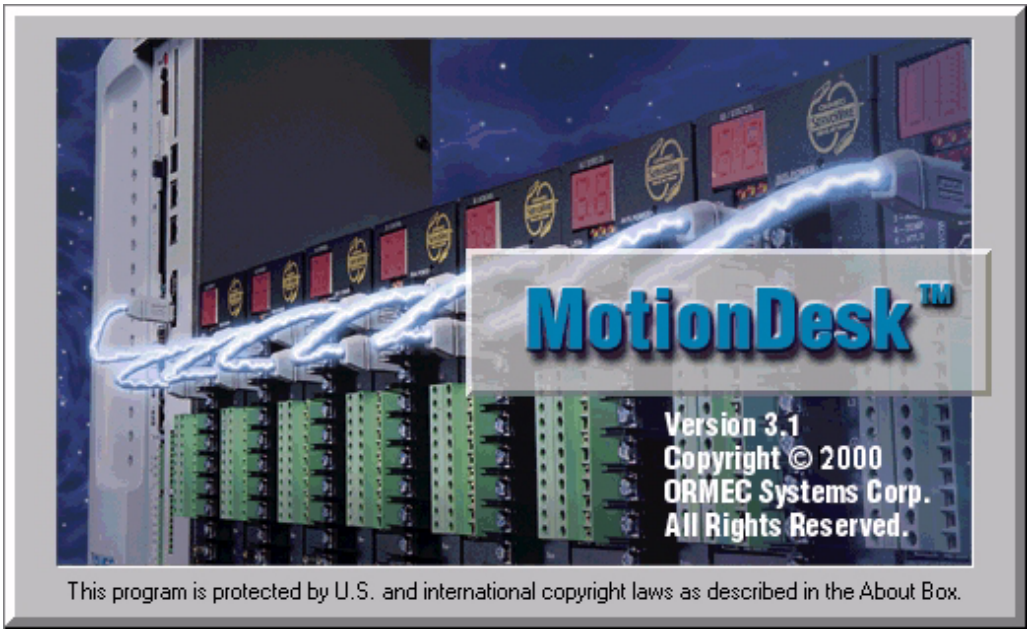
ORMEC

TECHNOLOGY FOR ELECTRONIC MOTION CONTROL



MP.CONFIG Motor Parameter Configuration

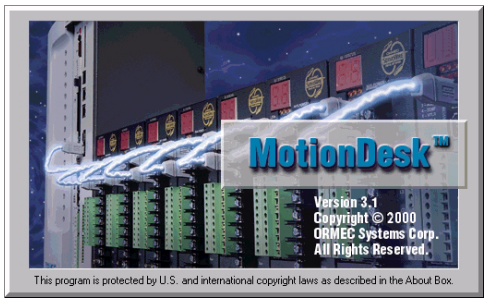
Establish valid settings for the Ormec Variables involved in the configuration of the controller and axes. The settings are established in the project file (.MTP) created from the MotionDesk software.

The variables which are initialized with the MP.CONFIG statement are listed below: *Page #*

MotionDesk 3.1 Software

MotionDesk™: Servo Developer's Kit

Features	Developer's Kit
Project Navigator incorporates "wizards"	✓
Automatic screen-oriented system configuration	✓
Development Console	✓
Multiple ORION® Program Development Windows	✓
Program Debug tools	✓
ORION® file management utilities	✓
Integrated with Windows Explorer	✓
Windows Help System	✓
Full on-line reference volume for MotionBASIC®	✓
MotionPad editor	✓
Full-featured program and text editor	✓
MotionBASIC® program development utilities	✓
Libraries of Operator Interface Development Tools	✓
QuickPanel programming tools	✓
QuickDesigner Touchscreen Development Tool	Optional
MotionPRO™ communications software	✓
Interface to Generation III motion controllers	✓



MotionDESK is a **Win 95 / 98 / NT** application that works with:

ORION running MotionBASIC	MotionDESK Ver 3.1	3.0	2.1	2.0
Ver 5.1 - May 2000	✓			
Ver 5.0 - June 1999	✓	✓		
Ver 4.1 - Aug. 1998	✓	✓	✓	
Ver 4.0 - July 1997	✓	✓	✓	✓

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Notes:

Part numbers:

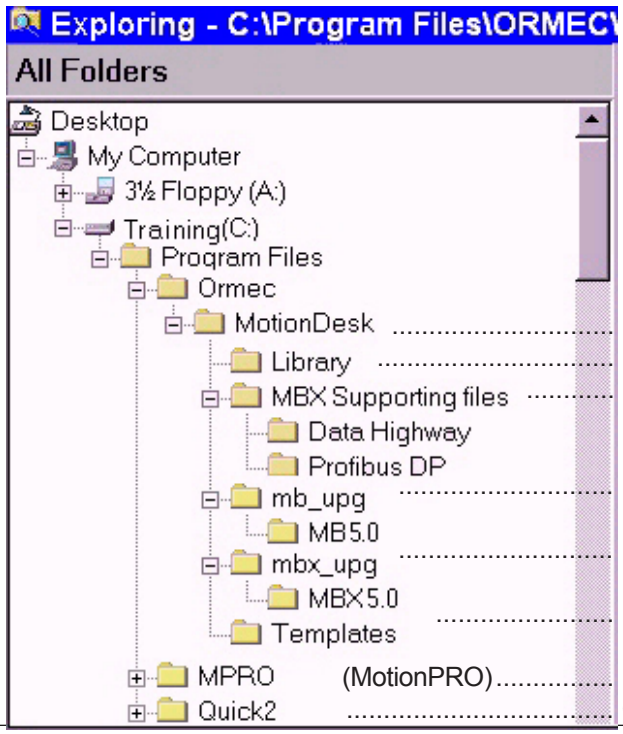
MDK-SW/3	MotionDesk Servo Developer's Kit, on 3.5" disks & cord with both connectors.
MDK-SW/C	MotionDesk Servo Developer's Kit, on CD ROM & cord with both connectors.
MBK-UPG-#	All current MBX's on disk with help files. Ex # = 5 for MotionBasic Ver 5.x
	Note: MBX's are available on WWW. The Internet Address http://www.ormec.com/user/
CBL-SER-AT (9 pin)	cable / connector only part number.
CBL-SER-PC (25 pin)	cable / connector only part number.

Direct Cable Hardware Installation:

Connect your computer's RS-232 Communication Port to a ORION motion controller, The RS-232 Development Port,

Serial D (J1), is located on the system module in the middle just below the PCMCIA slots.

MotionDesk Directory Structure



The various MotionBASIC program and system files that make up MotionDesk are organized by:

MotionDesk application files.
Source files - Error Handler, QuickPanel, AxisTune
MotionBASIC extension Supporting files.

MotionBASIC Upgrade files

MotionBASIC extension Upgrade files

Tools Application files

Used with ORION running MB v3.2 or Generation III
Optional software for QuickPanel Touchscreens

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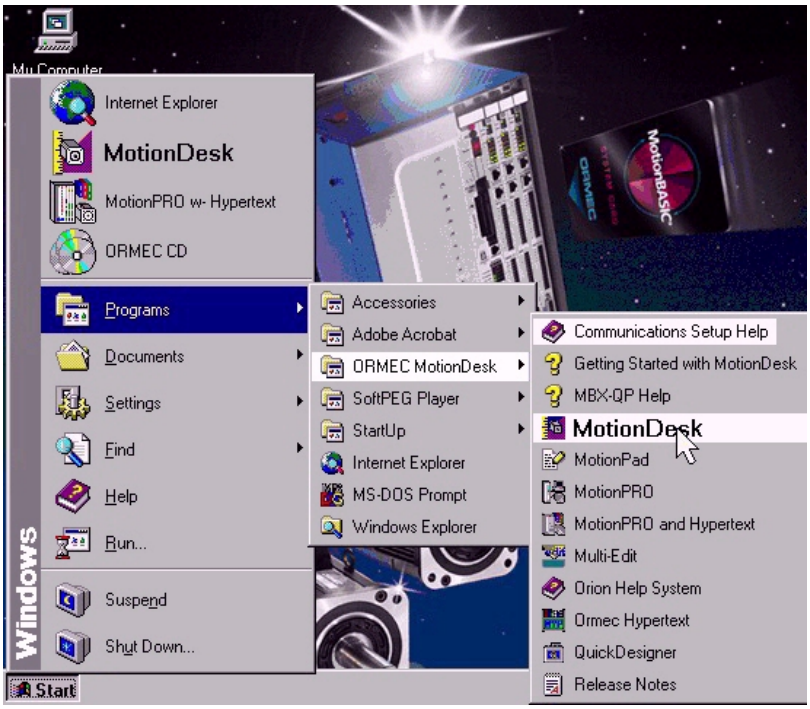
Notes: ORMEC has created a fully integrated, windows-oriented “desktop” for motion control. Utilizing standard drop-down menus, toolbars and dialog boxes, MotionDesk™ presents the user with a multi-window development environment and fully integrated set of tools for motion control system configuration, development and maintenance.

MotionDesk™ is a full-featured motion control development environment which guides the engineer through all aspects of designing and writing motion control programs. MotionDesk™ provides Windows 95 -based to simplify axis configuration and user units setup, a fully integrated program editor, a development console for monitoring ORION™ program execution, file management utilities and software tools for developing operator interface screens.

MotionDesk™ utilizes TCP/IP (Transmission Control Protocol / Internet Protocol) to implement high speed serial communications with ORION™ motion controllers. TCP/IP enables the MotionDesk™ to simultaneously open multiple communication channels with ORION™ and provide windows to modify, control and view program operation.

MotionDesk Ver 3.1



MotionDesk uses Dial Up Networking (DUN) to communicate with the ORION Motion Controller. When properly configured and initialized, communications between MotionDesk and ORION are automatically established whenever required by MotionDesk.

You must configure your Network Connections in Windows before you can communicate with an ORION. (See Network Setup in Help.)

It is not required to re-configure your PC if you are upgrading from an older version of MotionDESK.

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Notes: **What's New** in MotionDESK 3.1 - MotionBASIC Ver 5.1 required.

MotionDesk 3.1 projects are not downward compatible with earlier versions of MotionDesk. To learn more about converting read "About Converting MotionDesk Projects" in the help system.

Project Navigator - now supports configuration of various Commutation methods in user-defined servomotors.
Support for configuration of servomotor holding brakes.

Additional PLS configuration options: PLS Output and PLS Sensor.
Expanded MotionDATA configuration for ServoWire systems, including External MotionDATA.

Allows you to configure the Drive Command Low-Pass Filter, and offers an expanded range for the velocity integral torque loop parameter Kvi as well.

MotionDesk version 3.0 introduced the following tools and features, including support for the ORMEC ServoWire Drive Network. Use the help system to find out about these powerful enhancements to MotionDesk.
MotionDesk 3.0 projects are not downward compatible with earlier versions of MotionDesk. To learn more about converting read "About Converting MotionDesk Projects" in the help system.

Archive MotionDesk Project - by using the Create Backup/Archive command in the MotionDesk File menu.

Project Check - You can now easily compare projects between MotionDesk and an ORION, without the risk of an Upload or a Download. Use the Sync Project and choose CHECK Synchronization Status.

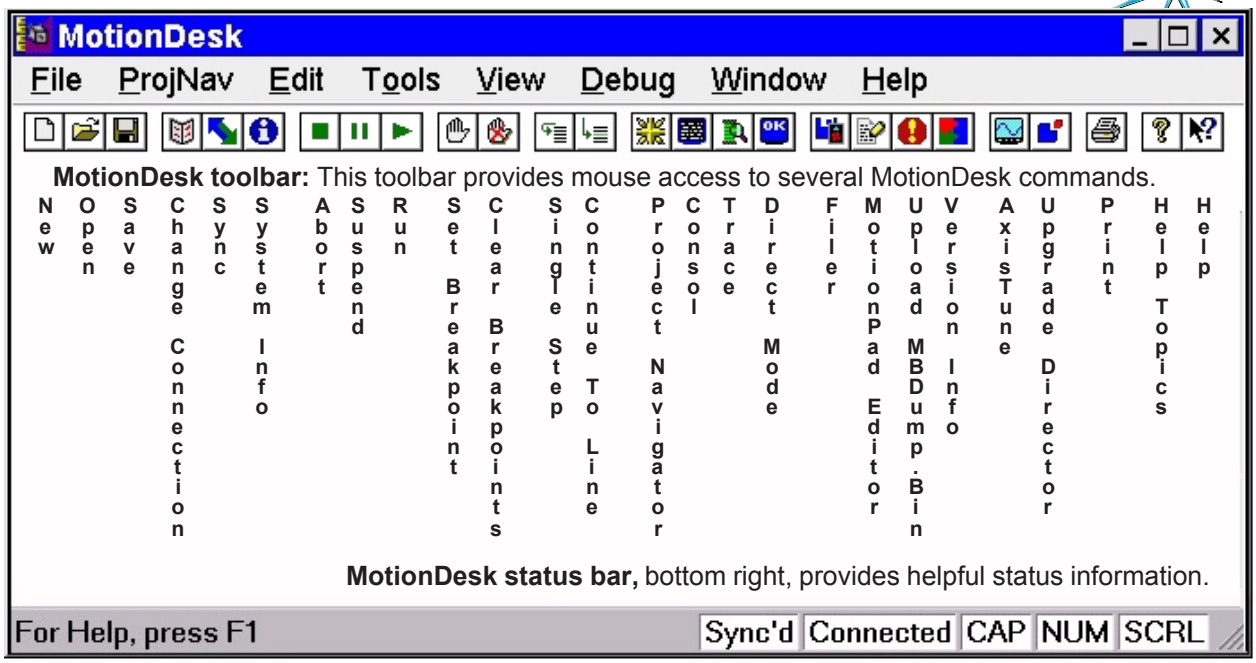
Auto Connect - MotionDesk can automatically connect to your ORION using Dial-Up Networking when needed. You can also specify that the connection should be closed whenever you exit MotionDesk.

Project Navigator - Use the Unit Configurator in Project Navigator to select the new ServoWire Axis Modules and Drives, or the traditional DSP Axis Modules and Drives. The Axis Configurator now supports user-supplied servomotors and pacer encoders for ServoWire systems.

System Information - Use the Print button in SysInfo to print the information displayed.

Version Information - Use the Print button in VerCheck to print the information displayed.

MotionDesk ... Menus, Toolbar & Status Bar



Notes: MotionDesk Commands Menus

File: The File menu allows you to select and work with Motion Control Projects. Each Project defines the configuration and operation of a Motion Control System using an ORION Motion Controller.

ProjNav: Short for Project Navigator. This menu controls the display or hide the ProjNav Toolbar.

Edit: The Edit menu provides standard access to the Windows clipboard.

Tools: The Tools menu provides several tools for working with MotionDesk.

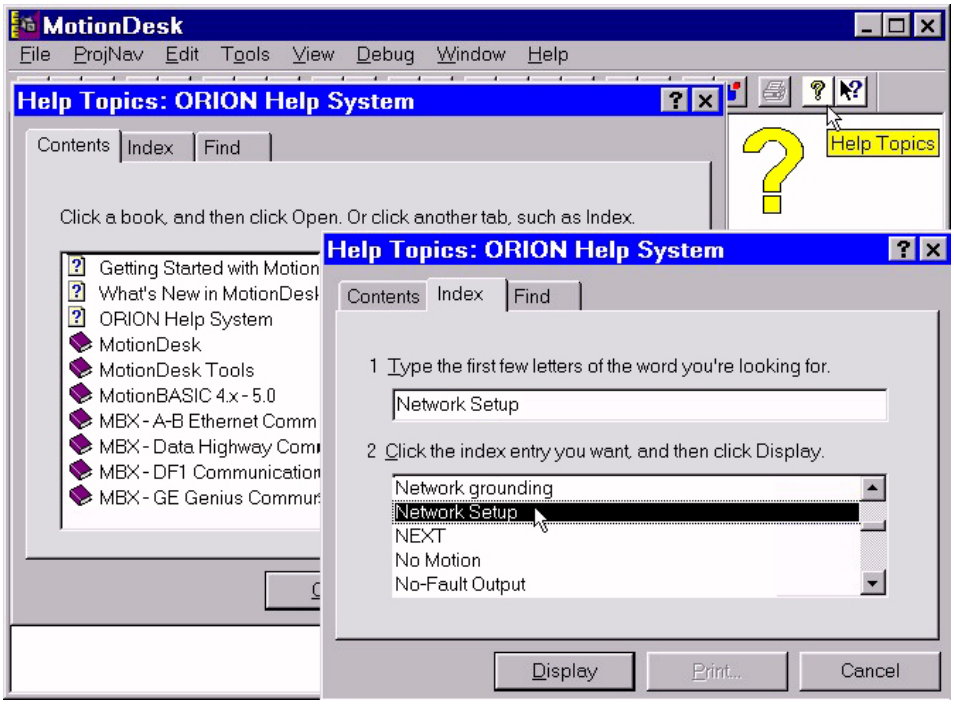
View: The View menu enables you to configure the appearance of the MotionDesk window.

Debug: The Debug menu permits user control of the ORION's MotionBASIC program.

Window: The Window menu lets you arrange the windows in the MotionDesk workspace.

Help: The Help menu supplies access to MotionDesk Help

MotionDesk Help Contents and Index



Notes: The ORION Help System is a suite of interwoven help documents that guide you toward the most productive use of your ORION Motion Controller.

When you Need Help: The ORION Help System is only a keystroke or mouse click away in all of the MotionDesk screens and windows. You can open help through the Help | Help Topics menu, or the Help icon on the toolbar.

From the ORION Help System Contents dialog, you can browse through the Contents tree, scroll through the Index, or Search the entire help system for a specific word or phrase.

Tooltips:

If you position the mouse cursor over a MotionDesk object, a popup window will display the name of the object, or a brief description of it.

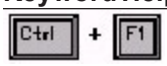
Context Help:

Use the Context Help button to see help on specific objects in any of the MotionDesk windows. Simply click on the button, then use the special context help pointer to click on an object to display it's popup help.

Most MotionDesk dialogs have a different Context Help button, found in the upper right hand corner of the dialog box. Use this button for context help within the dialog box.

Simple dialogs and message boxes do not have a Context Help button. When one of these is displayed, press the F1 key to display it's popup help.

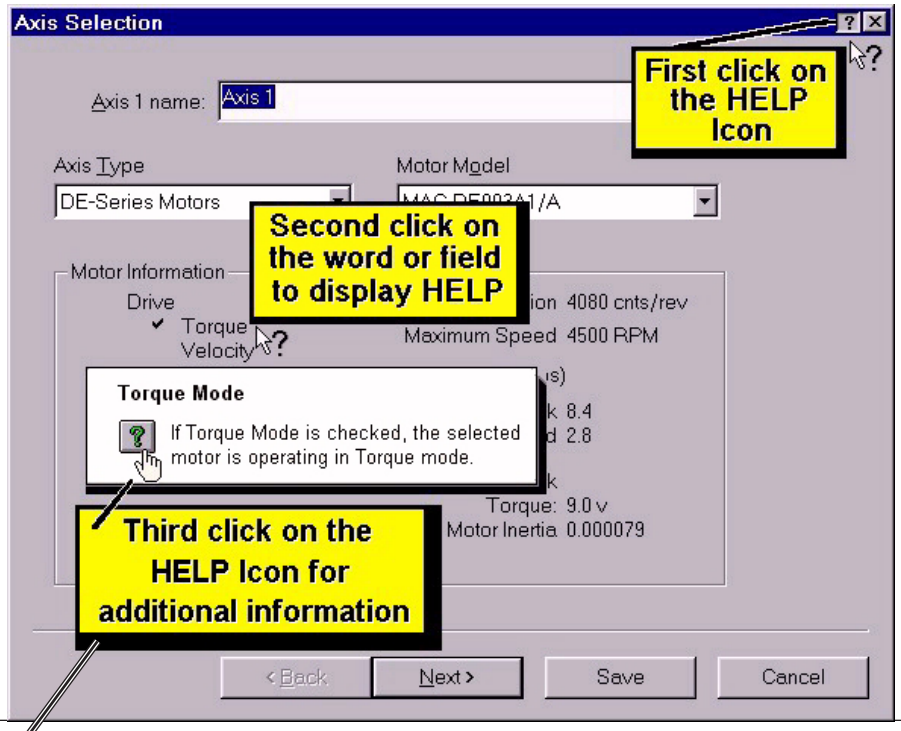
Keyword Help: When you are viewing or editing a MotionBASIC program with MotionPad, or entering a MotionBASIC command in Direct Mode, press **Ctrl-F1** while the cursor is in a MotionBASIC keyword. The help topic for that keyword will be displayed.



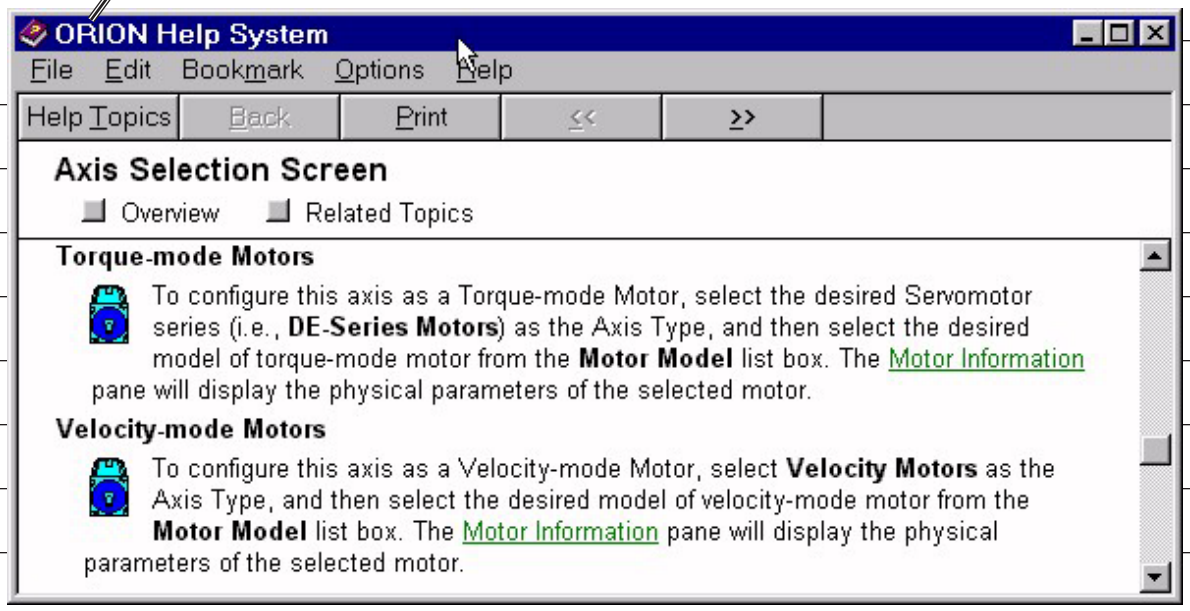
Extended Help:

If the Context Help does not go into sufficient detail on a particular topic, click on the Extended Help icon in the popup window to see more detail on the topic.

MotionDesk Help example

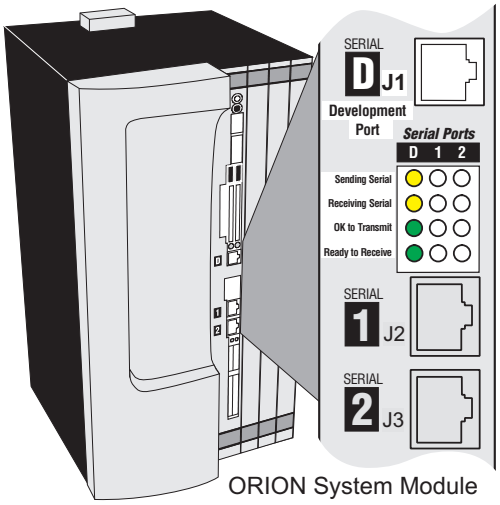


Notes:



Internet Protocol (IP) Address

Every computer on the Internet is identified by a number called Internet Protocol address. A unique number consisting of four parts, each called an octet (8 bits) having a range from 0 to 255 and separated by dots. Ex 200.200.200.200



ORION System Module

Using a direct cable connected from your PC's serial port to ORION's development port "J1", the default name for the ORION is **OrionPPP**, with an IP address of **200.200.200.200**

MotionDesk uses the communication protocol TCP/IP. This set of protocols allows PC's to exchange data across a network.

Transmission Control Protocol (TCP) is responsible for breaking up the message into datagrams, reassembling them at the other end, resending anything that gets lost, and putting things back in the right order.
Internet Protocol (IP) is responsible for routing individual datagrams. Orion uses the IP address 200.200.200.200
The interface between TCP simply hands IP a datagram with a destination.

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Notes: Every device that is connected to the network (PC, Printer, file server, motion controller) requires there own IP address. ORION uses a static or fixed IP address, you use the same number (200.200.200.200) each time you connect to ORION's "J1" development port using a direct cable connection.

The ORION Unit Name is used to associate an alphanumeric label with an ORION's Internet Protocol (IP) address. Under normal conditions, this association is fully configured for you by ORMEC and the MotionDesk installation utility.

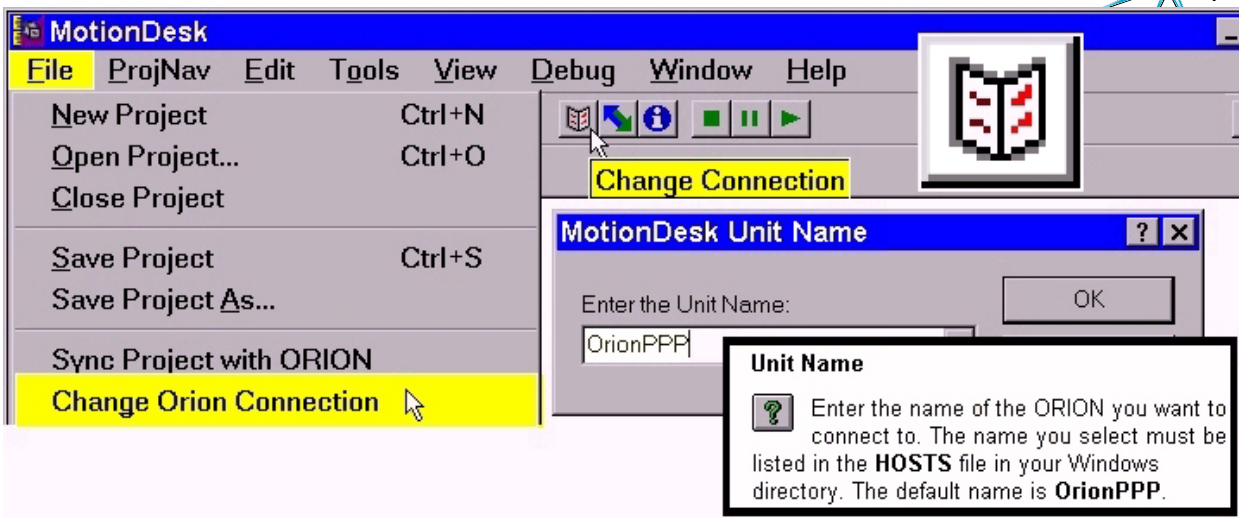
The HOSTS file on your development system should include the line:

200.200.200.200 OrionPPP

which establishes the OrionPPP host name that Windows recognizes as having an IP address of 200.200.200.200. This is configured for you during MotionDesk installation.

Note: Changing any of these parameters in such a way as to break the association will prevent MotionDesk from establishing a direct cable connection to ORION.

Changing Internet Protocol connection



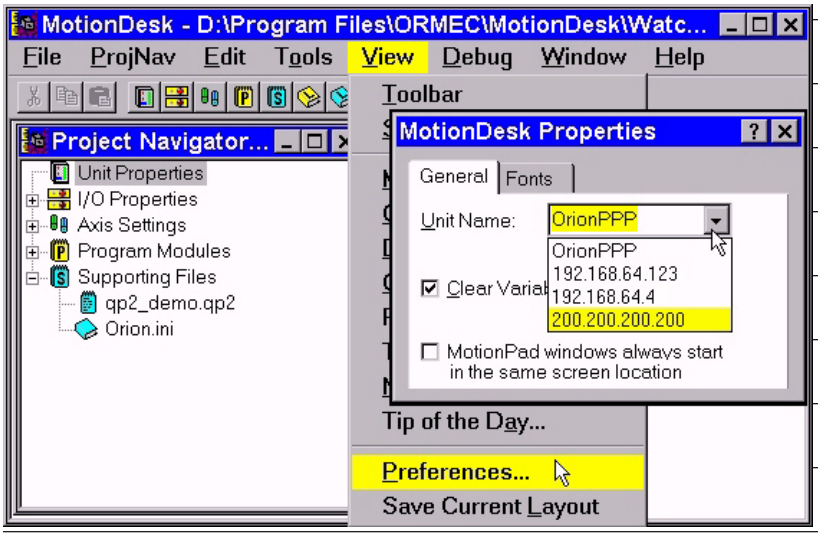
Unit Name

Enter the name of the ORION you want to connect to, or the ORION's IP address. If you enter a name, it must be listed in the HOSTS file in your Windows directory. This text file provides Windows the association between a logical name for an Internet site and its IP Address.

