

Compumotor



Motion Architect[®] User Guide

Compumotor Division
Parker Hannifin Corporation
p/n 88-013056-01



Motion Architect®

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WARNING



Motion Architect is used to control your system's electrical and mechanical components. Therefore, you should test your system for safety under all potential conditions. Failure to do so can result in damage to equipment and/or serious injury to personnel.

Technical Assistance

Contact your local automation technology center, or ...

**North America
& Asia** Compumotor Division of Parker Hannifin
5500 Business Park Drive
Rohnert Park, CA 94928
Telephone: (800) 358-9070
Fax: (707) 584-3793
BBS: (707) 584-4059

Europe Parker Digiplan
(non-German speaking) 21 Balena Close
Poole, Dorset
England BH17 7DX
Telephone: 0202-690911
Fax: 0202-600820

**Germany, Austria
& Switzerland** HAUSER Elektronik GmbH
Postfach: 77607-1720
Robert-Bosch-Str. 22 • D-77656 Offenburg
Telephone: (0781) 509-0
Fax: (0781) 509-176

Change Summary

Motion Architect User Guide

Revision C

The following is a summary of the primary technical changes to this user guide since the last version was released. This user guide, p/n 88-013056-01C (released in August 1994), supersedes 88-013056-01B.

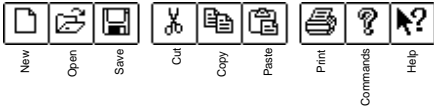
| Topic | Description | | | | | | | | | |
|-------------------------------|---|-----------------|--------|------|-------------|--------|-----------------|------|------|----------|
| Add-on Utilities | <p>Servo Tuner™: References to the Servo Tuner option for Motion Architect have removed to the new Servo Tuner User Guide (p/n 88-014249-01).</p> <p>CompuCAM is a new add-on module to Motion Architect (it can also be launched separately from Motion Architect). CompuCAM allows you to translate DXF, HP-GL, and G-Code files into 6000 Series Language motion programs.</p> <p>After add-on utilities are installed, they can be launched from the Utilities menu.</p> <p>To order CompuCAM or Servo Tuner, contact your local Automation Technology Center.</p> | | | | | | | | | |
| Installation | The procedure (setup utility) for installing Motion Architect has been changed. | | | | | | | | | |
| DLL (dynamic link library) | <p>Refer to the 6000 Series Programmer's Guide for instructions on using Compumotor's DLLs.</p> <ul style="list-style-type: none">WIN6400.DLL provides communication and fast status services for all 6000 Series bus-based products (not just the AT6400). Function prototypes, type definitions, and error conditions can be found in WIN6400.H.Functions added: Is controller ready; Timeout; Delay; Get extend fast status; and Send file. | | | | | | | | | |
| New Products Supported | <p>Motion Architect now supports these 6000 Series products, as shown in the product selection dialog box:</p> <table><tbody><tr><td>AT6400-AUX1</td><td>AT6250</td><td>6270</td></tr><tr><td>AT6400-AUX2</td><td>AT6450</td><td>APEX615n Series</td></tr><tr><td>6200</td><td>6250</td><td>ZETA6104</td></tr></tbody></table> | AT6400-AUX1 | AT6250 | 6270 | AT6400-AUX2 | AT6450 | APEX615n Series | 6200 | 6250 | ZETA6104 |
| AT6400-AUX1 | AT6250 | 6270 | | | | | | | | |
| AT6400-AUX2 | AT6450 | APEX615n Series | | | | | | | | |
| 6200 | 6250 | ZETA6104 | | | | | | | | |
| Panel Module Enhancements | <ul style="list-style-type: none">Following motion (master cycle number, master cycle position, master velocity, and net position shift) and Following status (TFS status report) may be displayed.Status of the ANI inputs (servos with ANI option) may be displayed—see "Hi-Res Analog Inputs".When you launch the Panel module, the controller is automatically "connected" (communication is established). When you close the Panel module, the controller is automatically disconnected. The changes you make under the Settings menu are automatically saved for subsequent Panel sessions.NOTE: The Panel module is considered a "test panel", not an "opera tor panel". | | | | | | | | | |
| On-Line Reference Guides | <ul style="list-style-type: none">The on-line <i>6000 Series Software Reference Guide</i> (see 6000 Software Reference) has been updated. Refer to the Help menu.The on-line <i>6000 Following User Guide</i> (see 6000 Following Reference) has been added. Following instructions and Following-specific command descriptions are found in this utility. Refer to the Help menu. | | | | | | | | | |
| Editor Module Enhancements | <ul style="list-style-type: none">A toolbar has been added to provide easy access to common functions:  New Open Save Cut Copy Paste Print Commands HelpThe View menu allows you to display or hide the toolbox and the status bar. You can also customize the fonts and colors in the editor window."Navigate" and "Search" have been removed from the menu header. Refer to the list of keystroke shortcuts on page 12.Editor now supports 255 levels of "Undo". "Redo" reverses the previous "Undo".Print Preview is now supported (see File menu). | | | | | | | | | |
| Terminal Module Enhancements | <ul style="list-style-type: none">Same toolbar and View enhancements as noted above for the Editor.Now you can paste code from the clipboard into the active Terminal window, where the code is immediately executed by the controller.When you launch the Terminal module, the controller is automatically "connected" (communication is established). When you close the Terminal module, the controller is automatically disconnected. The changes you make under the Settings menu are automatically saved for subsequent Terminal sessions.Print Preview is now supported (see File menu). | | | | | | | | | |

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W E L C O M E

Introducing Motion Architect®

Welcome to Motion Architect, a Microsoft® Windows™ based application development system to help you design, develop and debug programs for the entire 6000 Series motion controller family.

The heart of Motion Architect is the Shell, which provides an integrated environment to launch the following modules:

- **System Configurator and Code Generator (Setup):** Automatically generate controller code of basic system set-up parameters (I/O definitions, encoder operations, drive setup, etc.), based on answers you give to dialog boxes.
- **Program Editor (Editor):** Create blocks or lines of 6000 Series controller code, or copy portions of code from a previous file. You can save Editor files for later use in a high-level program (e.g., BASIC, C, etc.), or in the Terminal or Panel modules.
- **Terminal Emulator (Terminal):** Communicating directly with the 6000 Series product, the terminal emulator allows you to type in and execute controller code and transfer code files to and from the controller. Owners of 6000 Series bus-based controllers can transfer (download) the soft operating system.
- **Test Panel and Program Tester (Panel):** Create your own test panel to exercise your programs and check the activity of I/O, motion, system status indicators, timers and counters, and communications interface.

