** menu. The variable you want to set does not need to be in the screen display for you to set it. Note that a variable that has been set may later be affected by an active application task. Follow the directions below to set a variable:

1. Display the variable on the screen following the directions in 14.1.1 above to verify the present value of the variable (optional).
2. Enter "S" for Set from the **Monitor Variable Modify** menu.
3. If the variable you want to set is not displayed on the screen, enter the name of the task where the variable is defined at the blinking cursor, followed by "Enter" or <CR>. Continue at step 4.

   If the name of the variable you want to set is displayed on the screen, you can enter the number of the line (1–16) on which the variable name appears, followed by "Enter" or <CR>. The screen will display the task name in the "Task" field and the variable name in the "Var" field. Skip to Step 5.
4. Enter the name of the variable to be set, specifying variable type with the correct terminator at the blinking cursor, followed by "Enter" or <CR>.
5. The "Value" field will display the last value that was set for a variable. If this is the first time you are setting this variable, the field will be blank. Enter the desired value for the variable, typing over the last value entered, if it is displayed. The syntax and range of the value you enter will depend on the variable type. See Figure 14.3 for the value ranges of variable types. If you are setting a tunable variable, the value you enter must be within the range of the low and high limit.

14.1.5.2 Tuning a Variable

WARNING

DEPENDING ON THE APPLICATION, THE USE OF THE TUNE FUNCTION MAY RESULT IN INSTABILITY OF THE APPLICATION PROCESS. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

You can adjust the value of a variable designated as tunable in an application task by selecting "T" for Tune from the **Monitor Variable Modify** menu. The variable you want to tune does not need to be in the screen display for you to tune it. The value is set incrementally between the limits set in the application task. Follow the directions below to tune a variable.

1. Enter "T" for Tune from the **Monitor Variable Modify** menu.
2. If the variable you want to tune is not displayed on the screen, enter the name of the task containing the tunable variable, followed by "Enter" or <CR>. Continue at step 3.

   If the name of the variable you want to tune is displayed on the screen, you can enter the number of the line (1–16) on which the variable name appears, followed by "Enter" or <CR>. The

screen will display the task name in the "Task" field and the variable name in the "Var" field. The current value of the variable ("Value" field), high limit ("Hi" field), low limit ("Lo" field), and step value ("Step" field) will also be displayed. Skip to Step 4.

3. Enter the name of the variable, complete with the terminating character that designates variable type, followed by "Enter" or <CR>.

   The current value of the variable ("Value" field), along with the high limit ("Hi" field), low limit ("Lo" field), and step value ("Step" field) will be displayed.

4. Use the up arrow to increment the value in the Value field and the down arrow to decrement the value in the Value field by the Step value.

14.1.5.3 Forcing a Variable

WARNING

THE SET AND FORCE FUNCTIONS BYPASS CONTROL OF THE APPLICATION PROCESS BY THE APPLICATION TASKS. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

WARNING

VARIABLES AND OUTPUTS WHICH ARE FORCED BEFORE A-C POWER IS LOST WILL REMAIN FORCED WHEN A-C POWER IS RESTORED. SHOULD A-C POWER BE LOST WHILE VARIABLES ARE FORCED, THE USER MUST ENSURE THAT UNEXPECTED MACHINE MOVEMENT DOES NOT OCCUR WHEN A-C POWER IS RESTORED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

You can force up to 16 variables at a time to specific values. Forcing variables while in the **Monitor Variable Modify** menu is essentially the same as using the Force option described in 14.6. Strings, array elements, and tunable variables cannot be forced. Only booleans, single precision integers, double precision integers, and reals can be forced. If you define bits in a register that is also defined as a register, neither the bits nor the register can be forced. A forced variable cannot be changed in any way by application tasks or the state of physical I/O. The value of a forced variable can only be affected by forcing it to another value or unforcing it. See 14.1.5.4 for more information about unforcing a variable.

Follow the directions below to force a variable.

1. Enter "F" for "Force" from the **Monitor Variable Modify** menu.
2. Enter the name of the task containing the variable to be forced at the blinking cursor. If the variable is a COMMON, you do not need to enter a task name.
3. Enter the name of the variable to be forced, including any terminating character designating variable type, at the blinking cursor.
4. If this is the first time you are forcing a variable, the "Value" field will be blank. Otherwise, the "Value" field will display the last

value to which a variable was forced. Enter the desired value for the variable, typing over the last value entered, if it is displayed. The syntax and range of the value you enter will depend on the the variable type. See figure 14.3 for the value ranges of variable types.

14.1.5.4 Unforcing Variables

Unforcing a variable returns it to the state in which it was before it was forced. You can unforce one or all variables that are currently forced. To unforce one or all currently forced variables, follow the steps below.

1. Select "U" for "Unforce" from the **Monitor Variable Modify** menu.
2. To unforce one variable, use the up and down arrows to move the ">" pointer until you reach the desired variable. Then type "Enter" or <CR> to unforce the variable.

To unforce all forced variables displayed on the screen enter "A" for All.

14.2 Monitoring and Modifying I/O

The **Monitor I/O** menu is used to display the state of I/O registers continuously and to modify the state of registers and bits. This feature allows you to monitor I/O registers not defined in the configuration for the rack, as well as those that are defined. See figure 14.5 for the **Monitor I/O** menu.

To begin monitoring I/O enter "I" from the **Monitor** menu shown in figure 14.2. The resulting **Monitor I/O** menu, shown in figure 14.5 allows the following options:

Display: Adds an I/O register to the display list. See 14.2.2 for more information.

Clear: Removes a single I/O register or all I/O registers from the display list. See 14.2.3 for more information.

Modify: Allows you to modify an I/O register. See 14.2.1 for more information.

Save : Allows you to save a display list to your default path. See 14.2.5 for more information.

Recall: Allows you to recall a display list that was saved previously. See 14.2.6 for more information.

Path: Allows you to change the path.

Files: Allows you to display a directory of the files in the current path.

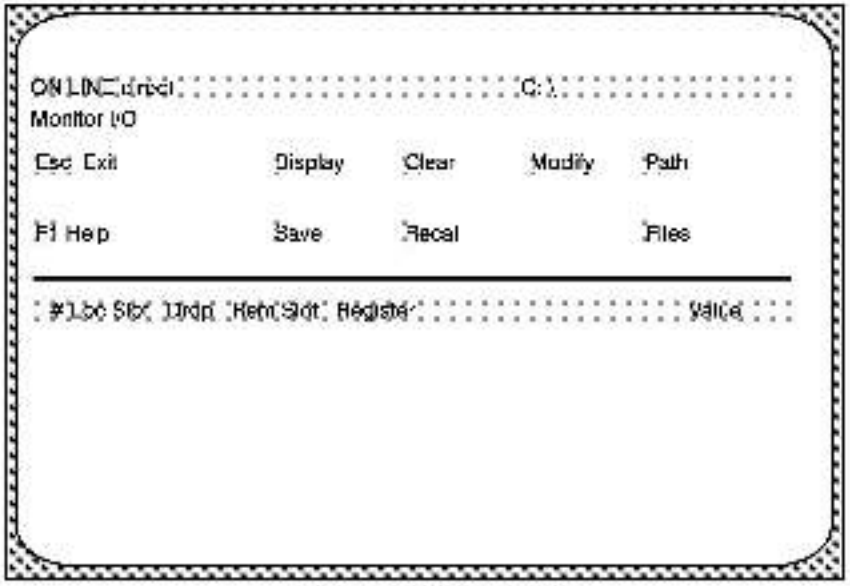


Figure 14.5 -Monitor I/O Menu

14.2.1 Monitor I/O Screen Display

The lower portion of the **Monitor I/O** screen display, which is updated continually, includes the following fields:

- (#) - Display number (screen position).
- Local Slot - The slot (0-15) in the local rack containing the I/O card to be monitored. If the card to be monitored is in a remote rack, this is the slot number of the Remote I/O Master in the local rack to which the remote rack is connected.
- Drop - The drop number (1-7) of the remote rack that contains the card to be monitored. If the card to be monitored is in a local rack, this field is blank.
- Remote Slot - The slot (0-15) in the remote rack containing the I/O card to be monitored. If the card to be monitored is in a local rack, this field is blank.
- Register - The register (0-32767) on the I/O card to be monitored.
- Value - The current value of the I/O register. The value is updated in real time. I/O registers may be displayed in either binary format (1s and 0s), decimal format (range: - 32768 to +32767), or hexadecimal format (range: 0 - FFFF).

14.2.2 Displaying I/O Registers

You can display up to 16 registers on the screen at one time. The **Monitor I/O** screen display is described in 14.2.1. To display a register on the screen, follow the directions below:

1. Enter "D" for "Display" from the **Monitor I/O** menu shown in figure 14.5.
2. If the register you want to display is in the local rack, enter "L" for Local and go on to the section entitled "Displaying Local I/O". If the register is in a remote rack, enter "R" for Remote and go on to the section entitled "Displaying Remote I/O".
3. If the Monitor I/O display is full (16 registers), you must delete a register from the list before you can display a new register. See Section 14.2.3, Clearing I/O Registers from the Display.

14.2.2.1 Displaying Local I/O

a. Enter the slot number of the module on which the register is found.

b. Enter the register number.

c. Select the format of the display in the "Value" field as follows:
"D" for decimal
"H" for hexadecimal
"B" for binary

d. Type "Enter" or <CR> to display the register.

14.2.2.2 Displaying Remote I/O

a. Enter the slot number of the Remote I/O master module (M/N 57C416) in the local rack.

b. Enter the drop number of the remote chassis in which the module containing the register is located.

c. Enter the slot number of the module in the remote rack that contains the register.

d. Enter the register number.

e. Select the format of the display in the "Value" field as follows:
"D" for decimal
"H" for hexadecimal
"B" for binary

f. Type "Enter" or <CR> to display the register.

14.2.3 Clearing I/O Registers from the Display

To clear I/O from the **Monitor I/O** display, follow the directions in "Clearing a Single Display" or "Clearing the Entire Display," whichever is appropriate. Refer to 14.2.5 for directions on saving a **Monitor I/O** screen if necessary.

14.2.3.1 Clearing a Single Display

1. From the **Monitor** I/O menu, enter "C" for clear.
2. Enter the display position (1-16) of the register you want to clear from the screen.

14.2.3.2 Clearing the Entire Display

1. From the **Monitor** I/O menu, enter "C" for clear.
2. Enter "A" to clear all I/O registers from the screen.

14.2.4 Saving a Monitor I/O Display List

You can save the variables listed on the **Monitor** I/O display to the default path. Only the list of variables is saved, not the variable values. If your default is a floppy disk, it must not be write-protected.