Notes: ***Changing TCP/IP connection using MotionDESK Properties***

Unit Name

Enter the name of the ORION you want to connect to, or the ORION's IP address. If you enter a name, it must be listed in the HOSTS file in your Windows directory. This text file provides Windows the association between a logical name for an Internet site and its IP Address.



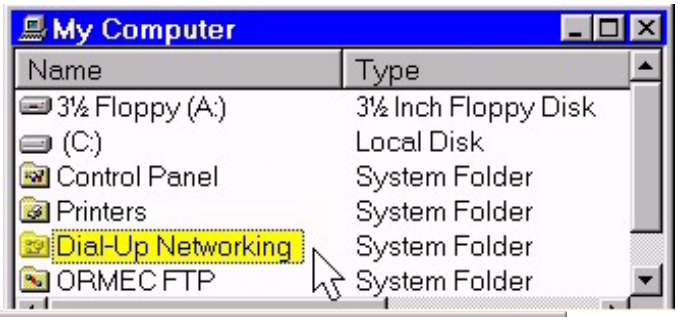
The default name for ORION using a direct cable connection (Development J1 port) is **OrionPPP**, with an IP address of **200.200.200.200**.

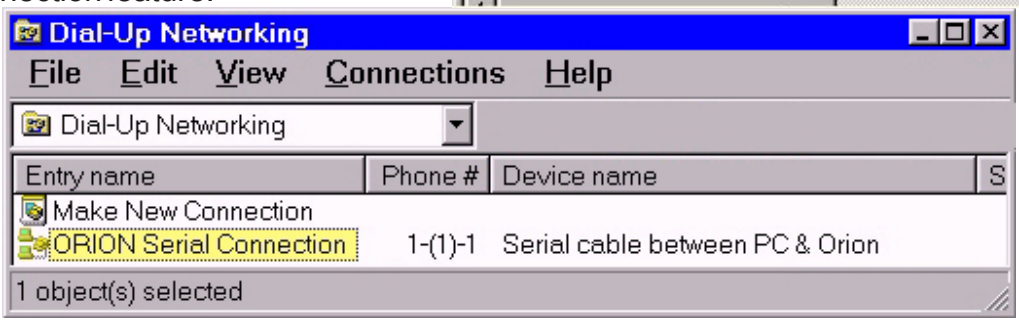
Establish communications manually

Using a direct cable connection on ORION's "J1" development port, communications must be established before any interaction between MotionDesk and the Orion controller is possible.

With MotionDESK v 2.0 or v 2.1, you will need to manually establish communications using Dial-Up Networking. Dial-Up Networking is found in "My Computer".

Note: MotionDESK v 3.0 added the auto-connection feature.





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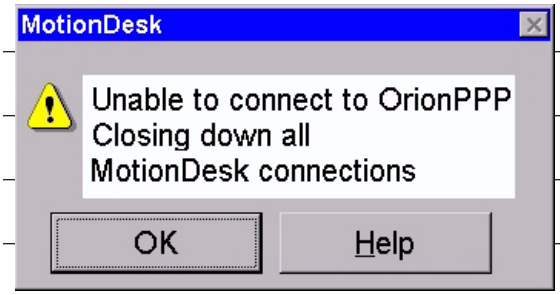
Notes: **Hardware Setup:** You will need a direct cable connection between your development computer and the ORION Development Port (port D). **Software Setup:** To set up the software for a direct cable connection on your development computer, refer to **Network Setup** in MotionDesk help.

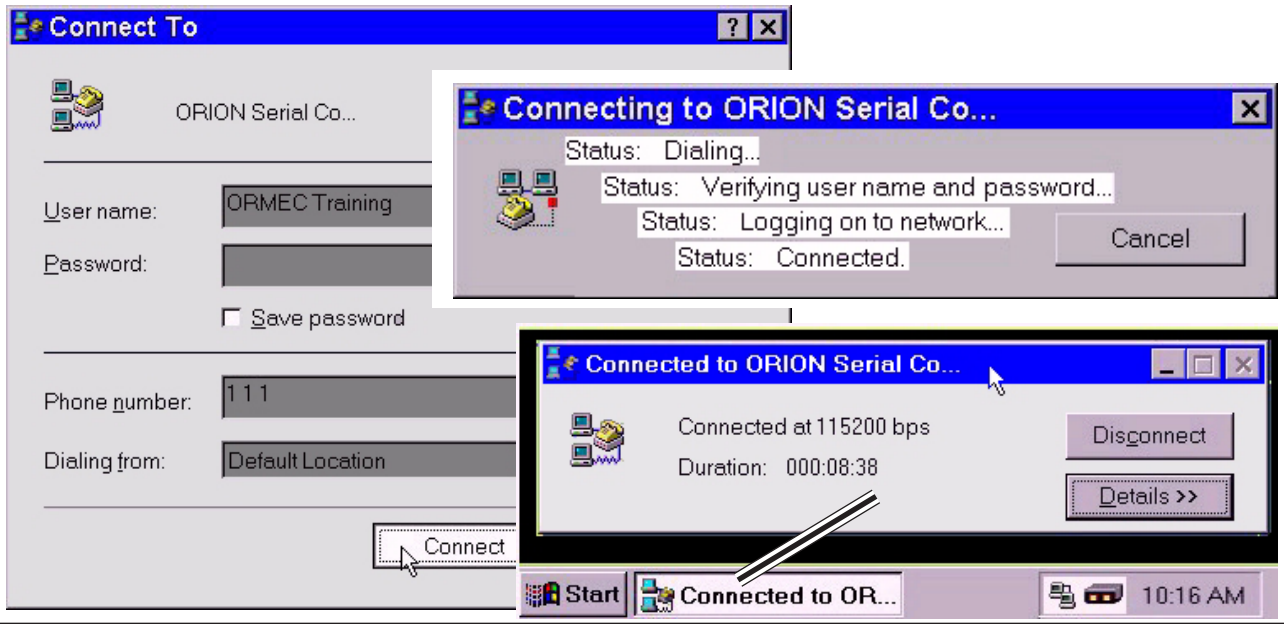
Internet Properties: Right click on the Internet Icon to display the properties. Select "Connection" and look under "Dialing". If the check mark is present, the "Connect to" prompt (on next page) will appear when you try to establish a Internet connection. If your workstation has direct access to the Internet through a local area network, you may want to chouse to clear this check mark. Removing the mark will require manual connection every time that you need to communicate with the ORION motion controller.



When attempting to establish communications between your PC and the Orion motion controller, this error message will be displayed if Dial-Up Networking is not running.

Connecting to Orion using Dial-Up Networking

Networking with MotionDesk
Setting up communications between MotionDesk and your ORION Motion Controller



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Notes:

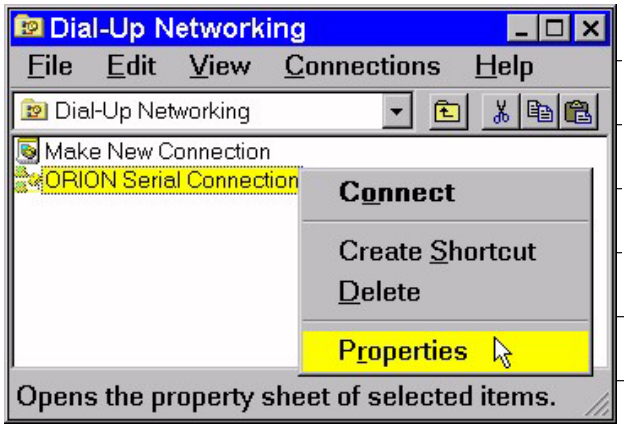
Note: You will need a direct cable connection between your development computer and the ORION Development Port (port D). To set up a direct cable connection on your development computer, refer to Network Setup help.

Having trouble connecting to Orion

If the below messages appear, you must
1) Check the hardware connection between your computer and the ORION Development port.
2) Check the setting in Dial-Up Networking for the proper communications port to use.
3) Then Communications must be reestablished. (See page 13 & 14)

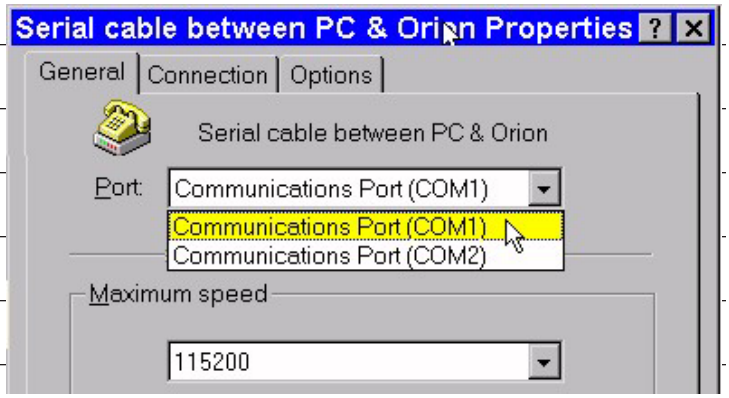
Notes:

CHECK THE CONNECTION: You will need a direct cable connection between your development computer and the ORION Development Port (port D). To check the software setup on your development computer, refer to " **Communications setup Help**" Click on the chapter ... " ORION Serial Connection dialog."



The steps are summarized below.

1. Click on "My Computer" to find "Dial-Up Networking".
2. Right-click on the **ORION Serial Connection** icon.
   (If you defined a different name for your connection, look for that instead of ORION Serial Connection.)
3. Select Properties from the popup menu.
   The ORION Serial Connection dialog will be displayed.
4. Click on the **Configure** ... button.
   The Serial Connection Properties dialog below will be displayed.

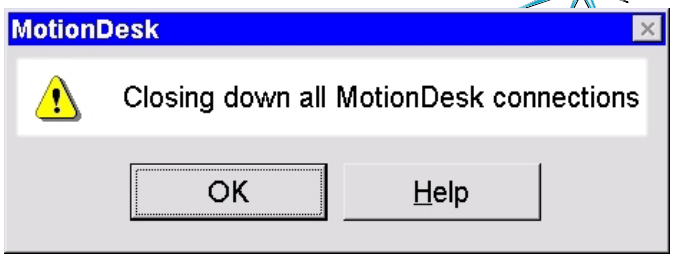


5. In the General tab.

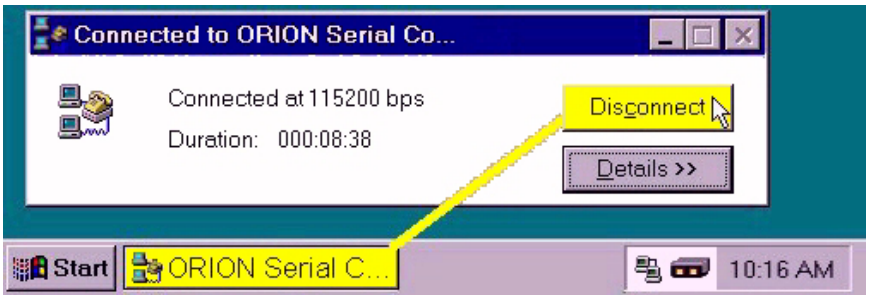
Check which COM port the software is configured to use. Then check the cable is plugged into it.

The Maximum Speed group, click the speed that your modem should use. If have a older PC that does not have the 16550 chip set, use 19,200 as a starting value - you may increase this speed later as long as communications between MotionDesk and the ORION are maintained at an acceptable rate.

Manually recovering from a lost connection



If the above messages appear, you must
1) Close the current project.
2) Disconnect windows Dial-Up Networking, then Reopen the project.
3) Then Communications must be reestablished. (See page 13 & 14)



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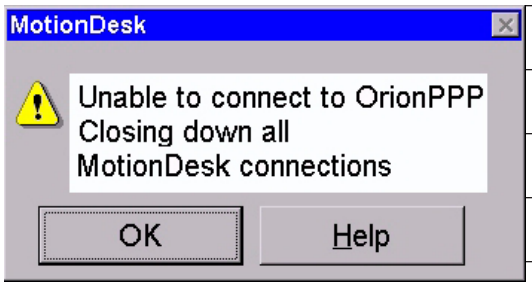
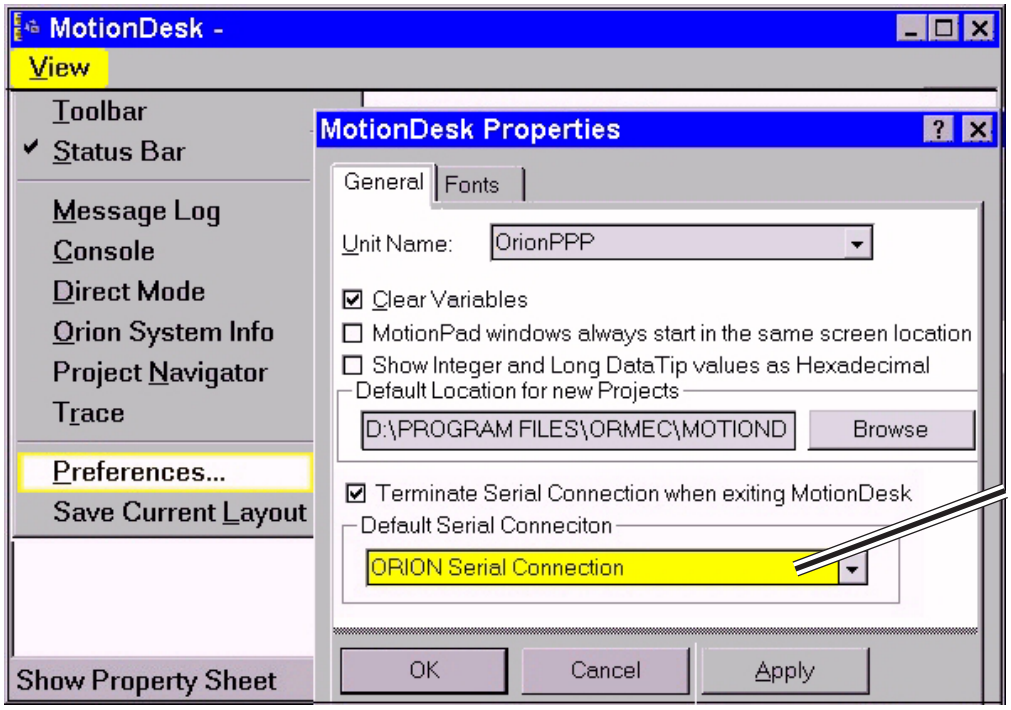
Notes:



MotionDESK v3.0 and later can automatically connect



A default serial connection must be selected for the auto-connect feature.

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Notes: MotionDesk properties - The following options allow you to specify various MotionDesk properties:

Unit Name - Enter the name of the ORION you want to connect to, or the ORION's IP address. If you enter a name, it must be listed in the HOSTS file in your Windows directory. This text file provides Windows the association between a logical name for an internet site and its IP Address.
The default name for the ORION is **OrionPPP**, with an IP address of **200.200.200.200**.

Clear Variables - Check this option to indicate that all nonvolatile variables in the ORION motion controller should be cleared when the ORION is synchronized with MotionDesk.

MotionPad windows always start in the same location - Check this option to ensure that when you open a MotionPad window, it is always displayed in the same location on the MotionDesk workspace.

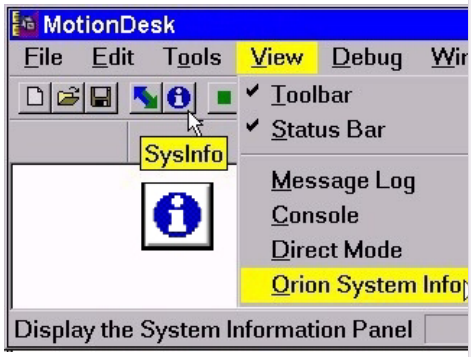
Show Integer and Long Data Tip values as Hexadecimal - Check this option to display numeric Data Tips in hexadecimal. Leave unchecked to show Data Tips in decimal notation.

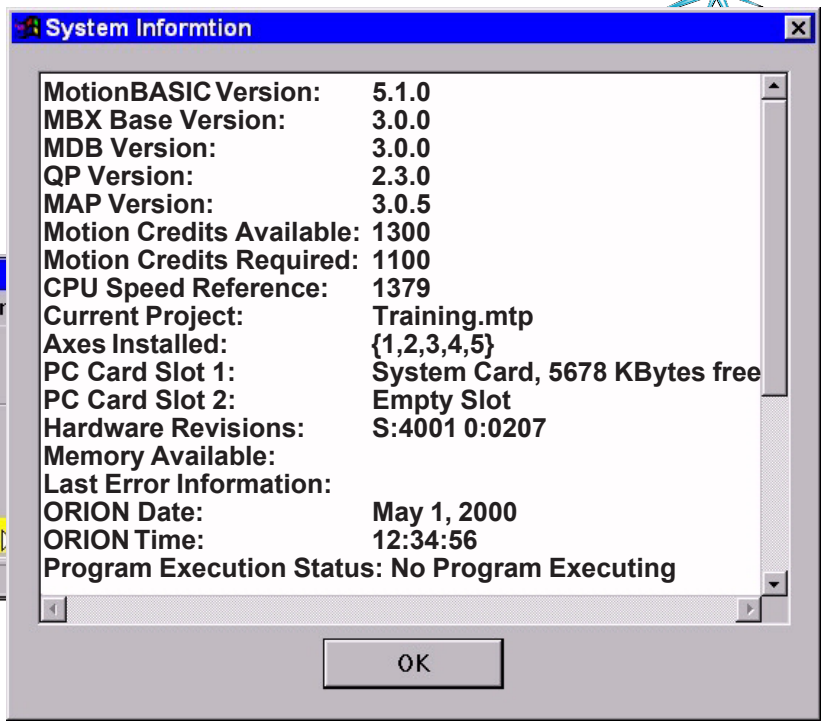
Terminate Serial Connection - Check this option if you want to automatically close your serial connection to the ORION when you exit MotionDesk.

Default Serial Connection - Select the ORION serial connection you want to use as your default connection. The default is undefined until you select one.

System Information

The System Information window displays a snapshot of current information about the ORION Motion Controller.





Notes: The data display is refreshed each time the window is opened.

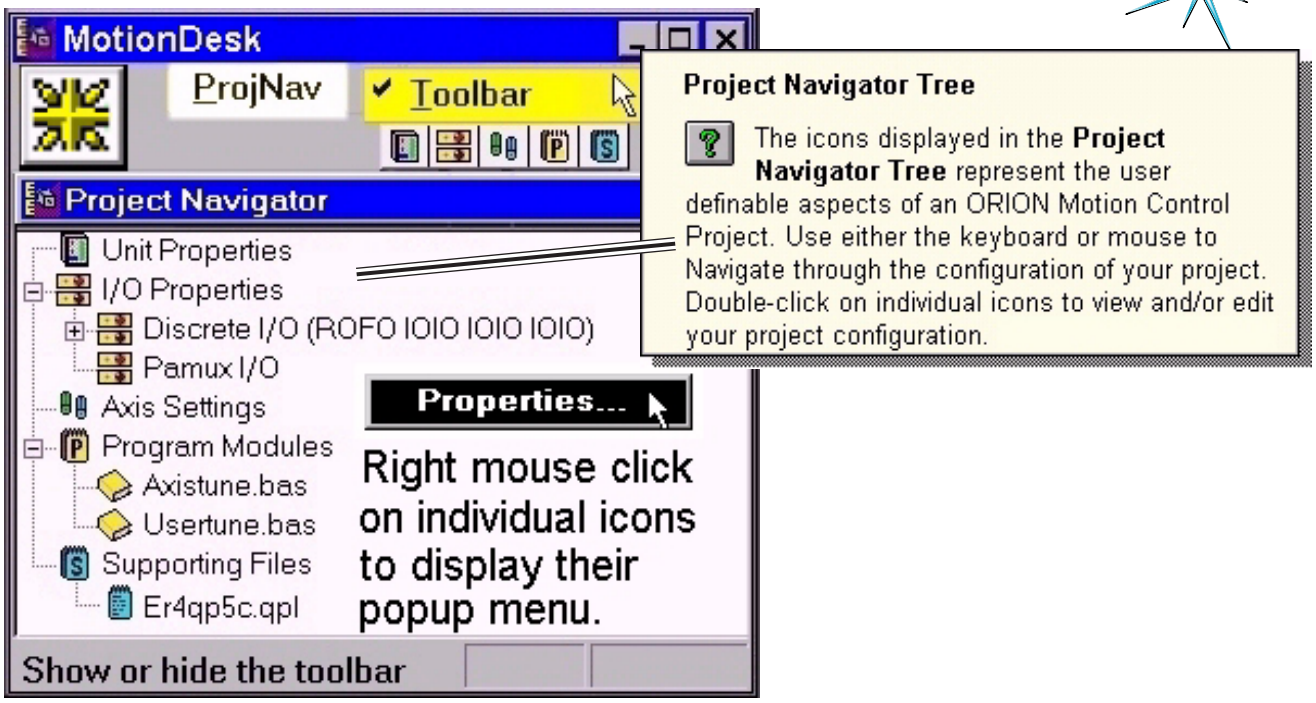
The following parameters are shown.

Version Information	
Motion Credits	
CPU Speed Reference	
Current Project	
Axes Installed	
PC Card Slots	
Hardware Revisions	
Memory Available	
Last Error Information	
ORION Date & Time	
Program Execution Status	
ServoWire Axis Modules (if present)	
Number of SAMs Installed, SAM Model and Version, SAM Serial Number, SAM Modification Info	
ServoWire Drives:	Drive ID, Drive Model and Version, Drive Firmware Version, Drive Serial Number
	Logic Board Version and Modification Info, Power Board Version and Modification Info

Note:

You can use the mouse to select information in the SysInfo window and copy it to the Windows clipboard for later use.

Project Navigator - Tree



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Notes: The Project Navigator tree is a graphical representation of your Motion Control project, and provides quick mouse access to the following areas, along with it's associated shortcut menu:

Unit Properties: The Unit Properties branch of the Project Navigator tree, allows you to configure the ORION Motion Controller for your application project.

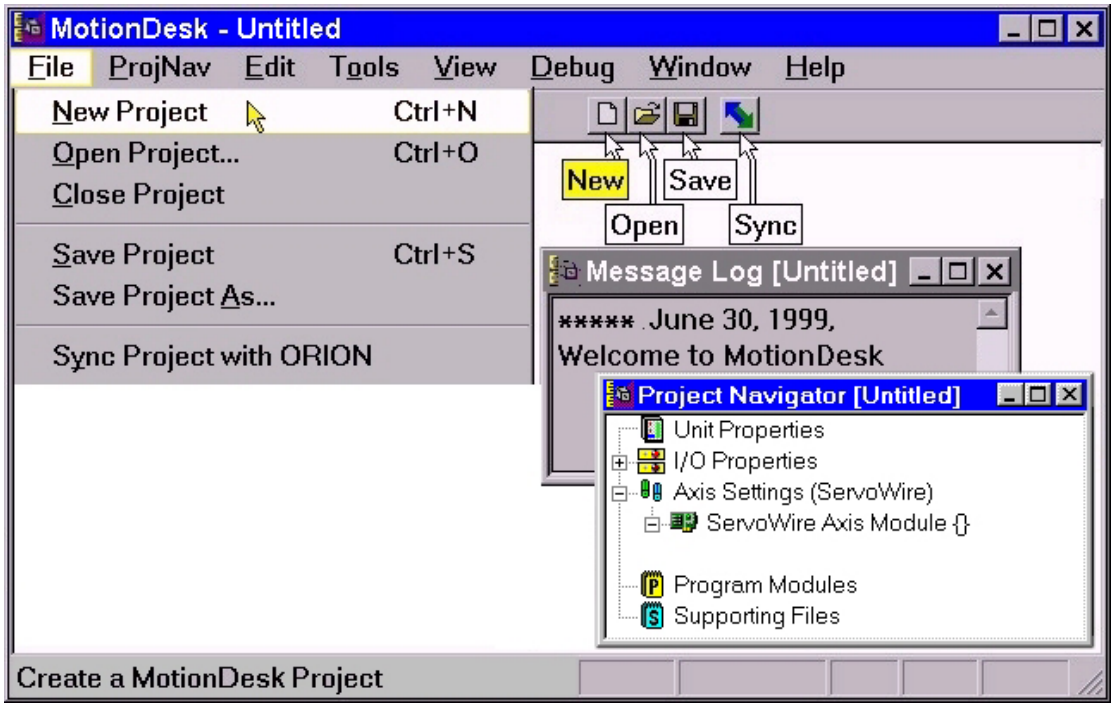
I/O Properties: The I/O Properties branch of the Project Navigator tree, allows you to configure the I/O points controlled by your ORION Motion Controller.

Axis Settings: The Axis Settings branch of the Project Navigator tree, allows you to add, remove, and configure the Axes controlled by your Motion Control project.

Program Modules: The Program Modules branch of the Project Navigator tree, allows you to add, remove, and edit the Modules that make up the MotionBASIC Program for your Motion Control project.

Supporting Files: The Supporting Files branch of the Project Navigator tree, allows you to add and remove the Supporting Files that are included in your Motion Control project.

Project Navigator - New Project

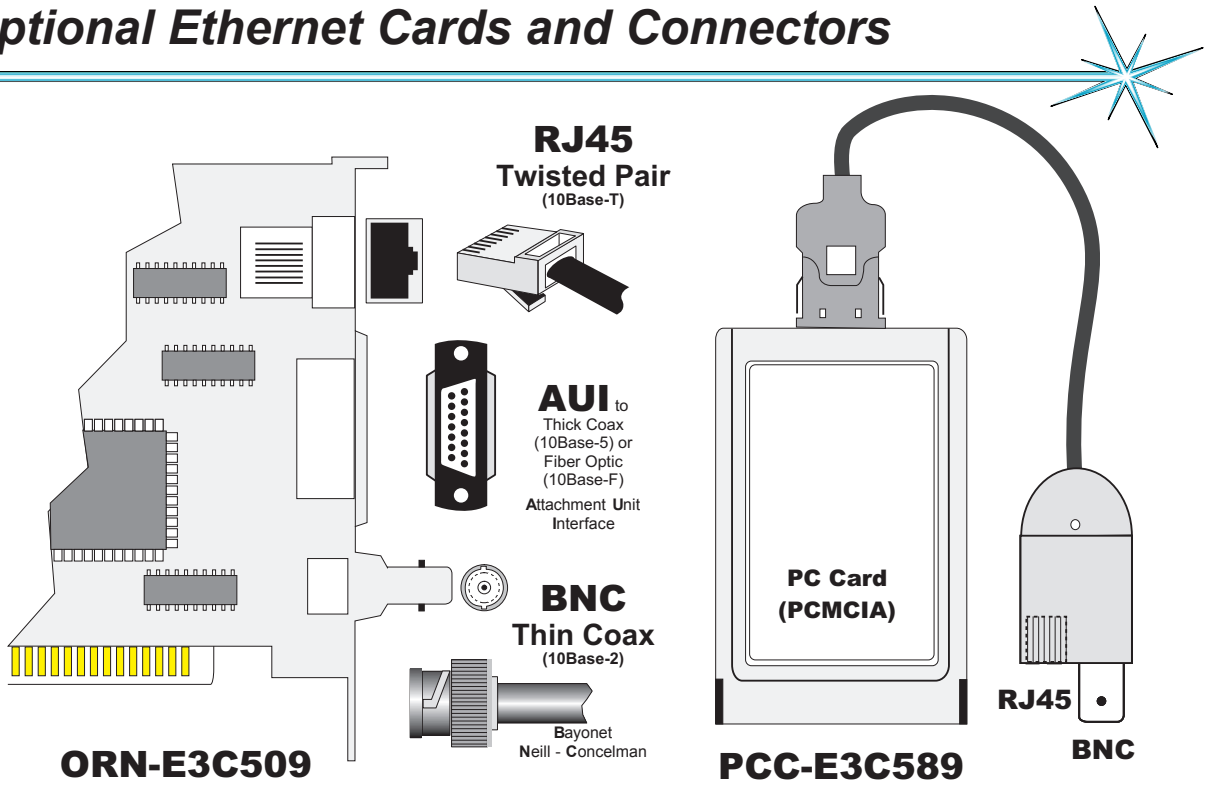


Notes: **New Project:** A project is a collection of information that defines a Motion Control application for an ORION Motion Controller. This project information includes: Configuration settings for your ORION Motion Controller with your MotionBASIC program, and any supporting files (such as QuickPanel screens or database files used for cams).

Creating a New Project: The first step in building an ORION Motion Control application is the creation of a Motion Control Project. Start MotionDesk, and from the File menu, select New Project (or click on the New Project icon on the Toolbar). This creates a new, untitled project, and opens the Project Navigator and Message Log windows.

