User Manual

Allen-Bradley

Ultraware Software

Catalog Number 2098-UWCPRG

Allen-Bradley • Rockwell Software

Rockwell Automation

Important User Information

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature/) describes some important differences between solid-state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid-state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence
	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

This manual contains new and updated information.

New and Updated Information

This table lists the changes made to this revision.

Topic	Pages
Chapter 5 - Configuring the Kinetix 3 Drive added.	221…297
Appendix A - Ultraware Software Updates adds Version 1.80 notes.	339

Chapter 3

Configuring the Ultra3000 Drive

Chapter 4

Configuring the Ultra5000 Drive

Chapter 5

Configuring the Kinetix 3 Drive

Chapter 6

Creating and Running Programs

Chapter 7

Creating Custom Motors

Appendix A

Ultraware Software Updates

About This Publication

This manual provides detailed installation instructions, defines software interface features, and programming assistance for Ultraware software.

Who Should Use this Manual

Use this manual when Ultraware software release 1.8 is used to configure and operate Ultra1500, Ultra3000, Ultra5000 and Kinetix 3 drives, or when designing, testing or running ModBus, C language programs, or cam tables on these drives.

Conventions Used in This Manual

The conventions listed below are used throughout this manual.

- Bulleted lists such as this one provide information, not procedural steps
- Numbered lists provide sequential steps or hierarchical information

Additional Resources

These documents contain additional information concerning related Rockwell Automation products.

Resource	Description
Ultra3000 Hardware Installation Manual, publication 2098-IN003	Ultra3000 drive installation and programming procedures.
Ultra3000 SERCOS Integration Manual, publication 2098-IN005	How to configure the Ultra3000 SERCOS interface hardware with the ControlLogix SERCOS module.
Ultra3000 DSD with DeviceNet Reference Manual, publication 2098-RM001	Object models for Ultra3000 DeviceNet applications.
Ultra5000 Hardware Installation Manual, publication 2098-IN001	Ultra5000 drive installation and programming procedures.
Ultra5000 IPD with DeviceNet Reference Manual, publication 2098-RM002	How to configure and monitor the Ultra5000 drive using the DeviceNet interface.
Kinetix 3 Component Servo Drive Installation Instructions, publication 2071-IN001	Information on installing your Kinetix 3 drive system.
Kinetix 3 Component Servo Drive Serial Host Command Reference Manual, publication 2071-RM001	Information on the serial communication commands, both ASCII and ModBus-RTU, for interfacing a motion controller with the Kinetix 3 drive.
Ultraware Programming Manual, publication 2098-PM001	Information on programming the Ultra5000 using the Ultraware programming environment. Intended for programmers with a basic understanding of the C programming language.
Ultraware CD Installation Instructions, publication 2098-IN002	Instructions for installing Ultraware software
System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001	Information, examples, and techniques designed to minimize system failures caused by electrical noise.
Kinetix Motion Control Selection Guide, publication GMC-SG001	Specifications, motor/servo-drive system combinations, and accessories for Kinetix motion control products.
Motion Analyzer CD, download at http://www.ab.com/motion/software/analyzer_download.html	Drive and motor sizing with application analysis software.
Rockwell Automation Configuration and Selection Tools, website http://www.rockwellautomation.com/en/e-tools	Online product selection and system configuration tools, including AutoCAD (DXF) drawings.
Rockwell Automation Product Certification, website http://www.rockwellautomation.com/products/certification	Website for declarations of conformity (DoC) currently available from Rockwell Automation.
National Electrical Code, published by the National Fire Protection Association of Boston, MA	An article on wire sizes and types for grounding electrical equipment.
Rockwell Automation Industrial Automation Glossary, publication AG-7.1	A glossary of industrial automation terms and abbreviations.

You can view or download publications at http://www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Rockwell Automation distributor or sales representative.

Before You Begin

Introduction

Use this chapter to become familiar with Ultraware software components.

This chapter also reviews design and installation requirements for Ultraware software.

About Ultraware Software

Ultraware software is a Windows 95/98/2000/NT/XP application by Rockwell Automation that provides a programming environment for the Kinetix 3, Ultra1500, Ultra3000, and Ultra5000 drives. You can use Ultraware software to accomplish these tasks.

- Communicate with multiple drives, using the serial port on your computer.
- Adjust the feedback loop gains and parameters of your drive for specific motors and loads.
- Define the motion capabilities of the drive with the operating modes and motion functions from compatible drives.
- Configure I/O for the drives.
- Write, load, and execute C language motion programs for Ultra5000 drives.
- Monitor a wide variety of status and motion parameters on the drives.
- Customize the application interface to display only the information you wish to see.

Download Ultraware Software

To communicate and configure your Kinetix 3 drive by using serial communication from a personal computer, download and install Ultraware software on your personal computer. To get the latest Ultraware software follow these steps.

1. Navigate to http://www.ab.com/motion/software/get/Ultraware_1_80.exe.
2. Click Run.

Using Online Help

The following types of online help are available.

To use this	Do this	Description
Help files	Click Contents and Index from the Help menu. Navigate the help files using the Table of Contents, the Index and the Search tabs.	Descriptions of all on-screen objects. Object property configuration settings. How to information.
Context Sensitive Help files	Click Help in the active window, or Click an on-screen object and press F1.	For help about the selected object.

You can also click the Tip of the Day command from the Help menu, which opens a dialog box that displays helpful hints on using Ultraware software.

How Ultraware Software Works

Ultraware software is one part of a motion control system. The user commands the Ultraware software to:

- use a compiler/linker tool to produce executable programs.
- communicate with the drive through a separate Communication library.
- use the Communication library to:
  - download program and configuration information,
  - execute direct commands, and
  - retrieve program, configuration, and status information.

At startup you see several work areas that let you perform tasks. For example, you can create or edit Ultra5000 programs in a text editor, using the C programming language.