You can give each list a standard 8 character filename. The AutoMax Executive software automatically attaches the file extension ".$IO". You can later recall the list to the screen using the Recall option described in 14.2.6.

To save the current **Monitor I/O** list, follow the directions below:

1. If you have not already done so, enter "S" for Save from the **Monitor** I/O menu shown in figure 14.5.
2. Enter the filename (up to 8 characters) for the display list. Do not attach a file extension. The file will automatically be given the extension $IO.
3. Type "Enter" or <CR>.
4. You can recall the screen display using the Recall option described in 14.2.6.

14.2.5 Recalling a Monitor I/O Display List

You can recall any previously saved **Monitor** I/O display list. To recall the **Monitor I/O** Display list, follow the directions below.

1. From the **Monitor** I/O menu, select "R" for Recall.
2. Enter the name of the display list to recall.
3. Type "Enter" or <CR>.

14.2.6 Modifying I/O Registers

WARNING

MODIFYING I/O REGISTERS MAY AFFECT THE OPERATION OF CONTROLLED MACHINERY. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

The modify option is used to change the value of a register. The register you want to modify does not need to be in the screen display for you to modify it. Recall that if application tasks are running, the value that you write to a register using this option may be overwritten by one of those application tasks.

You must be familiar with how the registers on the module you are working with are organized in order to use this option. Refer to the documentation for the individual module for any questions on register organization.

Follow the directions in 14.2.6.1 for modifying local I/O and in 14.2.6.2 for modifying remote I/O.

14.2.6.1 Modifying Local I/O Registers

WARNING

THIS FUNCTION MAY BYPASS CONTROL OF THE APPLICATION PROCESS BY THE APPLICATION TASKS. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

To modify a local I/O register, follow the directions below.

1. If you have not already done so, enter "M" for modify from the **Monitor I/O** menu shown in figure 14.5.
2. Enter "L" for "Local" I/O.
3. Enter the slot number of the module on which the register is found.
4. Enter the register number.
5. Enter the desired value of the register. You may enter a decimal or hexadecimal value only. If you enter a hexadecimal value, the last character of the value must be the letter "H" in upper- or lower-case.
6. Type "Enter" or <CR> to write the value to the register.

14.2.6.2 Modifying Remote I/O Registers

WARNING

THIS FUNCTION MAY BYPASS CONTROL OF THE APPLICATION PROCESS BY THE APPLICATION TASKS. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

To modify a remote I/O register, follow the directions below.

1. If you have not already done so, enter "M" for Modify from the **Monitor I/O** menu shown in figure 14.5.
2. Enter "R" for "Remote" I/O.
3. Enter the slot number of the Remote I/O master module (IMN 57C416) in the the local rack.
4. Enter the drop number of the remote chassis in which the module containing the register is located.
5. Enter the slot number of the module in the remote rack that contains the register.
6. Enter the register number.
7. Enter the desired value of the register. You may enter a decimal or hexadecimal value only. If you enter a hexadecimal value, the

last character of the value must be the letter "H" in upper- or lower case.

8. Type "Enter" or <CR> to write the value to the register.

14.3 Outputting Analog Signals

If your system configuration incorporates a DCS 5000 micro-regulator drive, the **Monitor Analog** menu allows you to output two analog signals that are proportional to the values of the specified integer variables. These signals can be used to drive a chart recorder, oscilloscope, or other test instrument. The **Monitor Analog** is functional only with a Processor containing a current minor loop (CML) application task, i.e., a task containing the CML control block. See J-3878 for more information on the Control Block language.

The analog signals are obtained from the the D/A converters located on the Drive Analog I/O Module (B/M 57405). The variable values are scaled and updated once every clock tick as long as the CML task is running. The D/A voltage is:

D/A(volts) = variable * scale *(10 volts/4096 counts)

A maximum of two single precision integer variables can be displayed simultaneously for each CML task, one per channel. Each variable is identified by the D/A channel from which the signal is obtained. The lower channel is identified as 0, and the upper channel is identified as 1.

14.3.1 Monitor Analog Display

The following fields will be displayed on the **Monitor Analog** screen for each variable:

(#)	- Identifies the D/A channel (0 or 1) through which the value will be displayed.
Task	- Identifies the task in which the variable is defined. This field is blank if the variable is common.
Variable	- Variable name, including the type character '%' for single precision integers.
Scale	- Identifies a scale factor of *16, *8, *4, *2, *1, *1/2, *1/4, *1/8, or *1/16.

14.3.2 Outputting a Variable

The procedure for adding a variable is the same whether you are actually adding the variable, or replacing a variable with another variable.

Follow the procedure below to output a variable.

1. From the **Monitor** menu, select 'A' for analog.
2. Enter the slot number of the Processor on which the CML task is running.
3. Select 'A' for Add to add a variable.
4. Enter the D/A converter through which the signal is obtained (0 or 1). The converter corresponds to the display position. If you enter a display position currently on the screen, the variable

associated with it will be replaced by the new variable you enter in step 5 below.

5. If the variable in question is a local variable, enter the name of the task in which the variable is defined. If the variable is a common variable, press the "Enter" key or <CR> to skip over the "Task" field.
6. Enter the name of the variable in the "Variable" field. Include the type character "%" for single precision integers. Type "Enter" or <CR>.
7. When the cursor has moved to the "Scale" field, use the up and down arrow keys to scroll through the available scale factors described in 14.3.1 above. The default scale factor is 1.
8. Press "Enter" or <CR> to terminate the entry and add it to the display.

14.4 Monitoring and Editing Ladder Logic/PC Tasks

WARNING

USE OF THE ON-LINE EDITING FEATURE CAN CAUSE THE CONTROLLED PROCESS OR MACHINE TO SUDDENLY CHANGE ITS OPERATION. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

Before you change any Ladder Logic task on-line, you should be familiar with the information in Appendix C, which describes variable types and naming conventions in AutoMax Ladder Logic tasks. Note that the terms "Ladder Logic task" "PC task" are used to mean the same thing, tasks written using conventional relay logic to show the sequence of power flow.

The **Monitor PC** menu is used to monitor the state of Ladder Logic task sequences in real-time and - unlike file editing - to modify individual control logic sequences **on line while tasks are running.** To make any changes to Ladder Logic tasks, the keyswitch must be in PROGRAM and the password must be entered.

On-line editing operations supported include adding, deleting, and modifying an existing sequence, modifying the value of a preset, forcing/unforcing a variable, moving one or a set of sequences, and resequencing all or part of a task. You can only modify one sequence (add one sequence, edit one sequence, or delete one sequence) at a time. Any on-line changes made take effect during the scan immediately following the task scan during which the change is installed.

When you monitor a sequence, the power flow is indicated by reverse video display for those portions of the sequence that have electrical continuity. If a sequence contains a timer or counter, the current value is displayed, along with the preset value. For shift registers, the current contents of the register are displayed. Variable names displayed in lower-case indicate local variables. Those displayed in upper case are common variables. See figure 14.6 for a sample display.

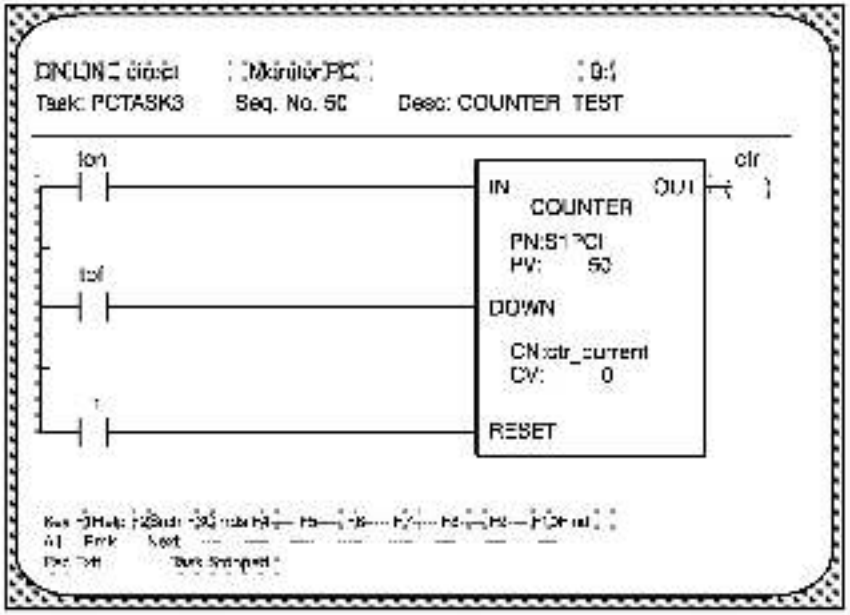


Figure 14.6 -Sample Monitor PC Display

While monitoring a sequence, you can use the four arrow keys to position the cursor over any element in the sequence. If there is a description for the selected element, it will be displayed on the screen in the field "Desc".

While you are in the **PC Monitor**, the following keys have the special functions indicated.

Home	Displays the first sequence in the task
PgUp	Displays the previous sequence in the task
PgDn	Displays the next sequence in the task
End	Displays the last sequence in the task

14.4.1 PC Monitor On-Line Edit Commands

WARNING

USE OF THE ON-LINE EDITING FEATURE CAN CAUSE THE CONTROLLED PROCESS OR MACHINE TO SUDDENLY CHANGE ITS OPERATION. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

F5 is used to initiate an on-line edit command. F5 followed by one of the following keys executes the indicated command. Each command is described in the section listed to its right.

Ins - Selects INSERT SEQUENCE	See 14.4.2 and 14.4.3
Del - Selects DELETE SEQUENCE	See 14.4.4
C - Selects CHANGE SEQUENCE	See 14.4.2 and 14.4.5
P - Selects the MODIFY PRESET menu	See 14.4.6
F - Selects the FORCE menu	See 14.4.7

U	- Selects the UNFORCE menu	See 14.4.8
R	- Selects the RESEQUENCE menu	See 14.4.9
M	- Selects the MOVE SEQUENCE menu	See 14.4.10

14.4.2 Limitations on Inserting and Modifying Sequences

There are a number of limitations on inserting and modifying a sequence or sequences into a Ladder Logic task that is running. These are detailed individually below.

14.4.2.1 Number of Sequence Insertions

When a PC task is downloaded, 1024 bytes are reserved for changes to PC task runtime code. Once this is used up, the screen will display an error message indicating that the memory is full. The smallest possible sequence uses 14 bytes of memory. The smallest possible block uses 22 bytes.

14.4.2.2 Adding Variables

From the time a task is downloaded, only 16 new symbols may be added to the task. They may be any combination of local booleans, common booleans, local integers, and common integers, but when the total number of new symbols exceeds 16, the screen will display an error message indicating the symbol table is full. Deleting a sequence does not remove symbols from the symbol table. In other words, if you add a sequence with two new symbols and then later take that sequence out, you will still have used up two of the 16 allowable new symbols.