Help Utilities

In addition to the functions of the above modules, Motion Architect gives you these on-line resources (see **Help** pull-down menu):

- **Context-Sensitive Help:** Access via the **Help** pull-down menu, the **Help** buttons in the dialog boxes, or by pressing the F1 key at any time. This resource provides comprehensive help information about the modules.
- **On-Line User Guide:** *6000 Series Software Reference*

Optional Modules

The modules listed below are sold separately as add-on utilities to Motion Architect. After they are installed, you can access them from the **Utilities** menu. To purchase one of these options, contact your local Automation Technology Center or distributor.

- **Servo Tuner™** (Tuning and Data Gathering Tool): Tune the drive(s) and the controller and receive instant data feedback on customizable displays.
- **CompuCAM™:** CAD-to-Motion (CAM) software allows you to translate DXF, HP-GL, and G-Code files into 6000 Series Language motion programs.

Before You Begin

User Guide Contents

- **Chapter ①—Motion Architect Basics:**
 - Motion Architect's on-line help and on-line reference guide utilities
 - Standard file operations (New, Open, Save, Save As, and Exit)
 - Managing multiple windows within one module
 - Productivity tips
- **Chapters ②-⑤:** These chapters describe how to use each of Motion Architect's four main modules (Setup, Editor, Terminal, and Panel). Information about the optional add-on modules, such as Servo Tuner and CompuCAM, (see Utilities menu) are provided in their respective user guides.

Who Should Use Motion Architect?

This software is intended to be used by software engineers or others responsible for programming 6000 Series products for motion control applications.

Windows™ Operating System Experience

To use Motion Architect most effectively, you should be familiar with the Windows operating environment. If you are new to the Microsoft Windows operating system, refer to your **Microsoft Windows User's Guide** to learn about the basic skills you need to work with Windows-based applications—such skills include:

- Mouse and keyboard techniques
- Standard file operations (opening, closing, saving, printing, etc.)
- Managing windows
- Using menus and dialog boxes

Hardware and Software Requirements

Motion Architect requires the resources listed below (this does not include memory requirements for optional add-on modules).

- Microsoft® Windows™ release 3.1 or later
- At least 2 MB of RAM
- At least 3 MB of hard disk space

Make a Backup Copy

*5-1/4" diskettes
may be requested
from your local
distributor.*

Motion Architect is shipped on two 3-1/2" high-density diskettes. Before you install Motion Architect on your hard disk, make backup copies of each diskette in your Motion Architect package (refer to your operating system manual for instructions). Label the diskettes identical to the originals. After you have made copies, store the originals in a safe place and use the copies as working copies.

Install Motion Architect on Your Hard Disk

- Step 1* Insert the Motion Architect diskette labeled *Disk 1 with Setup* into floppy disk drive **A**.
- Step 2* From the Program Manager, click **File** and choose **Run**. You can also do this from the File Manager. When the dialog box appears, type **a:setup**. When the Welcome screen appears, click **Continue**. After a short period, the registration screen will appear.

Step 3 In the Custom Installation dialog box, you can specify the location where you want to install Motion Architect, and you can select only those parts of Motion Architect you wish to install.

Unless otherwise specified with the **Set Location** option, Motion Architect will be installed in the MA6000 sub-directory.

In the Installation Options area, select the parts of Motion Architect you wish to install:

- **Motion Architect Program** installs the files necessary to run Motion Architect.
- **Motion Architect Help** installs the on-line help system for Motion Architect.
- **SDK/VB Samples** installs sample Microsoft C and Visual Basic source code that you can use to create your own Windows motion application.

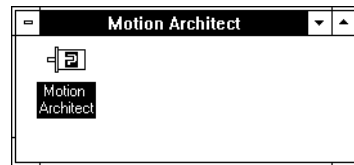
Also, in the Installation Options area, select one or more 6000 Series products that you will be working with.

After you have made the appropriate selections, click **Install**. If you selected **Motion Architect Help**, you will be prompted to insert "Disk 2" of the two Motion Architect diskettes. If you selected a 6000 Series bus-based product to work with, you will be prompted to insert the "DOS Support Disk" (the support disk that ships with the product and contains the soft operating system).

Step 4 After the installation is complete, the Installation Complete dialog box appears. At this point, you have the options of reading the README file, running Motion Architect, or returning to Windows.

Launching Motion Architect

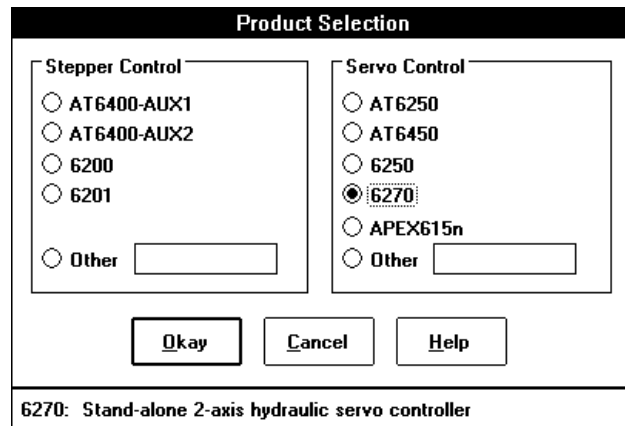
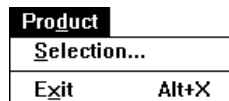
After the setup utility has finished installing Motion Architect, the following program group (**Motion Architect**) will appear.



To launch Motion Architect, double-click on the Motion Architect icon. The Motion Architect *welcome* screen will appear. Click the **Okay** button to remove the screen. After a few moments, the Shell window will be displayed.

Selecting a 6000 Series Product

Click **Product** on the Motion Architect shell menu bar and choose **Selection**. When the dialog box appears, select the 6000 Series product you are using and click **Okay**. As an example, the dialog box below shows that the 6270 is selected. The product you select here will be automatically selected the next time you launch Motion Architect.