Message Log: The Message Log Window displays error messages generated by the ORION Motion Controller. To use the Message Log window, a project must be loaded in MotionDesk and communications must be established with an ORION. You can select text anywhere in the Message Log window and copy it to the clipboard by right clicking anywhere in the window to access the Windows clipboard commands.

Optional Ethernet Cards and Connectors



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Notes: **Ethernet Communications Adapters:**

Three Ethernet communications adapters are available for use in an ORION controller, one PC Card based and two half-length IBM PC cards (ISA). All three have support RJ45 and BNC connectors, and the 3C509 contains an AUI connector as well.

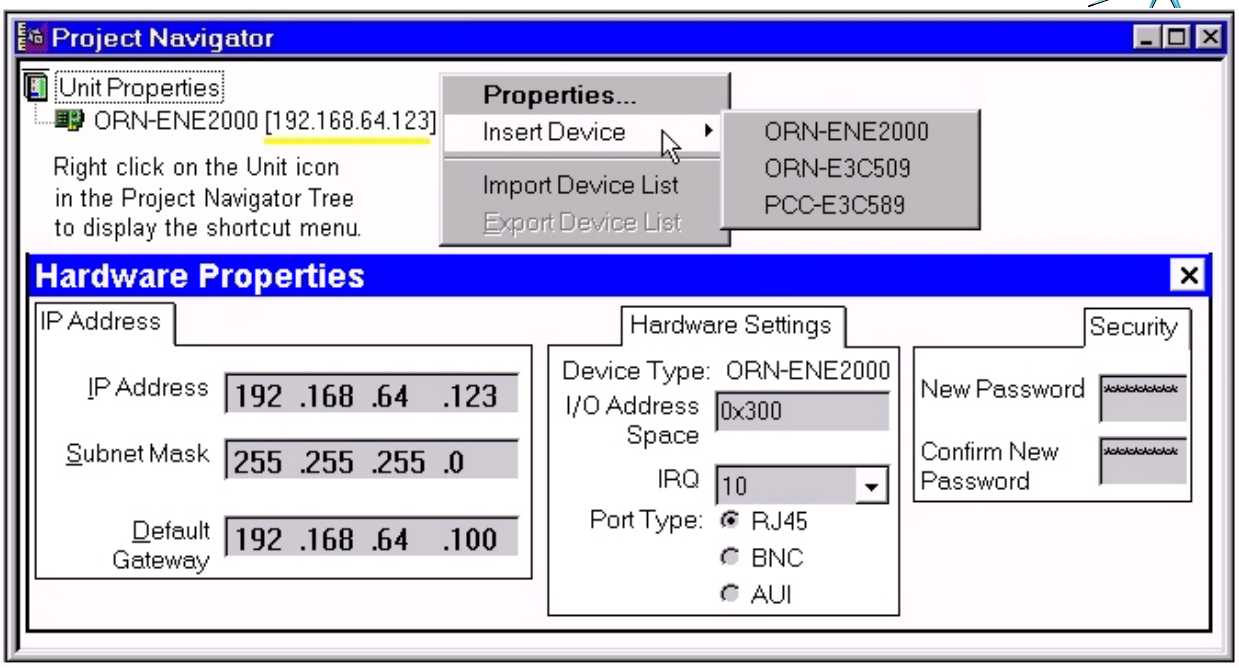
The ORION controller supports the use of multiple Ethernet adapters, however, no more than one of each type of Ethernet adapter (ORN-ENE2000, ORN-E3C509, and PCC-E3C589) may be used together in the same ORION. For example: An ORN-ENE2000 and an ORN-E3C509 may be used together in the same ORION, but two ORN-ENE2000 adapters cannot.

Adapter Configuration:

There are no hardware configuration jumpers on the ORMEC Ethernet communications adapters. All adapter configuration is performed using a setup software utility (included with each card), which requires installing the Ethernet adapter into the computer running this software. All ORMEC supplied Ethernet adapters I/O addresses and IRQs are configured and tested at the factory. Refer to the manufacturers installation and operation manual (included with the card) for further setup software utility information.

ORMEC supplied Ethernet adapter cards are configured to use the RJ45 connector, if you are using the RJ45 connector, separate configuration of the Ethernet adapter (as described in the previous paragraph) is not required. If you need to use a different connector (BNC or AUI) on an ORN-ENE2000 or ORN-E3C509 card, you will need to run the manufacturers setup utility.

Project Navigator - Insert Ethernet Device



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Notes: Hardware Properties - Contact your Network Administrator to obtain the needed information.

IP Address tab of the Hardware Properties dialog to set the following ethernet parameters:

IP Address - ..... Enter the four digit IP Address for this ethernet device. You must enter a nonzero IP Address before you can complete the installation of this device.

Subnet Mask - ..... Enter the four digit Subnet Mask for this ethernet device.

Default Gateway - . Enter the four digit Default Gateway for this ethernet device.

Hardware Settings tab of the Hardware Properties dialog to set the following ethernet parameters:

Device Type - ..... The type of ethernet device installed in the ORION. This will be the same device you selected from the Insert Device command.

I/O Address Space - Specify the I/O Address Space to be used by this ethernet device. The default is 0x300 for the NE2000, 0x360 for the 3C509, and 0x320 for the 3C589.

IRQ - ..... Select an IRQ for the ethernet device. The default is IRQ 10 for the NE2000, IRQ 5 for the 3C509, and IRQ 11 for the 3C589.

Port Type - ..... Select the type of port to be used on the ethernet device. The 3C509 supports RJ45, BNC, and AUI connections. The NE2000 and the 3C589 support RJ45 and BNC connections.
The default for all devices is RJ45.

Security tab of the Hardware Properties dialog to set the following ethernet parameters:

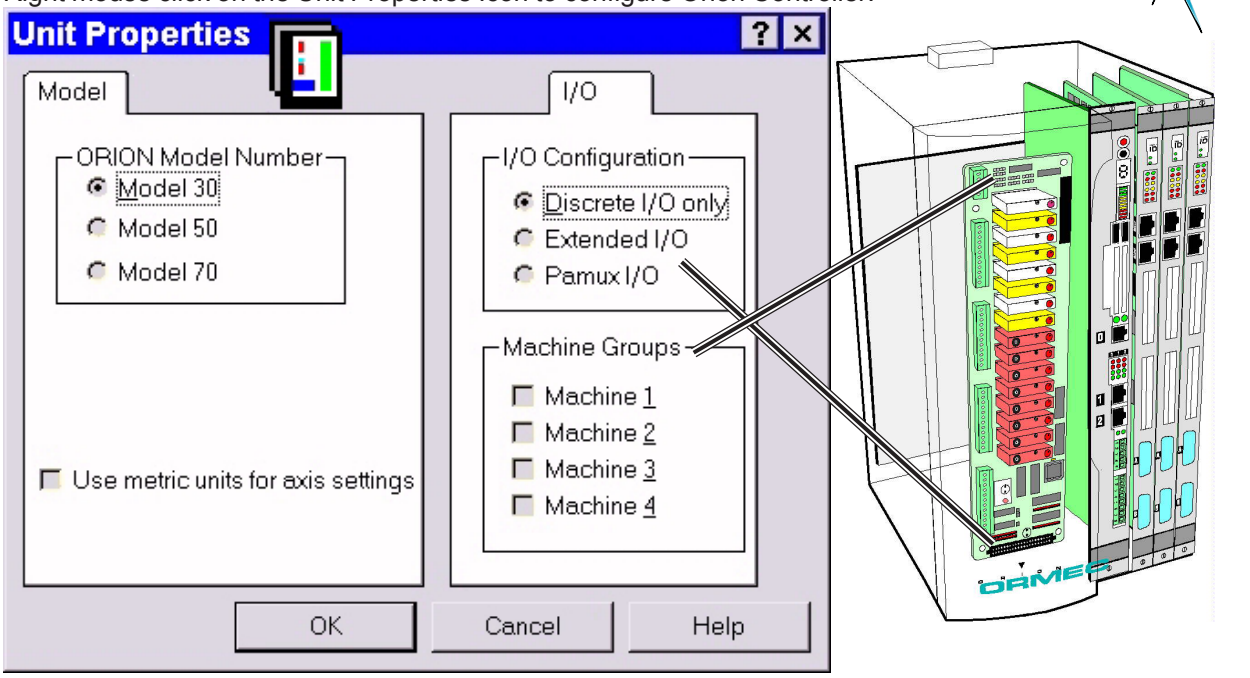
New Password ..... Enter the new password.

Confirm New Password ..... Enter the new password a second time to confirm the change.

Note: You must download your project changes with the Sync command before your new password will be effective.

Project Navigator - Unit Properties

Right mouse click on the Unit Properties Icon to configure Orion Controller.



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Notes: The Unit Properties branch of the Project Navigator tree allows you to configure the controller for your Motion Control project. Double-click on Unit Properties icon to configure the ORION Motion Controller.

ORION Model Number: Three ORION Motion Controllers are currently available: The Model (30,50,70) has (3,5,7) PC-AT expansion slots, providing the capability to control as many as (24, 32, 32) axis using ServoWire or (6,10,14) axes using DSP's.

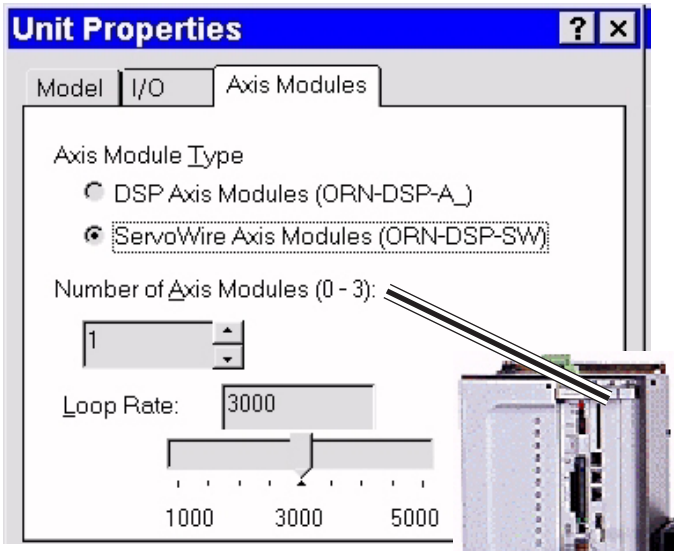
Metric Units:
Check the Use Metric Units for axis settings if you want to configure the axes in this system using metric units of measurement.

Under the I/O tab:
I/O Configuration Support:
Discrete I/O Only points (1 to 16) are integral to the ORION motion controller, and compatible with G4 Opto-22 style plug-in modules.

The OPTIONAL Extended I/O Support:
Extended I/O connector provides access to an additional 24 G4 Opto-22 compatible I/O points as 17 through 40. Alternatively, this connector may be configured for use with
Pamux I/O, providing access to an additional 512 fully isolated analog or digital I/O points.

Machine Group Configuration:
Use this group to indicate which discrete I/O points have been hardware configured as Machine Stop / No-Fault pairs. The first four pairs of Discrete I/O points (1-8) in an ORION Motion Controller can be configured to act as Machine Stop Input and No-Fault Output pairs. When these are enabled, you can use a single ORION to control up to four independent machines. Enabling a Machine Group automatically configures the corresponding I/O points. You may then use the Axis Configurator to assign individual axes to a Machine Group

Project Navigator - Axis Modules using ServoWire



For MotionBASIC 5.x and later

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Notes: **Axis Module Properties:**

ORION Axis Modules utilize the latest Digital Signal Processor (DSP) technology to implement all digital high performance motion control. Each Axis Module communicates with the main processor through an on-board shared memory interface. Axis Modules are available in two, mutually exclusive types, DSP Modules and ServoWire Modules.

ServoWire Axis Module Type:

Each ServoWire Axis Module (ORN-DSP-SW) implements up to eight servo control loops utilizing discrete signal processing algorithms to update the loops, eliminating the need for analog circuitry. Select ServoWire Modules if you are installing those modules in your ORION.

Note: DSP Modules and ServoWire Modules are mutually incompatible in an ORION. Changing the Axis Module Type after you have defined any axes will result in the loss of those axis definitions.

Number of Axis Modules:

Enter the number of ServoWire Axis Modules installed in the ORION.

Model 30 can support up to 3 ServoWire Modules
Model 50 can support up to 5 ServoWire modules
Model 70 can support up to 7 ServoWire modules.

Each ServoWire Module can independently support up to eight axes, with an overall limit of 32 axes per ORION.

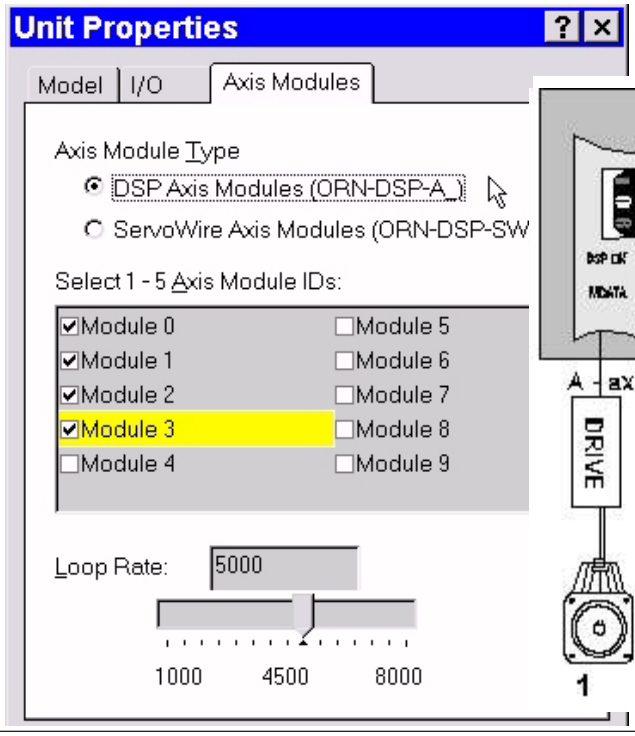
Note: When ServoWire Modules are installed in an ORION, AXIS.LIST@ is determined by the configuration of the individual axes in the system.

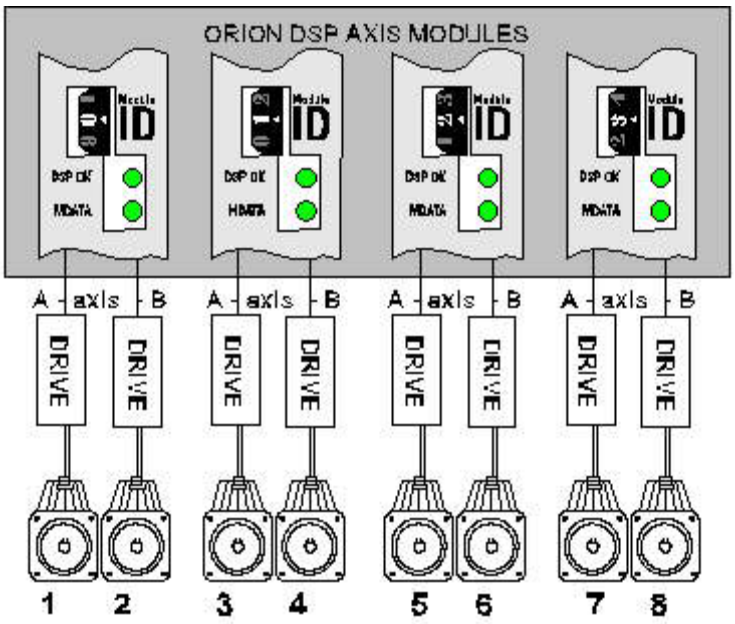
Loop Rate:

The servo loop update rate, LOOP.RATE@, defines the number of times per second (Hz) that the servo loops will be updated. The valid range for Loop Rate on a ServoWire Axis Module is 1000 Hz to 5000 Hz. Default is 3000 Hz.

Project Navigator - Axis Modules using DSP's

For MotionBASIC 3.2 and 4.x





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Notes: **Axis Module Properties:**

ORION Axis Modules utilize the latest Digital Signal Processor (DSP) technology to implement all digital high performance motion control. Each Axis Module communicates with the main processor through an on-board shared memory interface. Axis Modules are available in two, mutually exclusive types, DSP Modules and ServoWire Modules.

DSP Axis Module Type:

Each DSP Axis Module (ORN-DSP-A) implements up to two servo control loops utilizing discrete signal processing algorithms to update the loops. Select DSP Axis Modules if you are installing those modules in your ORION.

Note: DSP Modules and ServoWire Modules are mutually incompatible in an ORION. Changing the DSP Type after you have defined any axes will result in the loss of those axis definitions.

Axis Module IDs:

The Axis Module identification code (Module ID) is set by a rotary DIP switch on the DSP panel. This code can be set in the range 0 to 9. When two or more DSP Axis Modules are installed in an ORION, they must be assigned different Module IDs. The Module ID is used to determine the axis numbers of servos interfaced to the controller.

The axis number used for Axis A is (2 * Module ID) +1 Ex:DIP switch ID=4 so (2*4+1) = A axis number 9

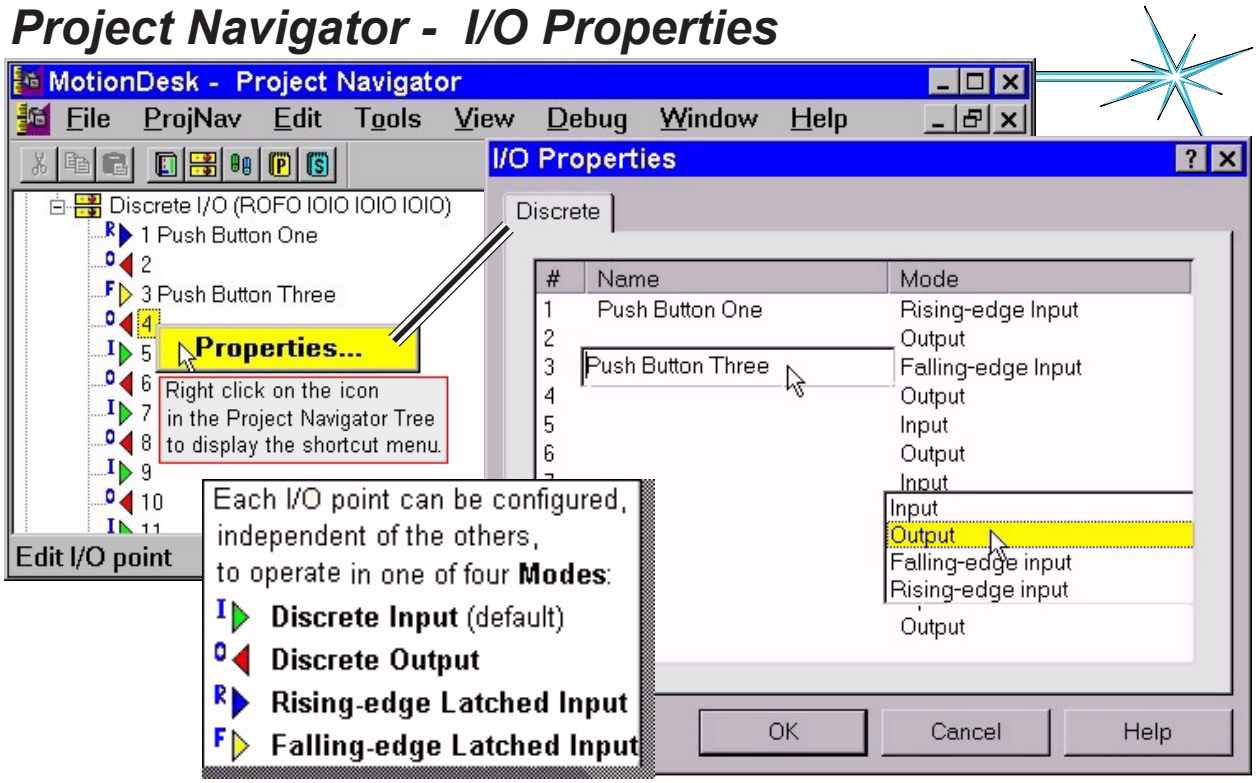
The axis number used for Axis B is (2 * Module ID) +2. B axis number 10

These settings are used on powerup to determine AXIS.LIST@.

Loop Rate:

The servo loop update rate, LOOP.RATE@, defines the number of times per second (Hz) that the servo loops will be updated. The valid range for Loop Rate on a DSP Axis Module is 1000 Hz to 8000 Hz, and the default is 5000 Hz.

Project Navigator - I/O Properties



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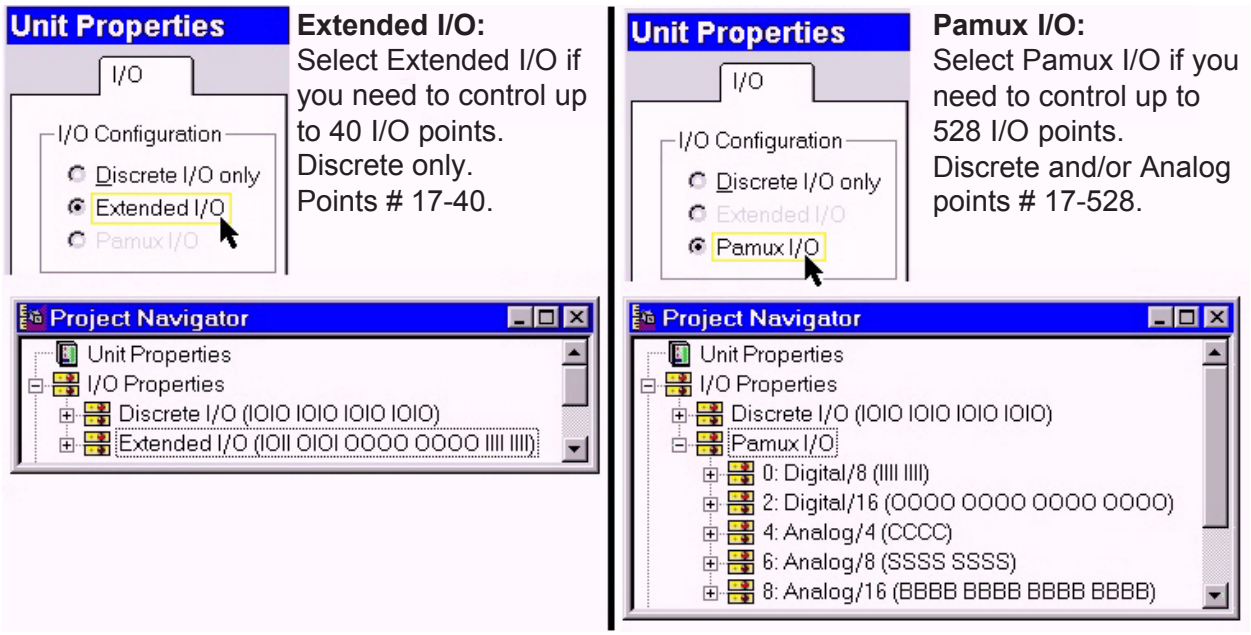
Notes: ORION controllers provide access to Discrete I/O points by referencing predefined arrayed variables in MotionBASIC. Discrete I/O points 1 to 16 are integral to the motion controller. The Discrete I/O properties branch of the Project Navigator tree allows you to configure the Integral I/O point settings for your Orion. Right mouse click on this icon to display its popup menu. The # column in the I/O Properties, displays the ORION I/O point number. Each I/O point can be assigned a unique name. I/O point names may consist of ASCII characters.

The first 16 integral I/O points can be configured, independent of the others, to operate in one of four Modes:

Discrete Input:	Return an ON value when voltage is applied to the input module. The default.
Discrete Output:	Generate a voltage from the output module when the I/O point is set ON .
Rising-edge Latched Input:	Return an ON value from the time voltage is applied to the input module until the I/O point is explicitly "cleared" by the MotionBASIC program. e.g. DIO@(1) = OFF
Falling-edge Latched Input:	Return an ON value from the time voltage is removed from the input module until the I/O point is explicitly "cleared" by the MotionBASIC program. e.g. DIO@(1) = OFF

Project Navigator - Extended I/O Properties



Extended I/O:
Select Extended I/O if you need to control up to 40 I/O points. Discrete only. Points # 17-40.

Pamux I/O:
Select Pamux I/O if you need to control up to 528 I/O points. Discrete and/or Analog points # 17-528.

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Notes:

Extended I/O:

ORION controllers can access, through the optional Extended I/O Connector, up to 24 additional Discrete I/O points, mounted in an external rack. These I/O points are configurable as Input (I) or Output (O) points. Use the Unit Properties dialog box to include Extended I/O in your project.

PAMUX:

Instead of Extended I/O, the optional Extended I/O connector can be used to access up to 512 Pamux Analog or Digital I/O points. Pamux utilizes an eight line parallel bus, and supports 32 groups of up to sixteen I/O, (512 points) supported by either analog and/or digital "Brain Board".

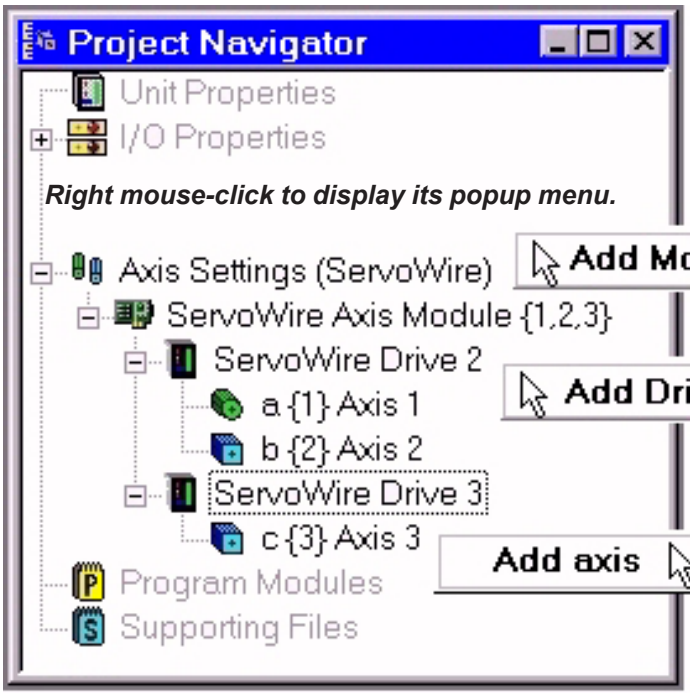
Digital I/O points can be configured as Discrete Inputs (I) or Discrete Outputs (O).

Analog Pamux I/O points are added in multiples of 4, 8, or 16. Once the size of the Brain Board rack is selected, and an address is assigned, the individual I/O points may be configured.

Analog I/O points can be configured as Bipolar Analog Inputs (B), Bipolar Analog Outputs (C), Single-ended Analog Inputs (S), and Single-ended Analog Outputs (T).

Use the Unit Properties dialog box to include Pamux I/O in your project.

Axis Settings - ServoWire Axis Selection



Each ServoWire Axis Module, ServoWire Drive, Pacer and Motor icon in the Project Navigator tree represents an element that is defined in your Motion Control project.

Project Navigator Tree Axis Icons

The Axis Settings icon allows you to - configure the axes for your ORION.

- A ServoWire Axis Module.
- A ServoWire Drive.
- An undefined axis.
- A Pacer Encoder axis.
- A User-defined Pacer Encoder axis.
- A Servomotor axis.
- A User-defined Servomotor axis.

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Notes: **ServoWire Axis Settings:** The Axis Settings branch represents the list of axes controlled by your motion control project. You can use this part of the Project Navigator tree to show or hide the list of axes, as well as adding axes to the list, configuring axes, and deleting axes from the list.

Right Mouse-click on the below icons to display its popup menu.

Axis Module: Each Axis Module icon in the Project Navigator tree represents one Axis Module that is defined in your Motion Control project.

ServoWire Drive: Each ServoWire Drive icon in the Project Navigator tree represents one ServoWire Drive that is defined in your Motion Control project.

Pacer Axis: Each Pacer icon in the Project Navigator tree represents one pacer encoder axis that is defined in your Motion Control project. Double-click on this icon to edit the axis settings.

Pacers that are shown within a grey box are User-defined pacers. The properties of these pacers may be viewed or edited through the Axis Configurator.

In a ServoWire system, Pacers share a servodrive with a servomotor. Pacer/servomotor pairs always have consecutive Axis ID's, with the pacer having the lower ID.

Motor Axis: Each Motor icon in the Project Navigator tree represents one servomotor axis that is defined in your Motion Control project. Double-click on this icon to edit the axis settings.

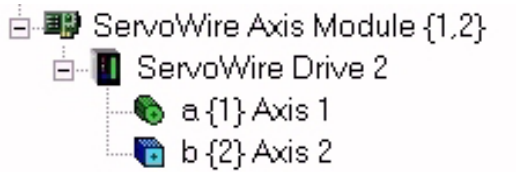
Motors that are shown within a grey box are User-defined motors. The properties of these motors may be viewed or edited through the Axis Configurator.