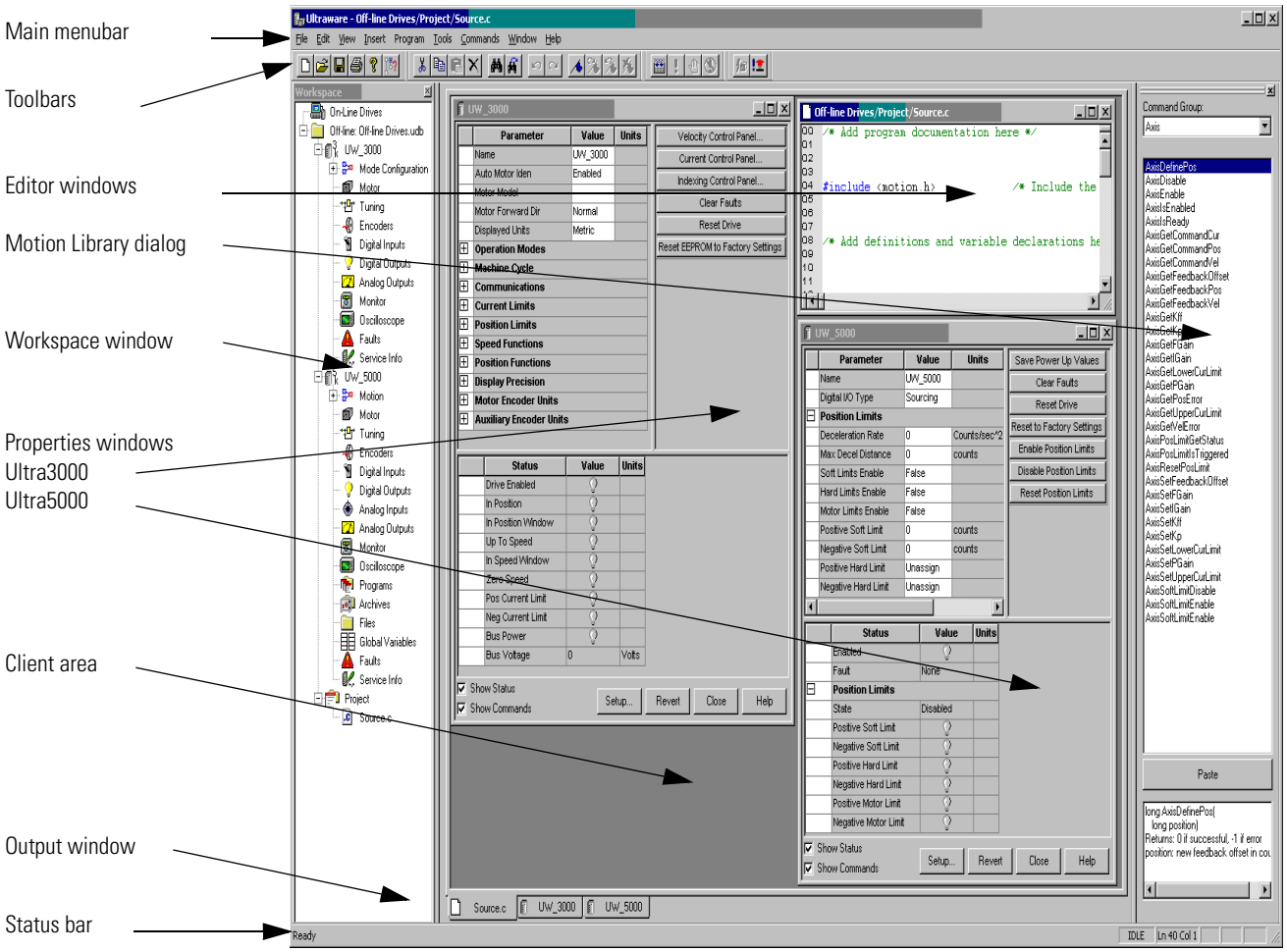
Understanding the Graphical User Interface

A graphical user interface lets you to configure your drives and run your program. The workspace consists of the pre-defined areas listed below and shown in the diagram.

- a Workspace window
- a Client Area
- an Output window
- a Main menubar
- a set of Toolbars
- a Status bar

Use the View menu commands to enable and disable the user interface features.

The user interface for drives is shown in the example. The example depicts the common control and command groupings for the drives listed on page 13 as compatible with Ultraware software.



Workspace Window

The Workspace window is, by default, beneath the menubar and toolbars, and above the Status Bar. Use the F7 key to return focus to the Workspace window.

The Workspace window has two main branches.

Branch	Description of Display
On-Line Drives branch	All connected online drives and their child objects.
File branch	All configured offline Ultra3000 and Ultra5000 drives, their child objects and available projects (including all child source, header and executable files)

Use the Workspace window to navigate to all of the connected online and offline objects and perform these tasks.

- Create new Drive, Folder, Project, Header, and Source files.
- Cut, Copy, Paste, and Delete Workspace window objects.
- Open the Properties dialog box for Workspace window objects.
- Copy or create cam table files, which you can edit or graphically modify.
- Open the text editor, which you can use to edit header and source files.
- Use the Build command to compile a Project and create an executable program (.exe) file.
- Copy or Move an executable program (.exe) file from an Ultra5000 drive's Projects branch to a Programs branch for storage or for execution.
- Copy a configured online drive with all its children from the On-Line Drives branch, to an offline file, or vice-versa.
- Run an executable program (.exe) file in the Programs branch of an online Ultra5000 drive.
- Issue direct commands for certain online drive objects.

You can resize and move the Workspace window in several ways.

- In its default state attached to the interface, you can double-click the title bar to detach the Workspace window from the interface.
- If detached, the Workspace window possesses all of the properties of any window. It can be resized or moved entirely outside the interface.
- To return the Workspace window to its default position, double-click the title bar.

To hide the Workspace window, remove the checkmark from the Workspace in the View menu.

Output Window

The Output window is, by default, beneath the Workspace window above the Status Bar. The Output window is visible when the View menu's Output command is active (denoted by a check mark); it is hidden when the Output command is not active. The Output window is also visible when you execute the Program menu's Build command.

The Output window describes the progress of the current (or most recent) Build command. If a Build succeeds, the Output window displays the message Build completed successfully!. If a Build fails, the Output window displays the message Build failed. along with an fault message describing the cause of the failure. Ultraware software removes any pre-existing executable program (.exe.) file, bearing the project name, if a Build fails.

When a Build fails, double-click the Output window fault message with the this format.

<Filename>:<Line number>:<fault or warning message>

This will open the associated source or header file and position the cursor at the line referenced by the fault or warning message.

You can resize and move the Output window in several ways.

- In its default state (attached to the interface) you can double-click the title bar to detach the Output window from the interface.
- Once detached, the Output window possesses all the properties of any window. It can be resized or moved entirely outside the interface.
- To return the Output window to its default position, double-click the title bar.

You can copy text in the Output window. However, you cannot type text into the Output window.

Client Area

The Client Area is the large gray area beneath the menubar and toolbars and to the right of the Workspace window.

Use the Client Area to display:

- property windows for objects in the Workspace window, where you can configure the object's properties.
- text editor windows for header and source files in the Workspace window, where you can create or edit these text files.

The Workbook Mode in the View menu displays a tab for each object in the Client Area. The tab contains the abbreviated name of the related object. Click a tab to bring the related object to the top of the Client Area.

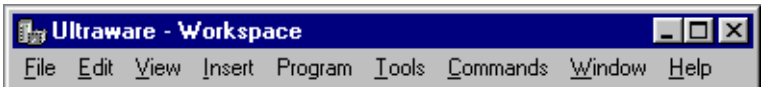
Unlike windows, the Client Area cannot be directly resized. The size of the Client Area depends upon the size and location of the surrounding Workspace and Output windows, the Main menubar, the Status Bar and the several toolbars.

However, you can use the Cascade, Tile Wide, Tile Tall and Arrange Icons Window menu commands to arrange the display of windows in the client area.

Main Menubar

The Main menubar is at the top of the interface. Use it to customize the main window, and to perform essential functions and procedures with respect to objects in the Main Window.

The main menubar looks like this.



The menu items contain these commands.

Menu Name	Contains these Commands
File	New, Open, Save, Save As, Close, Print, Print Preview, Print Setup, Import, Export, Upgrade Firmware, Exit
Edit	Undo, Redo, Cut, Copy, Paste, Delete, Find, Go To Corresponding { } ( ), Go To Line Number, Replace, Select All, Toggle Bookmark, Next Bookmark, Previous Bookmark, Clear All Bookmarks, Properties
View	Toolbars, Status Bar, Workspace, Output, Workbook Mode, Motion Library
Insert	Ultra3000, Ultra5000, Project, Source File, Header File, Variable, Cam Table
Program	Build, Run, Stop, Kill
Tools	Customize, Rescan, Serial Port, Recover Communications
Commands	Enabled, other direct commands
Window	Close All, Cascade, Tile Wide, Tile Tall, Arrange Icons
Help	Contents and Index, Tip Of The Day, Release Notes, About Ultraware

Toolbars

Four standard Windows toolbars can be detached from the user interface and relocated. To return a toolbar to its last docking position, double-click the header bar.