OEM Products:
Type in the name of your product in the "Other" field.

Motion Architect Basics

Shell Window

When you launch Motion Architect, the first window you see (after the start-up screen) is the *Shell*. Consider this window *home base*, if you will, for using Motion Architect. From the Shell window, you can do the following:

- Click the **P**roduct menu to select, or change, the 6000 Series product for which you are using Motion Architect (see *Step ①* in the installation procedure).
- Launch the four main modules of Motion Architect (**S**etup, **E**ditor, **T**erminal, and **P**anel).
- Launch optional add-on modules, such as Drive Tuner, Servo Tuner, or CompuCAM (**U**tilities).
- Access the on-line help utilities (**H**elp).

On-line Help (**H**elp)

| |
|---------------------------|
| Help |
| Index |
| Using Help |
| 6000 C ommands... |
| 6000 S oftware Reference |
| 6000 F ollowing Reference |
| A bout... |

Menu varies by module

From the menu bar in the Shell or any module, you can access the on-line help system by clicking on **H**elp, or by pressing the F1 key when a menu item is selected. The **H**elp pull-down menu items are briefly described below.

Tip ☞ Click on the underlined green words, known as *jump words*, to get information on a specific topic.

- **H**elp for help. The same help resource for all modules, describes how to use the on-line help system's features.
- **K**eys help. Defines the short-cut (*hot*) keys you can use within a particular module to help you select certain commands or menu items faster.
- **H**elp index. Provides information on how to use the particular module from which you accessed the on-line help system. The information is categorized by the items that appear in the module's menu bar.

- **6000 Commands.** Displays the Command Dialog Box, from which you can look up commands, edit them, and insert them into an active program editor session or terminal emulator session. For more information, refer to *Command Dialog Box* below.
- **6000 Software Reference.** Brings you directly to the Contents menu of the on-line version of the **6000 Series Software Reference Guide**. This is a valuable resource for detailed command descriptions and programming guidelines.
- **6000 Following Reference.** Brings you directly to the Contents menu of the on-line version of the **6000 Series Following User Guide**.
- **About.** Displays revision and copyright information.


Help Window Buttons

The buttons under the menu bar allow you to navigate through the on-line help system:

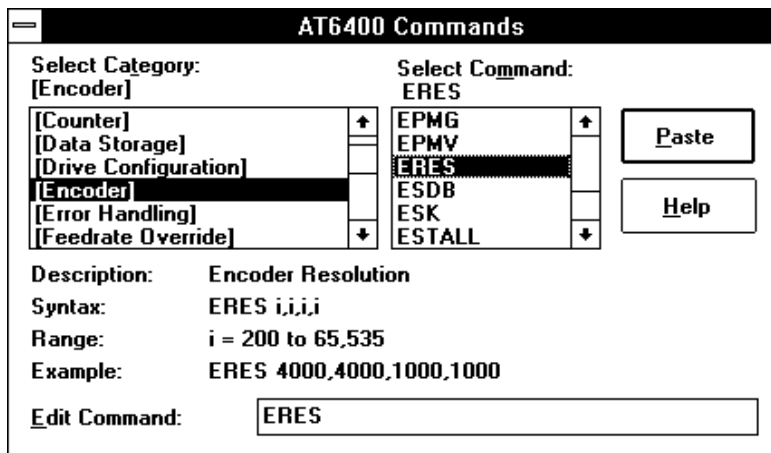


- **Contents** will display the table of contents for the help system. Clicking on an underlined green item will take you to a particular topic.
- **Search** will allow you to jump to topics based on a keyword search.
- **Back** will take you back to the previously selected topic.
- **History** shows a complete record of your movements through the on-line help session.
- **Glossary**, not shown on some menu bars, provides definitions of commonly used terms in the help system.
- **<< or >>**, not shown on some menu bars, allows you to browse backward or forward through a sequence of topics.

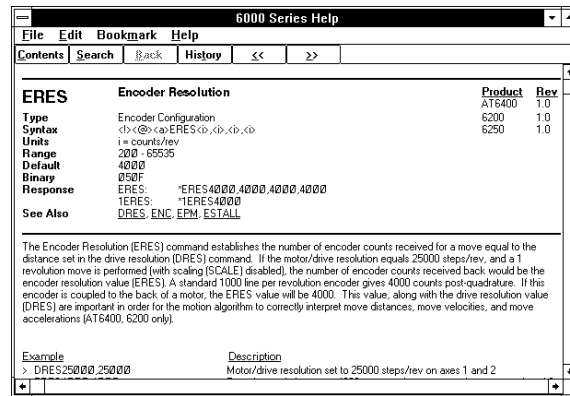
Command Dialog Box (6000 Commands)

Clicking on the **6000 Commands** menu item launches a dialog box similar to the one shown below (this dialog box can also be accessed in the Terminal and Editor modules by selecting the  button on the toolbar).

Selecting a command category will fill the adjacent list box with commands from that category. Selecting a command from the command list box will fill the edit box at the bottom of the dialog where further editing can be done. Clicking on **Paste** will paste the command from the edit box to the Editor or Terminal session you have open at the time (command is pasted at the location of the cursor).



Clicking on the **Help** button displays a detailed description of the command, as provided in the **6000 Series Software Reference Guide** (example below).



Standard File Operations (**File**)

| File | |
|----------------------------|--------|
| N ew | Ctrl+N |
| O pen... | Ctrl+O |
| S ave | Ctrl+S |
| S ave A s... | Ctrl+A |
| E xit | Alt+X |

Menu varies by module

These five standard file operations are found under the **File** pull-down menu in all four modules:

- **N**ew creates a new file.
- **O**pen opens an existing file.
- **S**ave updates the file currently open with the latest edits.
- **S**ave **A**s saves the file currently open as a separate file under a new name.
- **E**xit exits (closes) the module and any open files within that module.

The **New** and **Save As** file operations give you the flexibility of creating multiple controller code files and test panel files to solve complex or fluctuating applications. For instance, if you want to test several different system I/O configurations, you could create several system set-up controller code files with the Setup module. These files could later be edited in the Editor module and tested with several versions of test panels created with the Panel module.