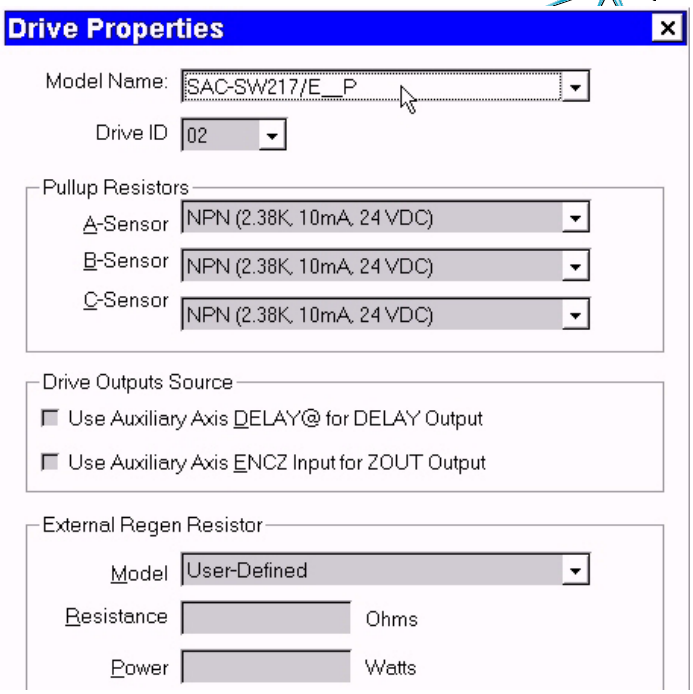
In a ServoWire system, Servomotors can share a servodrive with a Pacer. Pacer/servomotor pairs always have consecutive Axis ID's, with the servomotor having the higher ID.

Axis Settings - Add ServoWire Drive

Right mouse-click to display popup menu.

Note: If you want to connect both a pacer encoder and a servomotor to this drive, you must select a servodrive with a Pacer option (any model that ends with 'P').





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Notes: **Adding / Editing ServoWire Drives in the Project Navigator tree:**

To add a ServoWire Drive and display the Drive Properties dialog box do any of the following:

- Select Insert | Drive from the MotionDesk ProjNav menu .
- Right click on a ServoWire Axis Module icon to display the shortcut menu, and select Add Drive.
- If a ServoWire Axis Module has no servodrives, double-click on the ServoWire Axis Module icon.

Drive Properties:

Model Name: To chose a servodrive, select the desired Model Name from this list.

Drive ID: This is the same as the Axis ID of the primary axis attached to this drive. The next available Servodrive ID is displayed as the default. ID's that are currently in use will not be displayed.

Pull-up Resistors: Select the type of Pull-ups to use with the A-Sensor, B-Sensor, and C-Sensor inputs on this servodrive. Select between NPN @ 10mA (default), NPN @ 1.2mA, or PNP (no pull-up).

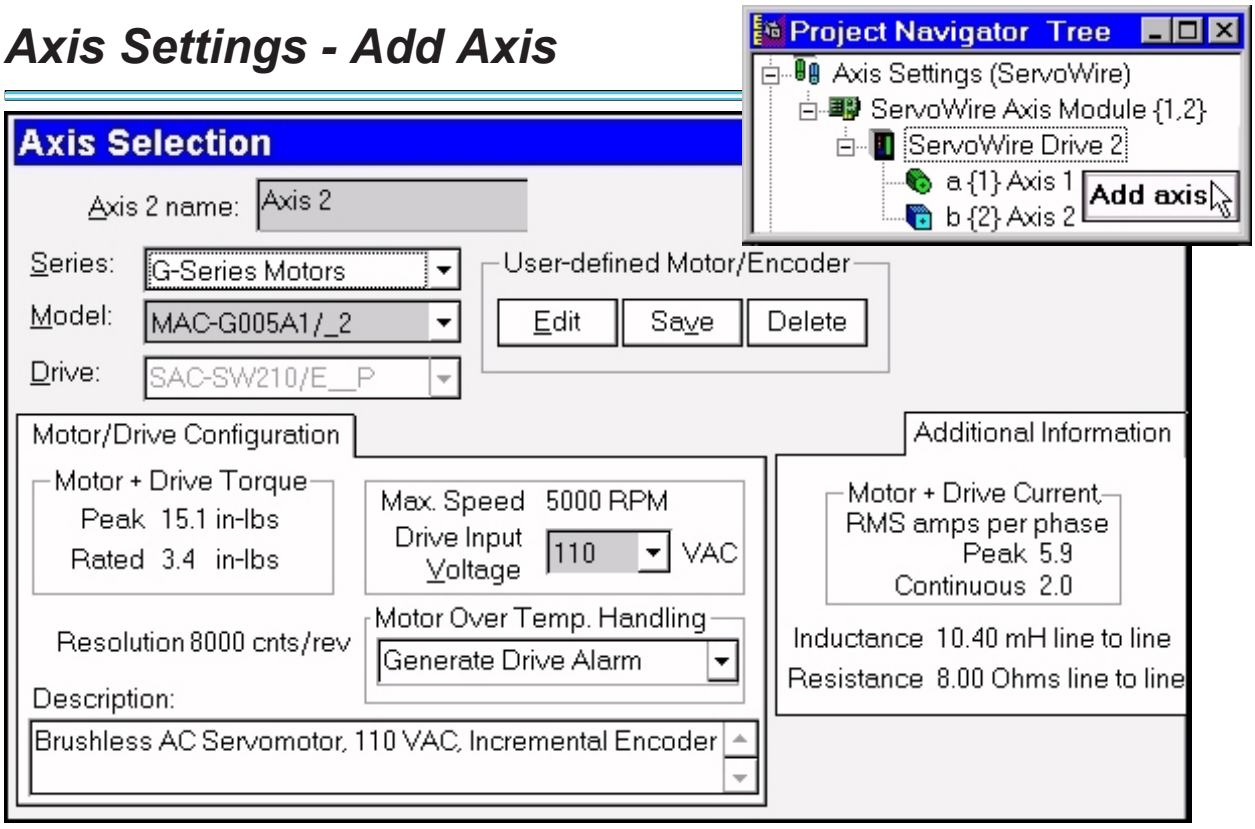
Drive Output Source:

Use Auxiliary Axis DELAY@ for DELAY Output if you want to connect the Auxiliary Axis Delay Counter output signal (DELAY@) to the DELAY output on this servodrive. If not checked (default), the Primary Axis Delay Counter output signal is connected to the DELAY output.

Use Auxiliary Axis ENCZ for ZOUT Output if you want to connect the Auxiliary Axis Zero Reference output signal (Aux ENCZ) to the ZOUT output on this servodrive. If not checked (default), the Primary Axis Zero Reference output signal (ENCZ) is connected to the ZOUT output.

External Regen Resistors: Select your regen resistors from this list:
Choose an ORMEC specified regen resistor or User-Defined.
Enter the Resistance and Power ratings in the boxes provided.

Axis Settings - Add Axis



Notes:

Series: ..... Chose the type of Servomotor or Pacer Encoder for this axis.

Model: ..... Chose a motor or pacer encoder for this axis, select the desired model number from the list. Change the Series if you wish to select a different type of Servomotor or Pacer Encoder.

Drive: ..... The servodrive powering this axis. To change the servodrive edit the Drive properties using the Project Navigator.

Motor / Drive Configuration

Motor/Drive Torque: The amount of rotary force this motor/drive combination can deliver to a load, specified in either inch-pounds (in-lbs) or Newton-meters (N-m).
Enter Peak and Rated Torque - The peak/rated torque of the selected motor.

Max. Speed: ..... The maximum speed of the motor, specified in revolutions per minute. This value may be lower than the motor's maximum if the Drive Input Voltage selected is less than the motor's rated voltage.

Drive Input Voltage: The nominal voltage supplied to the servodrive, in units of Volts AC..

Resolution: ..... The Axis Resolution parameter indicates the resolution of the selected motor encoder (or resolver), and is available as the ORMEC variable CNT.REV@. Axis Resolution units are specified in counts per revolution (cts/rev).

Motor OverTemp. Handling: ... Ignore, Generate Motion Error, Generate Drive Alarm

Description: ..... A short description of the selected servomotor.

Additional Information

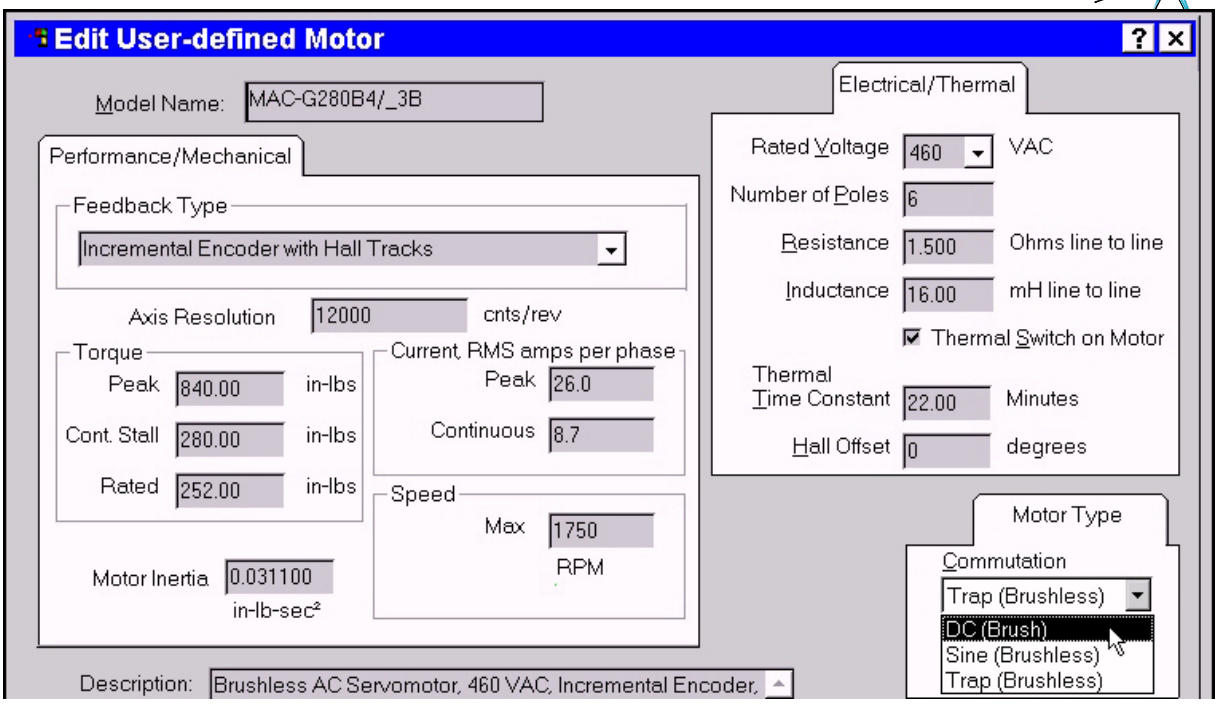
Motor+Drive Current: The current supplied by the drive to the selected motor, specified in RMS amps per phase.

Inductance ..... The inductance, from phase to phase, of the selected motor, specified in millihenries.

Resistance ..... The resistance, from phase to phase, of the selected motor, specified in Ohms.

User-defined Motors/Encoders: ... Use the Edit, Save and Delete buttons to create new motor and pacer encoder definitions, and to modify or delete existing user-defined definitions.

Axis Settings - Custom ServoWire Axis



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Notes: To open an axis for editing: Double-click on the Axis icon in the Project Navigator Tree or Right click on the Axis icon in the Project Navigator Tree to display the shortcut menu. Select the page of the Axis Configurator that you want to open.

The following parameters are specified for custom Torque Drive and Velocity Drive motors:

Performance/Mechanical Parameters:

Feedback Type . Specifies what type of position transducer is being used by the selected motor. Incremental Encoder with Hall Tracks, Incremental Encoder, Absolute Encoder.

Axis Resolution indicates the resolution of the selected motor's encoder and is available as the ORMEC variable **CNT.REV@**. Units are in counts per revolution (cts/rev).

Motor Torque .... The amount of rotary force this motor can deliver to a load, specified in either inch-pounds (in-lbs) or Newton-meters (N-m). Peak Motor Torque, Continuous Stall Torque, Rated Motor Torque

Motor Current ... The amount of current this motor needs to operate, specified in RMS amps per phase. Peak Motor Current - The current required to produce peak torque for the selected motor. Continuous Current - The current required to produce continuous stall torque for the selected motor.

Motor Inertia..... The rotor inertia of the motor itself (without load).

Speed ..... The speed of the motor, specified in revolutions per minute (RPM). Max Speed.

Electrical/Thermal Parameters:

Rated Voltage ... The rated voltage for this servomotor, specified in Volts AC (VAC), input to the servodrive.

Number of Poles The number of magnetic poles in the winding of this servomotor.

Inductance ..... The inductance, from phase to phase, of the selected motor, specified in millihenries.

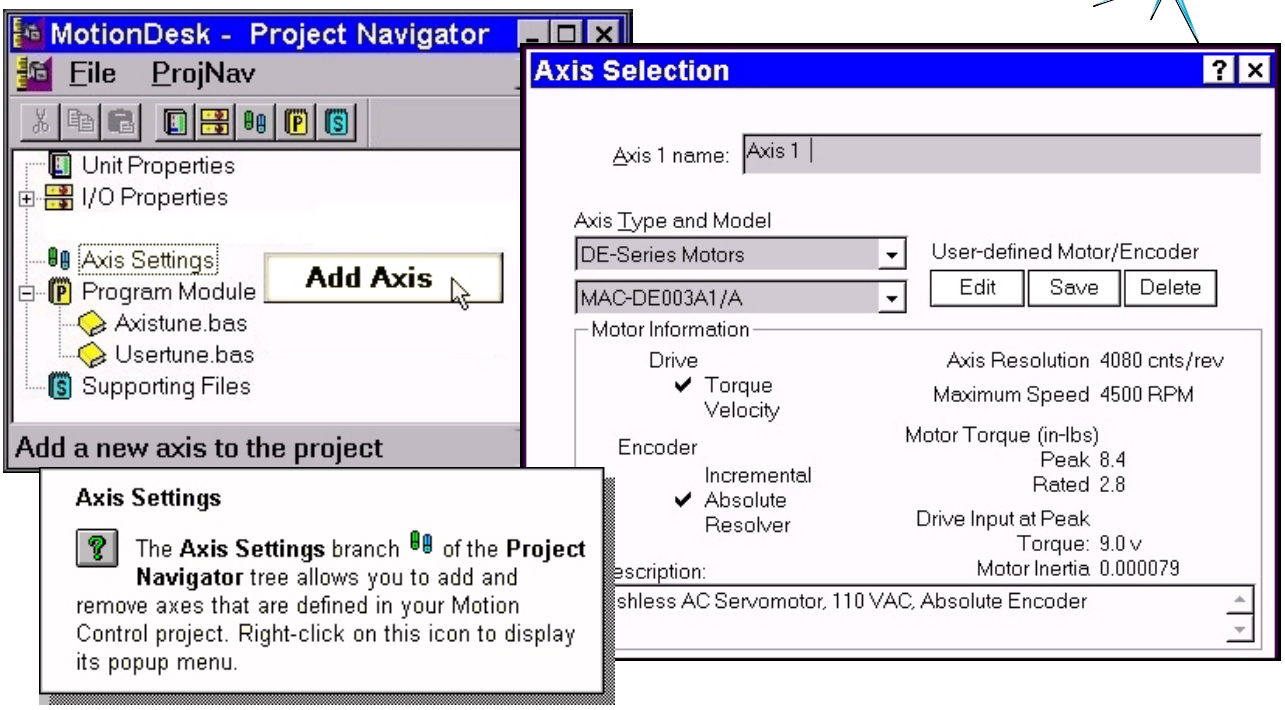
Resistance ..... The resistance, from phase to phase, of the selected motor, specified in Ohms.

Thermal Switch on Motor ..... Check this box if this servomotor has an internal over-temperature sensor.

Thermal Time Constant..... The Thermal Time Constant for this servomotor, specified in Minutes.

Hall Offset ..... The Hall Offset of this servomotor, specified in degrees.

Axis Settings - DSP Axis Selection



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Notes: The Axis Configurator enables you to customize the operational parameters of each (DSP) axis in your System.

Axis Identification ..... Axis ID and Axis Name are displayed at the top of every Axis Configurator screen, indicating the axis currently being configured. Axis ID is defined by the DSP Module ID selected in the Unit Setup screen of the Axis Navigator.

Axis Type and Model .... Axis Selection first consists of choosing the ORMEC series motor, Pacer encoder, or User-defined for a custom axis. Once this selection is made, the default parameters for the chosen motor or encoder may be customized.

Pacer Encoder...Select Pacer Encoders as the Axis Type, and then select the desired model of encoder from the Encoder Model list box.

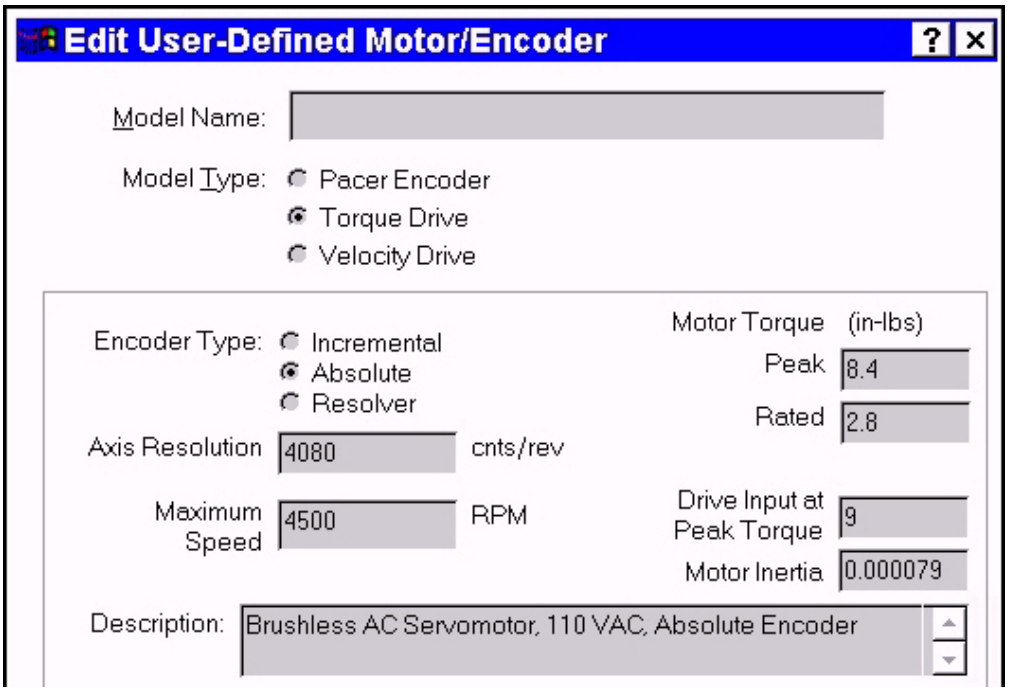
Torque-mode Motors .... To configure this axis as a Torque-mode Motor, select the desired Servomotor series (i.e., DE-Series Motors) as the Axis Type, and then select the desired model of torque-mode motor from the Motor Model list box. The Information pane will display the physical parameters of the selected motor.

Velocity-mode Motors ...To configure this axis as a Velocity-mode Motor, select Custom Motors as the Axis Type, and then select the desired model of velocity-mode motor from the Motor Model list box.

User-Defined Motors .... You can include your own motors and encoders in your Motion Control Project. To create a new motor or encoder, select a similar ORMEC model and click the Edit button. The Edit User-Defined Motor/Encoder dialog will allow you to name and define the profile of the new motor. After you have created a new motor or encoder, you can permanently add it to your personal list of Motors and encoders by clicking the Save button. You can revise your motor parameters at any time by clicking the Edit button. Motors and encoders can be removed from your list by selecting the unwanted motor and clicking the Delete button.

Custom Motor Model information is stored in the file "Program Files\Ormec\MotionDesk**Custom.MTR**".

Axis Settings - Custom DSP Axis



Notes: The Edit User-Defined Motor/Encoder dialog allows you to define a new motor or pacer encoder profile. After entering your own settings, click Save to return to the Axis Configurator with a new user-defined motor, or click Cancel to return without creating a new motor. Use Clear to delete all user entries in this dialog, or Restore to revert to the default settings of the motor or encoder you used as a template.

Model Name ..... Enter a unique name for your motor or encoder.
Model Type ..... This indicates the type of motor or pacer encoder that is being defined.

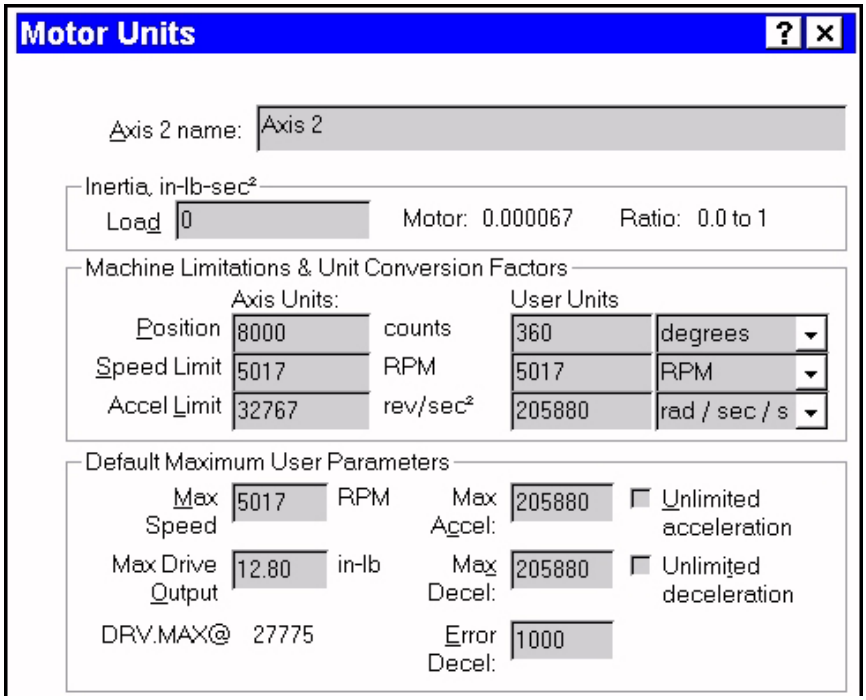
Encoder Parameters ..... The following parameters can be specified for all user motors and pacer encoders:
Encoder Type ..... specifies what type of position transducer is being used by the selected motor or encoder.

If checked: Incremental - the selected motor uses an Incremental Encoder for position information.
Absolute - the selected motor and drive support an Absolute Encoder for position information.
Resolver - the selected motor uses a Resolver for position information.

Axis Resolution ..... The Axis Resolution indicates the resolution of the selected motor encoder (or resolver), and is available as the ORMEC variable CNT.REV@. Axis Resolution units are specified in counts per revolution (cts/rev).
Maximum Speed ..... The maximum speed of the motor or encoder, specified in revolutions per minute (RPM).

Motor Parameters: The following parameters can be specified for custom Torque Drive and Velocity Drive motors:
Motor Torque ..... The amount of rotary force this motor can deliver to a load, specified in either inch-pounds (in-lbs) or Newton-meters (N-m)
..... Peak Motor Torque - The peak torque of the selected motor.
Rated Motor Torque - The rated torque of the selected motor.
Drive Input at Peak Torque ..... The servodrive input that generates peak torque on the motor.
For Torque Mode Drives only.
Drive Input at Max Speed ..... The drive input that commands maximum speed on the motor.
For Velocity Mode Drives only.
Motor Inertia ..... The rotor inertia of the motor itself (without load).
Description ..... Enter a short text description of your motor or encoder.

Axis Settings - Motor Units



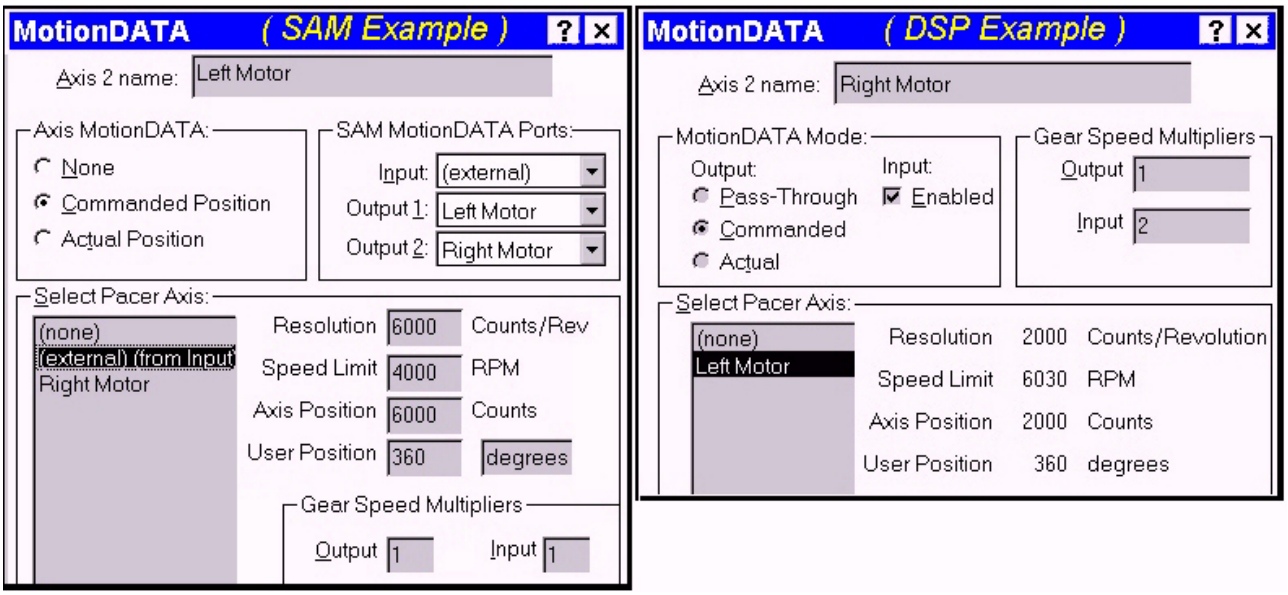
Notes:

Inertia: Enter the calculated, measured, or estimated inertia of the Load to be coupled to the motor shaft (not including the motor's inertia).

Machine Limitations & Unit Conversion Factors: Machine Limitations define the physical limitations of the servomotor selected, in terms of Axis Units. Unit Conversion Factors are used to convert Motor Position, Speed, and Acceleration into the user's preferred units of measurement for these parameters, in terms of User Units.

Default Maximum User Parameters: The Default Maximum User Parameters set here are used when motor motion is commanded without specified speed or acceleration values.

Axis Settings - MotionDATA



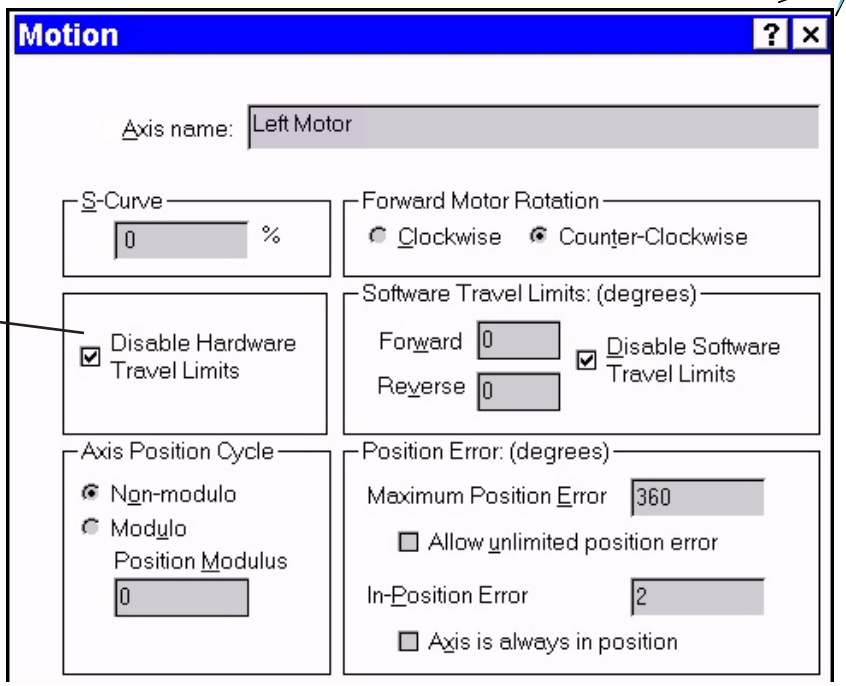
Notes:

MotionDATA Mode (MD.MODE@) MotionDATA Mode defines the configuration of MotionDATA for this axis.

Gear Speed Multiplier: The Gear Speed Multipliers set two factors so that GEAR AT statements are easy to write for machines. A straight-forward command, such as GEAR AT 1 to 1, uses this factor to account for the physical differences between the pacer axis and the follower axis, and yet achieve desired follower motion with this sort of simple command.