Toolbar Name	Contains these Commands
File	New, Open, Save, Print, About, Locate
Edit	Cut, Copy, Paste, Erase, Find, Find Next, Undo, Redo, Toggle Bookmark, Next Bookmark, Previous Bookmark, Clear All Bookmarks
Program	Build, Run, Stop, Kill
Enable	Enable, Disable All

Use the Toolbars command (in the View menu) to open the Toolbars dialog box, and enable or disable existing toolbars, and create new toolbars.

Use the Customize command (in either the Toolbars dialog box or the Tools menu) to open the Customize dialog box, where you can:

- add a command icon to a toolbar by dragging it from the Command tab and dropping it on the desired toolbar.
- delete a command icon from a toolbar by dragging it from a toolbar and dropping it off the toolbar.

Status Bar

To display the Status bar, use the View menu Status Bar command. The status bar contains:

- Tooltip help - a description of the menu or button command immediately beneath the pointer.
- indicators for caps lock (CAP), num lock (NUM) and scroll lock (SCRL).
- row and column reference for the cursor, if a source file or header file has focus in the Text Editor.

When the status bar is visible, a check mark appears to the left of the Status Bar command in the View menu.

Motion Library Dialog

The Ultraware Motion Library dialog lets you to quickly find and insert specific motion library commands and C statements in a motion program.

The Motion Library is displayed when a source or header file is open; and is hidden when source and header files are closed or not the top view windows. The Motion Library dialog is docked to the right side of the main window by default.

Starting Ultraware Software

When you start the software for the first time, it prompts you to Open Last File, xxx.udb, Open existing file, or Create new file. After you click the file to open or create, the software scans the network for online drives.

You may need to configure your PC's serial port settings (refer to Serial Port Settings on page 22) and rescan the network (refer to Scanning the Network on page 21) to verify that the software successfully locates all online network drives.

Opening an Ultraware File

The name and location of any open file is stored in memory, when you close your software. Each time the software opens, it displays a dialog that lets you do one of these commands.

Select	Description
Open Last File, xxx.udb, and then OK	Opens the most recently used Ultraware file.
Open existing file, and then OK	Open another, existing Ultraware file of your choice.
Create new file, and then OK	Open a new Ultraware file.
Cancel	Open Ultraware without an active file in the Workspace window.

TIP A new file is held in temporary storage until saved.

Scanning the Network

When the software opens, it conducts a search of the network for all connected drives. The Scan For On-Line Drives dialog displays the progress of the online node scan (0...255), and the specific task the software is currently undertaking (for example, Scanning Node or Attaching to Node).

Click Stop Scanning to stop the scanning for and attaching to online drives.

The On-Line Drives branch of the Workspace window displays each drive detected. Because the software does not automatically update the Workspace window, click Rescan from the Tools menu to display the list of drives that are currently online.

Serial Port Settings

After you open the software for the first time, you may change the configuration of the personal computer's serial port and baud rate settings. The default settings are COM1 and 38400. Perform these steps to change the settings.

1. Click Serial Port from the Tools menu.
2. In the PC Communications Setup dialog box, type the appropriate serial port settings.

IMPORTANT Ultra5000 drives support only the format 8 data bits, no parity.
Ultra3000 drives do not support the 57600 bps rate.

Upgrading Drive Firmware

You can use the software interface to upgrade the firmware for an online drive. Use the Upgrade Firmware command (in the File menu) to open the Firmware Upgrade dialog box, where you can perform a flash upgrade to the firmware of a drive appearing in the On-Line Drives branch of the Workspace window. Before issuing the Upgrade Firmware command, be sure to first obtain a copy of the new firmware and any related instructions.

Perform these steps to upgrade firmware in the Firmware Upgrade dialog box.

1. Click the drive for firmware upgrade from the list of On-Line Drives. If a drive name has been left blank, it is identified as <Unnamed Drive>.
2. Enter the pathname of the new firmware file. Either type in the pathname, or use the browse button (marked with an ellipsis) to navigate to the new firmware file. (The new firmware file must have an extension of .hex.)
3. Click Begin Load. The software informs you of firmware upgrade progress using both a progress bar and status messages.

IMPORTANT Click Cancel to stop the firmware upgrade. However, If you cancel the firmware upgrade while it is in progress, the selected drive ceases to be functional. Thereafter, the selected drive can be used only to complete a subsequent firmware upgrade.

If drivers are to be installed, also see Installing Drivers on page 145.

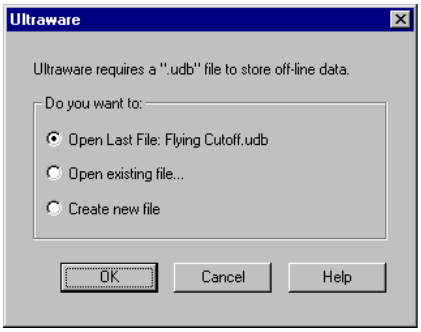
Common Commands for Ultra Drive Configuration

Introduction

This chapter describes show to configure both an online and an offline drive. It also describes how to copy or move it to an offline Ultraware file, or how to copy and paste an offline drive (in an Ultraware file) onto an existing online drive, thereby overwriting the online drive's settings. It also explains how to use drag-and-drop to accomplish the copy and paste process in a single step.

Opening Ultraware Software

Before you create a new offline drive, you must first create an Ultraware file to contain the new drive. When Ultraware opens for the first time, a window similar to the one below appears. Selecting any radio button causes the action described below.



- Click Open Last File: <filename> and then click OK to open the most recently used Ultraware file.
- Click Open existing file and then click OK. The Open window will appear, and you can navigate to and open a previously saved Ultraware file.
- Click Create new file and then click OK to create a new, empty file.

  TIP A new file is stored in temporary storage, and the Workspace icon displays Unsaved until the file is saved with a filename.

- Click Cancel to exit the window without opening an Ultraware file.

The selected Ultraware file, if any, is displayed in an Off-Line branch of the Workspace window.

Creating, Opening and Saving Ultraware Files

An Ultraware file is a container that can hold any number or combination of offline Ultra3000 and Ultra5000 drives, projects and their children. An Ultraware file is distinguished by its extension of .udb.

Creating a New Ultraware File

To create a new Ultraware DataBase (.udb) file, perform these steps.

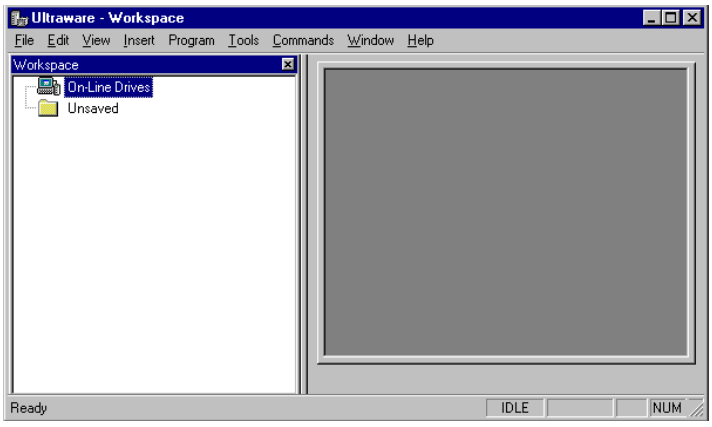
1. Open an Ultraware file using one of these options:
   - Click New in the File menu.
   - Click the New icon in the File toolbar.
   - Press the Ctrl + N keys.

IMPORTANT If an Ultraware file is already open, a Save Changes window opens and requires a response before the request to open a new file executes.

Choose one of these commands.

- Yes - Saves the open file under the filename in the designated location. Saves the open file under the filename in the designated location.
- No - Discards the changes to the open file.
- Cancel - Aborts the new Ultraware file, leaving the previous file open.