Printing

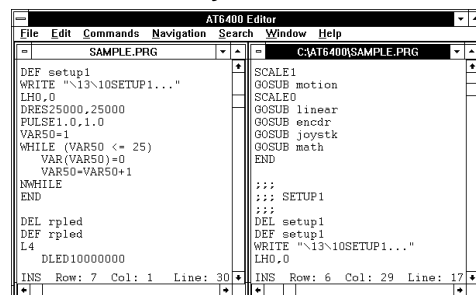
In the Editor and Terminal modules, printing operations (**Print**, **Print Preview**, and **Print Setup**) are included so you can print your controller code files. In the Terminal module, you can print only the contents (up to 1500 lines) of the terminal emulator window.

Arranging Multiple Windows in the Same Module (**Window**)

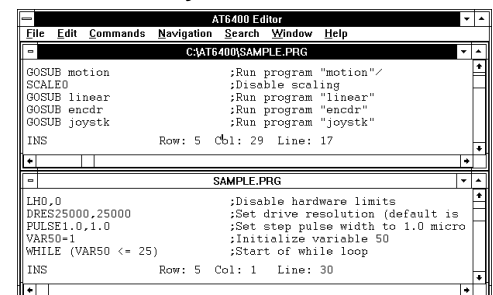
| Window | |
|---|--|
| T ile H orizontally | |
| T ile V ertically | |
| C ascade | |
| A rrange I cons | |
| C lose A ll | |
| 1 C:\AT6400\MIC'S.PRG √ 2 C:\AT6400\SAMPLE.PRG | |

In the Editor and Panel modules, you can work with multiple files or windows open at one time (e.g., viewing multiple controller programs in the Editor module, or viewing several status displays in the Panel module). To help you arrange these windows for easy viewing, use one of the window viewing options under the **Window** menu bar item.

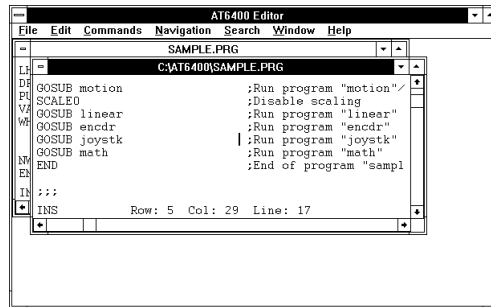
Tile Horizontally:



Tile Vertically:



Cascade:



Arrange (Arranging Icons of Minimized Windows):

If you minimized (reduced to the icon level—see below) some of the windows/files within a module, you can arrange their icons neatly along the bottom of the window by clicking on **Arrange**. To view the minimized window/file, simply double-click the icon.



Close All (Closing All Windows):

Chose **Close All** if you want to close all the windows/files within the module. If you made changes to the open files, you will be prompted with the option to save before closing.

Productivity Tips

- To help with the iterative process of creating and revising programs, open the Editor and Terminal modules and resize the two windows so that they are side by side on your screen. This allows you to easily switch between creating and editing programs in the Editor, and downloading programs and checking responses and error messages in the Terminal.
- Using the keystroke shortcuts (*hot keys*) to select menu commands is faster than if you use the mouse. To learn these hot keys, read the **Keys Help** descriptions under the **Help** menu in each module, or simply look through the pull-down menus for the keystroke listed next to the menu item.
- Use the on-line help, as well as the on-line 600 Software Reference (see **6000 Software Reference** under the **Help** menu):
- If you need to test several different system configurations, controller programs, or test panels, you may want to save several versions of the files created in each module. For instance, if you want to test several different system I/O configurations, you could create several system set-up controller code files with the Setup module. These files could later be edited in the Editor module and tested with several versions of operator panels created with the Panel module.
- Avoid confusion when several windows are open at one time:
 - Avoid having more windows open than you really need.
 - Use the Tiling feature in the Editor module to arrange the windows for easy access to other files you are using.
 - Try resizing windows, especially on-line help and command reference windows, to be less than full screen.
 - If you are working in a module and you lose track of a file's window (e.g., lost behind several others) or if you do not have a mouse, you can access the desired window by selecting its name from the list at the bottom of the **Window** pull-down menu.

System Configuration (Setup)

What is the Setup Module?

The Setup module takes much of the drudgery out of motion control programming. This module automatically generates configuration code in response to your answers to a series of dialogs concerning I/O definitions, encoder operations, homing operations, end-of-travel limits, drive setup, joystick setup, execution modes, etc.

Establishing System Set-up Parameters (Configure)

| |
|-------------------------|
| Configure |
| Define Setup Program... |
| Participating Axes... |
| Step Pulse... |
| Memory... |
| Drives... |
| Axis Scaling... |
| Incremental/Absolute... |
| Limits... |
| Encoder... |
| Outputs... |
| Inputs... |
| Triggers... |
| Analog... |

Under the **Configure** pull-down menu are the configuration parameters to consider for your application. When you select one of these parameters, a dialog box appears. Below is an example of the encoder configuration dialog box. Note that as you complete the configuration of the parameters, a check mark (✓) appears next to the menu item. If you are not going to generate code now, you can save these configuration parameters as a separate configuration (.cfg) file; otherwise, it will automatically be saved along with the program (.prg) file for the resultant code when you click the **Generate** menu (see below).

Encoder Configuration

Axis # Encoder Resolution (post-quad counts/rev)

Encoder Operations

Enable Position Maintenance

Enable Stall Detection

Position Maintenance(PM)

PM Deadband (post-quad counts)

PM Gain

PM Max Velocity (units/sec)

Enable Encoder Move Deadband

Stall Detection

Stall Backlash Deadband (motor steps)