14.4.2.3 Using an Existing Coil Name

You cannot insert a sequence with the same coil name as that found in an existing sequence. If you try to do so, the system will display an error message indicating there is a duplicate coil.

14.4.2.4 Adding Local Booleans

All local booleans that are added must first be entered as coils in order to be defined as locals. They must be defined as locals in this way before they may be used as contacts. All common symbols that are added must be defined using the Variable Configurator. If a new common that is not already defined is added, the screen will display an error message indicating that the symbol is not resolved.

14.4.2.5 Inserting a Sequence with Counter or Shift Register Blocks

If Counter or Shift Register blocks are installed when the UP, DOWN, or SHIFT inputs are conducting, the count or shift will not take place. The count or shift will take place only when the input is turned off and back on again.

14.4.2.6 Inserting or Modifying a Sequence with an Upward Transition Contact

If an upward transition contact references a new input in a register not previously used by the task, and if the input is conducting, an upward transition will be detected on the first scan after the new sequence is installed or the existing sequence modified.

For example, you insert the following sequence where Q_IN is defined in the configuration task for the rack, but is not used elsewhere in the Ladder Logic task:

If Q_IN is on when the sequence is inserted, B_OUT will turn on. If a different bit in the word where Q_IN is defined was already used by the task, then B_OUT will not turn on until Q_IN turns off and then on again.

14.4.3 Inserting a Sequence

WARNING

USE OF THE ON-LINE EDITING FEATURE CAN CAUSE THE CONTROLLED PROCESS OR MACHINE TO SUDDENLY CHANGE ITS OPERATION. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

Make certain you have read and understood the restrictions in 14.4.2.1 - 14.1.2.5 before proceeding.

To insert a sequence, follow the directions below.

1. Monitor the sequence that will precede where you want the new sequence to be inserted. For example, if you want to insert a sequence between existing sequences 20 and 30, you begin by monitoring sequence 20. The insertion will always occur immediately following the sequence being monitored. To insert a new sequence before the first sequence in the task, see 14.4.2.
2. Once you are monitoring the correct sequence, enter F3 followed by the "Ins" key. The system will test whether there is a sequence number that will fit between the monitored sequence and the one following it. For example, if the line number of the sequence being monitored is a multiple of 10, the system will test whether that line plus 10 is available. In the above example, where there is already a sequence 30, the system would then test if the monitored sequence line number plus one is available. If a sequence 21 already existed, you would be prompted to resequence the task. See 14.1.9 below for more information about resequencing.
3. After a valid sequence number is assigned for the sequence to be added, the sequence being monitored is cleared from the screen to allow you to enter the new sequence. For help in inserting the sequence, type F1.
4. After you have finished entering the new sequence, type F3 E to exit the editor and install the new sequence. If you change your mind and no longer want to insert the sequence, enter F3 Q. If you type F3 by mistake and you want to go back and edit the sequence further, type ESC.

14.4.4 Deleting a Sequence

WARNING

USE OF THE ON-LINE EDITING FEATURE CAN CAUSE THE CONTROLLED PROCESS OR MACHINE TO SUDDENLY CHANGE ITS OPERATION. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

To delete a sequence, follow the directions below.

1. Monitor the sequence that you want to delete.
2. Enter F8 followed by the Del key. The system will prompt with "Are you sure [n]?" If you enter anything other than a Y for yes, the sequence will not be deleted. All symbols that are used by the sequence remain in the symbol table. The 16 symbol limit described in 14.4.2.2 is not affected by deleting a sequence.

14.4.5 Editing a Sequence

WARNING

USE OF THE ON-LINE EDITING FEATURE CAN CAUSE THE CONTROLLED PROCESS OR MACHINE TO SUDDENLY CHANGE ITS OPERATION. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

Make certain you have read and understood the restrictions in 14.4.2.1 - 14.4.2.5 before proceeding.

To edit a sequence, follow the directions below.

1. Monitor the sequence you want to edit.
2. Enter F8 followed by "C" for Change.
3. For help in editing the sequence, enter F1.
4. After you have finished editing the sequence, type F8 E to exit the editor and install the edited sequence. If you change your mind and no longer want to insert the sequence, enter F8 Q. If you type F8 by mistake and you want to go back and edit the sequence further, type F8C.

14.4.6 Modifying a Preset

To modify the preset value for a COUNTER or TIME_ON or TIME_OFF block, follow the directions below. You cannot use this function if the preset is currently forced.

1. Enter F8, followed by "P" for Preset.
2. Enter the name of the task in which the preset is to be modified.
3. At the next prompt, enter the name of the preset followed by a % sign. The name you enter must be an existing integer name or an error message will be displayed.
4. Enter the new value. The new value is written into the variable and is saved as a part of the task. The unit is 1/10 of a second.

The new value must be in the range of 1 to 32767 for timers and −32768 to +32767 for counters.

14.4.7 Forcing a Variable

WARNING

THE SET AND FORCE FUNCTIONS BYPASS CONTROL OF THE APPLICATION PROCESS BY THE APPLICATION TASKS. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

You can access the same functions allowed in the Force menu described in 14.5 to force a variable while in the **PC Monitor**. Strings, array elements, and tunable variables cannot be forced. Only booleans, single precision integers, double precision integers, and reals can be forced. Once a variable is forced, its value cannot be altered by application tasks or the status of physical I/O. Its value can only be changed by forcing it to another value or unforcing it. See 14.4.8 for more information about unforcing a variable. To force a variable, follow the directions below.

1. Enter F3, followed by "F" for Force.
2. Enter the name of the task in which the variable is to be forced. If the variable is common, skip over this step.
3. Enter the name of the variable. The variable name must be terminated by the @ character for boolean variables, the % character for integer variables, or the ! character for double integer variables. Forced boolean variables are shown blinking on the display.
4. Enter the value to which the variable is to be forced in the "Value" field.
5. You can enter further values for the variable without entering F3 F if you have not exited using the <Esc> key. Enter the new value over the old.
6. To exit, type <ESC>.
7. To unforce a variable or all variables, follow the directions in 14.4.8.

14.4.8 Unforcing a Variable

WARNING

THE SET AND FORCE FUNCTIONS BYPASS CONTROL OF THE APPLICATION PROCESS BY THE APPLICATION TASKS. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

You can unforce variables by removing them from the Force table.

To remove variables from the Force table, follow the directions below.

1. Enter F3 followed by "U" for "Unforce".
2. To unforce all variables in the Force table, enter an "A". To unforce one variable, use the up and down arrow keys to move

the ">" pointer until the desired variable is displayed and then type a <CR>. If the force table is emptied, the system will exit to the menu.

3. To exit the function, type <ESC>.

14.4.9 Resequencing a Task

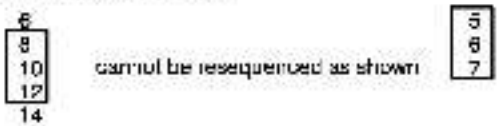
The method used to resequence tasks in the **PC Monitor** allows changes to take effect with the next scan.

To resequence a task, follow the directions below.

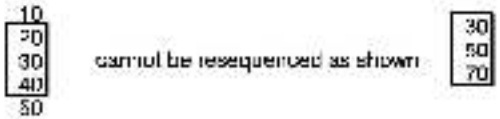
1. Type F3 followed by "R" for Resequence.
2. At the prompt "Old First Sequence", enter the sequence number at which you want to begin the resequence.
3. At the prompt "Old Last Sequence", enter the upper limit for the range of sequences you want to resequence. The range you select is inclusive.
4. At the prompt "New First Sequence", enter the new sequence number for the first sequence in the range.
5. At the prompt "New Increment", enter the number to add to subsequent sequence numbers, beginning with the "New First Sequence".

The following are not permitted when you resequence and will cause the system to display an error message if attempted:

* If "New First Sequence" is smaller than the sequence immediately preceding "Old First Sequence". For example, you cannot resequence the sequences shown boxed on the left as those shown boxed on the right:



* If the new last sequence in the range would become greater than the sequence that follows the "Old Last Sequence". For example, you cannot resequence the sequences shown boxed on the left as those shown boxed on the right:



* If the Old First Sequence or Old Last Sequence is not a sequence in the task, the system will display an error message indicating that the sequence was not found.

14.4.10 Moving a Sequence or Set of Sequences

The method used to move a sequence or set of sequences in the **PC Monitor** allows changes to take effect with the next scan. To move a sequence or set of sequences, follow the directions below.

1. Enter F3 followed by 'M' for 'Move'.
2. At the prompt "First Sequence To Move", enter the sequence or first of the set of sequences to be moved.
3. At the prompt "Last Sequence To Move", enter the last sequence or last of the set of sequences to be moved. If you are moving only one sequence, enter the same sequence number as you did in number 2 above. If you are moving a set of sequences, the range of sequences between the first and last sequence numbers you enter is inclusive.
4. At the prompt "New Sequence Number", enter the new number of the sequence or the first sequence of the set. If you are moving a set of sequences, they will be incremented by 10 after the first sequence.

The following are not permitted when you move a sequence and would cause the system to display an error message if attempted:

- If the sequences starting with the new sequence number would fall into the same range as existing sequences.
- If either the "First Sequence to Move" or "Last Sequence to Move" is not a sequence in the task.

14.4.11 Searching for a Sequence Number or Coil Variable Name

You can search a task for a sequence number or coil variable name using F10. To find a particular sequence number or coil variable name, follow the directions below.

1. Enter F10.
2. At the prompt, enter either the sequence number or the name of the coil. That sequence will then be displayed on the screen.

14.4.12 Searching for a Variable Name

You can search a task for a variable by following the directions below.

1. Enter F2 to initiate the search.
2. Enter the name of the variable.
3. By entering one of the letters indicated below, you can qualify the search to examine only certain types of elements for the variable:

   A - All contacts and coil
   O - Normally open contacts
   C - Normally closed contacts
   U - Upward transition contacts
   D - Downward transition contacts

   The task will be scanned from the beginning for a match. If a match is found, the search stops and the ladder sequence containing the match is displayed.

1. If you want to search for another instance of the same variable, enter Alt/F2. This function will cause the search to continue from the sequence at which it had stopped until the next match. A search must have been initiated with the F2 function key in order to use this function. It may be re-executed as many times as necessary.

14.4.13 Inserting a New First Sequence

To insert a sequence before the existing first sequence, follow the directions below. This is the only method of inserting a sequence before an existing first sequence. F10 can also be used to insert at any place in the task if the sequence number entered is not already in the task.

1. Enter F10.
2. Enter a sequence number smaller than the current first sequence number.
3. Proceed with the insert operation described in 14.4.2 and 14.4.3 above.