2. A new Ultraware file, titled Unsaved, appears in the Workspace under On-Line Drives.



3. The Ultraware file can be populated with drives as described in Creating a New Drive on page 28, and saved under a name using the directions in Saving an Ultraware File on page 27.

Opening an Existing Ultraware File

To open an existing Ultraware file, perform these steps.

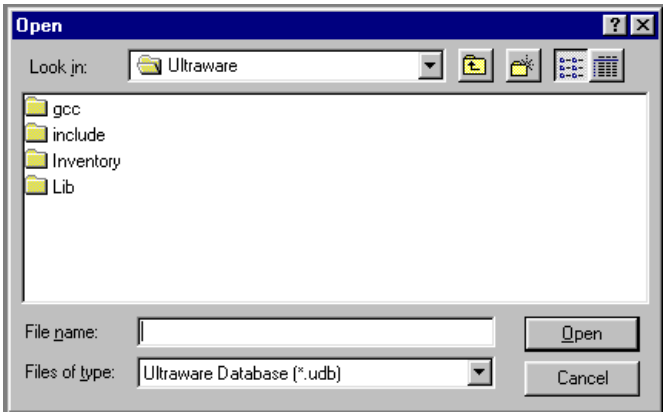
1. Open an existing Ultraware file using one of these options:
   - Click Open in the File menu.
   - Click the Open icon in the File toolbar.
   - Press the Ctrl + O keys.

IMPORTANT If an Ultraware file is already open, a Save Changes window opens and requires a response before the request to open a new file executes.

Choose one of these commands.

- Yes - Saves the open file under the filename in the designated location. Saves the open file under the filename in the designated location.
- No - Discards the changes to the open file.
- Cancel - Aborts the new Ultraware file, leaving the previous file open.

2. Perform these steps in the Open dialog box.



   a. Navigate to and click the name of the Ultraware file to open.

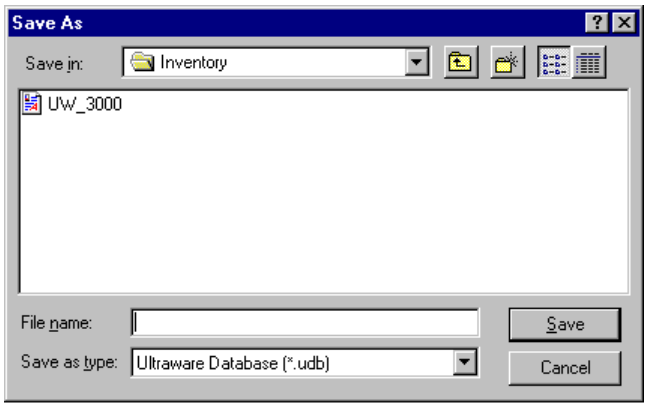
   b. Click Open.

   The selected Ultraware file appears in the Workspace window. If the Workspace window displayed a previously opened Ultraware file, the selected Ultraware file is displayed.

Saving an Ultraware File

To save all changes made to a drive or a project, perform these steps.

1. Choose one of these options.
   - Click Save in the File menu
   - Click the Save icon in the File toolbar
   - Press the Ctrl + S keys
2. Click Save As in the File menu to open the Save As dialog box.



3. Type or click a file name in the Save As dialog box.
4. Navigate to the location where the new Ultraware file should be stored.
5. Click Save.

TIP Save As saves the entire Ultraware database (.udb) file to a new name.

Creating a New Drive

With an Ultraware file open in the Workspace window, you can add a new offline Ultra3000, Ultra5000, or Kinetix 3 drive.

To add a new drive, perform these steps.

- Click Ultra1500, Ultra3000, Ultra5000, or Kinetix 3 in the Insert Menu.
- Right-click the Ultraware file, and then-click the drive type (Kinetix 3, Ultra1500, Ultra3000, Ultra5000).

A new drive appears in the Workspace window.

The name of the new drive is Drive or (if Drive already exists) Drive*n*, where *n* is the lowest positive integer that creates a unique drive name for the specific drive model. For example, two 2098-DSD-005 drives may be named Drive and Drive1, and two 2098-DSD-005X drives may also be named Drive and Drive 1.

Importing and Exporting a Drive

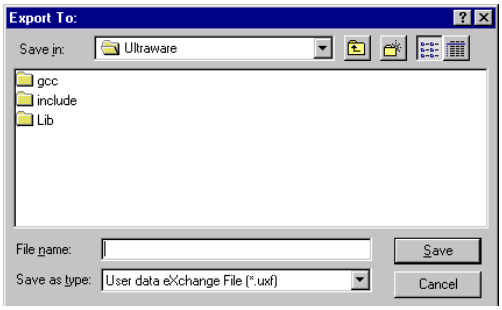
You can import an existing, previously configured drive to an Ultraware file using the File menu's Import command.

Only drives that have been previously exported, using the File menu's Export command, can be imported. Exporting a drive saves it as an User data eXchange File with a .uxf extension.

Exporting a Drive

To Export a drive, perform these steps.

1. Click a drive branch.
2. Do one of these actions to open the Export To dialog box.
   - Click Export in the File menu.
   - Right-click the drive branch, and click Export in the menu.



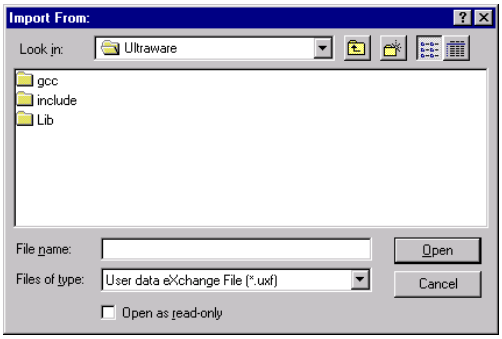
3. Type or click a name for the drive in the Export To dialog box.
4. Navigate to a location where the file should be exported.
5. Click Save.

The exported file is saved as an User data eXchange File (with an .uxf extension).

Importing a Drive

To Import a previously exported drive, performs these steps.

1. Click the offline Ultraware file.
2. Do one of these actions to open the The Import From window.
   - Click Import in the File menu.
   - Right-click the Ultraware file, and then click Import from the pop-up menu.



3. In the Import From window, navigate to and click the User data eXchange File (.uxf) that contains the desired drive settings.
4. Click Open to display the imported drive in the offline Ultraware file.

Working in the Workspace Window

You can use the Edit menu commands to Cut, Copy, Paste and Delete/Erase items in the Workspace window. You can also use a Drag and Drop function in place of Cut and Paste.

Cut

The Cut command removes selected items from the Workspace window. Any item cut from the Workspace window replaces any other item previously cut (or copied) and stored on the clipboard.

These Workspace window items cannot be cut.

- an On-Line Drives branch
- a drive in the On-Line Drives branch
- an Ultraware file
- any child branch of a drive
- a program (with an .exe extension) for a project in an offline Ultraware file

To Cut an item from the Workspace window, perform these steps.

1. Click a Workspace window item (other than one of those listed above).
2. Do one of these actions.
   - Click Cut in the Edit menu.
   - Click Cut from the pop-up menu.
   - Simultaneously press the Ctrl + X keys.
   - Click the Cut icon in the Edit toolbar.
3. A message box asks you if you wish to continue. Click OK to cut or Cancel.

Copy

The Copy command copies selected items from the Workspace window. Any branch or item copied in the Workspace window replaces any other branch or item previously copied (or cut) and stored in the clipboard.

The following Workspace window items cannot be copied:

- An Ultraware file
- Child branches of a drive.

To copy an item in the Workspace window, perform these steps.