Enable Kill Move on Stall

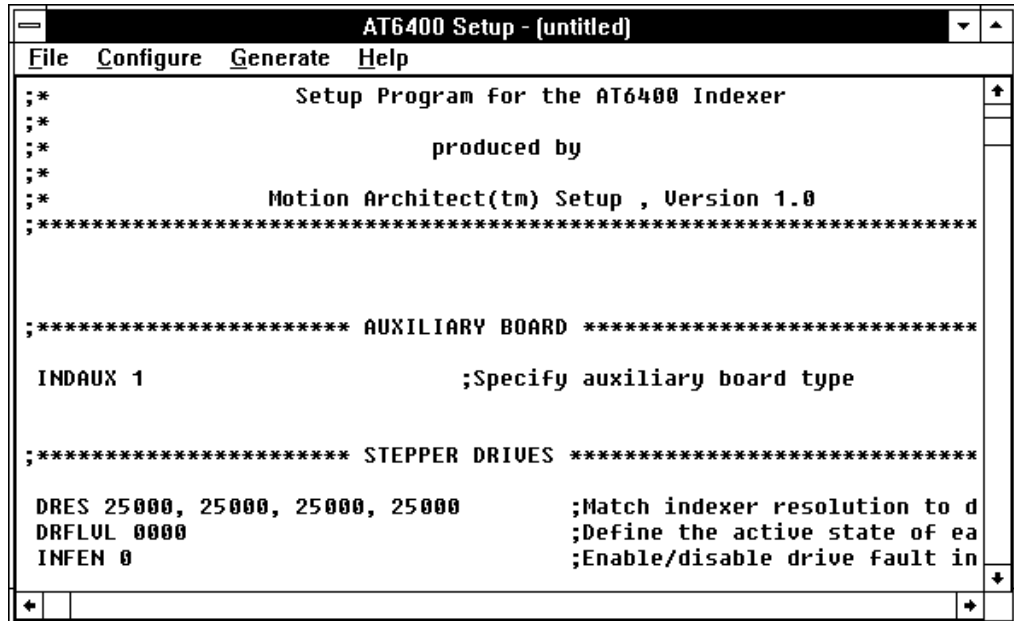
Generating Controller Code For System Set-up Parameters (**Generate**)

After you finish answering the dialog boxes under the **Configure** menu, click the **Generate** menu to view the resultant controller code. A message box will appear to let you know that code generation is complete—click **OK**. After you click **OK**, if you have not saved the configuration parameters established under the **Configure** menu, a **SAVE AS** dialog box appears and prompts you to save these parameters as a separate configuration (.cfg) file. As the .cfg file is saved, a program (.prg) file is automatically saved to store the newly generated code. You can later use this .prg file as a building block for a *set-up* program.

You will find the code to be neatly formatted and fully documented (see example below).

Generate

Controller set-up code is automatically generated, based on your answers to the configuration dialog boxes.



```
AT6400 Setup - (untitled)
File  Configure  Generate  Help
;*          Setup Program for the AT6400 Indexer
;*
;*          produced by
;*
;*          Motion Architect(tm) Setup , Version 1.0
;*****
;***** AUXILIARY BOARD *****
INDAUX 1          ;Specify auxiliary board type
;***** STEPPER DRIVES *****
DRES 25000, 25000, 25000, 25000      ;Match indexer resolution to d
DRFLUL 0000                          ;Define the active state of ea
INFEN 0                              ;Enable/disable drive fault in
```

Program Editor (Editor)

What is the Editor Module?

The Editor module is a tool you can use to create and edit controller programs using the 6000 Series Programming Language. You can then save these programs as separate files for later use in high-level programs (e.g., BASIC, C, etc.), or in the Terminal and Panel modules.

Using the Editor Module

This section describes the functions of the **E**dit and **V**iew menu bar items. The functions of **F**ile, **W**indow, and **H**elp are discussed in Chapter ①, *Motion Architect Basics*.



Printing Controller Code Program Files


The Editor allows you to print your controller code program files. Refer to the printing operation commands under the **F**ile pull-down menu.

Editing Your Controller Code (Edit)

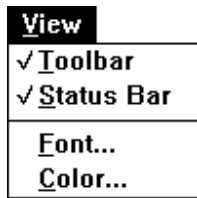
| Edit | |
|--------------------|--------------|
| <u>U</u> ndo | Ctrl+Z |
| <u>R</u> edo | Shift+Ctrl+Z |
| <u>C</u> ut | Ctrl+X |
| <u>C</u> opy | Ctrl+C |
| <u>P</u> aste | Ctrl+V |
| <u>D</u> elete | Del |
| <u>F</u> ind... | |
| Find <u>N</u> ext | F3 |
| <u>R</u> eplace... | |
| <u>S</u> elect All | |
| <u>C</u> lear All | |

Under the **E**dit pull-down menu are commands that help you edit the contents of your motion programs:

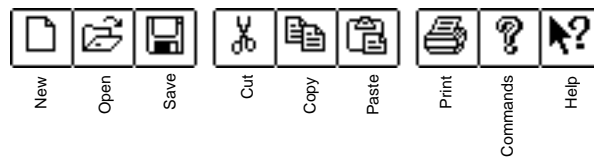
- **U**ndo: Undo the last edit operation, including deleting text (up to 255 consecutive undo operations are possible).
- **R**edo: Undo the last Undo operation (up to 255 operations).
- **C**ut: Cut (remove) highlighted text and send to the clipboard to later paste somewhere else in the same file or in another program file. This function is duplicated by the  button on the toolbar.
- **C**opy: Copy highlighted text to the clipboard to later paste somewhere else in the same file or in another program file, or in an active Terminal session. This function is duplicated by the  button on the toolbar.

- **Paste:** Paste text from the clipboard into any open program file. This function is duplicated by the  button on the toolbar.
- **Delete:** Delete highlighted text.
- **Find:** Search for a specified text string in the active program file.
- **Find Next:** Repeat the last Find operation to find the same text string elsewhere in the same program file.
- **Replace:** Search the entire active program file (or just an area of highlighted text) for a certain text string and replace it with a different text string.
- **Select All:** Select all text in the active program file.
- **Clear All:** Delete (clear) all text in the active program file.

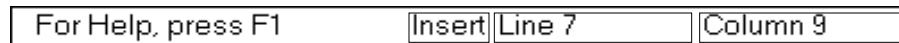
Customizing the Display Window (**V**iew)



- **Toolbar:** Display or hide the toolbar.



- **Status Bar:** Display or hide the status bar at the bottom of the window.



- **Font:** Change the characteristics (type face, size, color, etc.) of the font displayed in the window.
- **Color:** Change the color of the display window.

NOTE: The font and color changes are valid only for the active session and cannot be saved.