14.4.14 Remark Sequence Text

You can use Alt/F1 to toggle on/off the display of Remark sequence text.

14.5 Forcing Variables

WARNING

THE SET AND FORCE FUNCTIONS BYPASS CONTROL OF THE APPLICATION PROCESS BY THE APPLICATION TASKS. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

WARNING

VARIABLES AND OUTPUTS WHICH ARE FORCED BEFORE A-C POWER IS LOST WILL REMAIN FORCED WHEN A-C POWER IS RESTORED. SHOULD A-C POWER BE LOST WHILE VARIABLES ARE FORCED, THE USER MUST ENSURE THAT UNEXPECTED MACHINE MOVEMENT DOES NOT OCCUR WHEN A-C POWER IS RESTORED. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY INJURY.

From the **Monitor** menu shown in figure 14.1, you can select 'F' for Force to force and unforce up to 16 variables at the same time. Note that the limit of 16 forced variables applies regardless of the number of users who have access to the task. You can only force boolean, single precision integer, double precision integer, and real variables. Strings, array elements, and tunable variables cannot not be forced. A variable that is forced cannot be altered by any application task or the status of physical I/O. A forced variable will retain its forced value until it is unforced or forced to a different value.

See 14.5.1 for an explanation of the screen display and 14.5.2 and 14.5.3 for instructions on forcing and unforcing variables.

14.5.1 Monitor Force Screen Display

Forced variables are displayed in a table on the screen. The columns in the force table contain the following information:

(#)	Force table (screen) position (1-16).
Task	- The task in which the variable is defined. This field is blank if the variable is COMMON.
Variable	- Name of the variable being forced, including the type character.
Value	- The current forced value of the variable.

See figure 14.7 for a the **Monitor Force** menu.

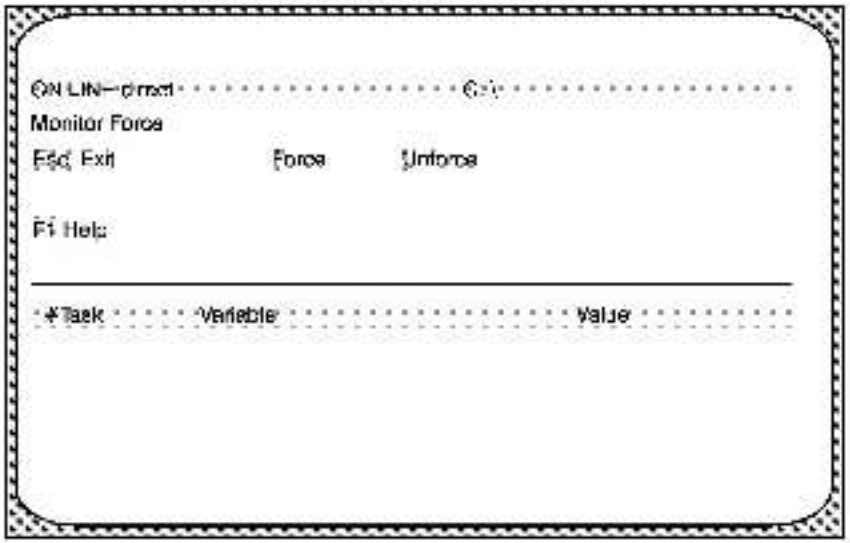


Figure 14.7 -Monitor Force Menu

14.5.2 Forcing a Variable

To force a variable, follow the directions below.

1. At the **Monitor** menu, enter "F" for Force. See Figure 14.8 for a sample screen containing 14 forced variables. Note that no task is shown for common variables.

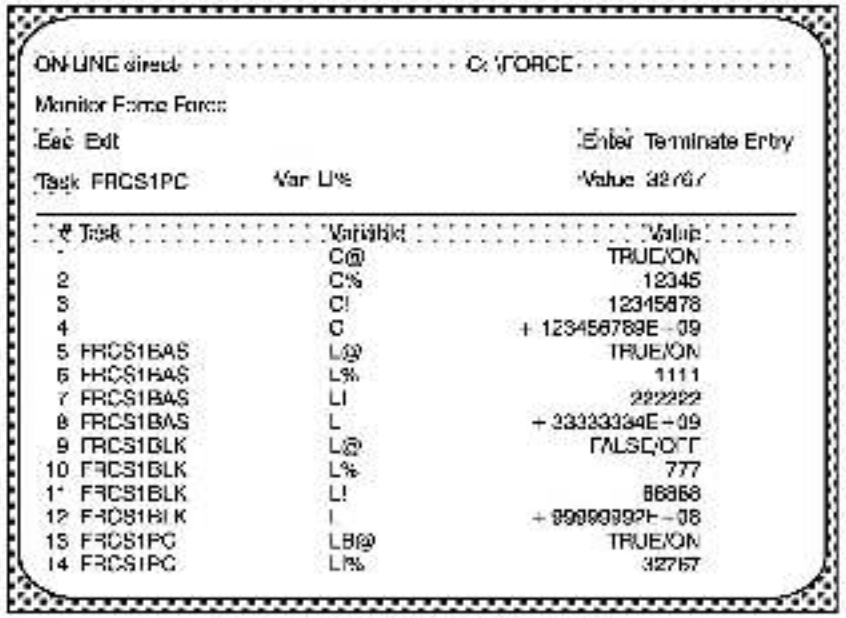


Figure 14.8 -Sample Monitor Force Display

2. Enter the name of the task in which the variable is to be forced.
3. Enter the name of the variable, terminated by the appropriate character ("@" for boolean, "%" for single precision integers, or "!" for double precision integers or [blank] for reals).
4. Enter the value to which the variable is to be forced in the "Value" field.
5. You can enter different values for the same variable if you have not exited using the <Esc> key. Simply use the arrow keys to move the cursor to the "Value" field again and enter the new value over the old.
6. To exit, type <ESC>.
7. To unforce one variable or all variables, follow the directions in 14.5.3.

14.5.3 Unforcing a Variable

You can unforce variables by removing them from the Force table. To remove variables from the Force table, follow the directions below.

1. Enter "U" for "Unforce".
2. To unforce all variables in the Force table, enter an "A". To unforce one variable enter the display position of the variable to be unforced. If the force table is emptied, the system will exit to the **Monitor** menu.
3. To exit the function, type <ESC>.

14.6 Setting Up the UDC and PMI Meter Ports

If your system configuration incorporates an AutoMax Distributed Power drive, the **Monitor Set Up UDC/PMI** menu allows you to select variables to drive the four D/A output ports (labeled "Meter Ports") on each of the UDC modules and PMI Processors. The analog signals output by these ports can be used to drive meters, chart recorders, or other test instruments. Refer to the D-C Drive Configuration and Programming Instruction manual (S-3006) for more information on connecting equipment to the UDC and PMI meter ports.

After the slot number of a UDC module is entered, the user can enter or modify setup information about the meter ports for the UDC module or for either of the PMI Processors associated with the UDC module. See figure 14.9 for the UDC Setup screen display.

ONLINE data):(Udc(Slot 06) : AUTOMAX : : C:\AMXUI3\SYSCNFG\3AC01 : :

Monitor Setup UDC/PMI

Esc Exit UDC A_PMI : : : : PMI

F1 Help

Location	Port	VarName/RegNum	Bit/Numeric (for Reg)	Val @ -10V	Val @ +10V
UDC	1				
UDC	2	02000	9	2	80
UDC	3				
UDC	4	00690		-32767	32700

Location	Port	Par Num	Description	Val @ -10V	Val @ +10V
PMI-A	1	4	ArmVolt (Volts E0)	32767	32700
PMI-A	2	16	ACRMSLineV (Volts E0)	0	10
PMI-A	3	3	ArmCurFdbk (Amps E1)	0	32700
PMI-A	4				
PMI-B	1				
PMI-B	2	21	RslPort 3 channel 1	0	0
PMI-B	3	9	FieldCurFdbk (%)	-3200	0
PMI-B	4				

Figure 14.9 - UDC Setup Screen

Each UDC entry has a port number (1-4), a variable name or register/bit number, and a minimum (Val @ -10V) and maximum (Val @ +10V) value. "Val @ -10V" specifies the value of the variable that will be output as the minimum voltage, and "Val @ +10V" specifies the value of the variable that will be output as the maximum voltage. This allows a small area of the signal range to be displayed over the full range of the 8-bit digital-to-analog converter. Values are transferred to the analog output every scan if CCLK has been turned on in a UDC application task that is running, and every 5 milliseconds if CCLK is off.

Each PMI entry has a port number (1-4), a parameter number and description, and a minimum and maximum value. You can select the parameter from a list of available parameters and set the "Val @ −10V" and "Val @ +10V" values in the same way as for a UDC module. Only data that exists on the selected PMI Processor can be output to one of its meter ports. Values are transferred to the analog output after every current minor loop scan in the PMI Processor.

Use the following procedure to set up the meter ports for the UDC modules and PMI Processors.

Step 1. Enter "S" for Set Up UDC/PMI from the **Monitor** menu shown in figure 14.1.

Step 2. Enter the slot number of the UDC module. The screen will display the current variable name (or register and bit number) and the minimum and maximum values for each port on the UDC module. It will also display the parameter number and name and the minimum and maximum values for each port on the PMI Processors associated with the selected UDC module (A and B).

Step 3. Enter "U" to select the UDC analog outputs, "A" to select the PMI-A analog outputs, or "B" to select the PMI-B analog outputs.

Step 4. Enter the port (1-4) you want to configure.

Step 5. If you entered "U" (UDC) above, enter the variable name or register and bit number of the variable you want to assign to the selected UDC meter port.

If you selected "A" (PMI A) or "B" (PMI B), select the parameter you want to assign to the port. Use the Up Arrow and Down Arrow keys to scroll through the list of available parameters displayed on the screen.

Step 6. Enter a minimum and maximum value for the selected variable in the "Val @ −10V" and "Val @ +10V" fields, respectively. See instruction manual S-3008 for more information on setting values to take maximum advantage of the D/A port resolution.

Step 7. When you are finished setting up the UDC and PMI meter ports, press <ESC> to return to the Monitor menu.

15.0 ON LINE MENU: ERROR CLEAR

Any errors in the AutoMax Processor error log, the UDC error log, or on the AutoMax Processor LEDs should first be cleared if you wish to run any tasks on that particular Processor or UDC module. The Error Clear menu allows you to clear the error logs of AutoMax Processor modules and UDC modules as well as the LED fault codes on AutoMax Processor modules. This option simply clears the error log and the LEDs; it does not correct the errors themselves. Follow the steps below to clear a UDC error log, an AutoMax Processor error log, the LEDs on an AutoMax Processor, or the error log and LEDs for an AutoMax Processor.