Select Pacer Axis: Select Pacer Axis displays the name and motion parameters for the axis that is providing MotionDATA information to this axis.

Axis Settings - Motion



ServoWire only, Hardware Travel Limits under software control. Note: DSP Axis Module use jumpers.

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Notes:

S-Curve Distribution: (SCURVE@) The S-Curve Distribution defines the percentage of the velocity ramp that will be "smoothed" during motion of this axis.

Forward Motor Rotation (CW.FWD@) Forward Motor Rotation defines the servomotor's direction of "forward" rotation, as viewed when facing the end of the motor shaft.

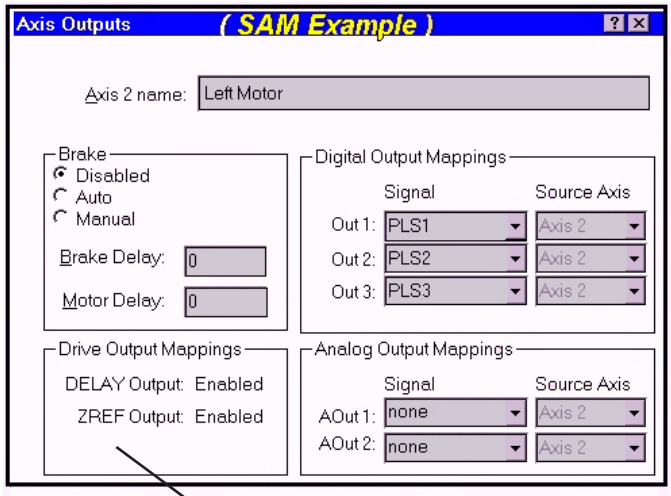
Software Travel Limits: (STL.FWD@, STL.REV@) Software Travel Limits allow you to specify the maximum allowable range of travel for this axis. Software Travel Limits are specified in the user units for position.

Hardware Travel Limits (HTL)- (ServoWire only) Each axis in a an ORION Motion Controller provides two hardware travel limit switch inputs. With ServoWire, the HTL can be disabled by checking the Disable HTL box.

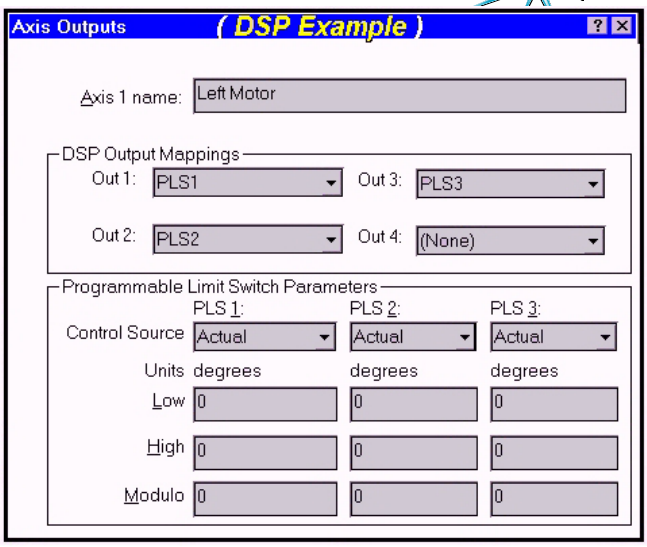
Axis Position Cycle: (POS.MOD@) Axis position can be configured to operate in a non-repeating mode, or to repeat periodically.

Position Error: (PERR.MAX@, PERR.INPOS@) Position Error affects how axis position error information is handled. Position Error is specified in the user units for position.

Axis Settings - Axis Output



ServoWire only, source for DELAY and ZOUT under software control.



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Notes:

Break ..... The Motor Brake signal can be configured for any servomotor on a ServoWire drive. It is not available when the Primary axis of a ServoWire drive is a pacer.

Digital Output Mappings ... OUT1 is mapped to PLS1@ of the Primary axis of the servodrive. OUT4 is mapped to PLS1@ of the Auxiliary axis of the servodrive. These mapping are fixed, and cannot be changed using MotionBASIC Ver 5.1 and earler.

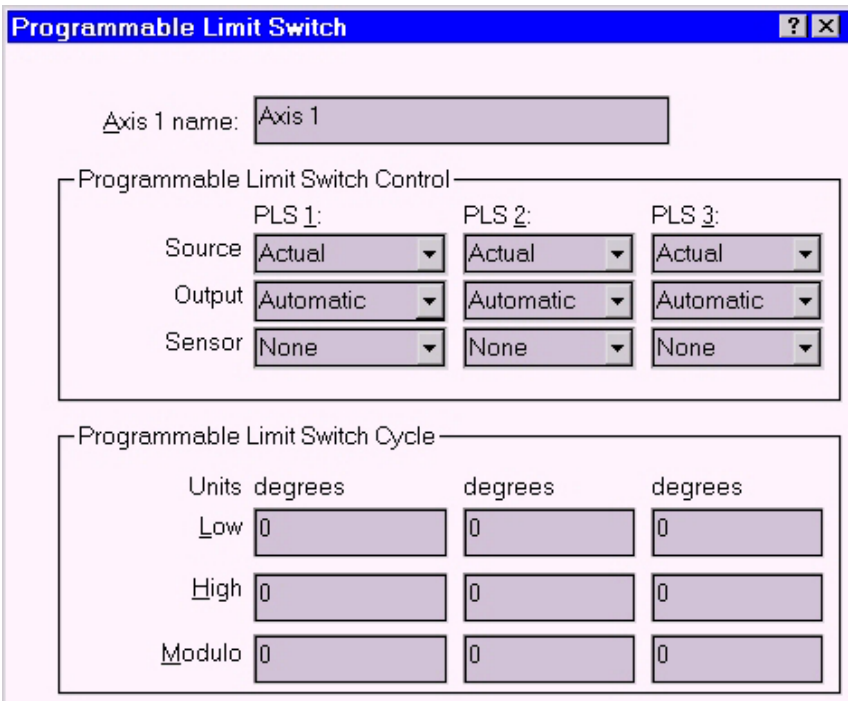
Drive Output Mappings

DELAY Output ..... (ServoWire only) When Enabled, DELAY Output indicates that this axis is the source of the Delay Counter signal at the servodrive. To change this parameter, open the Drive Properties dialog for the servodrive for this axis.

ZOUT Output ..... (ServoWire only) When Enabled, ZOUT Output indicates that ENCZ from this axis is the source of the ZOUT signal at the servodrive. To change this parameter, open the ServoWire Drive Properties dialog for the servodrive for this axis.

Analog Output Mappings ..... Each ServoWire axis in an ORION Motion Controller system has two analog output signals, AOUT1 and AOUT2.
AOUT1 is mapped to the Torque Monitor of the Primary axis.
AOUT2 is mapped to the Velocity Monitor of the Primary axis.
If the primary axis is a Pacer, then AOUT1 and AOUT2 are mapped to none.

Axis Settings - Programmable Limit Switch



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Notes:

Programmable Limit Switch Control:

Each axis has three independent programmable electronic limit switches which turn ON and OFF automatically with respect to axis position.

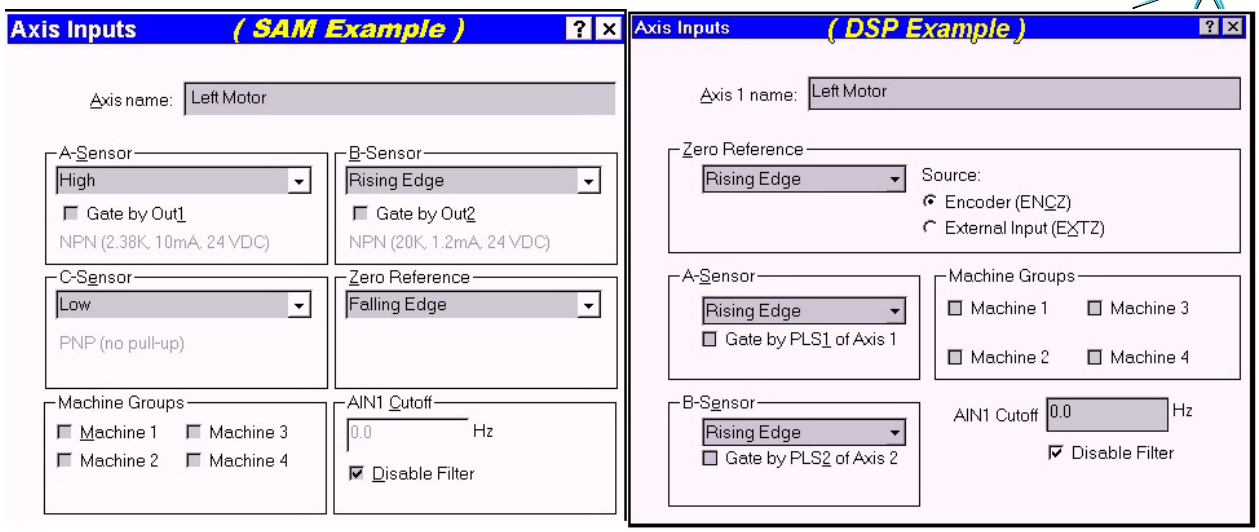
PLS Control Source ...	Chose the source of control information for each PLS.	(PLSx.MODE@)
PLS Output	Choose whether the PLS operates in automatic or manual mode.	(PLSx.MODE@)
PLS Sensor	Select the sensor that will reset the PLS when the sensor is asserted.	(PLSx.SEN@)

Programmable Limit Switch Cycle:

Each axis has three independent programmable electronic limit switches which turn ON and OFF automatically with respect to axis position.

PLS Low	Enter the axis position at which point this Limit Switch should turn OFF.	(PLSx.LOW@)
PLS High	Enter the axis position at which point this Limit Switch should turn ON.	(PLSx.HIGH@)
PLS Modulo	Enter the size of the PLS modulus if PLS axis position is cyclical.	(PLSx.MOD@)

Axis Settings - Axis Input



ServoWire only,
Sensor Pull-up Resistors under software control.
See drive properties.

Note: DSP Axis Module use jumpers.

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Notes:

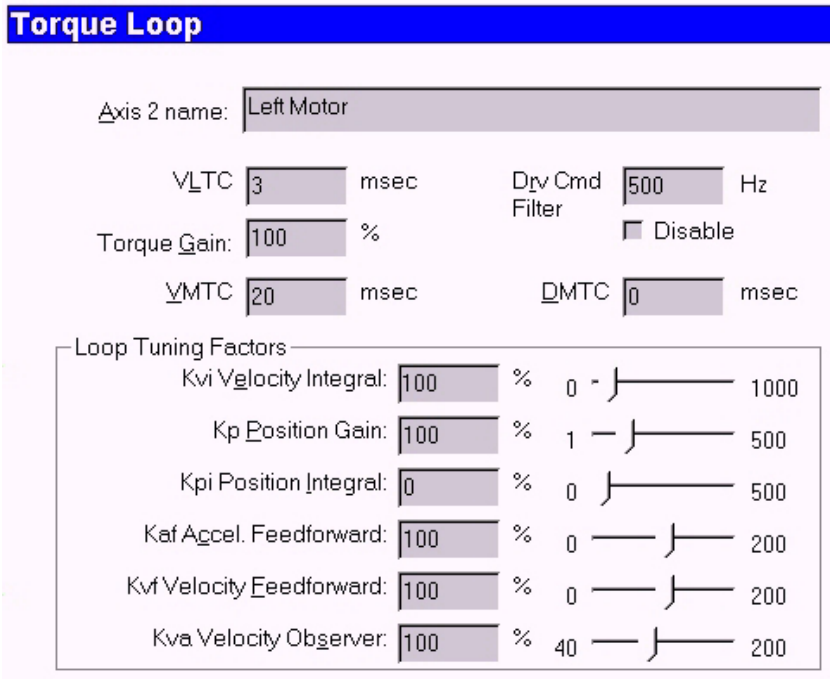
High Speed Sensors - Each ServoWire Drive has four high speed sensor inputs (A-Sensor, B-Sensor, C-Sensor & a Zero Reference) that can be used to initiate, terminate, or control axis motion. Sensors (A,B, and C) inputs are individually configurable. The Drive Properties dialog allows you to configure a ServoWire drive Pull-up resistors. Select the type of Pull-ups to use with the A-Sensor, B-Sensor, and C-Sensor inputs on this servodrive.

Zero Reference Input: Select the Zero Reference input configuration desired.
Encoder ENCZ: Select ENCZ to derive the Zero Reference signal from the servomotor's encoder.
External EXTZ: Select EXTZ to derive the Zero Reference signal from the DSP's EXTZ input signal.

A-Sensor Input: Select the A-Sensor input configuration desired.
A-Sensor Gating: Check this box to enable the A-Sensor when PLS1 is ON.

B-Sensor Input: Select the B-Sensor input configuration desired.
B-Sensor Gating: Check this box to enable the B-Sensor when PLS2 is ON.

Axis Settings - Torque Loop



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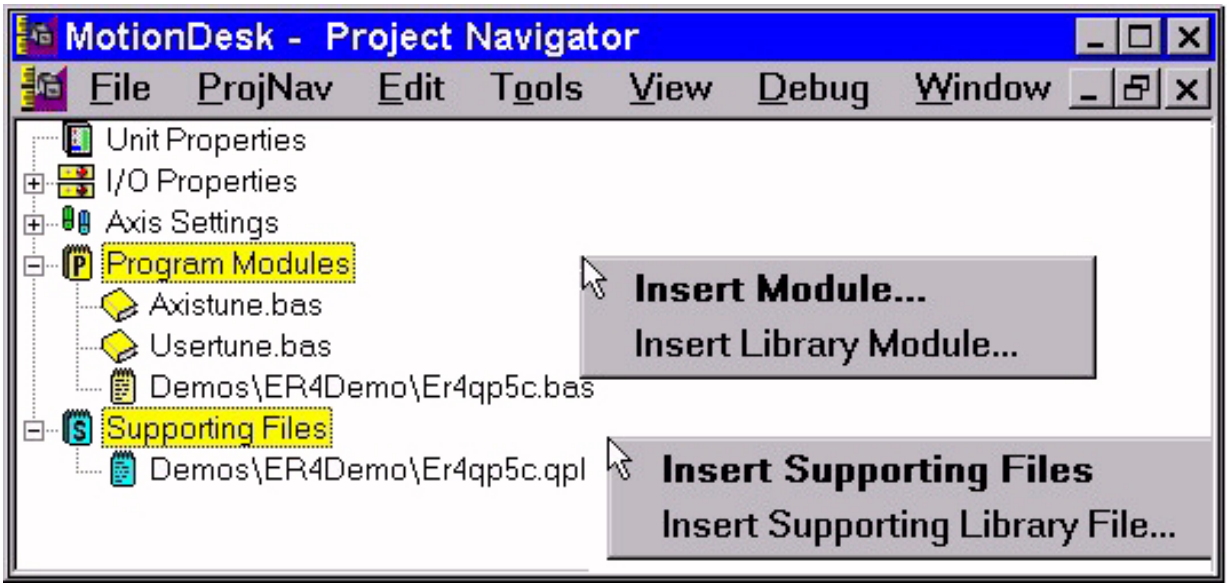
Notes:

Velocity Loop Time Constant:	(VLTC@) The Velocity Loop Time Constant sets the velocity proportional gain.
Torque Gain:	(TRQ.GAIN@) The Torque Gain sets the Torque Mode Servo Gain for this servomotor.
Velocity Monitor Time Constant:	(VMTC@) The Velocity Monitor Time Constant is used to set sets the time constant of the filter on the velocity monitor variable, VEL.MON@.
Drive Command Low-Pass Filter:	(DRV.CMD.3DB@) Enter the cutoff frequency of the lowpass filter for Drive Command for this axis.
Filtered Drive Command Monitor Time Constant	(DMTC@) The Filtered Drive Command Monitor Time Constant is used to set sets the time constant of the filter on the drive command monitor variable, DRV.MON@.
Velocity Integral Factor:	(KVI@) Select a Velocity Integral Factor. (Kvi)
Position Gain Factor:	(KP@) Select a Position Gain Factor. (Kp)
Position Integral Factor:	(KPI@) Select a Position Integral Factor. (Kpi)
Acceleration Feedforward Factor:	(KAF@) Select an Acceleration Feedforward Factor. (Kaf)
Velocity Feedforward Factor:	(KVF@) Select a Velocity Feedforward Factor. (Kvf)
Velocity Observer Sensitivity:	(KVA@) Select a Velocity Observer Sensitivity (Kva)

Program Modules and Supporting files

Program Modules: Program Modules are text files containing MotionBASIC statements.
Supporting Files: Supporting Files are files that are a necessary part of your Motion Control project.



Right-click on the Program Modules or Supporting icon to display its popup menu.

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Notes:

Program Modules: Program Modules are text files containing MotionBASIC statements that make up the control program for your Motion Control project. Library Modules are standard Program Modules that are kept in the MotionDesk Library for use in any Motion Control project. A MotionBASIC program can consist of as many modules as desired.

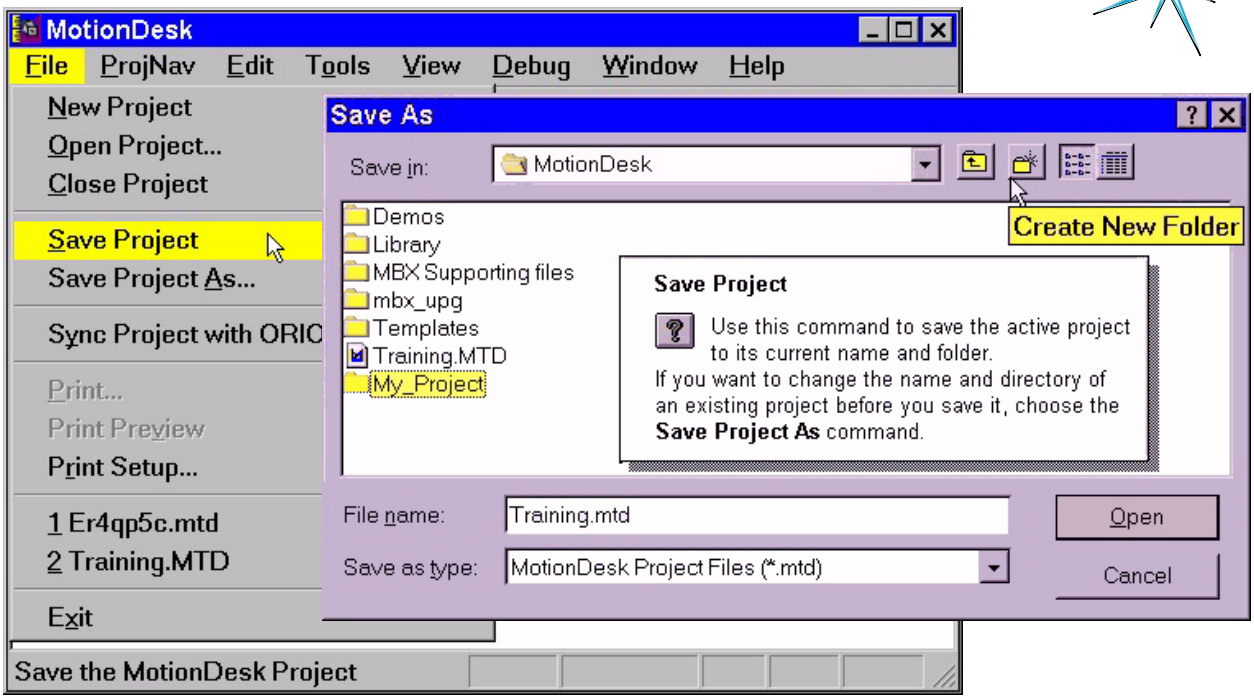
- The Project Navigator is used to add modules to the project, and delete modules from the project.
- MotionPad is used to edit Program Modules and to view Library Modules.

Supporting Files: Supporting Files are files that are a necessary part of your Motion Control project. Library Files are standard Supporting Files that are kept in the MotionDesk Library for use in any Motion Control project You can identify as many Supporting Files as needed.

- The Project Navigator is used to add files to the project, and delete files from the project.
- Your default file associations are used to select the application for editing Supporting Files and viewing Library Files.

Note: Supporting Files are not the same as Program Modules. Although you could add a MotionBASIC module as a supporting file, it will not be part of your executable program.

Saving a MTD Project file



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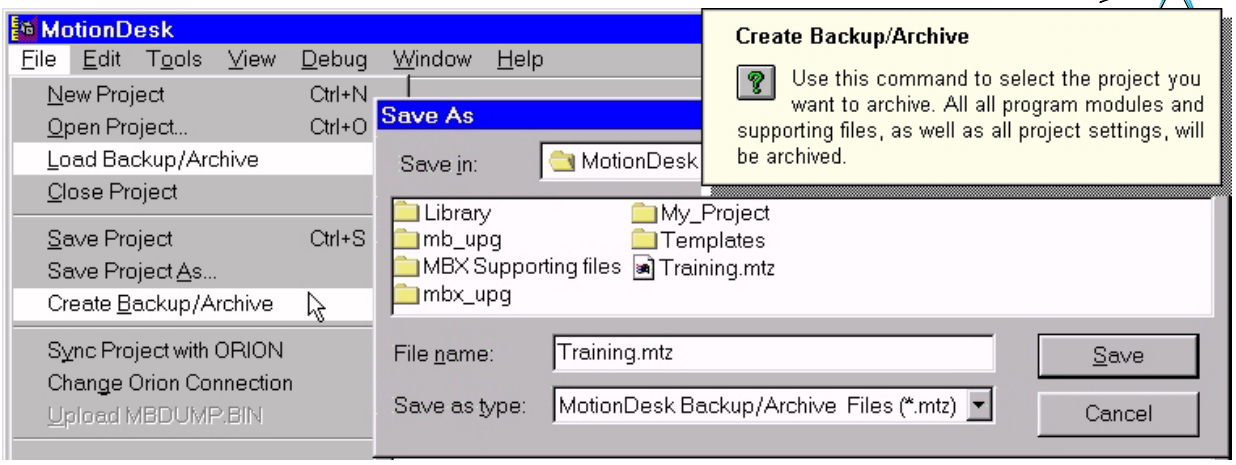
Notes: MotionDesk creates project files to record the unique configuration settings of each Motion Control Project that you create. These projects reside on your development system (with .MTD as a filename extension) and also on your ORION Motion Controller (with .MTP as a filename extension). The name of the current project is displayed in the title bar of the various MotionDesk windows.

Project Documents:(MTD) The Project Document is a binary file produced by MotionDesk when a new project is created. This file, which has the extension .MTD, defines all the aspects of a project. Project Documents reside on your development system along with MotionDesk.

Project Files: (MTP) The Project File is an ASCII file that is automatically produced by MotionDesk when a Project Document is saved, and when you synchronize MotionDesk with ORION. This file, which has the extension .MTP, is a subset of the Project Document. The Project File defines all aspects of a project that relate to an ORION Motion Controller. Project Files reside on both your development system and on the ORION System Card.

Motor Parameter Configuration "MP.CONFIG" Establish valid settings for the Ormec Variables involved in the configuration of the controller and axes. **The settings are established in the project .MTP file created from the MotionDESK software.**

Create or Load Backup/Archive file - MTZ



When you choose to Archive a Motion Control Project, project information is saved in a single compressed file (*.MTZ) that can be easily transferred to floppy disk, or moved to another development system with MotionDesk. This information includes:

- The ORION Configuration settings that were defined in the Project Navigator.
- All Program Modules that are referenced in the project.
- All Supporting Files that are referenced in the project.

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Notes:

Create Backup/Archive: Use this command to archive the active Motion Control Project. MotionDesk displays the Save As dialog box so you can change the name the archive of your project. Archived projects have the file extension .mtz. This command will archive all program modules and supporting files, as well as all project settings.

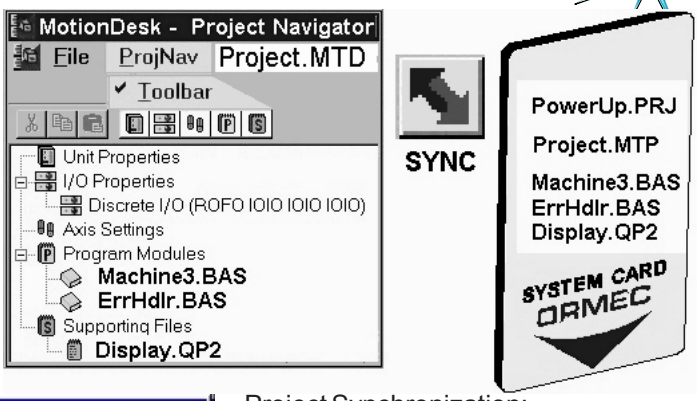
Load Backup/Archive: Use this command to load an archived Motion Control Project. MotionDesk displays the Select the Backup/Archive file dialog box so you can select the project archive you want to load. Archived projects have the default file extension .MTZ.

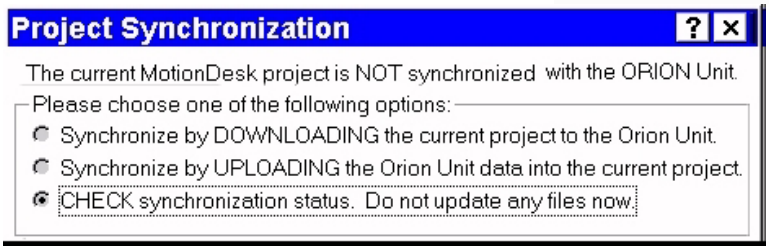
This command will restore all program modules and supporting files, as well as all project settings.

Sync a project

The Project Document (extension **.MTD**) is a binary file produced by MotionDesk when a new project is created. This file defines all the aspects of a project and resides on your development computer.

The Project File (extension **.MTP**) is an ASCII file that is automatically produced by MotionDesk when you synchronize MotionDesk with ORION. This file is a subset of the Project Document (.MTD).





Project Synchronization:
When MotionDesk is actively working with an ORION Motion Controller, the Motion Control Projects (.MTD and .MTP) on the two platforms must be "in sync".
The last project installed (downloaded) in the controller is the default project to be restored on powerup. The name of that project (.MTP) is stored in a pointer file on the system card: **POWERUP.PRJ**.

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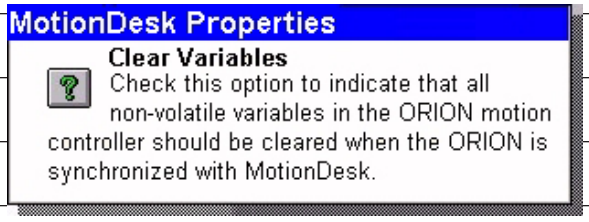
Notes: MotionDesk creates project files to record the unique configuration settings of each Motion Control Project that you create. These projects reside on your development PC (with .MTD as a filename extension) and also on your ORION Motion Controller System Card (with .MTP as a filename extension). The name of the current (open) MotionDESK project (.MTD) is displayed in the title bar of the various MotionDesk windows.

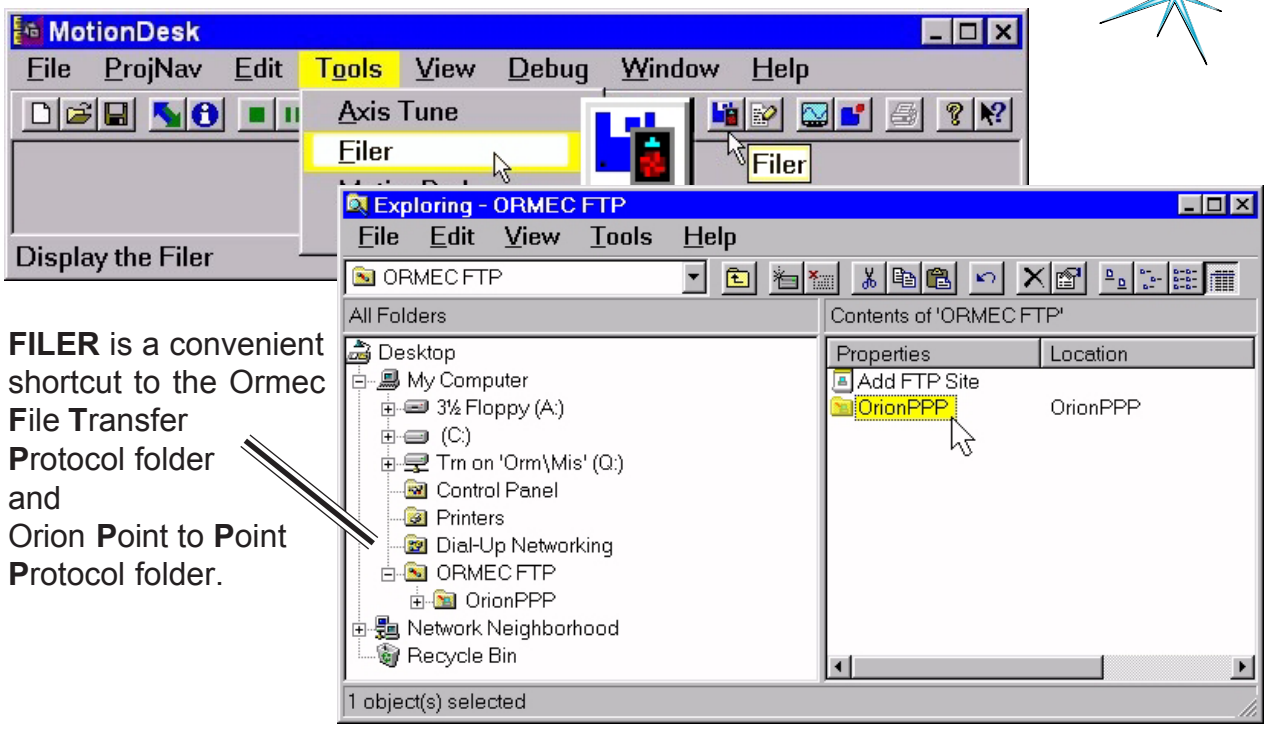
Project Synchronization:
When MotionDesk is actively working with an ORION Motion Controller, the Motion Control Projects on the two platforms must be "in sync". Most MotionDesk windows (such as Console, Trace, AxisTune and Upgrade Director) force a Sync to occur when they are invoked. Other MotionDesk windows (such as Direct Mode, Project Navigator and System Information) are designed to work properly no matter what project may exist in the ORION.
Projects lose synchronization when you change configuration settings, add, remove or modify a program module, or change the active project in either MotionDesk (by loading a new project) or the ORION (by changing the System Card). Synchronization will automatically be restored as soon as you perform any MotionDesk operation that requires synchronization. You can also force project synchronization at any time by selecting Sync Project with ORION.