1. Click a Workspace window item (other than one of those listed above).
2. Do one of these actions.
   - Click Copy in the Edit menu.
   - Right-click on a drive in the Workspace window, then click Copy from the pop-up menu.
   - Simultaneously press the Ctrl + C keys.
   - Click the Copy icon in the Edit toolbar.

Paste

The Paste command inserts a previously copied or cut Workspace window item or branch into the selected location of the Workspace window.

When pasting into the Workspace window, three results can occur:

- If the selected Workspace window item is of the same type as the item to be pasted, the pasted item replaces the selected item.
- If the selected Workspace window item is a parent branch that must always have one child of the same type as the item to be pasted, the pasted item replaces the selected branch's child of the same type.
- If the selected Workspace window branch can have multiple child branches of the same type as the item to be pasted, the pasted item:
  - replaces a child branch with the same name as the pasted item, or
  - is added as an additional child branch, if no other child branch shares the pasted item's name.

Any Workspace window item can be selected to receive a pasted item, except these items:

- a source (.c) file
- a header (.h) file
- child branches of an Ultra3000 drive.
- some child branches of an Ultra5000 drive

To paste an item in the Workspace window, perform these steps.

1. Click a Workspace window branch in which to paste the item.

IMPORTANT The Workspace window branch selected can not be any of these branch types.

- an on-line drive
- a child project in the archives
- a source (.c) file
- a header (.h) file
- a child or the children of an Ultra3000 drive

2. Do one of these actions.
   - Click Paste in the Edit menu.
   - Click on a branch drive in the Workspace window, then right-click Paste from the pop-up menu.
   - Click Paste from the pop-up menu.
   - Simultaneously press the Ctrl + V keys.
   - Click the Paste icon in the Edit toolbar.

   If you are pasting an item into the Workspace window that replaces another item of the same name, a message box asks if you wish to continue.
3. Click OK to paste, or Cancel to quit.

Delete

The Delete command removes selected branches or items from the Workspace window. The deleted item is permanently destroyed. The Delete command cannot be reversed by an Undo command.

These Workspace window items cannot be deleted.

- an On-Line Drives branch
- a drive in the On-Line Drives branch
- an Ultraware file
- an immediate child item branching directly from a drive
- an executable program child (with an .exe extension) of an offline project

To delete an item from the Workspace window, perform these steps.

1. Click a Workspace window item (other than one of those listed above).
2. Do one of these commands.
   - Click Delete in the Edit menu.
   - Click Delete in the pop-up.

- Click the Erase icon in the Edit toolbar.

3. Click OK to delete or Cancel in the message box that appears.

Drag and Drop

You can use the drag-and-drop method to copy and move a Workspace window branch or item to other locations within the Workspace window. The drag-and-drop method combines the Cut, Copy and Paste commands, as follows:

- the drag-and-drop method copies a Workspace window branch or item that can be both copied using the Copy command, and pasted using the Paste command.
- the drag-and-drop method moves a Workspace window branch or item that can be both cut using the Cut command, and pasted using the Paste command.

To use the drag-and-drop method to copy a Workspace window branch or item:

1. Place the cursor arrow on a Workspace window branch or item that can be copied and hold down the left mouse button.
2. Drag the selected Workspace window branch or item to the desired destination. One of two things happens:
   - If the item can be copied, the pointer continues to appear as an arrow and a + (plus) sign appears to the right of the arrow (for as long as you continue drag the item over a place in the Workspace window where it may be dropped).
   - If the item cannot be copied, or if you are dragging the item over a part of the Workspace window where it may not be dropped, the arrow is replaced by a circle with a line through it.
3. Release the mouse button when you arrive at the Workspace window location where you want to copy the Workspace window branch or item. The result is the same as if you had Copied then Pasted it to this location.

To use the drag-and-drop method to move a Workspace window or item:

1. Place the cursor arrow on a Workspace window or item that can be cut and hold down both the left mouse button and the Ctrl key.
2. Drag the selected Workspace window or item to the desired destination. One of two things occurs:
   - If the item can be cut, the pointer continues to appear as an arrow (for as long as you continue drag the item over a place in the Workspace window where it may be dropped).
   - If the item cannot be cut, or if you are dragging the item over a part of the Workspace window where it may not be dropped, the arrow is replaced by a circle with a line through it.

3. When you arrive at the Workspace window location where you want to move the item, release both the mouse button and the Ctrl key. The result is the same as if you had Cut then Pasted it to this location.

Configuring the Ultra3000 Drive

Introduction

This chapter describes how to configure your Ultra3000 drive to an operational mode.

Also described are these Ultra3000 drive interface options:

- homing
- oscilloscope
- drive tuning
- drive monitoring
- motor and encoder diagnostic routines

Configuring the Ultra3000 Drive

Each Ultra3000 drive in the Workspace window has these child branches or windows:

- Operation Modes
  - Analog
  - Preset
  - Follower
  - Indexing
  - Homing

  Indexing and Homing operation modes are available only for drive types whose catalog numbers end in X (for example, 2098-DSD-005X).
- Motor
- Tuning
- Encoders
- Digital Inputs
- Digital Outputs
- Analog Outputs
- Monitor
- Oscilloscope
- Faults
- DeviceNet
- Service Information

Except for the Monitor windows, all of a drive's child branches can and must be configured in a Properties window.

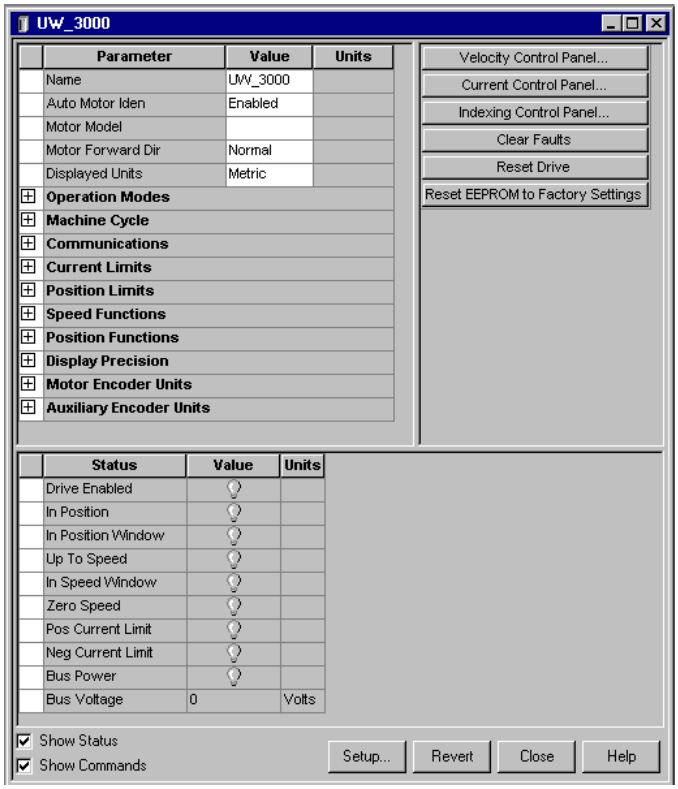
Configuring Properties for the Ultra3000 Drive

To configure the properties for an Ultra3000 drive or one of its child branches, perform these steps.

1. In the Workspace window, click the drive branch to configure.
2. Do one of these:
   - Click Properties from the Edit menu.
   - Right-click the drive in the Workspace, and click Export from the pop-up menu.
   - Double-click the drive branch.

   TIP If the drive is a SERCOS drive, only those parameters, status and direct commands appropriate for a SERCOS drive are displayed.

   A Properties window, such as the Drive Properties window displayed below, appears for the selected drive branch.