1. From the ON LINE menu shown in figure 7.1, select "E" for Error Clear.
2. Enter the slot number of the AutoMax Processor or UDC module whose error log you want to clear.
3. If you entered the slot number of a UDC module, select "E" to clear the error log.

If you entered the slot number of an AutoMax Processor, select "F" to clear the error log, "L" to clear the LEDs, or "B" to clear both the error log and LEDs.

16.0 SOFTWARE TROUBLESHOOTING

Error messages may be displayed on the screen if there are problems with memory or disks. This section describes some actions you can take to correct these problems.

16.1 Memory Errors

Some errors are caused by insufficient memory on the personal computer. An error message will indicate if this occurs. Recall that the AutoMax Run-Time Executive requires 640K of RAM. When one of these errors occurs, exit the AutoMax Executive, make more RAM memory available and re-start the system.

Memory can be made available by:

- removing any terminate and stay resident (TSR) programs (e.g., Sidekick)
- removing any driver programs or moving them to high memory
- reducing the memory reserved for environment variables
- reducing the number of files and buffers reserved in CONFIG.SYS

16.2 Disk Errors

Some errors are caused by problems with the hard or floppy disk on which files are stored. An error message will indicate if this occurs. When one of these errors occurs, check for problems with the disk or disk drive and re-start the system.

Disk problems include:

- a write-protected disk
- lack of sufficient disk space
- hardware problems with the disk drive

16.3 System Errors

Errors that indicate a problem with the AutoMax Run-Time Executive software will cause the application in which they occur to close. If this type of error occurs, write down the error message, then contact Reliance.

Appendix A

AutoMax File Types

The following file types may have been created when your AutoMax system was configured. You may see any of these files on your hard disk or on floppy disks you receive from your software supplier. In AutoMax, the file type is determined by the file extension. The AutoMax Executive software uses the file extension to determine the particular editor (Text Editor or PC Editor) to be used when editing a file. When a file is created, the AutoMax Executive appends one of the following file extensions to designate the file type:

.BAS	BASIC tasks
.BLK	Control Block tasks (AutoMax or UDC)
.CNF	Configuration files
.PC	PC/Ladder Logic tasks
.INC	Include files (see BASIC statement INCLUDE)
.TUN	Tunable variable files
.SDC	System documentation files
.CDC	Section documentation files
.RDC	Rack documentation files
.TDC	Task documentation files
.IDC	Include documentation files
.DBF	Database files
.NDX	Database index files
.XRF	Cross reference files
.LOG	Log files
.LST	Task list files
.OBJ	Object files (BASIC, Control Block, or Configuration)
.POB	Parameter object files
.OS	System files
.EXE	" "
.BAT	" "
.INI	" "
.FRM	" "
.HLP	" "

Appendix B

Processor Module Error and Status Codes

All AutoMax Processor module error and status codes (displayed on the two seven-segment LEDs on the faceplate) are listed below, organized first by error type and second, in numerical/alphabetical order.

Processor Overload

00	CPU overload

Corrective action: move one or more application tasks to other Processor modules in the rack, or make scan times longer.

Power-Up Diagnostics

The following error codes are displayed while the Processor module performs power-up diagnostics.

0.0.		EPROM failed
0.1.	– 0.3.	Bad CPU
0.4.		Internal bus error test failure
0.5.		Parity test failure
0.6.		External bus error test failure
0.7.		Processor in the wrong slot
1.0.	1.6.	RAM failure
2.0.		I/O protection failure
2.1.		PIO failed
2.2.		PC accelerator failed
2.3.		8253 timer/counter failed
2.4.		SIO failure
2.5.		Communications interrupt failed
2.6.		SIO interrupt failed
2.7.		8253 counter/timer interrupt failed
2.8.		Local watchdog failed
3.0.		Bad backplane
3.1.		Multibus parity test failure
4.0.	4.5.	Common memory RAM failure
4.6.		Common memory system watchdog failure
5.0.		Processors with incompatible EPROMs in the rack.

Corrective action: replace the Processor, or replace the Common Memory module if error codes 4.0. – 4.6. remain on.

Run Time Errors

02	Task or Configuration checksum failure

Corrective action: replace the Processor (M/N 57C430A, 57C431, or 57C435).

Runbase Booting

The following status/error codes are displayed while you load the runbase or operating system onto the Processor module(s). All of the following codes except 6.5. apply to the top port of the Processor module, labeled "Programmer/Port B".

5.1.	Incompatible runbase downloaded
6.0.	Unexpected interrupt on upper port of Processor
6.1.	Parity error
6.2.	Receiver overrun
6.3.	Framing error
6.4.	Serial port fatal error
6.5.	Illegal interrup. on lower port of Processor
6.6.	Transmit interrupt error
6.7.	Runbase integrity lost
6.8.	Bad runbase checksum
6.9.	Transmit buffer error
7.0.	Multi-Processor runbase download in progress
7.1.	Disconnect time-out during download
7.2.	Spurious interrupt received

Corrective action: 6.5. may be caused by attempting AutoMax ON-LINE PROGRAMMING functions before the runbase is loaded onto the Processor module(s) in the rack. In this case, exit the ON-LINE PROGRAMMING menu and download the runbase. 7.0 is a status message only. For all other error codes, cycle power and try to load the runbase again.

Loading the Runbase over the Network

8.0.	Bad message length specified for network message
8.1.	Bad destination drop
8.2.	Transmitting drop inactive
8.3.	Destination port unallocated
8.4.	Destination port busy
8.5.	Did not receive expected response
8.6.	Spurious network interrupt received
8.7.	Network message is being transmitted

Corrective action: 8.0. and 8.1. are caused by a failed Processor in the leftmost slot. For 8.2., check the coax cable; then try replacing the network module. For 8.3. – 8.5., check the destination Network module, then the leftmost Processor in the destination rack. For 8.6. and 8.7., cycle power and try to load the runbase again.

Miscellaneous Process Errors

8.8	Processor failure

Corrective action: replace Processor module.

STOP ALL Error Codes

The following hardware and software error codes cause all tasks running in the rack to stop.

10	Event count underflow – too many WAITs (max. 32768) – not enough SETs (BASIC tasks)
11	Event count overflow – too many SETs (max. 32767) – not enough WAITs (BASIC tasks)
12	Hardware event time-out – interrupt time exceeded programmed time-out – limit in a Control Block task

13	Runbase boot error – a check on the runbase failed
14	Processor overlap limit exceeded – ran out of processing capacity (time)
15	External watchdog time-out detected – another Processor in the same rack stopped
17	Address error detected – caused by a read/write to an invalid address
18	Spurious interrupt or hardware failure
19	Power failure detected
1A	Watchdog on this Processor failed
1b	Hardware event count limit exceeded – too many interrupts set without being acknowledged – program too long – collective scans too fast
1C	Illegal instruction detected – runbase software fault – bad processor module – bad EPROMs
1d	Privilege violation detected – runbase software fault – bad processor module
1E	Un-implemented instruction detected – runbase software fault – bad processor module
1F	Illegal interrupt detected – runbase software fault – bad processor module
31	Bus error – attempt to access invalid address
32	Define channel error – problem in application software
33	Define scan error – hardware fault
34	Memory integrity lost – hardware fault
35	D-C drive CM- block initialization error
36	Communication between drive Processor and I/O controller lost
37	D-C drive I/O controller run-time board error – hardware fault
38	UDC module generated a STOP ALL
39	UDC module interrupt allocation failed
3A	UDC and AutoMax Processor OS incompatibility

Corrective action: correct the problem in application software. Try to reset by cycling power and re-loading configuration and application tasks. Replace the Processor module. For error code 31, see J-3650 or J-3669; for error code 37, see J-3669. For error code 17: If you define bits in a register that is also defined as a register, neither the bits nor the register can be forced. For 38, examine the error logs for all UDC tasks in the rack. For 39, cycle power to the rack and re-load the configuration and application tasks.

BASIC STOP ALL Error Codes

The following error codes are caused by problems in BASIC tasks and cause all tasks to stop.

40	Too many RETURNs from GOSUBs (or RETURN without GOSUB)
41	Illegal jump into a FOR loop
42	NEXT statement does not match current FOR
43	Invalid START EVERY statement
44	Invalid EVENT statement
45	STOP statement executed in application software (causes a STOP ALL/CLEAR)
46	SET or WAIT attempted with no event definition
47	Task stack overflow
48	GOSUBs not balanced at END statement
49	Insufficient space for channel buffer
4A	Attempted to execute undefined opcode
4B	Attempted to execute non-executable opcode
4C	Attempted to execute illegal opcode
4D	RESTORE to non DATA statement line number
4E	Attempted to take square root of a negative number
4F	Attempted RESUME without being in an ON ERROR handler

Corrective action: correct the problem in application software. Error code 47 can be caused by performing a PUT on a closed port, PRINT statements, complex mathematical expressions, deeply nested subroutines, and deeply nested IF–THEN–ELSE statements. Error code 4A can be caused by attempting to use Ethernet functions with the standard operating system loaded. To use Ethernet functions, you must load the Ethernet operating system.

Multibus® and Processor Bus STOP ALL Error Codes

50	Onboard parity error
51 – 54	Onboard bus error or access violation
55	Multibus parity error during read access
56 – 58	Multibus access violation or bus error
60	Network interrupt allocation failed
61	Network receiving queue overflow
62	Network transmit queue underflow

Corrective action: reset by cycling power and re-loading configuration and application tasks. If the small green LED labeled "OK" on the Processor module faceplate is off, replace the Processor module. Correct any incorrect accesses in application software. Systematically swap out hardware modules. For error codes 55–58, if none of the above correct the problem, try replacing the backplane.

AutoMax Drive-Related Error Codes

The following error codes indicate a power circuit or external drive system fault. They apply only to systems that incorporate DCS 5000 micro-regulators. After correcting the problem, reset the Processor module by cycling power and re-loading the configuration task and application tasks to clear the error code. Note that these error codes also appear in the Error Log for the Processor.

80	Instantaneous overcurrent fault – armature current exceeded IOC_THRESH value in CMI_task
81	Line sync loss fault
82	Tach loss fault – 40% armature phase angle with less than 5% tach feedback
83	Overspeed/overvoltage fault – CMI_task OSV_FDBK exceeded OSV_THRESH number
84	Hardware overspeed fault – drive analog module potentiometer setting exceeded by input voltage
85	External FT fault – external fault input triggered
86	Phase rotation fault – incorrect phasing
87	Shorted SCR detected in power module

Corrective action: troubleshoot power circuit and external drive system. These errors do not cause a STOP ALL and do not require re-loading the configuration file or tasks.

Configuration Error Codes

The following error codes usually indicate a discrepancy between the actual hardware configuration and the I/O definitions in the configuration for the rack.