Hot Keys (Keystroke Shortcuts)

| <i>Cursor Movement Keys</i> | Press | To move the insertion point |
|-----------------------------|--------------------|--------------------------------------|
| | Up Arrow | Up one line |
| | Down Arrow | Down one line |
| | Right Arrow | Right one character |
| | Left Arrow | Left one character |
| | Ctrl + Right Arrow | Right one word |
| | Ctrl + Left Arrow | Left one word |
| | Home | To the beginning of the line |
| | End | To the end of the line |
| | Page Up | Up one screen |
| | Page Down | Down one screen |
| | Ctrl + Home | To the beginning of the program file |
| | Ctrl + End | To the end of the program file |

Editing Keys

| Press | To |
|------------------------------|--|
| Backspace | Delete one character to the left of the insertion point |
| Delete | Delete one character to the right of the insertion point, or delete the highlighted text |
| Ctrl + C, or Ctrl + Insert | Copy the select text and place it onto the Clipboard |
| Ctrl + X, or Ctrl + Delete | Delete the select text and place it onto the Clipboard |
| Ctrl + V, or SHIFT + Insert | Paste from the Clipboard into the active window |
| Ctrl + Z, or Alt + Backspace | Undo the last editing action (up to 255 levels of undo) |
| SHIFT + Ctrl + Z | Undo the last Undo action (up to 255 levels) |

Text Selection Keys

| Press | To select or cancel selection of |
|-----------------------------|--|
| SHIFT + Left or Right Arrow | One character at a time to the left or right |
| SHIFT + Up or Down Arrow | One line of text up or down |
| SHIFT + Page Up | All text, one screen up |
| SHIFT + Page Down | All text, one screen down |
| SHIFT + Home | Text to the beginning of the line |
| SHIFT + End | Text to the end of the line |
| Ctrl + SHIFT + Left Arrow | The previous word |
| Ctrl + SHIFT + Right Arrow | The next word |
| Ctrl + SHIFT + Home | Text to the beginning of the program file |
| Ctrl + SHIFT + End | Text to the end of the program file |

What to do after Editing

After you have created or edited an controller code file in the Editor, you can save it as a separate file. This file can then be used in the following ways:

- Before running the program in an application, you can test-run the file from the Panel module.
- From within the Editor module, you can open any program file and print its contents.
- From within the Editor module, you can copy the contents (part or all) of the file and then paste it into the Terminal module for immediate execution.
- Within the Terminal module, download the file that was created in the Editor module to the 6000 Series product for immediate execution (see Chapter ④).
- Use the file's controller code in a high-level program (e.g., BASIC, C, etc.).

Note to bus-based controller users: Refer to the DOS Support Disk for sample programs in C, QuickBasic, Pascal, and Assembly.

Terminal Emulator (Terminal)

What is the Terminal Module?

Communicating directly with the 6000 Series product, the Terminal module allows you to type in and execute controller code and transfer code files to and from the controller. The *code* is based on the 6000 Series Programming Language. From the Terminal module, bus-based product owners can transfer (*download*) the soft operating system.

Using the Terminal Module

This section describes the functions of the following Terminal module menu bar items: **E**dit, **S**ettings, **T**ransfers, and **V**iew. The functions of **F**ile and **H**elp are discussed in Chapter ④, *Motion Architect Basics*.



Printing Controller Code


The Editor allows you to print the contents (up to 1500 lines) of the terminal emulator window. Refer to the printing operation commands under the **F**ile pull-down menu.

Editing Your Controller Code (**E**dit)

| E dit | |
|----------------------------|--------|
| C opy | Ctrl+C |
| P aste | Ctrl+V |
| F ind... | |
| F ind N ext | F3 |
| S elect A ll | |
| C lear A ll | |

Under the **E**dit pull-down menu are commands that help you edit (on a line-by-line basis) the contents of your motion programs:

- **C**opy: Copy highlighted text to the clipboard to later paste it in the active terminal emulator session or paste it in a program editor file. This function is duplicated by the  button on the toolbar.
- **P**aste: Paste text from the clipboard into the active terminal emulator session. **When the text is pasted, it is immediately executed.** This function is duplicated by the  button on the toolbar.
- **F**ind: Search for a specified text string in the active session.
- **F**ind **N**ext: Repeat the last Find operation to find the text string elsewhere.
- **S**elect **A**ll: Select all text in the current terminal emulator session.
- **C**lear **A**ll: Delete (clear) all text in the current terminal emulator session.

Tip  You can save the contents of the active terminal emulator session to a “____.ter” file and then edit that file in the Editor module.

Setting Up Communications with the 6000 Series Controller (**S**ettings)

Settings

Board Address...

PC-AT Interrupt...

Serial Port...

The changes you make to the communication settings will be used for all subsequent Terminal sessions, until you change them again.

NOTE

You can change these settings only if the controller is disconnected. This is evident if there is no check mark (✓) next to **C**onnect under the **T**ransfers pull-down menu.

Bus Based Controllers: The address and interrupt settings are essentially a verification of the DIP switch settings on the controller card mounted in your PC-AT; they do not override the DIP switches. Refer to the controller's user guide for procedures to set the DIP switches.

- **Board Address:** Use the dialog box to set the bus-based controller's board address. The default is 768 Decimal (300 Hexadecimal).
- **PC-AT Interrupt:** Use the dialog box to set the PC-AT interrupt. The default is no interrupt.
- **Serial Port:** If you are using a stand-alone 6000 Series controller, use the dialog box to select a communications port. The default is COM1.

Communicating with the 6000 Series Controller (**T**ransfers)

Transfers

Connect

Send Operating System...

Send Motion Program...

Receive Motion Program...

Use the commands under the **T**ransfers pull-down menu to communicate with the 6000 Series controller (referred to as *controller*).

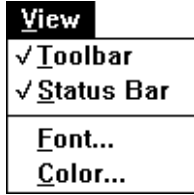
- **C**onnect: Click this menu item to connect (enable communication with) or disconnect the controller. A check mark (✓) appears to indicate successful connection to the controller. Once the controller is connected, the **N**ew and **O**pen file operations under the **F**ile pull-down menu are not allowed until the controller is disconnected. To disconnect, select this menu item again (disconnection is verified when the check mark disappears). *Launching the Terminal module automatically connects the controller, and exiting the Terminal module automatically disconnects the controller.*
- **S**end **O**perating **S**ystem (bus-based controllers): Click this menu item to send the soft operating system (6000 Series Command Language) to the bus-based controller. (This is a prerequisite to connecting, programming, or sending/receiving a motion program.) A message box appears to indicate if this operation was successful. If you have problems downloading the operating system, refer to the troubleshooting procedures in the bus-based controller's user guide.
- **S**end **M**otion **P**rogram: Click this menu item to send a controller code program (file from your hard drive) to the controller, where it is immediately executed. A message box appears to indicate if this operation was successful.