3. To configure properties for the selected drive branch, use the features of the Properties window as follows.

Section	Description
Parameters	Located in the upper left part of the Properties window. Type or click settings in the parameter fields to configure the drive branch.
Commands	Located in the upper right part of the Properties window. Click any button to issue the associated command. Click Show Commands, below, to display command buttons. Not every drive branch has associated commands.
Status	Located beneath the Parameters and Commands sections. By default, these fields display the online status of the selected drive branch. Click Setup to open a window where you can customize the status to be displayed. Status fields are read-only. Click Show Status to display the status section. Note: Status values for offline drives may not be meaningful.
Show Status	Displays status for the drive branch.
Show Commands	Displays commands for the drive branch. Commands can be executed only for online drives. This selection is dimmed if no commands are associated with the selected drive branch.
Setup	Opens the Monitor Setup window, where you can customize the status display. Refer to Understanding the Monitor on page 105 for more information about using the Monitor window.
Revert	Returns parameter settings to the values they had when you first opened this window.
Close	Closes the window.
Help	Displays online help for this window.

The remainder of this chapter describes the process of entering and editing drive configuration settings, the status are displayed by default for each drive branch when the drive is online, and the commands available to a user for each drive branch when the drive is online.

Understanding the Ultra3000 Drive Branch

The Properties window for the Ultra3000 Drive branch looks like this.

Parameter	Value	Units
Name	UW_3000	
Auto Motor Iden	Enabled	
Motor Model		
Motor Forward Dir	Normal	
Displayed Units	Metric	
Operation Modes		
Operation Mode	Analog Velocity Input	
Oper Mode Override	Analog Velocity Input	
Machine Cycle		
Position Rollover	Disabled	
Size	2147483647	Counts
Communications		
Drive Address	0	
Broadcast Address	255	
Baud Rate	38400	
Frame Format	8 Data, No Parity	
Current Limits		
Positive	14.0	Amps
Negative	14.0	Amps
Position Limits		
Positive Decel Distance	0	Counts
Negative Decel Distance	0	Counts
Enable Soft Limits	off	
Positive Soft Limit	2147483647	Counts
Negative Soft Limit	-2147483647	Counts
Speed Functions		
Zero Speed	4	RPM
Speed Window	7	RPM
Up to Speed	750	RPM
Position Functions		
In Position Size	20	Counts
In Position Time	20	msec
Posn Compare 1 Type	Greater Than	
Posn Compare 1	0	Counts
Posn Compare 2 Type	Within Window	
Posn Compare 2 Min	0	Counts
Posn Compare 2 Max	0	Counts
Display Precision		
Velocity Precision	0	
Position Precision	0	
Acceleration Precision	0	
Current Precision	1	
Motor Encoder Units		
Velocity Label	Counts/sec	
Velocity Scale	1	Counts/sec per User Units
Position Label	Counts	
Position Scale	1	Counts per User Units
Acceleration Label	Counts/sec/sec	
Acceleration Scale	1	Count/s^2 per User Units
Auxiliary Encoder Units		
Velocity Label	Counts/sec	
Velocity Scale	1	Counts/sec per User Units
Position Label	Counts	
Position Scale	1	Counts per User Units
Acceleration Label	Counts/sec/sec	
Acceleration Scale	1	Count/s^2 per User Units

Status	Value	Units
Drive Enabled		
In Position		
In Position Window		
Up To Speed		
In Speed Window		
Zero Speed		
Pos Current Limit		
Neg Current Limit		
Bus Power		
Bus Voltage	0	Volts

Use this Ultra3000 window to:

- configure the parameters for an offline or an online drive
- monitor the status of an online drive
- execute commands that clear faults, reset the drive or reset the EEPROM
- open the Control Panel windows, where you can issue commands that control drive motion

If the drive is a SERCOS drive, with its SERCOS interface active, the drive is displayed with a small "S" next to the drive icon. The software displays a custom workspace tree and property windows, limiting the display appropriately for a SERCOS drive.

You can edit parameters for both an online and an offline drive. However, you can monitor status and execute direct commands (executed through the Ultraware interface) only for an Ultra3000 drive in the On-Line Drives branch.

The following parameters apply to the Ultra3000 Drive window.

Parameter	Description
Name	The name of the drive, up to 32 characters long. Note: The drive name is displayed in the title bar of the windows relating to this drive.
Auto Motor Iden	Select: • Enabled: Causes the drive to read motor parameters from an intelligent encoder, or • Disabled: Causes the drive to read motor parameters from a Motor Model selected, below.
Motor Model	The model of the motor to be controlled by the drive. Selecting a motor model from the drop-down list sets its parameters in the Motor window. Note: For an online drive, you must disable the drive before you can edit its Motor Model parameter. Note: Ultraware software ships with a utility that lets you create custom motor configurations. Use that utility to add customized motor selections to the Motor Model list.
Motor Forward Dir	Click either: • Normal: a positive direction move increases the encoder count. • Reverse: a positive direction move decreases the encoder count.
Displayed Units	Click a unit of measure for position, velocity, and acceleration displays: Metric: • units for rotary motors are: counts (position), rpm (velocity), rpm per second^2 (acceleration); • units for linear motors are: meters (position), meter per second (velocity), and meter per second^2 (acceleration). English: • units for rotary motors are: counts (position), rpm (velocity), rpm per second^2 (acceleration); • units for linear motors are: inches (position), inches per second (velocity), and inches per second^2 (acceleration)., User: displays measurements in terms defined by the user in the Units section, below.
Operation Modes	

Parameter	Description
Operation Mode	The drive's command source. Note: An online drive must be disabled before you can edit its Operation Mode parameter. Selections include: • Analog Current Input: a +/- 10 volt analog input provides the current command. • Analog Position: a +/- 10 volt analog input provides the position command. • Analog Velocity Input: a +/- 10 volt analog input provides the velocity command. • Follower: Auxiliary Encoder: a quadrature encoder provides a position command signal input to the drive. • Follower: Step/Direction Input: Step and Direction inputs provide a position command signal input to the drive. • Follower: Step Up/Step Down Input: Step Up and Step Down inputs provide a position command signal input to the drive. • Indexing: (only for Indexing drives) Up to 64 indexes can be configured in the Indexing window. The combination of Preset Select Lines 0, 1, 2, 3, 4 and 5, in the Digital Inputs window, determines the Index (0 – 63) that is selected. Refer to Understanding the Digital Inputs Window on page 95 for more information about how to assign a Preset Select Line to a Digital Input. • Preset Current: a preset Current provides the current command. Up to 8 Preset Current values can be set in the Preset window. The combination of Preset Select Lines 0, 1 and 2 in the Digital Inputs window, determines the Preset Current (0 – 7) that is selected. Refer to Understanding the Digital Inputs Window on page 95 for more information about how to assign Preset Select Line functions to a Digital Input. • Preset Position: a preset Position provides the position command. Up to 8 Preset Position values can be set in the Preset window. The combination of Preset Select Lines 0, 1 and 2 in the Digital Inputs window, determines the Preset Position (0 – 7) that is selected. Refer to Understanding the Digital Inputs Window on page 95 for more information about how to assign a Preset Select Line to a Digital Input. • Preset Velocity: a Preset Velocity provides the velocity command. Up to 8 Preset Velocity values can be set in the Preset window. The combination of Preset Select Lines 0, 1 and 2 in the Digital Inputs window, determines the Preset Velocity (0 – 7) that is used for the velocity command. Refer to Understanding the Digital Inputs Window on page 95 for more information about how to assign Preset Select Line functions to a Digital Input.
Operation Mode Override	The connected drive's command source that is used when the Operation Mode Override input is active. The Operation Mode Override input is assigned to a digital input in the Digital Inputs window. Note: See Operation Mode, above, for an explanation of the available selections.