C0	TASK specified in configuration uninstalled, at wrong priority, of wrong type, on wrong Processor module; wrong spelling of TASK
E1	Invalid configuration, configuration not successfully downloaded.
E2	I/O referenced in configuration is missing.
E3	I/O referenced in configuration is missing. Invalid configuration, configuration not successfully downloaded.
E4	Error building task, insufficient memory in Processor Module. Invalid configuration, configuration not successfully downloaded.
E5	Error building task, insufficient memory in Processor Module. Invalid configuration, configuration not successfully downloaded.
E6	I/O referenced in configuration is missing. Error building task, insufficient memory in Processor Module.
E7	Invalid configuration, configuration not successfully downloaded. I/O referenced in configuration is missing. Invalid configuration, configuration not successfully downloaded.
E8	Error installing application task, common symbol could not be resolved, insufficient memory in Processor Module.
E9	Error installing application task, common symbol could not be resolved, insufficient memory in Processor Module. Invalid configuration, configuration not successfully downloaded.

EA	Error installing application task, common symbol could not be resolved. Insufficient memory in Processor Module. I/O referenced in configuration is missing.
Eb	Error installing application task, common symbol could not be resolved. Insufficient memory in Processor Module. I/O referenced in configuration is missing. Invalid configuration, configuration not successfully downloaded.
EC	Error building task; and error installing application task, common symbol could not be resolved. Insufficient memory in Processor Module.
Ed	Error building task; and error installing application task, common symbol could not be resolved, insufficient memory in Processor Module. Invalid configuration not successfully downloaded.
EE	Error building task; and error installing application task, common symbol could not be resolved, insufficient memory in Processor Module. I/O referenced in configuration is missing.
EF	Common variable forced by another Processor Module.

Corrective action: verify that the configuration correctly describes the physical configuration of the system and the tasks installed on the Processor module(s). Reset by cycling power and re-loading the configuration and application tasks. For error code EF, un-force the variable and do a STOP ALL from the AutoMax ON LINE PROGRAMMING menu.

Fatal Errors

The following error codes usually indicate that the runbase is not functioning correctly. If any of these error codes appears, the configuration and all application tasks are deleted from the Processor module.

F0–F9	Fatal error
FA–FF	Fatal error

Corrective action: cycle power. Re-load the configuration and all application tasks. Replace the Processor module.

Informational Messages

The following codes signify a particular condition, not necessarily an error.

dd	This Processor module has successfully completed power-up diagnostics and is waiting for other Processor modules to complete their diagnostics
L0	The runbase needs to be loaded onto the rack
b0	Rack configuration is being validated
d0	Application task installation in progress
d1	Waiting on synchronizing event (in a rack with multiple Processors)
d2	Waiting on mutual exclusion lock (in a rack with multiple Processors)

Corrective action for b0 and d0 that do not change or disappear: re-load configuration and application tasks.

Appendix C

Ladder Logic/PC Task Variable Names and Types

In AutoMax Ladder Logic, variable names are used in place of physical addresses. They are limited to 14 alphanumeric characters, and must begin with a letter. Some names are split into two lines.

Each variable name has been defined as one of two types: local to the task or common to all Processors in the rack. Local variables are those that do not represent a physical I/O point and are not referenced by any other application tasks running in the rack. Common variables are those that represent physical I/O points or are referenced by other tasks in the rack.

Each variable name can have a 40-character description. When you monitor PC tasks in the on-line mode (see 14.4), however, the screen will display the description for any variable you are monitoring.

The description is broken down into four groups of 10 characters. The "^" characters indicate where the line will be broken up on the printout of the task.

Appendix D

System Security

To protect the system against unauthorized on-line changes being made from the personal computer, AutoMax incorporates two types of security: a keyswitch on the rack Power Supply module, and a password.

Keyswitch

The keyswitch on the rack Power Supply module provides security for on-line operations such as starting and stopping application tasks by defining a privilege level for the rack. Only on-line operations are affected by the position of the keyswitch. Saving tasks from the rack, however, is permitted regardless of the keyswitch position. The keyswitch has three possible settings: "PROTECT", "SETUP", and "PROGRAM". The AutoMax Executive software displays the current position of the keyswitch on the top of the screen while you are on-line. See below for a description of the privilege level defined by each keyswitch position.

PROTECT Position

If the keyswitch is in the "PROTECT" position, the user can only monitor variables and save tasks from the rack. Even if the user knows the password, he cannot perform any other operations.

SETUP Position

If the keyswitch is in the "SETUP" position, the user can monitor all variables, and save tasks from the rack only. If the USER knows the password, he can also modify tunable variables. He cannot perform any other operations.

PROGRAM Position

If the keyswitch is in the "PROGRAM" position, the user can perform all on-line operations from the personal computer, i.e., load, save, run, delete, and stop application tasks, and monitor and tune variables. If, however, the password has not been entered previously, or is not entered when the user is prompted, the privilege level defaults to that of the "PROTECT" position.

Password

The password provides an additional level of security for the rack if the keyswitch on the power supply is kept in the "PROGRAM" position. Any on-line operations beyond what is allowed in the "SETUP" mode of the keyswitch will require the user to enter the password first. The password will time out after 2 minutes.

Up to four users can access password-protected features in an AutoMax rack via the AutoMax network. See section 8.5 for how to connect to a rack over the network. In order to prevent conflicts, users will be granted one of the following access levels when the go on-line.

None - This level provides the user with monitoring capability only. The correct password has not been entered by the user.

Data Access - This level provides the user with the ability to Set/Tune/Force only common or I/O variables. Data Access will not be granted when another user has Rack Access. All users connected to a rack may have Data Access. It is the responsibility of all users to coordinate the effect of setting, tuning, or forcing on common variables and other areas of conflict.

Task Access - This level provides the user with the capabilities of Data Access plus the ability to Run/Stop/Delete/Load a task and to modify the local variables in the task using the Set/Tune/Force functions. If the user has Task access to all the

tasks in a rack, he can Run/Stop/Delete/Load ALL tasks. Other network users trying to access the task will be denied access and will be shown the username of the user with privileged access. A user may have access to one or more tasks as long as no other user has access to those tasks and no other user has Rack Access.

Rack Access - This level gives the user complete control of all tasks in the rack. A user with this access level can Run/Stop/Delete/Load ALL tasks. Rack Access will not be granted if any other user has Data, Task, or Rack Access.

Users may set their level of access by using the Set Access function from the Connect menu (see 6.2). A specific level of access will be granted (if possible) when the user executes a function which requires that level of access. For example, if a user had previously entered the password and then attempts to force a local variable, Task Access will be granted to the user for the task containing the local data if no other user has access that task. Table 9.1 lists the access levels required to access password-protected features.

Data Access will be granted when the user first enters the password. The user will then be given the opportunity to acquire Rack Access. This will prevent other users from accessing the protected features in the rack. If another user has already reserved the rack, a message will be displayed on the user's workstation that identifies the other users connected to the rack and their access levels. The user can also display a list of all other users currently logged onto the rack with their associated access levels (see 8.6).

Rack Power Supply Key-switch Position	Any Position	PROTECT	SETUP			PROGRAM		
User's Access Level	None	Any level	Data	Task	Rack	Data	Task	Rack
Action								
Force Common	No	No	No	No	No	Yes	Yes	Yes
Force Local	No	No	No	No	No	No	Yes	Yes
Force I/O	No	No	No	No	No	Yes	Yes	Yes
Set Common	No	No	No	No	No	Yes	Yes	Yes
Set Local	No	No	No	No	No	No	Yes	Yes
Set I/O	No	No	No	No	No	Yes	Yes	Yes
Set/Tune Tunable	No	No	No	Yes	Yes	No	Yes	Yes
Load Normal Config	No	No	No	No	No	No	No	Yes
Load Debug Config	No	No	No	No	No	No	No	Yes
Load Single POB File	No	No	No	No	No	No	Yes[1]	Yes
Load Single Task	No	No	No	No	No	No[2]	Yes	Yes
Delete Task	No	No	No	No	No	No	Yes	Yes
Start Task	No	No	No	No	No	No	Yes	Yes
Stop Non Critical Task	No	No	No	No	No	No	Yes	Yes
Save Task from Rack	No	Yes[3]	No	Yes	Yes	No	Yes	Yes
Load All POB Files	No	No	No	No	No	Yes	Yes	Yes
Load All	No	No	No	No	No	No	No	Yes
Delete All Tasks	No	No	No	No	No	No	Yes[4]	Yes
Start All Tasks	No	No	No	No	No	No	Yes[4]	Yes
Stop All Tasks	No	No	No	No	No	No	Yes[4]	Yes
Load AutoMax OS	No	No	No	No	No	No	No	Yes
Load Single UDC OS	No	No	No	No	No	No	Yes[1]	Yes
Load All UDC OS	No	No	No	No	No	No	Yes[1]	Yes
Modify PC Task	No	No	No	No	No	No	Yes	Yes
Auto Run	No	No	No	No	No	Yes	Yes	Yes
Monitor	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: A user with privileged access may relinquish this privilege by timing out after two minutes off-line, or by selecting to relinquish access on-line. Functions not listed in the table do not require privileged access.

1 Must have TASK Access to both tasks in UDC.

2 A single task may be loaded with only DATA Access if the task does not already exist on the Processor or UDC module.

3 Requires TASK or RACK Access.

4 Must have TASK Access to all tasks.

Appendix E

AutoMax and UDC Operating System Part Numbers

The following table shows the operating system part numbers which can be displayed in the on-line Processor Info/Log or UDC Info/Log.

Part Number	OS Type	AutoMax Exec. Version
422503-033C	6010 Standard	Version 3.3C
422503-033D	6010 Standard	Version 3.3D
422503-033E	6010 Standard	Version 3.3E
422503-033F	6010 Standard	Version 3.3F
422526-033C	7010	Version 3.3C
422526-033D	7010	Version 3.3D
422526-033E	7010	Version 3.3E
422526-033F	7010	Version 3.3F
422544-033C	UDC	Version 3.3C
422544-033D	UDC	Version 3.3D
422544-033E	UDC	Version 3.3E
422544-033F	UDC	Version 3.3F
422547-033C	6010 Ethernet	Version 3.3C
422547-033D	6010 Ethernet	Version 3.3D
422547-033E	6010 Ethernet	Version 3.3E
422547-033F	6010 Ethernet	Version 3.3F

Appendix F

AutoMax Task Execution

This appendix provides background information about how AutoMax tasks execute. The Run-Time Programming Executive software does not support changing of any tasks or changing how they are executed in the rack.