WARNING

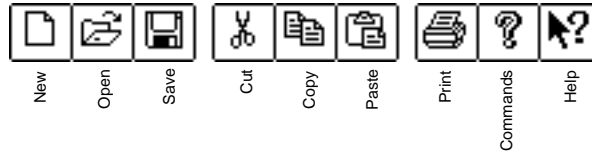
Downloading a motion-based program file to the controller can cause motion. Before downloading the program file, make the necessary precautions to ensure the safe operation of the equipment. Failure to do so can result in damage to equipment and/or serious injury to personnel.

- **R**ecieve **M**otion **P**rogram: Click this menu item to receive (*upload*) a controller code program residing in the controller's memory. From the dialog box, click on the program(s) you wish to upload and click **O**kay. When the **S**ave **A**s dialog box appears, you can save the contents of the uploaded file under a new file name or overwrite the contents of an existing file on your hard drive.

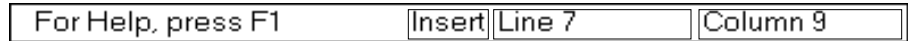
Customizing the Display Window (View)



- **Toolbar:** Display or hide the toolbar.



- **Status Bar:** Display or hide the status bar at the bottom of the window.



- **Font:** Change the characteristics (size, type face, color, etc.) of the font displayed in the window.
- **Color:** Change the color of the display window.

NOTE: The font and color changes are valid only for the active session and cannot be saved.

Test Panel (Panel)

What is the Panel Module?

The Panel module allows you to test your controller programs with your own test panel. You can customize the panel with multiple windows (monitoring controller output) and programmable buttons (for user input).

One or more windows can be opened to view the following controller information:

- I/O (programmable I/O, analog I/O, limits)
- Motion (motor and encoder position, velocity)
- Status (axis, system, interrupt, user status, and Following)
- Misc. (timer and counter values)
- Communications interface

Four tiers of eight user-definable buttons are available that allow you to send controller code fragments (up to 256 characters each) to a 6000 Series product.

You can download controller programs to the 6000 Series product via the file-transfer (**T**ransfer) menu, and execute them using programmable buttons or external I/O.

Additionally, you can create as many test panel configurations as you wish, and save them as separate files.

The remainder of this chapter is divided into *Creating Your Own Custom Test Panel* and *Communicating with the 6000 Series Controller*. The functions of menu bar items **F**ile, **W**indow, and **H**elp are discussed in Chapter ①, *Motion Architect Basics*.

Creating Your Own Custom Test Panel

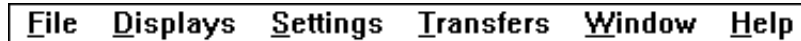
This section describes how to create a custom test panel of display windows and user-defined buttons.

Setting Up Displays

- Displays**
- New I/O Display
 - New Motion Display
 - New Status Display
 - New Time Display
 - New Comm Display

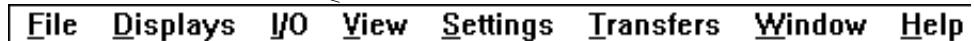
The following is a typical procedure to create new display windows:

- ① Select the subject of the new display from the **Display** pull-down menu. An empty window appears, displaying a message like **Display not defined**. Select (*I/O, Motion, Status, etc.*) menu to define. Notice that the menu bar changes to include a pull-down menu item for the display subject (e.g., **I/O, Motion**, etc.) and **View**. Below is an example of the menu bar change after selecting **New I/O Display**.



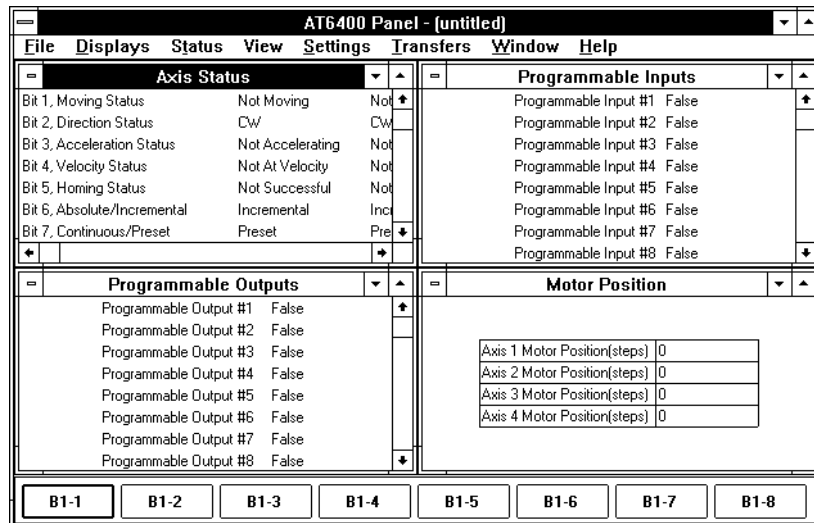
① From the **Displays** menu, select **New I/O Display**.

② New menu bar items appear.

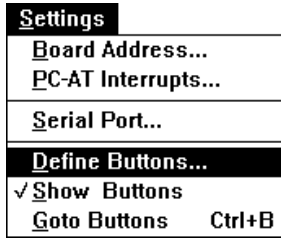


- ② From the **I/O, Motion**, etc. pull-down menu, select what you want to display.
- ③ Complete the dialog box. *Hint: Using the tab and arrow keys may be the most efficient means of navigating through the dialog boxes.* (If you need help, click the **Help** button.)
- ④ When you have completed the dialog box, click **Okay**. The new window is displayed with the parameters specified.
- ⑤ From the **View** pull-down menu (**Font...**, **Color...**, and **Grid...**), tailor the display's font, color, and grid as desired.
- ⑥ Repeat steps ① through ④ for the rest of the display windows you want in your custom operator panel.
- ⑦ From the **Window** pull-down menu, select the desired window tiling method. Tiling is described in Chapter ①, *Motion Architect Basics*.