Parameter	Description
Machine Cycle	
	Enable or disable a Single-Turn Absolute encoder. • Enabled: to cause the SRS encoder to be used as an absolute feedback device • Disabled: to cause the SRS encoder not to be used as an absolute feedback device. (Default) Note: This parameter is visible only if the offline motor selection or online motor has an SRS/SRM encoder. Enable or disable Position Rollover: • Enabled: to cause the position variable to rollover to zero when it exceeds the specified size. (Default) • Disabled: to cause the position variable to rollover only when it exceeds 2147483647 counts, or its equivalent in other units. Note: This parameter is disabled when Single-Turn Absolute is enabled. Size: Type a rollover value in counts. This is an integer at which the next increment of a position variable will be the value of zero (0). Note: This parameter is disabled when Single-Turn Absolute is enabled, and is automatically set to one revolution.
Communications	
Drive Address	The drive's communication port address - an integer from 0 to 255 - used in multiple axis applications. For single axis applications, this value is usually set to 0. The drive must be reset before it recognizes an edited drive address. Note: Communication port parameters can be set in the PC Communications Setup dialog box, that is opened using the Tools menu Serial Port command.
Broadcast Address	The address used by a host PC or PLC to issue a single broadcast command to all connected Ultra3000 drives. The drive does not send a response to commands received with the broadcast address. Note: If a drive's Broadcast Address and Drive Address are set to the same value, that drive treats all commands as normal, point-to-point commands, and sends a response to all commands it processes.
Baud Rate	Baud rate setting for the drive. Note: The drive's Baud Rate must be the same as the PC's Baud Rate (set in the PC Communications Setup dialog box) if the PC and drive are to successfully communicate. Refer to Serial Port Settings on page 22 for restrictions.
Frame Format	Specify the drive's communication port packet framing format. Note: The drive's Frame Format must be the same as the PC's Format (set in the PC Communications Setup dialog box) if the PC and drive are to successfully communicate.

Parameter	Description
Current Limits	
Positive	The drive's positive current limit value. Note: The value entered here is divided by the lesser of intermittent drive current rating and intermittent current rating of the motor, and is stored on the drive as a percentage. If a different motor is selected for the drive, with a different current capacity, this parameter value changes. During runtime, the drive limits positive current to the lesser of: • the Positive Current Limit (this value), • the analog current limit Input (an analog input of the drive that limits current proportionately to its value), • the Intermittent Current rating of the drive (a fixed value, hard-coded into the drive), or • the Intermittent Current rating of the motor (stored in the motor database).
Negative	The drive's negative current limit runtime value. Note: The value entered here is divided by the lesser of intermittent drive current rating and intermittent current rating of the motor, and is stored on the drive as a percentage. If a different motor is selected for the drive, with a different current capacity, this parameter value changes. During runtime, the drive limits negative current to the lesser of: • the Negative Current Limit (this value), • the analog current limit Input (an analog input of the drive that limits current proportionately to its value), • the Intermittent Current rating of the drive (a fixed value, hard-coded into the drive), or • the Intermittent Current rating of the motor (stored in the motor database).
Position Limits	
Positive Decel Distance	The stopping distance used when the drive encounters a positive overtravel limit.
Negative Decel Distance	The stopping distance used when the drive encounters a negative overtravel limit.
Enable Soft Limits	Select: • On: Causes the drive to compare the motor feedback position to the Positive and Negative Soft Limits to determine if the drive has exceeded an overtravel limit. • Off: Turns off software overtravel limit checking.
Positive Soft Limit	If the motor feedback position is greater than this value, the drive has exceeded the soft overtravel limit.
Negative Soft Limit	If the motor feedback position is less than this value, the drive has exceeded the soft overtravel limit.
Speed Functions	
Zero Speed	This value creates a plus or minus (+/-) range, or window, around the zero velocity. If the motor feedback velocity falls within this range, the Zero Speed flag is (or remains) set. Note: You can assign the Zero Speed, In Speed Window or Up To Speed flags to digital outputs and control execution of your process based on the state of these flags.
In Speed Window	This value creates a plus or minus (+/-) range, or window, around the programmed velocity. If the motor feedback velocity falls within this range, the In Speed Window flag is (or remains) set.
Up to Speed	This value sets a velocity level. If the motor feedback velocity is greater than or equal to this value, the Up To Speed flag is (or remains) set.

Parameter	Description
Position Functions	
In Position Size	The maximum amount of position error that permits the In Position and the In Position Window flags to be (or remain) set.
In Position Time	The minimum length of time the position error must be less than the In Position Size value, for the In Position and the In Position Window flags to be (or remain) set.
Posn Compare 1 Type	Specify the type of comparison that will determine if the Posn Compare 1 flag should be set. Either: • Greater Than: the flag will be set if the motor feedback position is greater than the Posn Compare 1 value. • Less Than: the flag will be set if the motor feedback position is less than the Posn Compare 1 value. • Within Window: the flag will be set if the motor feedback position is greater than Posn Compare 1 Min and less than Posn Compare 1 Max. • Outside Window: the flag will be set if the motor feedback position is less than Posn Compare 1 Min or more than Posn Compare 1 Max. Note: This parameter is supported in firmware revision 1.29 and higher.
Posn Compare 1	Enter the position, in counts, that is compared to the motor feedback position to determine if the Posn Compare 1 flag should be set.
Posn Compare 1 Min	Enter the minimum position, in counts, that will be compared to the motor feedback position to determine if the Posn Compare 1 flag should be set. Note: Displayed if Posn Compare 1 Type is set to Within Window or Outside Window.
Posn Compare 1 Max	Enter the maximum position, in counts, that will be compared to the motor feedback position to determine if the Posn Compare 1 flag should be set. Note: Displayed if Posn Compare 1 Type is set to Within Window or Outside Window.
Posn Compare 1 Polarity	The type of comparison that determines if the Posn Compare 1 flag should be set. Either: • Greater Than: the flag is set if the motor feedback position is greater than the Posn Compare 2 value. • Less Than: the flag is set if the motor feedback position is less than the Posn Compare 2 value. Note: Replaced with Posn Compare 1 Type starting with firmware revision 1.29.
Posn Compare 2 Type	The type of comparison that will determine if the Posn Compare 2 flag should be set. Either: • Greater Than: the flag will be set if the motor feedback position is greater than the Posn Compare 2 value. • Less Than: the flag will be set if the motor feedback position is less than the Posn Compare 2 value. • Within Window: the flag will be set if the motor feedback position is greater than Posn Compare 2 Min and less than Posn Compare 2 Max. • Outside Window: the flag will be set if the motor feedback position is less than Posn Compare 2 Min or more than Posn Compare 2 Max. Note: This parameter is supported in firmware revision 1.29 and higher.
Posn Compare 2	Enter the position, in counts, that is compared to the motor feedback position to determine if the Posn Compare 2 flag should be set.