When synchronization of the project is requested, MotionDesk prompts you with the Project Synchronization dialog, asking if you want to Downloading your project to the ORION, or Uploading your project from the ORION. When you choose to Check a Motion Control Project from the ORION, the Motion Project (MTP) on your ORION is compared with the current project on your development system. If the projects are identical, then they are considered to be "In Sync". You can also choose not to synchronize or check by pressing the cancel button.

Clear Variables:
MotionDESK properties indicates (by a check-mark present in the "Clear Variables" field) that all nonvolatile variables in ORION will be cleared when the ORION is synchronized with MotionDesk.
To check, open "View - Preferences" to display Properties.



Filer - File Transfer Protocol



FILER is a convenient shortcut to the Ormec **F**ile **T**ransfer **P**rotocol folder and Orion **P**oint to **P**oint **P**rotocol folder.

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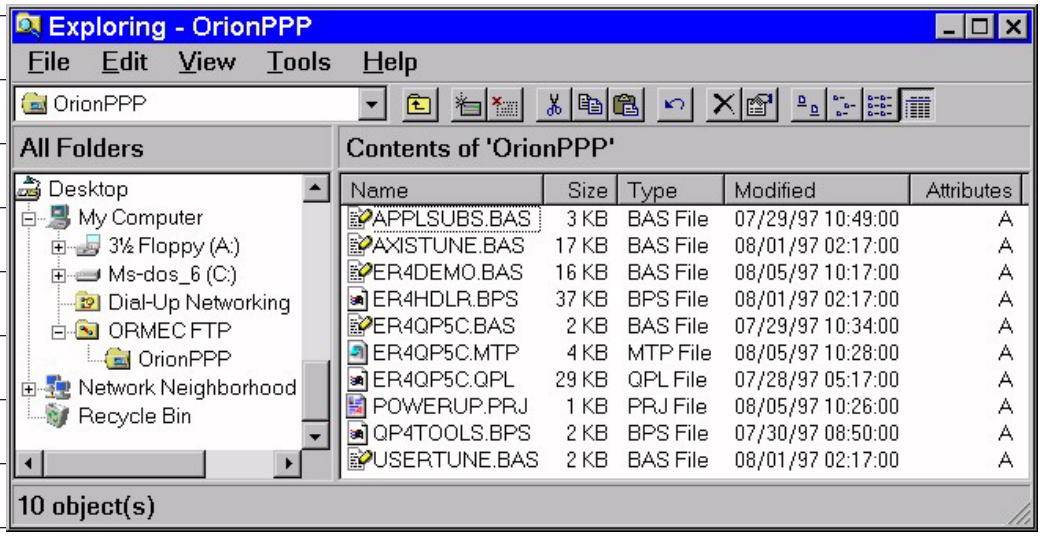
Notes: The Ormec FTP folder is an extension of the Windows Explorer that allows access to the MotionBASIC System Card installed on your Orion motion controller.

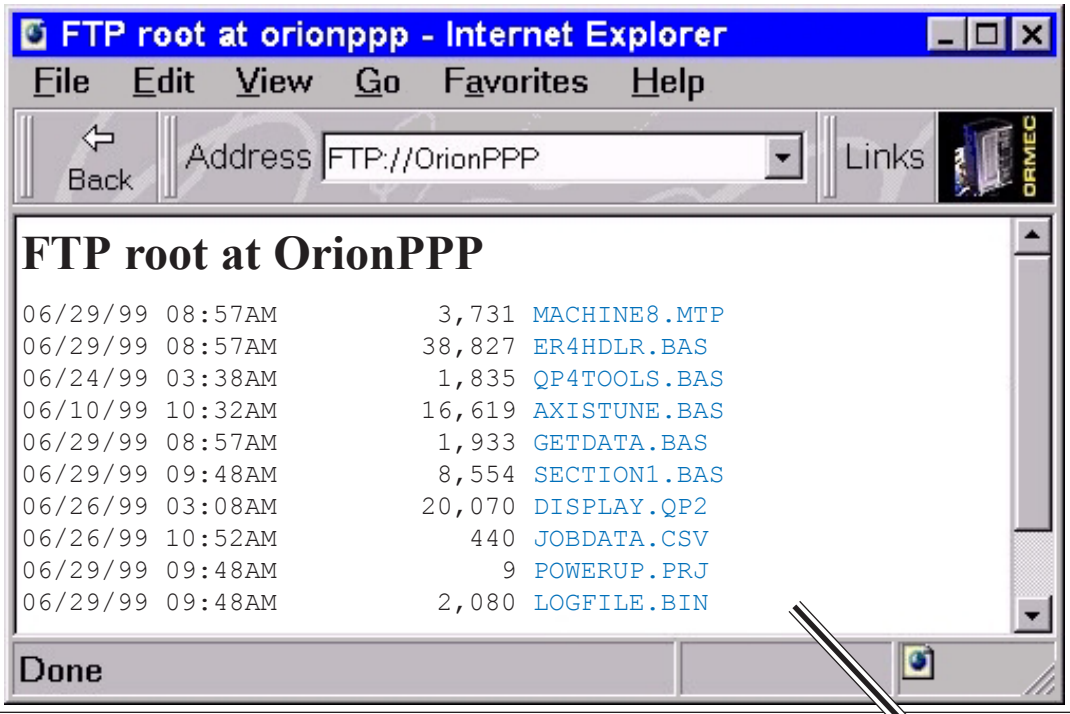
To display the FTP Folder window, click on the FTP Folder icons or open "My Computer".

File Transfer Protocol: The FTP Folder allows files to be transferred between the MotionDesk development computer and the ORION Motion Controller System Card.

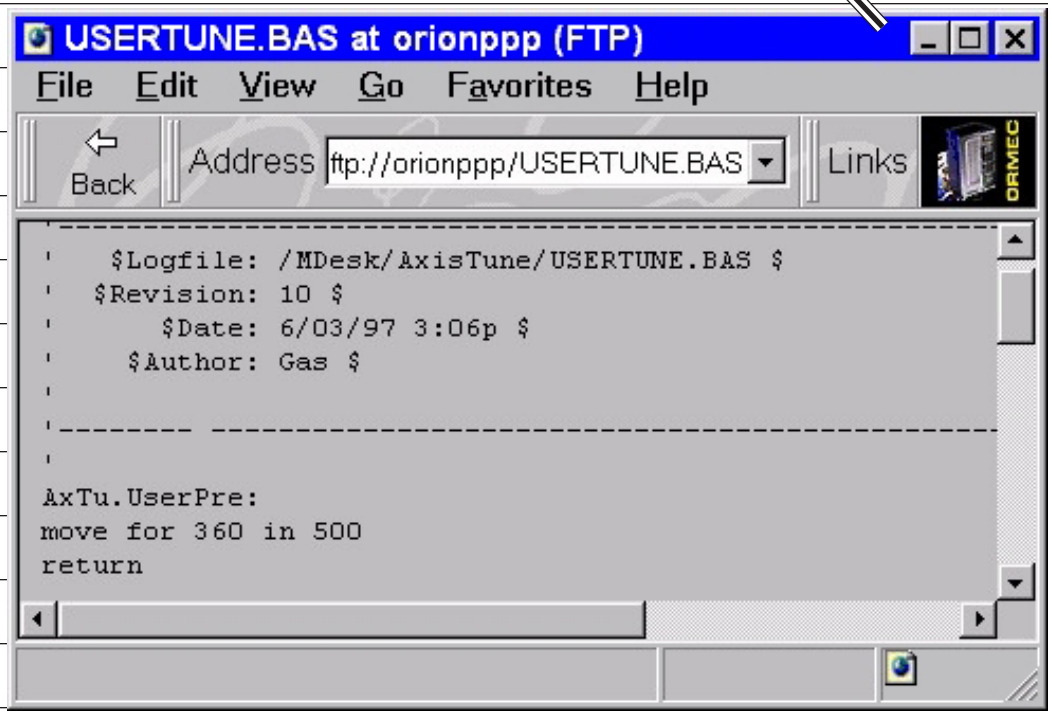
Point-to-Point Protocol: Windows supports PPP connections, a communications protocol for transmitting information over standard telephone lines.

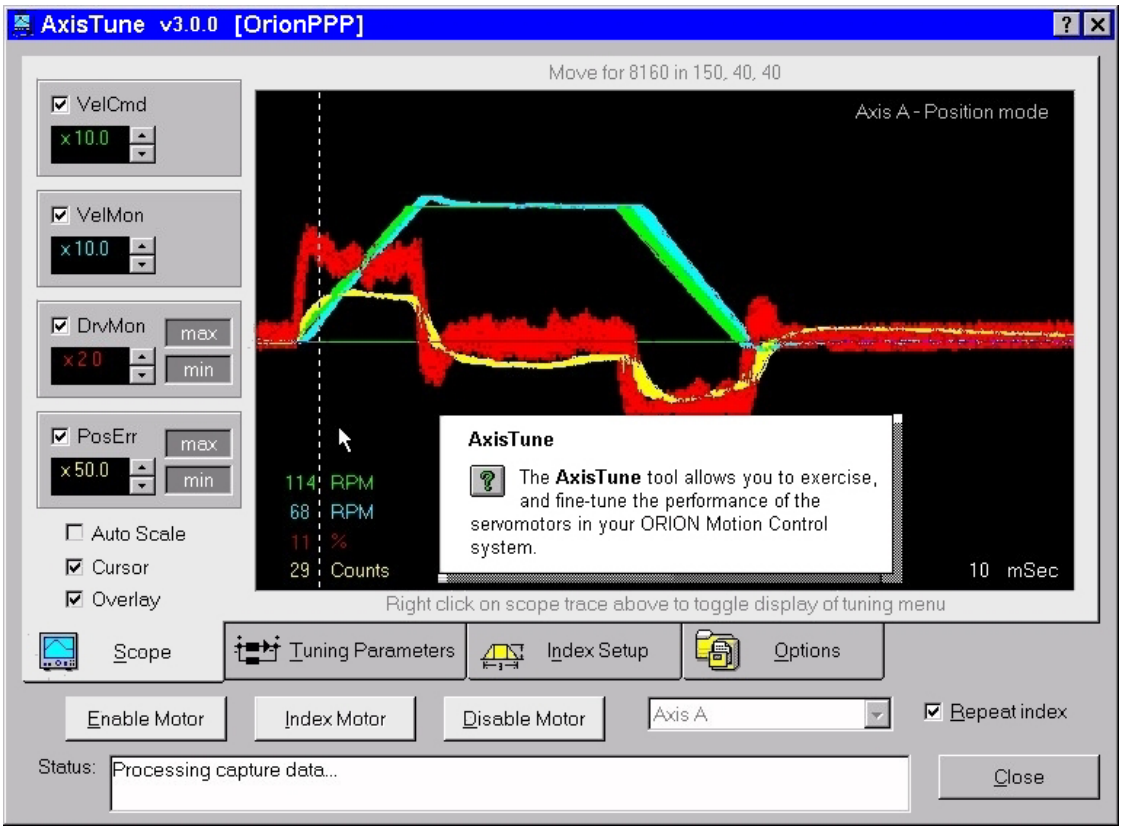


Surfing the System Card with Internet Explorer



Notes: Using Internet Explorer with the address **FTP://OrionPPP**, files can be retrieved from the ORION Motion Controller System Card.

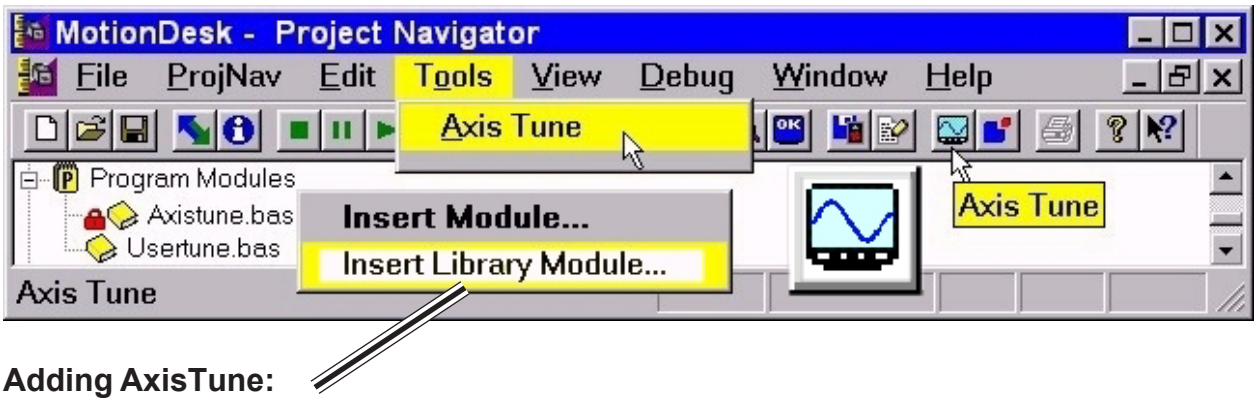




Notes: Axis Tune requires no programming to get your motors and drives TUNED to your system load. Built-in and user modifiable test motions with default parameters can be adjusted to meet your system inertia load requirements, allowing fine tuning of your system's DSP loop response. All modifications applied to the loop parameters are implemented dynamically, with visual feedback of their effect displayed on the above color scope. Final adjustments can then be stored in the configuration file for your project.

Preparation before using AxisTune

AxisTune.bas is a MotionDesk library module that allows you to exercise a motor with a standard trapezoidal index. This library module is a MotionBasic subroutine that defines and executes the index motion for MotionDesk.



Adding AxisTune:
In the MotionDesk Project Navigator tree, add the AxisTune.bas and UserTune.bas library modules to your project.

Notes: **WARNING!** It is strongly recommended that the servo system is initially tested with the motors shafts mechanically disconnected from any machine or load. AxisTune test program is generic in nature and is intended for use as an exerciser for the system's motors.

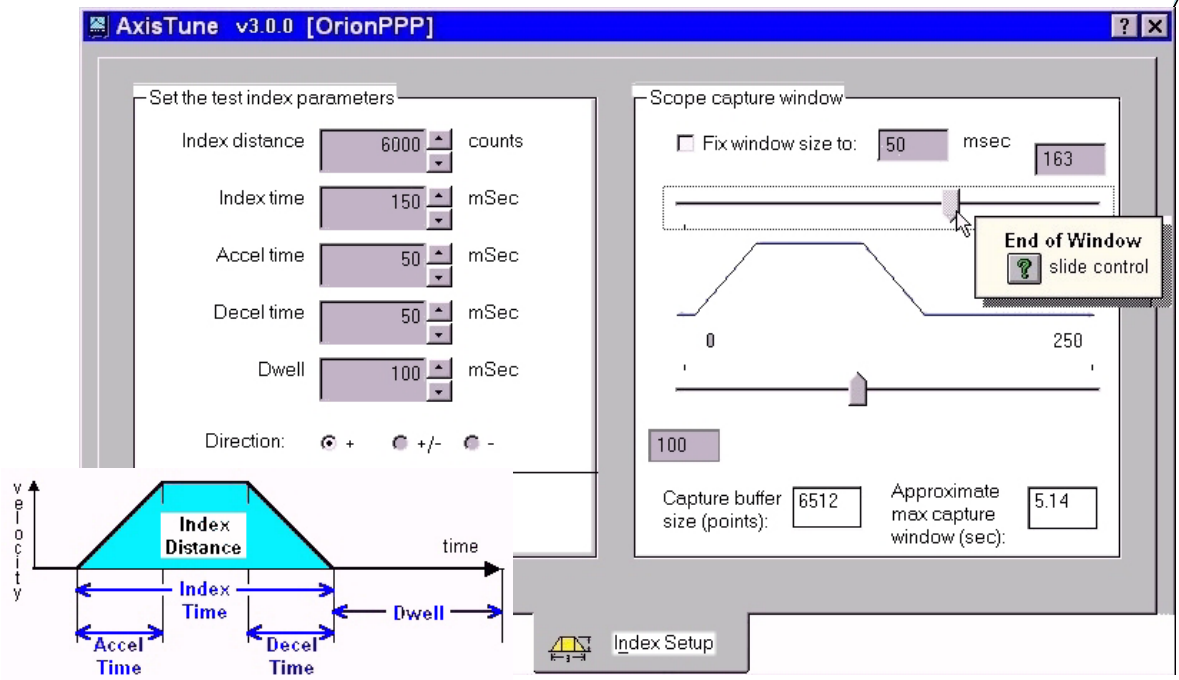
NOTE: All axis tune variables start with "**AxTu.**"

UserTune.bas is a MotionDesk library module that allows you to exercise a motor with custom motion profiles in addition to the default trapezoidal index. User Tune is a user-defined MotionBasic subroutine that defines and executes the desired custom index motion. The sample UserTune.bas supplied with MotionDesk defines a simple sinusoidal motion.

Preparation before using AxisTune and User Tune:

1. In the MotionDesk Project Navigator tree, add the AxisTune.bas and UserTune.bas library modules to your project.
2. Optional: Edit the User Tune module as required to define your custom motion.
3. Start AxisTune by pressing the AxisTune Icon. NOTE: DO NOT USE THE RUN ICON!
4. Optional: Check "User supplied motion subroutine" in the Index Setup tab. AxisTune is now configured to use your custom motion profile.

Axis Tune - Index Setup



Notes:

Index Setup allows you to define the shape of the index command that is used to exercise the servomotor under test.

Index Distance The distance (in counts) that the motor will move during one index command.

Index Time..... The time required to move the full Index Distance.

Accel Time ..... The time the motor is under acceleration. Min 5 msec. , Max Index Time less the Decel Time.

Decel Time ..... The time the motor is under deceleration. Min 5 msec. Max is the Index Time less the Accel Time.

Dwell ..... The time that the motor is at rest before the next index command.

Direction ..... Forward (+) or Reverse (-) , as defined by CW.FWD@, also perform an index in each direction (+/-)

Capture window allows you to define the shape of the window that displays the index command that is used to exercise the servomotor being tested.

Window Size .. The Scope capture window is normally configured to start 10 msec before the beginning of the index, and stop at the end of the dwell time. Check Fix window size to set the screen width to that duration.

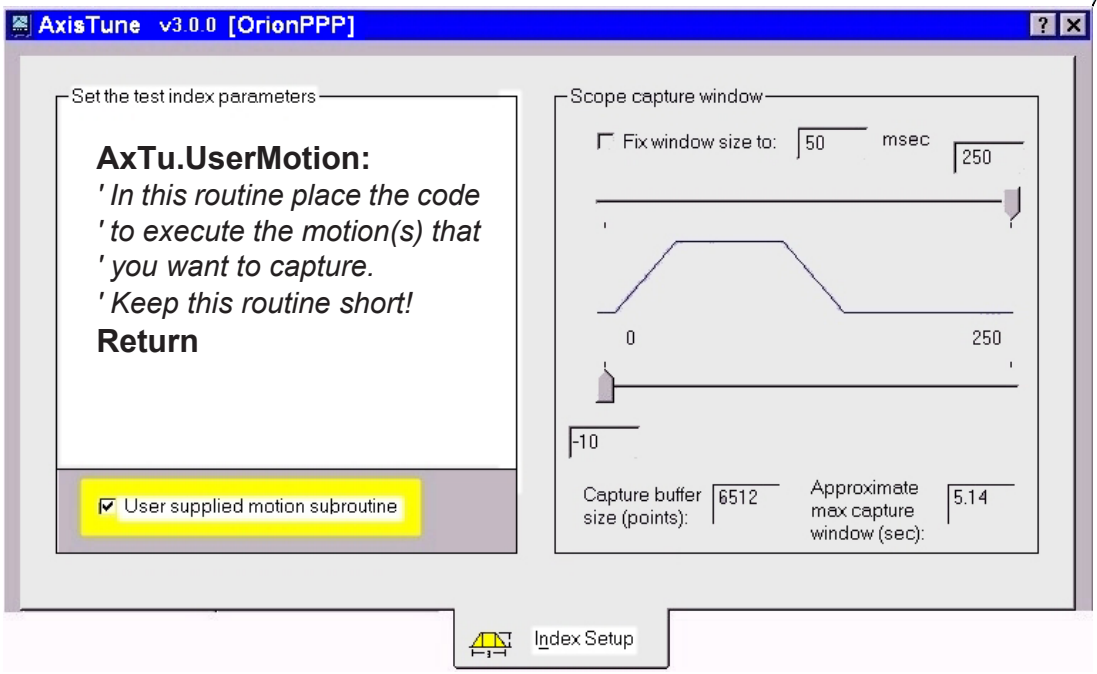
End of Window Use the upper slide control, or enter the desired duration (after the start of the index) to end the capture window. If Window size is fixed, changing this parameter will change Start of Window proportionally.

Start of Window Use the lower slide control, or enter the desired time (before the start of the index) to start the capture window. If Window size is fixed, changing this parameter will change End of Window proportionally.

Buffer Size..... The Capture buffer size field displays the number of data points that will be captured for display in the Scope window. This field is read-only.

Maximum Size The Approximate max. capture window field displays the approximate maximum duration, in seconds, that can be displayed in the Scope window. This field is read-only.

✓ User supplied motion subroutine



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Notes: USERTUNE.BAS is a MotionDesk library module that allows you to exercise a motor with custom motion profiles in addition to the default trapezoidal index. User Tune is a group of three user-defined MotionBasic subroutines that define and executes the desired custom index motion. The sample USERTUNE.BAS supplied with MotionDesk defines a simple sinusoidal profile motion.

Library file USERTUNE.BAS

AxTu.UserPre:

```
' This is where you put any code required to set up your user defined motion. This includes preparing cams
' or profiles, starting a pacer axis, setting up a GEAR AT, etc. This code will be called every time you press the
' Index button on AxisTune.
Return
```

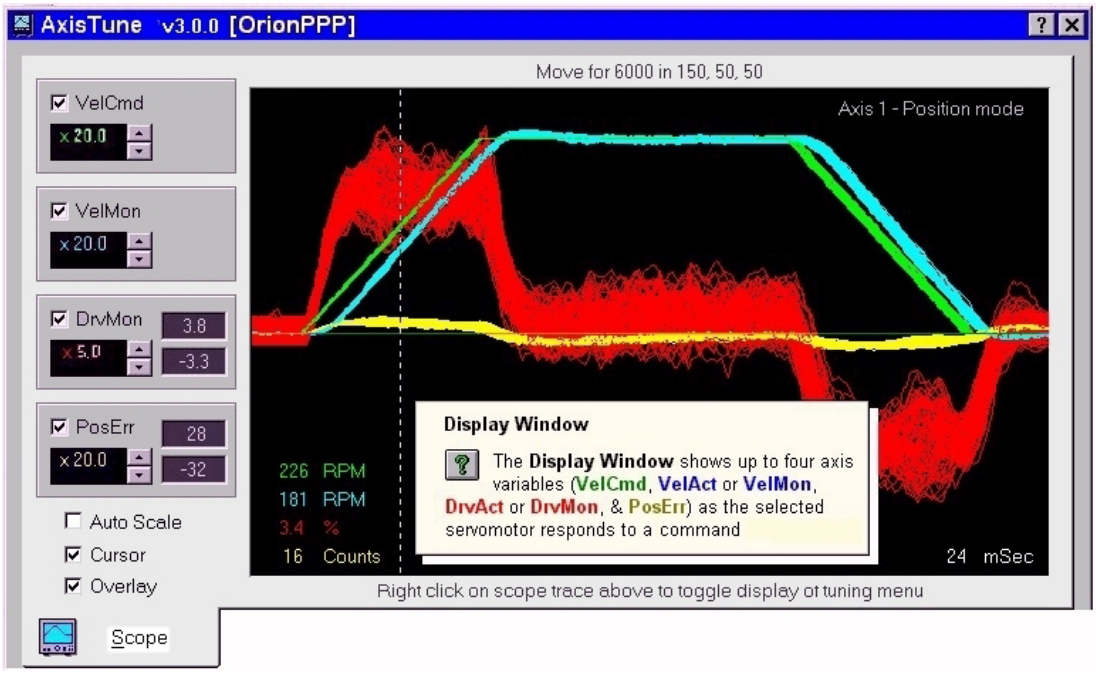
AxTu.UserMotion:

```
' In this routine place the code to execute the motion(s) that you want to capture.
' Keep this routine short!
Return
```

AxTu.UserPost:

```
' In this routine put any code that you want to execute after the motion is complete.
' An example would be stopping and disabling a pacer axis.
Return
```

Axis Tune - Scope



Notes: **Display Window:** The Display Window shows up to four axis variables (VelCmd , VelMon, DrvMon, & PosErr) as the selected servomotor responds to a command, as defined in the Index Setup tab. The current MOVE parameters or "User defined motion" are shown above the window.

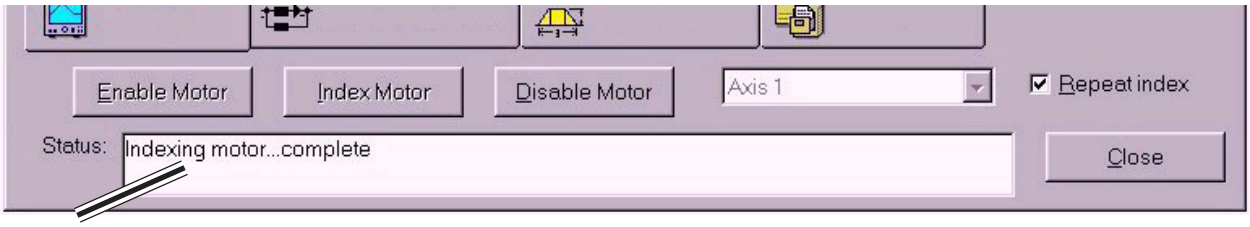
Adjust Gains: A right-click in the Display Window will bring up the Adjust Gains window, allowing you to adjust axis loop gains while you observe how the axis responds to the changes. See Tuning parameters.

Auto Scale: If Auto Scale is checked, the scope traces are automatically displayed full-scale with each index.

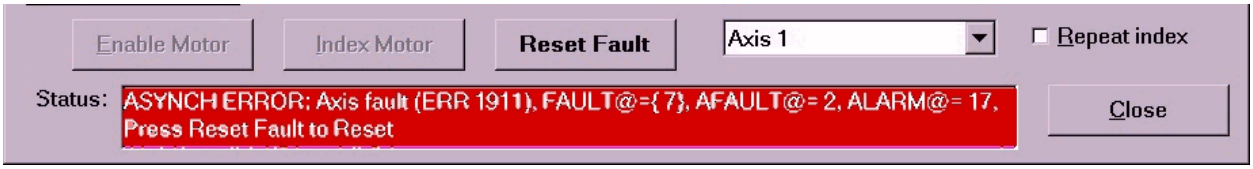
Cursor: If Cursor is checked, a vertical marker is shown in the display window, and the actual values of the displayed traces at the mark are displayed in the lower left quadrant of the screen. You can use the mouse (or the cursor keys) to move the marker to any point on the time axis of the display window, in increments of 1 msec.

Overlay: If Overlay is checked, the screen is not cleared before a new index is displayed. This allows multiple traces to be displayed as you adjust loop gains, or observe the influence of external forces on the axis.

Axis Tune - Status & Control buttons



Status: This message pane displays the operational status of AxisTune during an Index Motor sequence. The message text is displayed until a new status message is displayed.



If an asynchronous error is detected by AxisTune, the message pane background changes to red, and an appropriate error message is displayed.