In AutoMax applications that incorporate multi-tasking, task execution is determined by eligibility to run. A task's eligibility, in turn, is determined by its priority, scan time, and any links to other tasks built into the task by the application software supplier. This appendix describes task execution for AutoMax application tasks. Refer to S-3006 for a description of the task execution for UDC tasks.

Priority

Task priority refers to the relative importance of a task in the application. Tasks whose execution is more critical to the operation of the controlled machinery should be assigned higher priority. Priority can range from 1 (highest) to 11 (lowest). Priority is specified by the programmer when adding a task to the rack.

Scan Time

Scan time refers to how often the task is scheduled to be executed. It is usually measured in ticks. A tick rate can be assigned for each AutoMax Processor. The tick rate can range from 5.5 ms to 10.0 ms. The default tick rate is 5.5 ms. For example, an AutoMax task with a 20 tick scan time (using the default tick rate) means that the task is scheduled to start every 110ms.

Scan time is specified differently for PC/Ladder Logic, Control Block, and BASIC tasks. In each case, before setting the scan time, it is important to know approximately how long the task takes to execute. For example, a task that takes 20ms to execute cannot be assigned a scan time of 2 ticks because a 20ms task cannot be started every 11ms. This situation would result in an overlap error (error code 14 would be displayed on the Processor and all tasks in the rack would be stopped).

Scan time for PC/Ladder Logic tasks is set using the PC Editor in the full AutoMax Programming Executive software. The F8 key, followed by T, allows the programmer to enter the scan time. The screen display will indicate the approximate execution time of the task, determined by the Executive software. The AutoMax Ladder Logic language instruction manual contains execution time estimates for each type of Ladder Logic operation.

For AutoMax Control Block tasks, the scan time is specified in ticks using the SCAN_LOOP statement. The approximate execution time of the task can be calculated using the execution time estimates found in the AutoMax Control Block language instruction manual (J-3678).

The scan time for BASIC tasks is usually specified in the START EVERY statement. The START EVERY statement, which is optional, allows the programmer to use seconds, minutes, and hours, as well as ticks, as the time unit. Note that there is no simple method of estimating execution time for BASIC tasks ahead of time. One method of estimating execution time for a specific BASIC task is to include a statement that turns on a DC output at the beginning of the task (after the START EVERY statement, if used) and turns it off at the very end of the task. Then the task is put into run with no other tasks running, and an oscilloscope is used to measure the time that the output is on.

Synchronizing Tasks

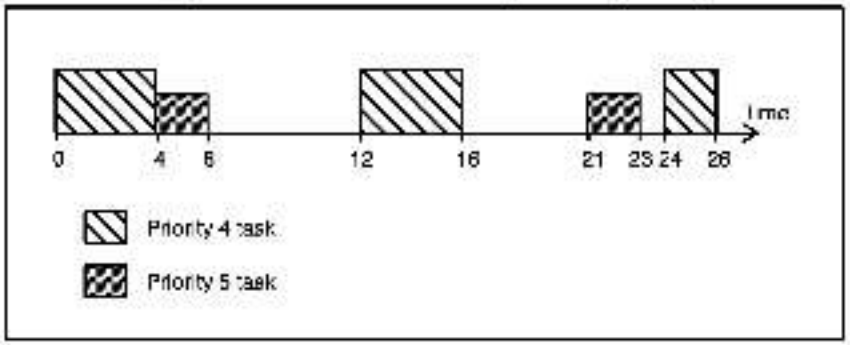
The implications of scan time and priority are particularly important in applications that require tasks to share data or to be synchronized based on hardware or software events. Priority, however, cannot be used to synchronize tasks on different Processors. This is because each Processor controls only the scheduling of the tasks that reside on it. Therefore, the concept of task priority is relevant only for the Processor on which the tasks reside. Task synchronization between AutoMax Processors and UDC modules is handled by interrupts. See S-3006 for more information about UDC tasks.

In addition to priority, there are other methods of synchronizing tasks that work with both tasks on the same Processor and tasks on different Processors. In BASIC tasks, statements such as DELAY, WAIT, SET, OPEN, and INPUT can be used for this purpose. In Control Block tasks, the EVENT parameter in the (required) SCAN_LOOP statement is used to synchronize tasks. PC/Ladder Logic tasks use the EVENT coil for task synchronization.

Examples of Task Execution

The scan time required for the highest priority task on the AutoMax Processor should be used as a guide to determine how tasks should be scheduled. It is also necessary to factor in system overhead, e.g., communication with the personal computer, when assigning priority and scan time. Total Processor utilization should be kept to 80–85%. Processor utilization can be monitored using the Info/Log option in the Executive software.

See the figure below for an example of task execution. Assume you have a priority 4 PC/Ladder task that needs to be executed approximately every 12 ticks and that takes 4 ticks to execute. Assume you also have a less critical priority 5 BASIC task that needs to be executed approximately every 17 ticks and takes 2 ticks to execute. The PC/Ladder task would start at time 0, then finish execution at 4 ticks. At this point the BASIC task would be eligible to run (its time 0).

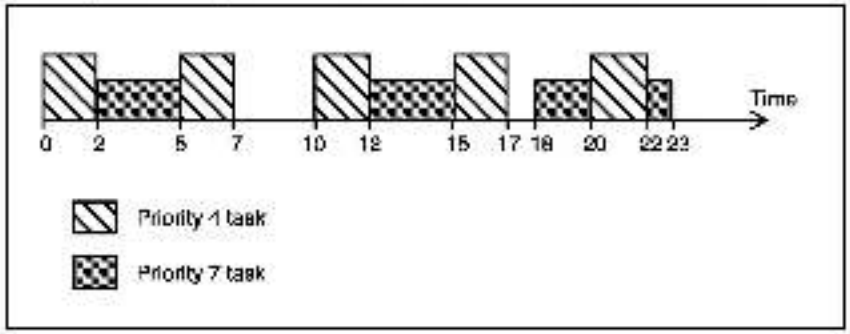


If there are any scheduling conflicts between tasks, i.e., more than one task is ready to run, priority takes precedence over scan time. A higher priority task that is scheduled to run can suspend a lower priority task, regardless of whether the lower priority task is ready to begin execution or has already begun executing. The suspended task is allowed to execute or continue execution from where it was suspended only after the higher priority task is finished.

Consider the following example. There are two tasks on a Processor: a priority 4 Control Block task that needs to be executed every 5 ticks and a priority 7 BASIC task that needs to be executed every 8 ticks. Assume the Control Block task requires 2 ticks to execute and the BASIC task requires 3 ticks to execute.

The Control Block task starts, and finishes executing 2 ticks later. At this point, the BASIC task is eligible to run its time 0). When it finishes, the time elapsed from the point of view of the Control Block task is 5 ticks and the higher priority task can then execute again. At 10 ticks, however, both the Control Block and the BASIC task are scheduled to run. Because the Control Block task has a higher priority, it will execute first. The BASIC task will execute immediately afterwards.

Note that although the BASIC task was prevented from executing at the originally scheduled 10 ticks, it is still scheduled to run again at the next 6-tick interval, i.e., at 16 ticks. Two ticks into this scan, however, it will be suspended by the Control Block task which is scheduled to run at 20 ticks. After the Control Block task completes its scan, the BASIC task will continue the remainder of its scan.



Initial Scan

In applications that require multiple interdependent tasks, the programmer needs to ensure that the structure of the individual tasks takes into account the possible timing lag between execution of different types of tasks. The first scan of the task is used to execute only the initialization code for the following types of tasks: all BASIC tasks with a START EVERY statement, all PC/Ladder Logic tasks, and all Control Block tasks.

Control Block initialization code consists of all statements before the SCAN LOOP statement. BASIC task initialization code consists of all statements before the START EVERY statement. PC/Ladder Logic task initialization code is constructed by the Executive software.

BASIC tasks without a START EVERY statement do not have initialization code and are always executed in total (if they are not suspended by a higher priority task which is scheduled to run) during their first scan. Execution of BASIC tasks without a START EVERY statement is based only on their priority or their links to other tasks because there is no method of establishing scan time without a START EVERY statement. Note that this type of BASIC task is executed only once unless it includes a GOTO statement that results in a loop.

Appendix G

Limitations on Object File Size

This appendix explains application and configuration file limits. Note that there are limits both on the size of tasks that can be compiled and on the size of tasks that can be loaded onto the rack.

When BASIC, Control Block, and Configuration files are compiled using the Ta AutoMax Programming Executive software, the object, symbol, and data size are printed to the screen and totaled. For Control Block tasks, estimated execution time is also printed to the screen. Note that for BASIC and Control Block tasks, the data required for arrays is included in the total displayed but does not actually affect the maximum allowable task size.

Task Size Limitations

	Object	Symbol	Data
Configuration file	*	**	**
BASIC task	***	64K	***
AutoMax Control Block task	32K	<------ 32K ------>	
UDC Control Block task	20K	<------ 20K------>	
	# of Symbols		
PC/Ladder Logic task	2047		

* The configuration file has an object size of 0 unless the reconstructible option is used.

** The size limit for the configuration file is determined by the amount of memory available on the Common Memory module (M/N 57C415B or M/N 57C423), or if a Common Memory module is not being used, the AutoMax Processor that will store the configuration file.

*** The size limit for the object and data is determined by the amount of memory available for application tasks on the AutoMax Processor that will run the task. Refer to the AutoMax Processor Module Instruction manual (I-3650) for this information.

Determining the Size of Individual Tasks

For Control Block, BASIC, and Configuration files, after the task is compiled, the pertinent information is printed to the screen both in terms of object, symbol, and data, and in total. To the total figure add approximately 1K for system overhead. This figure will tell you how much memory on the Processor or UDC each task requires. You can also choose to create log files when you compile or verify application tasks. The log file will contain the same statistics printed to the screen.

For PC tasks, the command FS I in the PC editor is used to determine both the number of symbols and the approximate amount of memory the task will require on the Processor (this includes system overhead).

Application Task Memory Utilization in the Rack

See instruction manual I-3650 for the amount of memory available on each Processor module. In racks with a single Processor, add the total size of all the application tasks and the configuration to determine the amount of memory they will require on the Processor. In racks with multiple Processors, the configuration file will reside on the Common Memory module (M/N 57C413 or M/N 57C493 in slot 0). To determine the amount of memory that will be utilized on each Processor, add the total size of all the application tasks that will reside on each Processor.

Note that if you have deleted and re-loaded tasks numerous times, or have added new tasks to the rack, the memory available in a Processor module may become fragmented. That is, there may be enough memory for the file you want to load, but the memory may not be contiguous. In this case, you can save all of the tunable variable values back from the rack (Save/Tun/All) and then save all the tasks back from the rack (Save/All). Then re-load all of the tasks to the rack using the Load/All option. Use the Monitor function to set the values of the tunable variables to the values listed in the .TUN files.