The following is an example of a panel of display windows created to show programmable inputs, programmable outputs, motor position, and axis status. **Tile Horizontally** is selected.



Setting Up User-Defined Buttons



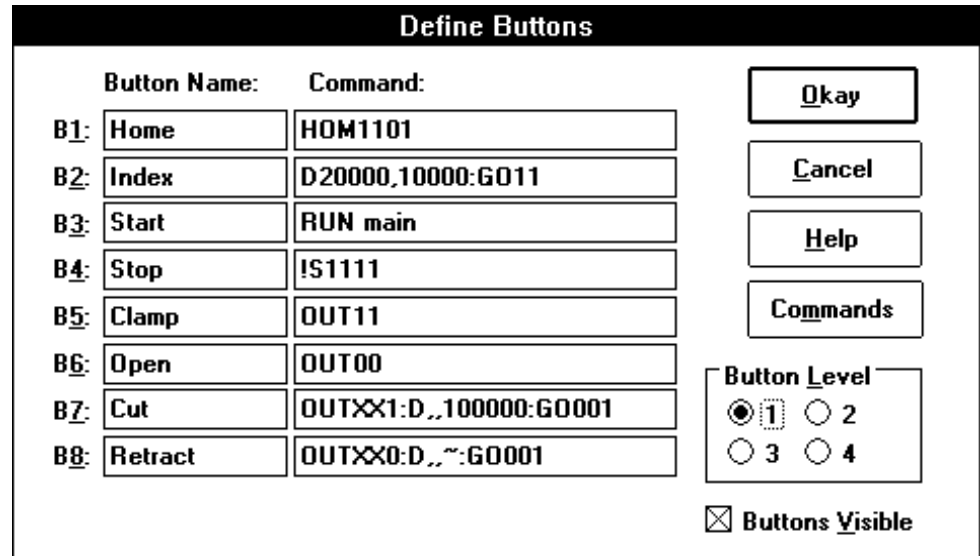
The following is a typical procedure to set up the buttons:

- ① Select **Define Buttons** from the **Settings** pull-down menu. A dialog box is displayed.
- ② In the **Button Name** column of the dialog box, type in the description for each button. Up to nine characters are allowed (at maximum window sizing). If you need more than eight buttons, select more levels from the **Button Level** area of the dialog box. To create a hot key for the button, place “&” before the desired character in the button name (e.g., type “S&top” to get **Stop**). Remember to select **Buttons Visible** for each level (row) of buttons you wish to be displayed.
- ③ In the **Command** column, type in the 6000 Series command(s) to be executed when the corresponding button is selected. To execute multiple commands with one button, type in the commands and separate them with colons (refer to the Index, Cut, and Retract button commands in the example below).

If you do not know the exact syntax, select the **Commands** button to access the on-line command reference, the same on-line tool provided in the Editor and Terminal modules. *When you select the **Paste** button from the command dialog box, the command will be pasted in the command column field where the cursor was last located.*

Instead of 6000 Series commands, you can use a DOS prompt command. Simply type in “>” followed by the path to the executable file.

- ④ Check to make sure you have defined the buttons with the desired name and command. The following is an example of a completed button definition dialog box.



- ⑤ Click the **Okay** button when you have completed the button definitions and display options. The eight-button row(s) will be displayed at the bottom of your screen, beneath the display windows (see example below).



Selecting **Show Buttons** from the **Settings** pull-down menu toggles between displaying and hiding the buttons.

If you are not using a mouse, you can access the buttons (if displayed) via **Goto Buttons** under the **Settings** pull-down menu. Use the tab key to move from button to button, and the space bar to activate the button.

Communicating with the 6000 Series Controller

This section describes how to set up communications (**Settings**) and perform transfer operations (**Transfers**) between your custom test panel and the 6000 Series Controller (referred to as *controller*).

Setting Up Communications with the 6000 Series Controller (**Settings**)

| |
|------------------------|
| Settings |
| Board Address... |
| PC-AT Interrupts... |
| Serial Port... |
| Define Buttons... |
| ✓ Show Buttons |
| Goto Buttons Ctrl+B |

The changes you make to the communication settings will be used for all subsequent Panel sessions, until you change them again.

NOTE

You can change these settings only if the controller is disconnected. This is evident if there is no check mark (✓) next to **Connect** under the **Transfers** pull-down menu.

Bus Based Controllers: The address and interrupt settings are essentially a verification of the DIP switch settings on the controller card mounted in your PC-AT; they do not override the DIP switches. Refer to the controller's user guide for procedures to set the DIP switches.

- **Board Address:** Use the dialog box to set the bus-based controller's board address. The default is 768 Decimal (300 Hexadecimal).
- **PC-AT Interrupt:** Use the dialog box to set the PC-AT interrupt. The default is no interrupt.
- **Serial Port:** If you are using a stand-alone 6000 Series controller, use the dialog box to select a communications port. The default is COM1.

Communicating with the 6000 Series Controller (**Transfers**)

| |
|--------------------------|
| Transfers |
| Connect |
| Send Operating System... |
| Send Motion Program... |

Use the commands under the **Transfers** pull-down menu to communicate with the controller.

- **Connect:** Click this menu item to connect (enable communication with) or disconnect the controller. A check mark (✓) appears to indicate successful connection to the controller. Once the controller is connected, the **New** and **Open** file operations under the **File** pull-down menu are not allowed until the controller is disconnected. To disconnect, simply select this menu item again (disconnection is verified when the check mark disappears). *Launching the Panel module automatically connects the controller, and exiting the Panel module automatically disconnects the controller.*
- **Send Operating System** (bus-based controllers): Click this menu item to send the soft operating system (6000 Series Command Language) to the bus-based controller. (This is a prerequisite to connecting, programming, or sending/receiving a motion program.) A message box appears to indicate if this operation was successful. If you have problems downloading the operating system, refer to the troubleshooting procedures in bus-based controller's user guide.
- **Send Motion Program:** Click this menu item to send a controller code program (file from your hard drive) to the controller, where it is immediately executed. A message box appears to indicate if this operation was successful.

WARNING

Downloading a motion-based program file to the controller can cause motion. Before downloading the program file, make the necessary precautions to ensure the safe operation of the equipment. Failure to do so can result in damage to equipment and/or serious injury to personnel.

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