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Notes:

Enable Motor: Enable the selected motor. MODE@ will be set.

Index Motor: The motor will attempt to execute the MOVE command defined in the Index Setup tab.

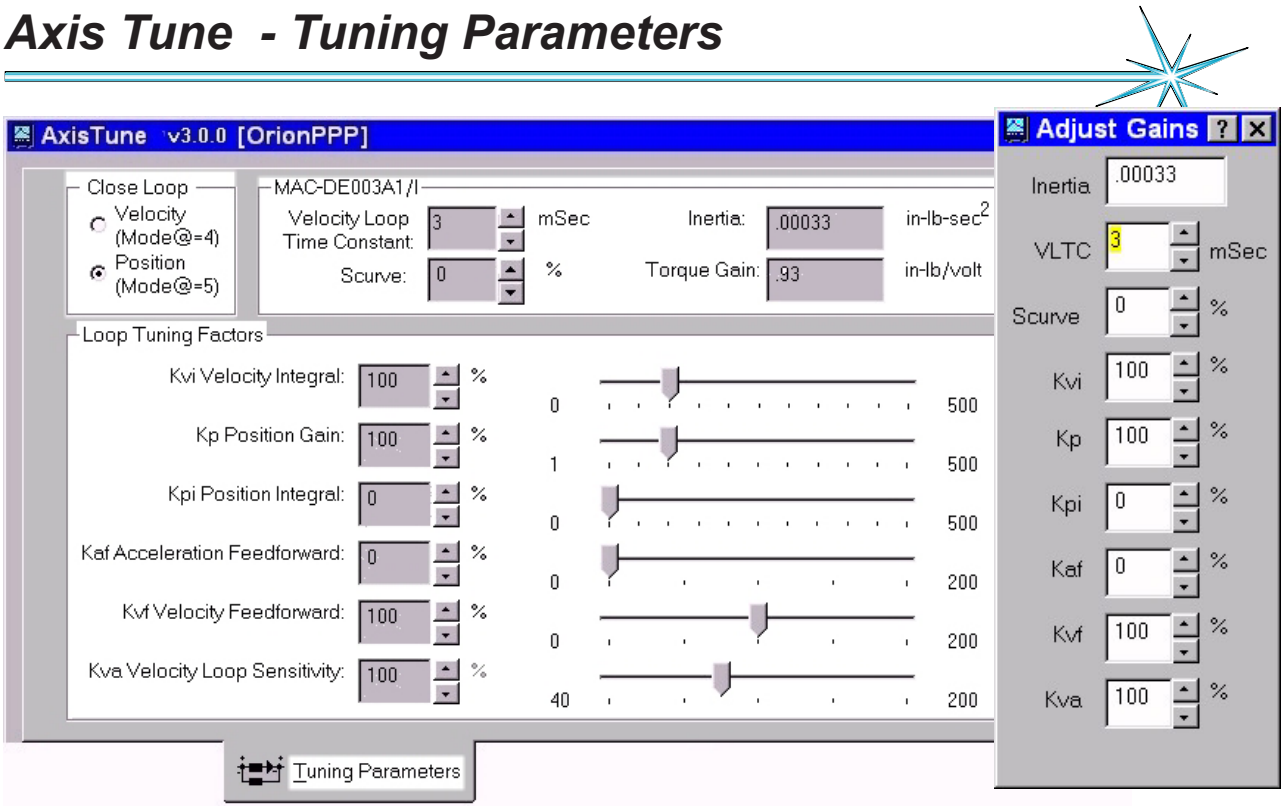
Disable Motor: MODE@ will be set to 0, and any faults will be cleared.

Axis Selection: Select an axis to exercise from the list of axes available to your ORION Motion Controller.

Repeat Index: If this option is checked, the MOVE will repeat indefinitely. It can be stopped by removing this check.

Close: Use this button to exit AxisTune.

Axis Tune - Tuning Parameters



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Notes: The Tuning Parameters tab of AxisTune allows the adjustment of servo loop gains and related parameters.

Position Enable both the Position and Velocity Control Loops, and operate this axis in Position Mode MODE@ =5.

Velocity Enable only the Velocity Control Loop and operate this axis in Velocity Mode (MODE@ = 4).

VLTC@ The Velocity Loop Time Constant is used to set the velocity proportional gain of the servo loop.

SCURVE@ defines the percentage of the velocity ramp that will be "smoothed" during MOVE motion of this axis.

INERTIA@ Total Inertia is the sum of the inherent inertia of the motor, and the inertial load seen at the motor shaft.

TRQ.GAIN@ Torque Gain is based on the motor and drive selected for an axis.

KVI@ Velocity Integral. Higher values result in an underdamped, lower values yield no improvement in response.

KP@ Position Gain. Higher values result in an underdamped, and lower values yield an overdamped response.

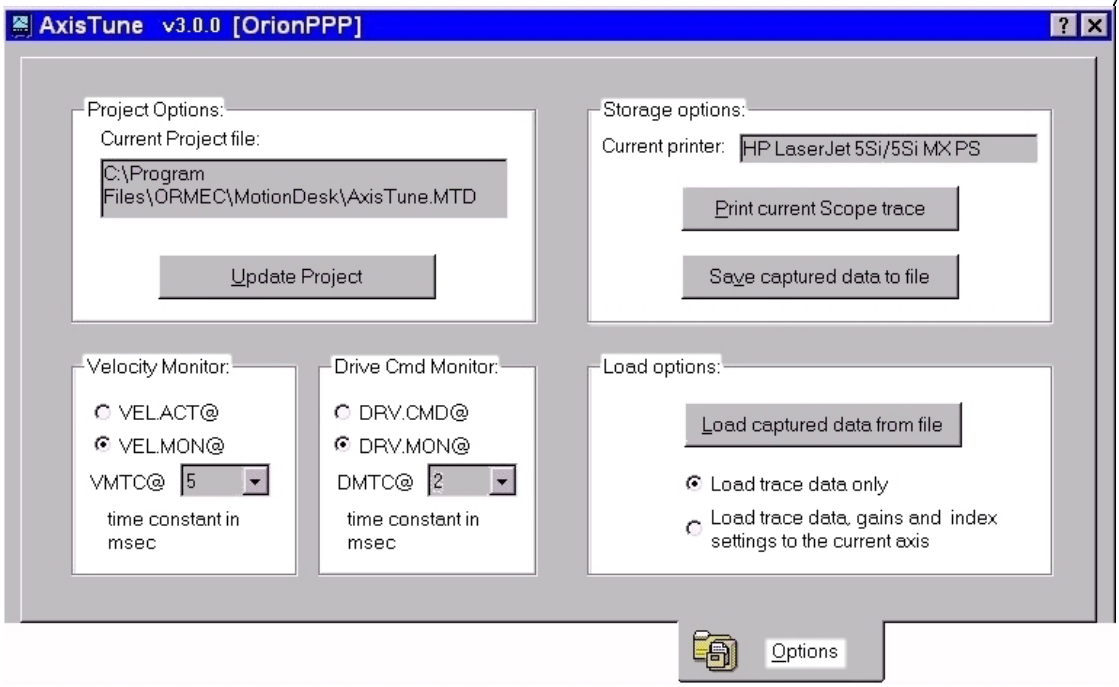
KPI@ Position Integral. Set KPI@ to 100% for applications where position error during motion is critical.

KAF@ Acceleration Feedforward. Higher values can enhance servo response and accuracy.

KVF@ Velocity Feedforward gain factor for a servo axis.

KVA@ Velocity Observer Sensitivity. Lower values will smooth low speed motion, but increase settling times on quick stops.

Axis Tune - Options



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Notes: The Options tab of AxisTune allows you to configure AxisTune to suit your preferences.

Project Options: The Current Project file shows the name and full path of the Motion Control project under test. Select Update Project if you want to save the Tuning Parameters to the Current Project.

Velocity Monitor: Select VEL.ACT@ if you want to display the Actual Velocity on the Scope. Select VEL.MON@ to display the Filtered Actual Velocity instead. If VEL.MON@ is selected, VMTC@ can be set in the range 0-200 msec as the filter time constant.

Drive Command Monitor: Select DRV.CMD@ if you want to display the Drive Command on the Scope Select DRV.MON@ if you want to display the Filtered Drive Command instead. If DRV.MON@ is selected, DMTC@ can be set in the range 0-200 msec as the filter time constant. The default is 1 msec.

Storage options: The Current printer shows the name of the current default printer. This is the printer that will be used to print the Scope trace. The default printer can be selected through the Windows Control Panel . Select Print current Scope trace if you want to print a copy of the current Scope trace. Select Save captured data to file if you want to save the current Scope trace for later review and analysis. The Data file to save dialog is displayed, allowing you to save the captured data to a Comma Separated Data (CSV) file.

Load options: Select Load captured data from file if you want to display a previously saved Scope trace for review. The Data file to load dialog is displayed, allowing you to select a data file to load. If Load trace data only is selected, the current Tuning Parameters are preserved - only the trace is recalled. If Load trace, gains & index settings... is selected, all of the stored parameters are recalled.

Upgrade Director

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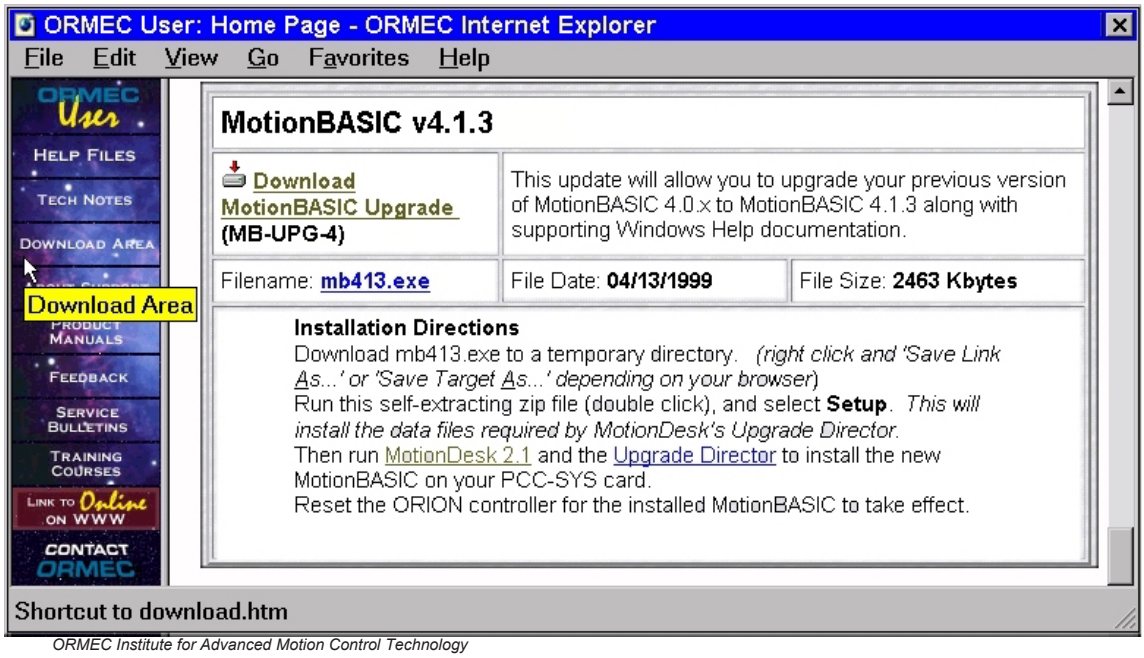
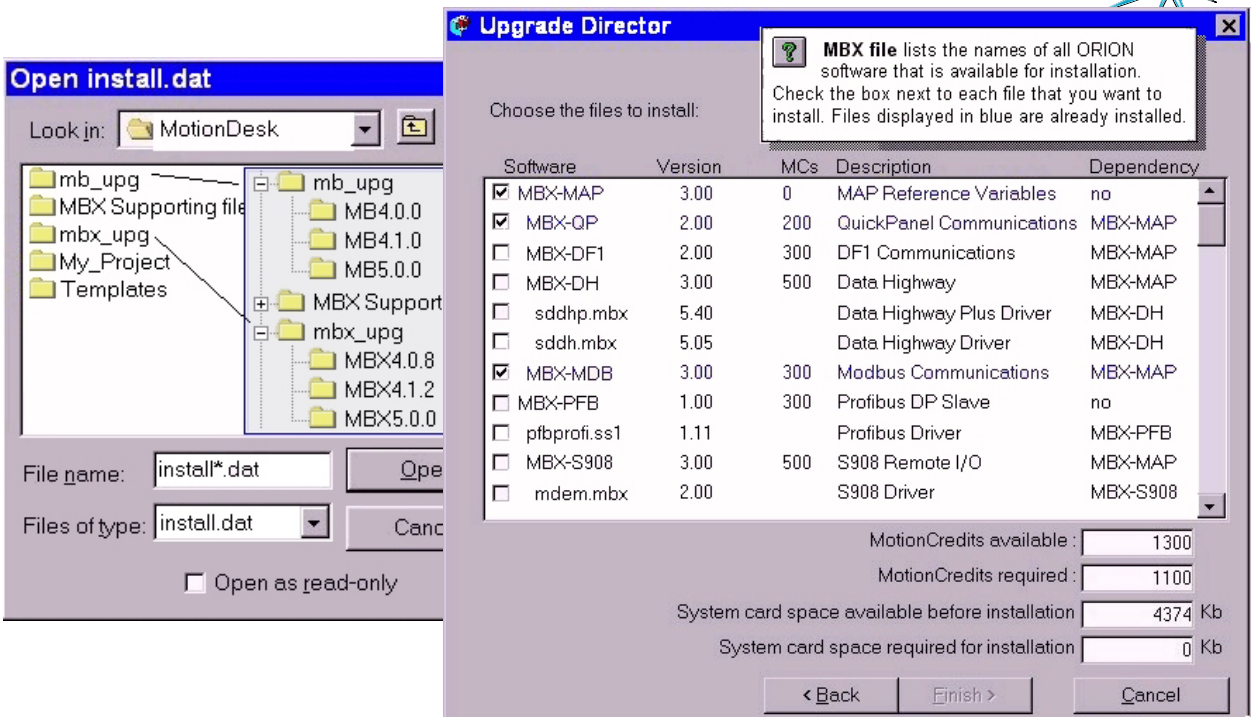
Notes: Upgrade Director loads the latest software files onto the ORION system PC-card using data files stored in sub-directories under the MotionDesk directory. These data files are placed into the proper directories with the installation programs named MB-UPG-4 for MotionBASIC 4.0 operating system upgrades and MBX-UPG-4 for MotionBASIC 4.0 Extension upgrades. **Get the files quickly using the World Wide Web** All MotionBASIC software update programs MBX-UPG-4 and MB-UPG-4 are available free on the ORMEC User's web to download or you may order them on floppy disk for a nominal handling fee from the ORMEC sales office directly.



Upgrade Director Installing software



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Open install.dat: Browse through your file system until you locate the ORION software installation file (**install*.dat**) that you want to install from. When you find the installation file, select it (or type the name in the File name box) and click the Open button to continue. Use the Cancel button if you don't want to install new software at this time.

Select software to install: The following information is displayed for all files available for installation:
The name of the software. Version information. MotionCredits needed to use the software.
A brief description of the software. Any software dependencies
Select a software files to install by clicking on the check box to the left of the name. You may select any number of software files. Note: Software that is already installed on your system is displayed in blue.

Dependencies: If a software file requires another to function, the required file is displayed in the Dependency column. When you select software that has a dependency, the required file is automatically selected as well.

Check MotionCredits: Each installable MBX requires a certain number of MotionCredits to operate. If you install more MBX's than you have MotionCredits to use, you will not be able to command motion on any axes. This quantity is set by the ORION Hardware Key, and can only be changed by replacing the key with another. The MotionCredits required field displays the number of MotionCredits required to operate all of the MBX's you have decided to install, plus all of the MBX's currently installed, plus an additional 600 MotionCredits to support MotionBASIC. If this quantity exceeds the MotionCredits available, the MotionCredits required field is illuminated in red as a warning.

Examine System Card space available: If you do not have sufficient System Card space for all selected software files you must either remove one or more files, or upgrade your ORION System Card.

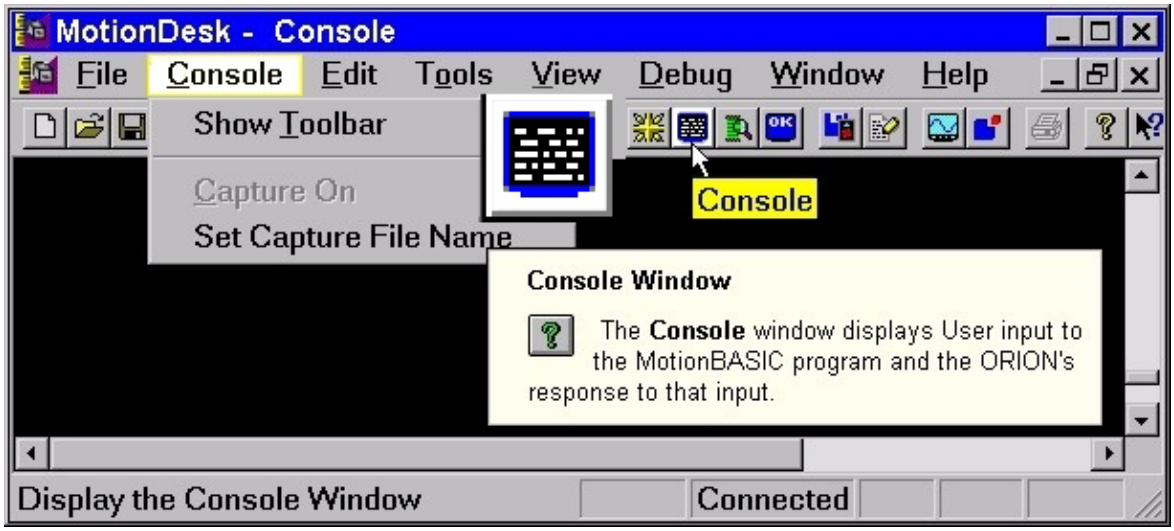
Proceed with Installation: When you are satisfied that you have selected all the software files you want to install, and that you have sufficient MotionCredits and Disk Space, click on the Finish button to start the Installation.

Installation Status: If the installation is successful, you will be prompted to Disconnect MotionDesk from the ORION, and to reset the ORION to complete the installation and enable the new ORION software.

The Upgrade Director Installation Status is maintained in a log file **(buddy.log)** on your development, detailing the changes made to your ORION software.

Console Window

ORION program input and output is displayed in the Console Window.
This window will display user input and program output on a first in-first out basis.



Notes:

Using the Console window: To use the Console window with a MotionBASIC program, a project must be loaded in MotionDesk and the ORION must be running a MotionBASIC program. Select the Console icon from the MotionDesk Toolbar to display the window.

Start your MotionBASIC program, either by selecting Run from the MotionDesk Debug menu.
The Console window will display all user input and program output for your MotionBASIC program until you stop the program in the ORION.

Console with a Running Program: To display MotionBASIC Console while the program is running, you need to open the Console window. If you don't have a project loaded, select New Project from the MotionDesk File menu to enable the Console window. The Console window will now track the execution of the MotionBASIC program. Console will continue until the program in the ORION stops running.

Clearing the Window: The bottom 25 lines of the Console window are cleared as a result of a MotionBASIC program executing the CLS statement. The entire Console window is automatically cleared when the window is closed.

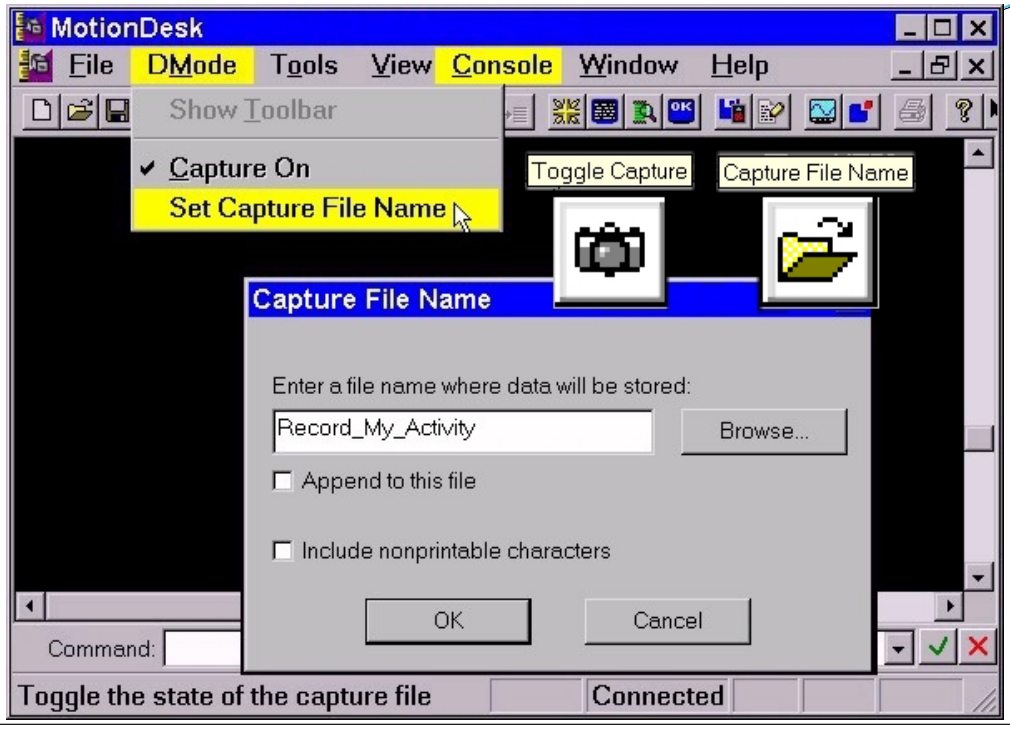
Program Output: Program output to the Console Window occurs when the MotionBASIC program running in ORION executes one of the following MotionBASIC,

Functions: SPC, TAB, and **Statements:** PRINT, CLS, CLREOL, COLOR, LOCATE, WIDTH

User Input: User input to the Console Window is only possible when window is active, and the MotionBASIC program running in ORION requests user input. This can occur as a result of one of the following MotionBASIC,

Functions: INKEY$, INPUT$ and **Statements:** INPUT, INPUT @, KEY, KEY (n), ON KEY

Capture File



Notes:

Set Capture File Name:

Use this command to set the name and path of a window capture file. The Capture File Name dialog is displayed, allowing you to identify a capture file for the active window. Both the Direct Mode and Console windows support capture files. Set Capture File Name is not available for a window if Capture On is checked for that window. Capture On is automatically checked whenever a capture file is set.

Shortcuts: Menu: DMode | Set Capture File Name Menu: Console | Set Capture File Name

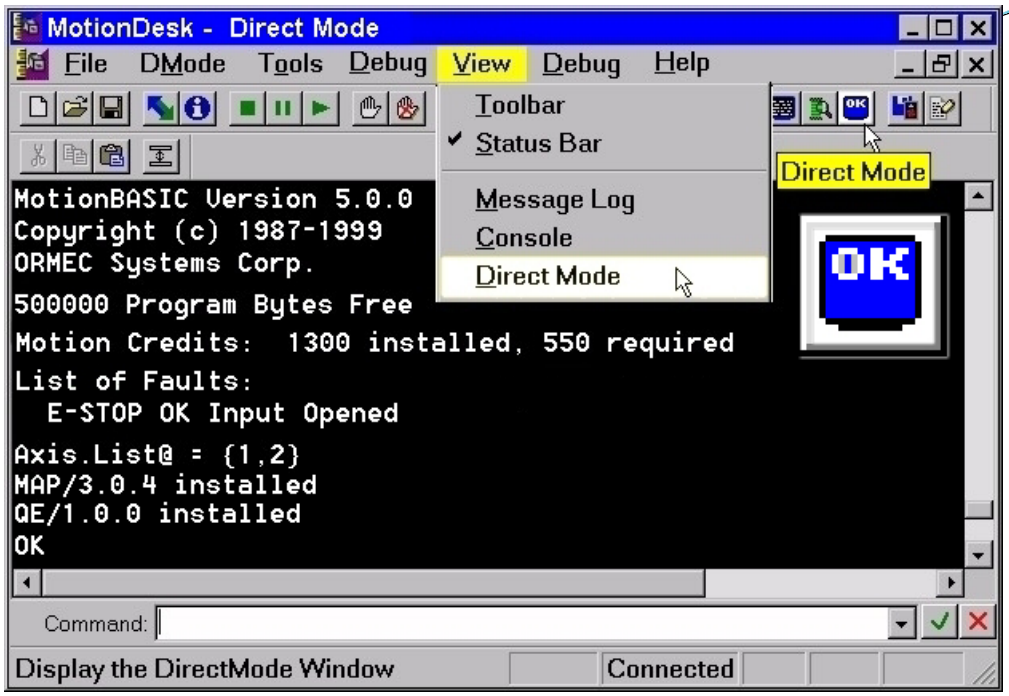
Capture On:

Use this command to allow or disallow the capture of window information. Both the Direct Mode and Console windows support capture files. A check mark appears next to the menu item when capture is enabled. Capture On is not available if a capture file has not been identified.

Capture On is automatically selected when a capture file is set with the Capture File Name dialog .

Shortcuts: Menu: DMode | Capture On Menu: Console | Capture On

Direct Mode Window ... Sign on Message



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Notes:

To use the Direct Mode window, a project must be loaded in MotionDesk.

1. Load a new project (Select New Project from the MotionDesk File menu).
2. Select the Direct Mode icon from the MotionDesk Toolbar to display the window.
3. If MotionDesk is not currently connected, an attempt to connect is generated.
4. The MotionBASIC Sign On message (see above example) will be displayed, with:

   MotionBASIC Version and Copyright information.

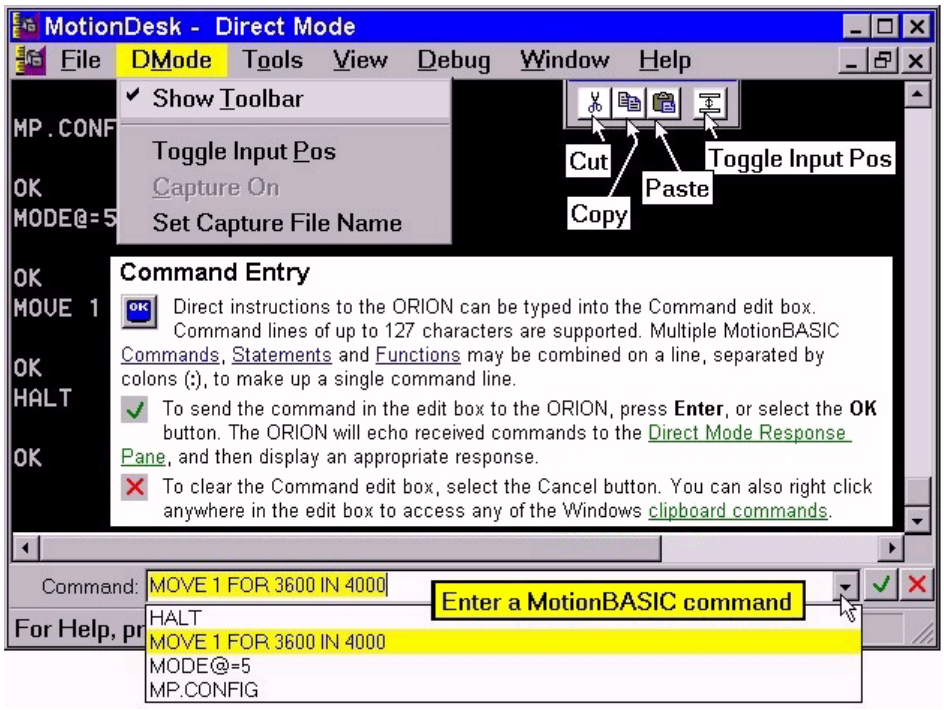
   Memory report.

   ORION Motion Credits installed, and credits in use.

   Axes (AXIS.LIST@) installed.

   ORION fault (FAULT@) status.

Enter Direct MotionBASIC Commands



Caution:
Since Direct Mode commands run concurrently with a running MotionBASIC program, any interference with the operation of the running program could have unforeseen results.

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Notes: You can now use the Direct Mode window to interact with your ORION Motion Controller.

Direct Mode with a MotionBASIC Program. If you have a program loaded in the ORION, you may use the Direct Mode window to run any subroutine contained in your program, in addition to executing direct commands. Enter the name of the subroutine in the Command edit box and press enter. The subroutine will run to completion, or until MotionDesk is disconnected from the ORION.

Direct Mode with a Running Program

If you have a program running in the ORION, you may still use the Direct Mode window to execute direct commands or run a subroutine contained in your program.