In rare cases, PC/Ladder Logic tasks that are within the limit specified above may not be loadable on a Processor. This is due to the manner in which Processor memory is allocated for bit variables in PC tasks. The smallest amount of Processor memory that can be allocated for any PC task variable is one word (16 bits). Each 16-bit register used in the PC task requires one word of memory. Individual bits within registers also require one word of memory. However, if more than one bit in a register is used, all those bits can be stored in one word of memory.

When there is a Common Memory module located in slot 0 of the rack (i.e., being used for bus arbitration and common memory storage) there are approximately 1400 words (2.8K) of memory available on each Processor for storing PC task bit variables. If there is no Common Memory module in the rack, or the Common Memory module is in a slot other than 0 (i.e., serving as extra memory), there are approximately 1000 (2K) words of memory available on each Processor for storing PC task bit variables. The M/N 57C435 Processor has approximately 2000 words (4K) of memory available for storing PC task bit variables regardless of whether or not a Common Memory module is in the rack.

This method of allocating space for bit variables will not cause a problem unless you use a large number of single bits within different words. Note that if you have run out of room for PC tasks for this reason, you can still load BASIC and Control Block tasks up to the limit of the Processor's memory.

Note that each physical on-line connection (maximum of four, one to each Processor) made through the Executive software either over the network or directly to the rack will require an additional 5K of memory on the Common Memory module. If there is no Common memory module, the 5K required will be allocated from the Processor.

Appendix H

What Can Go Wrong When Loading Tasks and Files

This appendix describes some problems you might encounter when loading tasks and files to the rack.

H.1 Error Messages on the Personal Computer Screen

Error messages that appear on the personal computer screen are usually specific enough to help you pinpoint any problems you are experiencing. In most cases error messages are also specific to the operation that was in process when the error occurred. When you see an error message on the screen during any loading operation, first write down the message. Then, after checking to make sure your connection to the rack is good, and that you are loading the correct file to the designated Processor or UDC module, re-try the operation. Generally, it is best to load every file (except operating system files, which are loaded separately) and task to the rack at one time using the LOAD ALL option.

This section will describe errors that might be difficult to resolve using error messages only. The section is organized by when the error could occur. However, if you load tasks and files to the rack using the LOAD ALL command, you might see any of these errors during the procedure.

H.1.1 Errors that Occur When Loading an AutoMax Processor Operating System or UDC Operating System

In most cases, errors that occur when loading an operating system to the rack are due to improper cabling or high Processor or UDC utilization (a combination of large tasks executing very fast, accompanied by error code "00" on a Processor faceplate). Always make sure that you have a good connection between the personal computer and the rack before trying to communicate with the rack. In addition, it is good practice to stop any tasks that are running in the rack (using the STOP ALL command) before trying to re-load an operating system to the rack. In most cases, re-trying the loading operation will be successful. In rare cases, it may be necessary to replace a Processor module or UDC module in the rack.

H.1.2 Errors that Occur When Loading a Rack Configuration or Parameter Object File

Errors that can occur when loading a rack configuration are usually due to a mismatch between the actual hardware in the rack and what is described in the configuration. For example, it is possible that the configuration describes a hardware module that was mistakenly placed into the wrong slot in the rack, or one that was not installed in the rack at all. It is also possible that the configuration file or parameter object file is actually meant for another rack. Error

messages displayed while loading a UDC task may reference PMI tunables, task tick rates, or a "PMI OS." These error messages indicate a problem in UDC tasks or the UDC operating system.

H.1.3 Errors that Occur When Loading Tasks

Errors that can occur when loading tasks are usually specific enough to pinpoint the problem. If a particular task is specified in the error message, contact your software supplier. Error messages displayed while loading a parameter object file may reference PMI tunables, task tick rates, or a "PMI OS." These error messages indicate a problem in UDC tasks or the UDC parameter object file. Other errors that may occur:

"Task not found"

- attempting to load a task that does not exist in the specified directory on the personal computer

"Task not installed"

either a task or the rack configuration file has not been loaded into the rack successfully

"Critical task cannot be stopped by itself"

- only a STOP ALL command can stop this task, which you are trying to stop individually

"Task already exists in chassis" and "Given UDC drive already contains a task"

- warns you that if you continue with the loading operation, you will overwrite an existing task with the same name

"Invalid data type in symbol table" or "Invalid control type in symbol table"

- there is an error in the configuration file in this rack; it is also possible that the wrong configuration file has been loaded or a wrong task has been loaded

"Too many tunables"

too many tunable variables defined in a UDC task

"No symbol table present" or "Array name not found"

- error in the configuration file in this rack

H.1.4 Errors that Can Occur in More than One Type of Loading

If an error message indicates insufficient memory on a Processor, the configuration and/or tasks are too large for the amount of memory available on a Processor. Note that this error may occur even if there is technically enough memory (in kilobytes) on the Processor. If tasks have been deleted from the rack or loaded to the rack numerous times individually, the memory available may be fragmented into many small areas, none of which are large enough to store the task or configuration file.

If you see the error **"No common storage allocated,"** there has been an error in the sequence of loading. In this case, you must load (or re-load) the rack configuration to the Processor module. It is very important to load the files in this order if you are loading individual files. Alternately, you can choose the LOAD ALL command and the

Programming Executive software will automatically load the files in the correct sequence.

H.2 Processor or Universal Drive Controller Module LEDs Displaying Errors

If the Processor module OK LED is off or the two seven-segment LEDs on the Processor faceplate display a code, see instruction manual I-9650, which describes the AutoMax Processor module. If the seven-segment LEDs display "LO" (reading top to bottom), this simply means that you need to load the operating system to the Processor.

For racks containing a Universal Drive Controller module, the "OS OK" LED on the module will turn on only after it has received its operating system. See instruction manual S-9007 in binder S-9000 for more information about the Universal Drive Controller module.

H.3 Loss of Task Modifications Made On-Line

If you or someone else makes changes to tunable variables in existing application tasks in the rack, or makes changes to Ladder Logic/PC tasks on the rack, you must save those tasks back from the rack to the personal computer. This will ensure that you have a copy of the same task on both the personal computer and the rack. Section 10.4 describes how to save tasks back to the personal computer.

If you do not save tasks back from the rack to the personal computer, and a situation arises that requires you to re-load all tasks to the rack, the version of each task that does exist on the personal computer will write over the version in the rack when all tasks are loaded. If the version of the task on the personal computer is not the most up-to-date version, that is, you or someone else made the changes described above to tasks in the rack, the changes will be lost.

H.4 Tasks in the Rack Do Not Go into Run

Tasks in the rack will go into run, i.e., execute the instructions stored in the task, when they are put into run by the operator using the RUN command described in section 11 in this instruction manual. The status (run, stop, or error) of all tasks in the rack can be accessed from the ON LINE menu display described in section 7.3. If tasks are not running and there is no error in the rack, you can use the RUN command to start a task or all tasks in the rack. Review section 11 thoroughly before putting one or all tasks into run.

The nature of the application may require that tasks go back into run after a power cycle (power going off, then on). This is made possible by using the AUTO RUN software switch described in detail in section 6.16 in this instruction manual. If AUTO-RUN is enabled when power is turned off and then turned on again, all tasks that were in run when power went off will go into run again, assuming there are no errors in the rack.

If AUTO-RUN is enabled and tasks do not automatically go into run when power is turned back on, there is an error in the rack. Review section 6.16 thoroughly and troubleshoot the problem.

Appendix I

Using an AutoMax PC Link Module for On-Line Communication

The AutoMax Run-Time Programming Executive software supports the use of the AutoMax PC Link interface module (M/N 57C715) to communicate with a rack over the AutoMax Network. The PC Link module is functionally equivalent to a Network Communications module, and allows the personal computer in which it is installed to function as a drop on the AutoMax Network. By using AutoMax PC Link modules, up to four PC workstations can communicate with a single AutoMax rack.

Use the procedures described in the AutoMax PC Link Interface Module instruction manual (I-E93011) to configure and install the PC Link module in the personal computer, and to load the PC Link software onto the personal computer's hard disk. **Note that the PC Link software (included with the PC Link module) must be loaded to the same directory as the AutoMax Programming Executive software (C:\AMX3RUN).** This will ensure that the PC Link module is recognized by the Run Time Executive.

Configuring On-line Communication

In order to use the PC Link module for on-line communication, you must modify the On-line communication setup for the AutoMax RunTime Executive by manually editing the AUTOMAX.INI file located in the directory AMX3RUN on drive C:.

You must set Use_Serial_Port=NO and then specify a PCLink_Drop number that is not already used by a Network module or another PC Link module. Drop numbers are 1 through 99 (default). You must also specify the base memory address (0xD000 (default), 0xD400, 0xD800, 0xDC00), and the port address (0x250 (default), 0x258, 0x260, 0x268) for the PC Link module. The base memory address and port address parameters must match the parameters set on the PC Link module when it was installed in the personal computer. The PC Link module will be configured with a drop depth of 1. If there is more than one PC Link module in a personal computer, AutoMax will use the PC Link module whose base memory address and port address matches the addresses found in Communication section in the AUTOMAX.INI file.

The following is a list of the parameters that must be set in the AUTOMAX.INI file:

[Communication]

Use_Serial_Port=NO		Use Serial Port or PC Link Card Yes = Serial Port, No = PC Link
Com_Port=1	-	Use Com 1 or Com 2 (1 or 2)
Com_Baud=19200	-	Set Max. Baud Rate for Serial Port 19200, 9600, 4800, 2400, 1200
PCLink_Drop=99	-	Drop 1 – 99, Default 99
PCLink_Seg=0xD000	-	Base Memory Address, 0xD000 (default), 0xD400, 0xD800, 0xDC00
PCLink_Port_Addr=0x250	-	I/O Port Address, 0x250 (default), 0x258, 0x260, 0x268
Timeout_Scale=1	-	Must be set to 1

[Setup]

Workspace Drive=C		Must be drive C:
Workspace Directory=AMX3RUN	-	Must be directory AMX3RUN

Troubleshooting

If the "Load OS" or "Online" commands cause the error "Bad port address/memory segment", verify that the information that you configured in the Communications section of the AUTOMAX.INI file matches the physical hardware configuration of the PC Link module.

If the personal computer "hangs" when executing the "Load OS" or "Online" commands, verify that there are no other devices using the port address or memory segment that you have selected for the PC Link module. Refer to the PC Link Module Instruction Manual (J2-3011) for instructions on how to exclude memory segments when using a memory management program.

If an error referencing a missing RE2INST.EXE file appears, verify that this file exists in the AutoMax Run Time Executive directory (/AMX3RUN). If a message that the drop is not available appears, change the Communication section in the AUTOMAX.INI file to a drop that is available (not used).

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