MotionDESK Direct Mode Shortcut Key's

The Alt-Shift keys are provided to minimize typing in the Direct Mode Command box. By pressing [Alt] and [Shift] with one of the letter keys, a command will be automatically entered into the Command box at the cursor. You can sequentially combine several Alt-Shift Keys if desired
<Alt Shift + *letter*>

A ... REPEAT
B ...
C ... New Clear Faults
D ... Dump Thread
E .... Error Status
F .... New Fault Status
G ... GEAR_
H ... HALT_
I ..... MOVE FOR_(Index)
J .... MOVE AT_ (Jog)
K ... Show Servo Gains
L ....
M ... MP.CONFIG
N ... Normalize Axes
O ... Clear Overtravel
P ... Position Status
Q ... Error Stop
R ... REPEAT
S ... MODE Status
T .... Torque Status
U ... _UNTIL_
V ... Velocity Status
W .. WAIT_
X ... AXIS.SET@={
Y
Z .... Axis Set Status

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Notes:

Note: You need to press Enter to send the resultant command in the edit box to the ORION

<Alt Shift C> Clear	AFAULT@=0 : FAULT@=0 : WAIT 300 : MODE@=
<Alt Shift E> Error Status	Error 1910 E-Stop OK input open Module 1: Filename.bas, Line: 15 Thread: 1 Process: 0
<Alt Shift F> Fault Status	{} 1st of {} faulted. FAULT@:{6} AFAULT@: 0 ALARM@: 0
<Alt Shift N> Normalize Axes	MOVE AT 30 UNTIL ZREF@:WAIT 100 AFTER AT.REST@:POS.ACT@=0
<Alt Shift P> Position info	? POS.CMD@, POS.ACT@, POS.ERR@, "Axis:" INT(AXIS.SET@);SPC(6)
<Alt Shift Q>	ERROR 1910 **Note:** This will force a E-Stop Open ERROR STOPPING YOUR MACHINE.

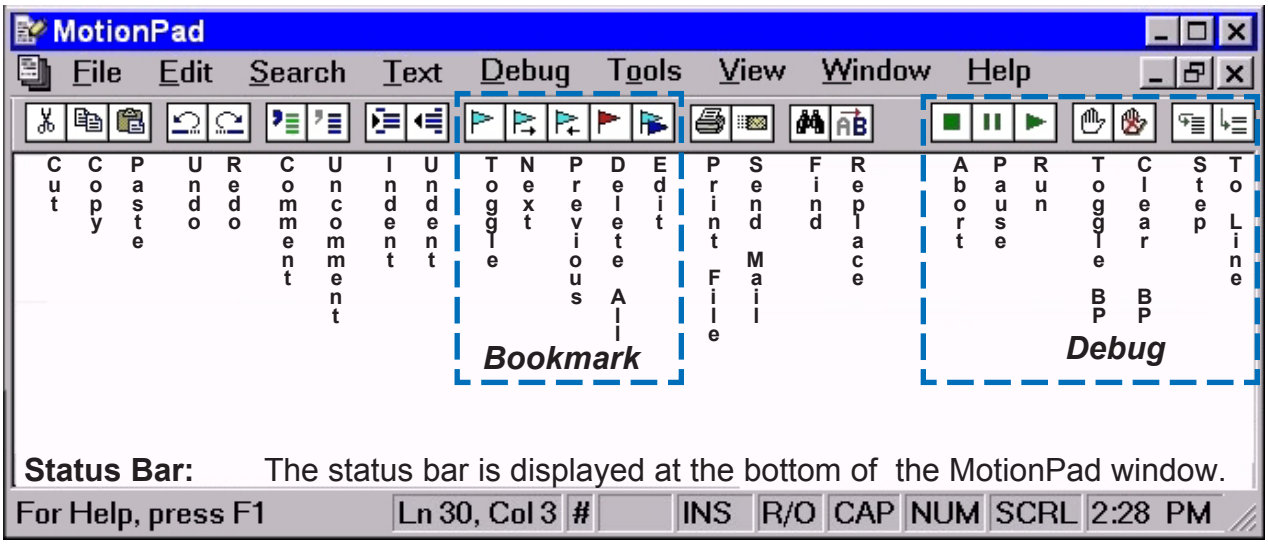
Note: The file **DMKEYS.INI** contains this information.

MotionPad Text Editor

MotionPad text editor provides powerful program editing tools to speed the development of your application program.

Notes:

MotionPad Toolbar & Status bar



Toolbar: The toolbar is normally displayed across the top of the application window, below the menu bar. The toolbar provides quick mouse access to many tools used in MotionPad. **The toolbar is only visible when editing a MotionBASIC Program Module as part of a MotionDesk project.**

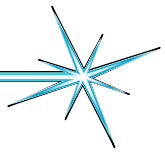
Notes: **Menu Commands:** The menu bar shown at the top of the main window contains a selection of items that you can use to perform many of MotionPad's operations. Not all of the menu items on the menu bar, and not all of those on each of the pull down menus will be active if you don't have a file open.

File Menu	File-related commands that let you open, close and save files, etc.
Edit Menu	Text-altering commands that let you modify the file, use the clipboard, etc.
Search Menu	Text-altering commands that let you search for strings and replace them.
Text Menu	Text-altering commands that let you reformat text.
Debug Menu	Commands for debugging your program.
Tools Menu	Commands for changing the MotionPad user interface.
View Menu	Commands for viewing the MotionPad user interface.
Window Menu	Commands for arranging and selecting windows.
Help Menu	Commands that start the Windows help engine.

Status Bar: The status bar is displayed at the bottom of the MotionPad window.
The left message area of the status bar describes actions of menu items.
The right areas of the status bar indicates:

Cursor Position:	The current cursor position is shown in the form: Ln #, Col #
# (pound)	Indicates that file has changed from when it was opened or last saved.
Insertion Mode:	INS / OVR The keyboard will not or will overwrite text as you type.
R/O	File is read only.
Keyboard Latch State:	CAP-Caps Lock , NUM-Num Lock , SCRL-Scroll Lock.
System Time	

Manual & Automatic Program Start



Normal Powerup Sequence

Under normal operation, a power cycle or controller reset causes the ORION Program Buffer to be restored from the System Card. The last project installed in the controller is the default project to be restored on powerup. If the restored project code contains the label "**MAIN:**" then program execution will automatically commence at that line of code in the program buffer.

```
DEBUG.MAIN:                          Manual Program Start
        Debug.Flag = True            ' This code will only run when you
        ID.Debug = Start(Debug.Thread) ' press the RUN Icon.
        Trace Val A,B,C
```

```
MAIN:                                Automatic Program Start
        MP.CONFIG                    ' This code will be executed after a
        Init.Map                     ' Red Reset button or Power Cycle.
        Init.QP
        Init.DIOs
```


Notes:

Automatic Program Start (formerly provided by line number zero)

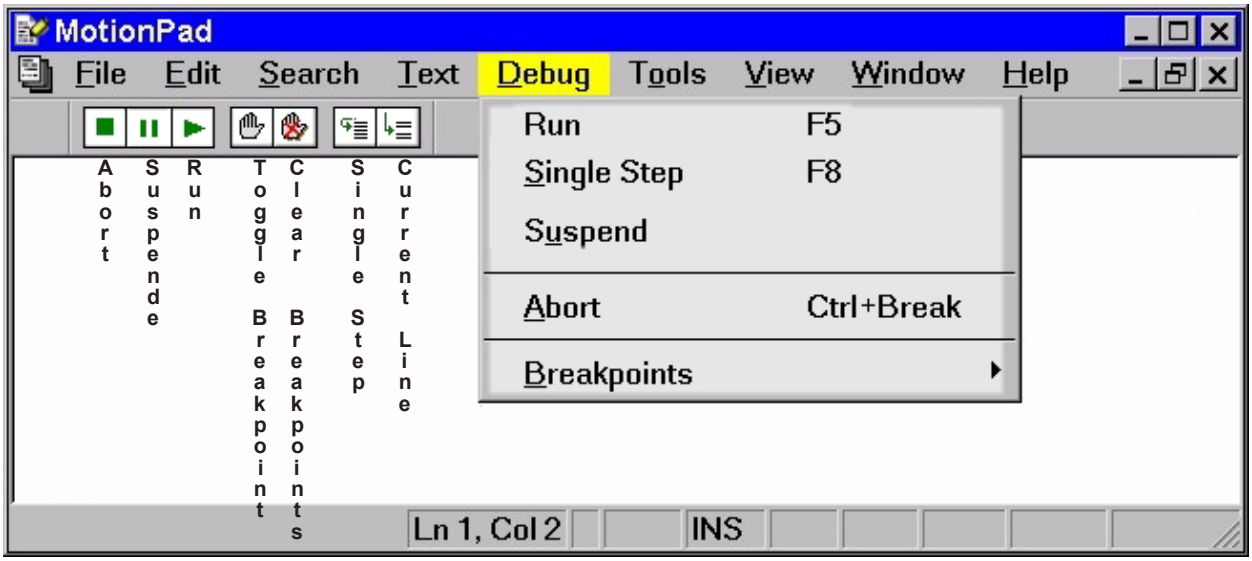
Any program which is required to automatically start after successful completion of the controller powerup sequence must now contain the label, "**MAIN:**". This is the automatic entry point of program execution.

Manual Program Start (formerly provided by the RUN command, now the RUN Icon)

Any program which is required to start from a command by the user at the development environment must now contain the label, "**DEBUG.MAIN:**" This is the manual entry point of program execution, which is begun after the user clicks the "run button" in the MotionDesk programming environment.

Debug Menu

When using MotionPad, just press RUN after making changes to your program. MotionDESK will automatically save and sync your MotionBASIC program for you.



Notes: **Debug Toolbar:** This toolbar is normally displayed across the top of the application window, below the menu bar. The toolbar provides quick mouse access to many tools used in MotionPad.

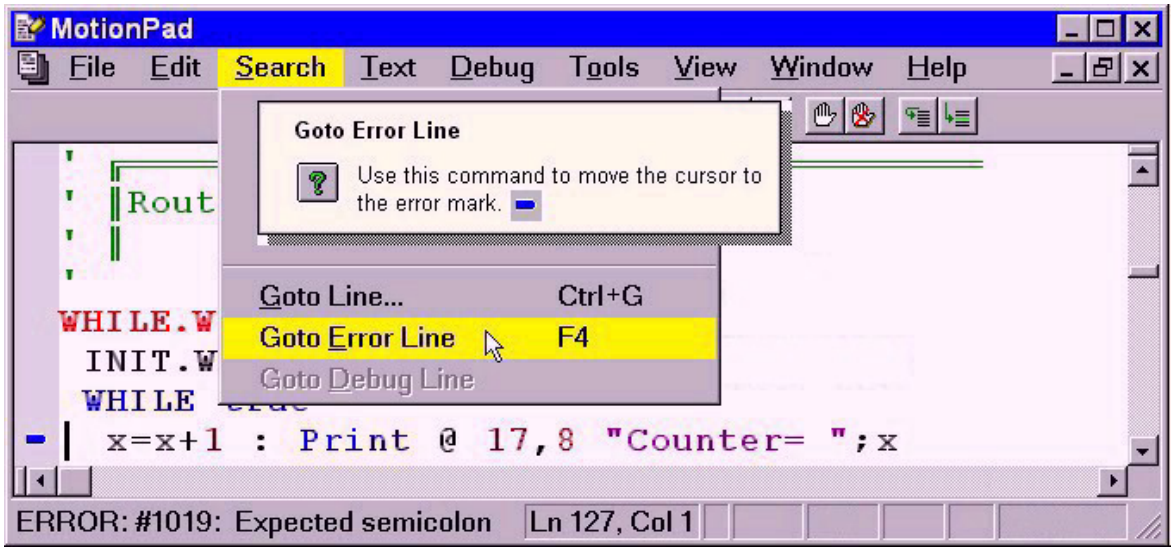
Debug Commands:

To use the debugging commands:

1. Start MotionDesk and load the project that includes the program that you want to debug.
2. Select the Sync Project with ORION command.
3. Display the Program Module branch of the Project Navigator and double click on the module that you want to debug.
4. When MotionPad opens, the module you selected will be displayed, and the Debug menu and toolbar will be displayed.

Error Mark

Error Mark: The Error mark, a blue bullet, indicates the line where MotionBASIC execution stopped due to a program error. If MotionDesk is running when a MotionBASIC error is encountered in a program, a MotionPad window is opened, with the newly marked program line displayed in the document window.



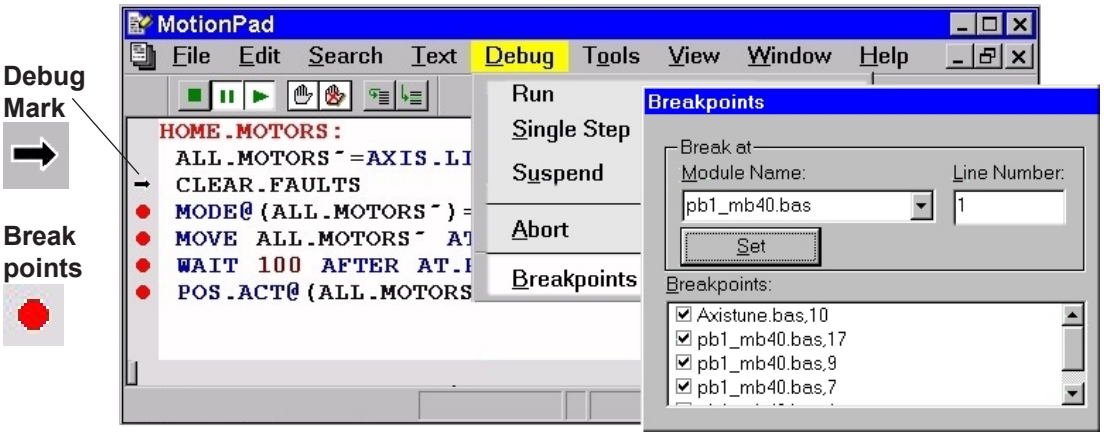
Notes: After viewing and editing the file, you can quickly reposition the cursor to the Error mark with the Goto Error Line command. This mark is displayed until the program file is either closed and reopened, or until the program is run again. "Goto Error Line" command does nothing if there is no error mark.

Note: The Error mark is not displayed when MotionBASIC program execution is stopped by an asynchronous error.

Breakpoints

MotionBASIC Programs can be set to stop execution at a specified point in the program. Such a point in a program is called a Breakpoint. Once a program has been loaded into the ORION, you can establish a breakpoint at any line in the program. You can set as many breakpoints as you wish, limited only by the number of lines in your program.
The Breakpoint mark, a red dot, is displayed to the left of every breakpoint in your program.

Toggle and **Clear All** commands are used to set and clear breakpoints.



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Notes: File marks are a visual indicator that denote specific lines in your MotionBASIC program file. These marks are displayed along the left edge of the document window when MotionPad is in Debug mode.

Breakpoint Mark: The Breakpoint mark, a red dot, is displayed to the left of every breakpoint in your program. The Toggle Breakpoint and Clear All Breakpoints commands are used to set and clear breakpoints.

Debug Mark: The Debug mark, a black arrow, indicates the next line to be executed in your MotionBASIC program. This mark is displayed when MotionBASIC execution is suspended after a Single Step or Continue to Line command. This mark is also displayed, superimposed on a red dot, when MotionBASIC execution encounters a breakpoint. The Debug mark is displayed until the program is either stopped or run again.
Note: The Debug mark is not displayed when MotionBASIC execution is Suspended or Aborted by the user, or stopped by an error.

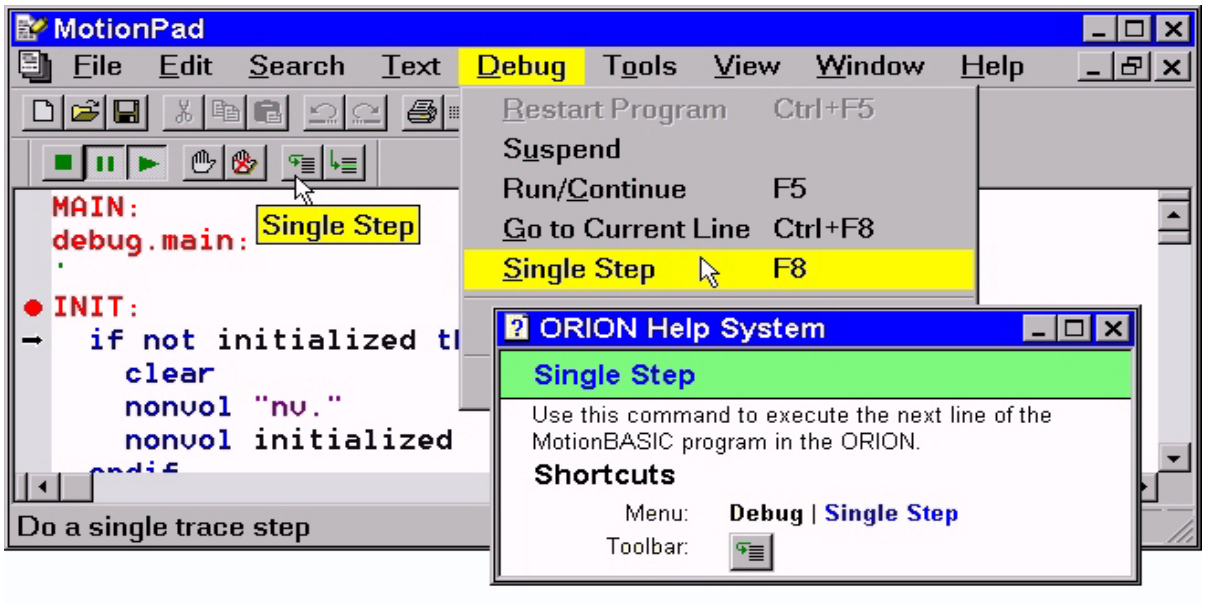
Using Breakpoints:

When a running MotionBASIC program encounters a Breakpoint, execution stops before the line is processed, and the line is displayed in a MotionPad window. At this point you can:

- Continue execution, with the Resume, Single Step, or Continue to Line commands (found in both the MotionDesk Debug menu and the MotionPad Debug menu).
- Examine your program with MotionPad.
- Query your program in the ORION with Direct Mode .
- Review the contents of the Trace buffer (If Trace was on).

You can disable an existing breakpoint by clicking on the checkbox next to the breakpoint in the Breakpoint dialog. Disabled breakpoints can be re-enabled by clicking on the checkbox again.

Single Step

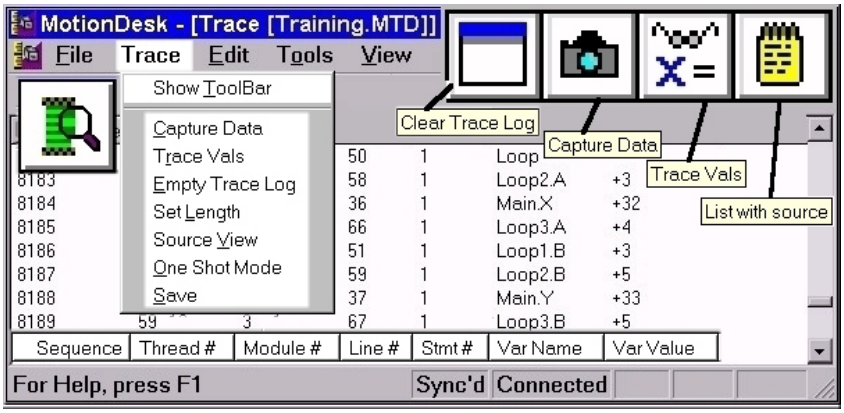


Notes: Execute the next line in the program, then Suspend execution.

Trace ON/OFF Control

TRACE can enable or disable the active tracking of all program statement execution to the MotionDESK Trace Window. TRACE ON added to a program, enables users to selectively activate a point within a program where the tracing of code execution should commence, and selectively determine at which point tracing should conclude (with TRACE OFF). Trace On and Trace Off control can also be initiated (changed) with a control button or menu from the Trace Window.

TRACE ON Causes MotionBASIC to output a copy of the program line before it is executed.
TRACE OFF Causes MotionBASIC to stop tracing the program.



Notes:

Sequence: The Sequence column indicates the order in which program statements were executed, with one (1) marking the first statement executed since the trace window was last initialized .

Thread Number: MotionBASIC can execute multiple programs concurrently . Each thread started in a MotionBASIC program is assigned a distinct Thread ID . The Thread Number column displays the Thread ID of every traced statement, allowing review of the processing of individual program threads.

Module Number: MotionBASIC programs can consist of several program modules. The Module Number column identifies which program module executed each statement. The Direct Mode window is Module zero (0), and the Modules shown in the Project Navigator window are numbered sequentially, starting with one (1). This column is only visible when the List with Source option is deselected.

Line Number: The Line Number gives the line of the program module that was executing, numbered sequentially form the beginning of the module (The Direct Mode window has a line number of zero (0)). Clicking on the Line # column header sorts the trace display by program module, line and statement number. This column is only visible when the List with Source option is deselected.

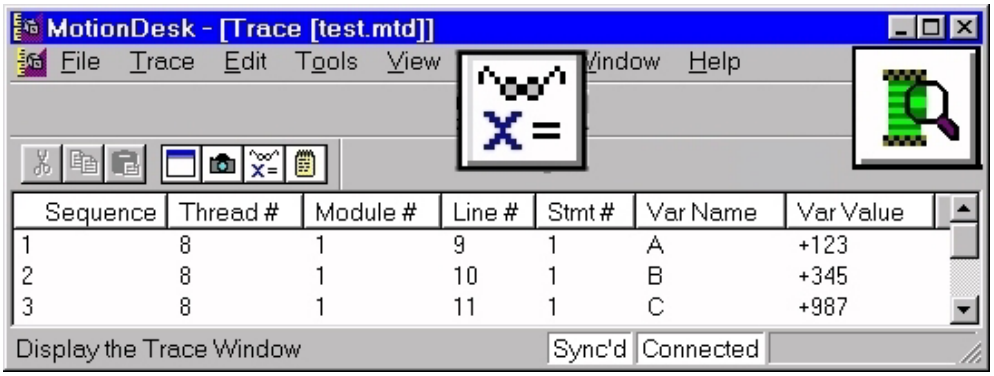
Statement Number: MotionBASIC program lines can consist of several MotionBASIC statements. The Statement Number identifies which statement in the program line was executing. Since each line must include at least one statement, the first statement is not numbered. Subsequent statements on a line are numbered sequentially, starting with one (1).

Variable Name: The Variable Name column lists variables whose value has changed during the trace. If a statement assigns a value to a variable, that variable is named here.

Variable Value: The Variable Value column lists the values assigned to variables during the trace. If a statement assigns a value to a variable, that value is shown here.

Trace Val

It is often desirable when debugging programs to observe when an user variable value changes occur. The MotionDESK Trace Window supports this feature when running in value trace capture mode. With the **TRACE VAL** statement the user has the ability to establish and manage a list of variables that MotionBASIC "traces" when a value change is applied to that variable. While the Trace Window's "value trace capture mode" is on, these program lines are logged into the Trace Window.



Notes:

Syntax 1 ... TRACE VAL [ON] varlist Add variables with the "value change tracking" feature turned on.

Syntax 2 ... TRACE VAL OFF varlist Remove (turn off) the "value change tracking" feature from variables.

Syntax 3 ... TRACE VAL OFF Remove (turn off) the "value change tracking" feature for all variables.

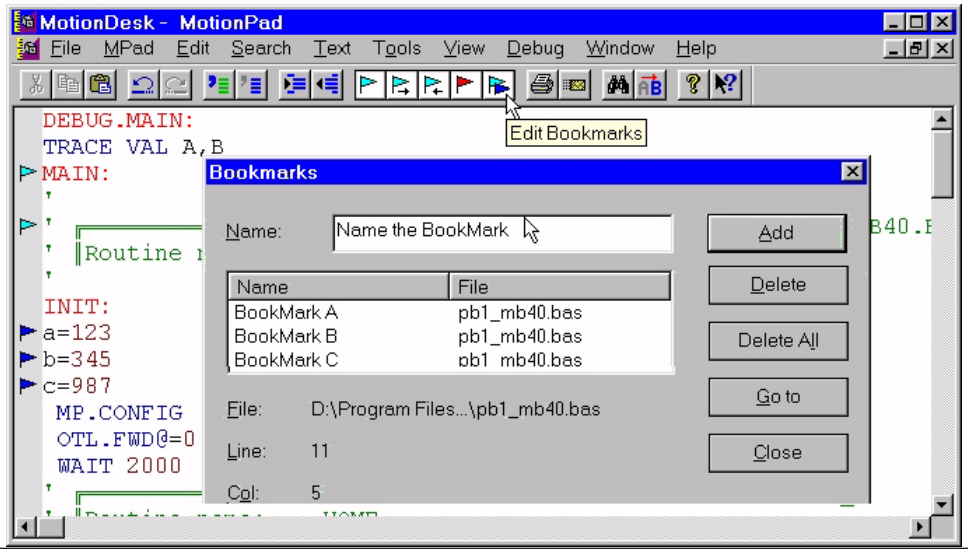
Syntax 4 (Direct Mode only) ... TRACE VAL LIST Reveal the current list of variables in "value change tracking" mode. A list of variables (separated by commas) to be added or removed from "value change tracking" mode.

TRACE VAL may be executed in either Direct Mode or as part of a program execution.

When used with ORMEC variables which are indexed by axes, the axes can not be specified in the varlist. TRACE VAL will display changes to that ORMEC variable on all axes.

Bookmarks

Bookmarks are a convenient way to mark important locations in your MotionBASIC program so that you can return to those locations quickly and easily. Bookmarks specify a row & column location in a specific program module of your MotionBASIC program. Once placed in your program, bookmarks remain a part of your program until you remove them.



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Notes:

Named bookmarks are designated by a dark blue flag in the left hand margin. You can have as many named bookmarks in your program as desired. Use the Bookmarks dialog to create a named bookmark.

Automatic bookmarks are designated by a light blue flag in the left hand margin. Only nine automatic bookmarks are allowed. If you add more than that, the oldest bookmark is removed to make room for the new one. Use the Toggle Bookmark command icon on the toolbar to place an automatic bookmark.

Bookmark Commands - Use the Toggle Bookmark command to alternately create and remove an automatic bookmark at the current line.

Use the Next Bookmark command to move the cursor to the next bookmark in your MotionBASIC program. Both named and automatic bookmarks are included in this search.

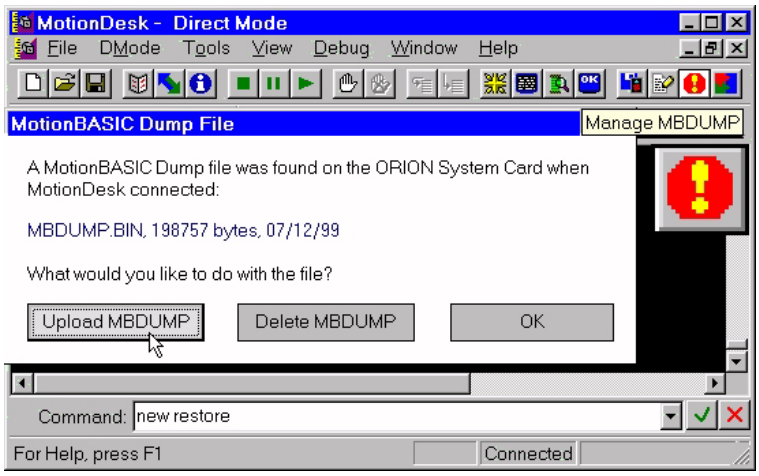
Use the Previous Bookmark command to move the cursor to the previous bookmark in your MotionBASIC program. Both named and automatic bookmarks are included in this search.

Use the Delete All Bookmarks command to remove all of the bookmarks in your project. Note: To remove specific bookmarks, locate the bookmark and use the Toggle Bookmark command.

Use the Bookmarks command to display the Bookmarks dialog. This dialog allows you to insert and remove bookmarks in your program, and to jump directly to any named bookmark in your project.

MB.DUMP file

The MBDUMP.BIN file is a binary file containing information about the status of an ORION Controller. This file is created automatically by MotionBASIC in the event of an ORION system failure.



When MotionDesk detects the presence of an MBDUMP file on the system card during Project Synchronization , it enables the Upload MBDUMP.BIN command in the MotionDesk File menu, and the Manage MBDUMP icon in the MotionDesk toolbar. Invoking the command displays the MotionBASIC Dump File dialog, which presents three options for dealing with the MBDUMP file detected.

Notes: **Upload MBDUMP** - Select Upload MBDUMP when you want to copy MBDUMP.BIN. The Save As dialog allows you to specify the destination filename, disk and directory. The original MBDUMP.BIN on the system card is not affected by this operation. If the MBDUMP file was created by an ORION system failure, please call ORMEC Service (716-385-3520) for further information.
Note: If you do not elect to upload an MBDUMP file at this time, you risk the loss of the file in the event of another system failure.

Delete MBDUMP - Select Delete MBDUMP when you want to delete the MBDUMP file from your system card. The file will be removed and the dialog closed.
Note: This operation permanently removes the file from your system card.

OK - Select OK to close this dialog. The original MBDUMP.BIN on the system card, if still present, is not affected by this operation.