Parameter	Description
Posn Compare 2 Min	Enter the minimum position, in counts, that will be compared to the motor feedback position to determine if the Posn Compare 2 flag should be set. Note: Displayed if Posn Compare 2 Type is set to Within Window or Outside Window.
Posn Compare 2 Max	Enter the maximum position, in counts, that will be compared to the motor feedback position to determine if the Posn Compare 2 flag should be set. Note: Displayed if Posn Compare 2 Type is set to Within Window or Outside Window.
Posn Compare 2 Polarity	Specify the type of comparison that determines if the Posn Compare 2 flag should be set. Either: • Greater Than: the flag is set if the motor feedback position is greater than the Posn Compare 2 value. • Less Than: the flag is set if the motor feedback position is less than the Posn Compare 2 value. Note: Replaced with Posn Compare 1 Type starting with firmware revision 1.29.
Display Precision	
Velocity Precision	The number of characters displayed to the right of the decimal point for velocity values.
Position Precision	The number of characters displayed to the right of the decimal point for position values.
Acceleration Precision	The number of characters displayed to the right of the decimal point for acceleration values.
Current Precision	The number of characters displayed to the right of the decimal point for current values.
Motor Encoder Units	
Velocity Label	When User is selected for Displayed Units, this is the user-defined label for velocity values relating to the motor encoder. Limited to 16 characters in length.
Velocity Scale	When User is selected for Displayed Units, this is the user-defined conversion factor used to convert velocity values, relating to the motor encoder, into user units. In counts per second per user unit.
Position Label	When User is selected for Displayed Units, this is the user-defined label for position values relating to the motor encoder. Limited to 16 characters in length.
Position Scale	When User is selected for Displayed Units, this is the user-defined conversion factor used to convert position values, relating to the motor encoder, into user units. In counts per user unit.
Acceleration Label	When User is selected for Displayed Units, this is the user-defined label for acceleration values relating to the motor encoder. Limited to 16 characters in length.
Acceleration Scale	When User is selected for Displayed Units, this is the user-defined conversion factor used to convert acceleration values, relating to the motor encoder, into user units. In counts per second squared per user unit.

Parameter	Description
Auxiliary Encoder Units	
Velocity Label	When User is selected for Displayed Units, this is the user-defined label for velocity values relating to the auxiliary encoder. Limited to 16 characters in length.
Velocity Scale	When User is selected for Displayed Units, this is the user-defined conversion factor used to convert velocity values, relating to the auxiliary encoder, into user units. In counts per second per user unit.
Position Label	When User is selected for Displayed Units, this is the user-defined label for position values relating to the auxiliary encoder. Limited to 16 characters in length.
Position Scale	When User is selected for Displayed Units, this is the user-defined conversion factor used to convert position values, relating to the auxiliary encoder, into user units. In Counts per user unit.
Acceleration Label	When User is selected for Displayed Units, this is the user-defined label for acceleration values relating to the auxiliary encoder. Limited to 16 characters in length.
Acceleration Scale	When User is selected for Displayed Units, this is the user-defined conversion factor used to convert acceleration values, relating to the auxiliary encoder, into user units. In counts per second squared per user unit.

The following status is displayed by default for an Ultra3000 drive in the On-Line Drives branch of the Workspace window.

Status	Description
Note: All ON status have a value of 1; all OFF status have a value of 0.	
Drive Enabled	ON indicates the power stage of the drive is enabled. As a precondition, all software and hardware enable inputs must be active, and the drive cannot have any faults.
In Position	ON indicates position error has been less than the In Position Size setting for longer than the In Position Time setting, and the speed is less than the Zero Speed setting.
In Position Window	ON indicates position error has been less than the In Position Size setting for longer than the In Position Time setting.
Up To Speed	ON indicates motor velocity feedback is greater than the Up To Speed setting.
In Speed Window	ON indicates motor velocity feedback falls within the range of programmed velocity +/- the Speed Window value.
Zero Speed	ON indicates the motor velocity feedback value is less than the Zero Speed setting.
Pos Current Limit	ON indicates the current of the drive is limited by the Positive Current Limit, above.
Neg Current Limit	ON indicates the current of the drive is limited by the negative Current Limit, above.
Bus Power	ON indicates power is applied to the DC Bus.
Bus Voltage	The present measure of Bus voltage.

The following commands can be executed for an Ultra3000 Drive window that is in the On-Line Drives branch. These commands are explained in these sections.

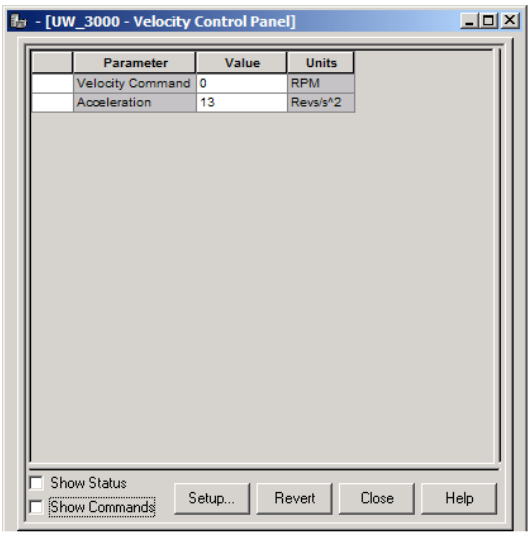
Command	Description
Velocity Control Panel	Opens the Velocity Control Panel window. Refer to Velocity Control Panel Window on page 50 for more information about how to set a drive's velocity command and monitor its motor velocity or current.
Current Control Panel	Opens the Current Control Panel window. Refer to Current Control Panel Window on page 52 for more information about how to set a drive's current command and monitor its motor velocity or current.
Indexing Control Panel	Opens the Indexing Control Panel window. (Only for Indexing drives.) Refer to Indexing Control Panel on page 54 for more information about how to set one of sixty-four possible indexes, monitor the status of the selected index, and send direct commands to the selected drive.
Clear Faults	Attempts to clear all drive faults.
Reset Drive	Resets, or reboots, the hardware and firmware for a drive.
Reset EEPROM to Factory Setting	Resets a drive's parameters by reinitializing them to factory default settings. Stored faults and the Time in Service clock remain unchanged

Customize the window for your Ultra3000 Drive branch by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window shown on page 105, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Velocity Control Panel Window

The Properties window for the Velocity Control Panel looks like this.



Use the Velocity Control Panel window to directly set the drive's velocity in a temporary velocity mode.

Opening the Velocity Control Panel will stop any motion commands originating from the drive's normal operation mode, set in the Kinetix 3 Drive window.

ATTENTION: The Velocity Control Panel commands override the normal operation mode. The motor will move in response to Velocity Control Panel commands!

The Jog Forward and Jog Reverse commands of the Velocity Control Panel are not changed by the Command Polarity selection in the Kinetix 3 Drive Window. They always behave as though the Command Polarity were set to Normal.

The Velocity Control Panel has these parameters, status, and direct commands.

Parameter	Description
Velocity Command	The speed at which the motor will turn when the Jog Forward or Jog Reverse command executes, provided that the drive is online and enabled. The range is 0…6000 rpm for rotary motors (0…6000 millimeters per second for linear motors). The default is 50.
Acceleration	Displays the maximum rate of acceleration (or deceleration) the drive uses to ramp up (or down) to the commanded velocity when velocity changes.

The following statuses can be displayed from the Velocity Control Panel window of an online drive.

Status	Description
Drive Enabled	ON indicates that the power stage of the drive is enabled. For the power stage to be enabled: • the drive cannot have any faults, and • any digital inputs configured as a Drive Enable must be active, and • the drive must be set to Enabled, in the Commands menu. Note: The Drive Enabled status has a value of 1 when ON, and 0 when OFF
Velocity – Motor Feedback	The actual motor velocity.
Current – Motor Feedback	The actual motor current.

TIP The drive will ramp up, or ramp down, to the commanded velocity at the rate of acceleration set in the Acceleration Limits in the Kinetix 3 Drive window.

Command	Description
Set to Zero	Sets the Velocity Command to zero.
Enable Drive	Enables the power stage of a drive.
Disable Drive	Disables the power stage of a drive.
Clear Faults	Clears all drive faults.

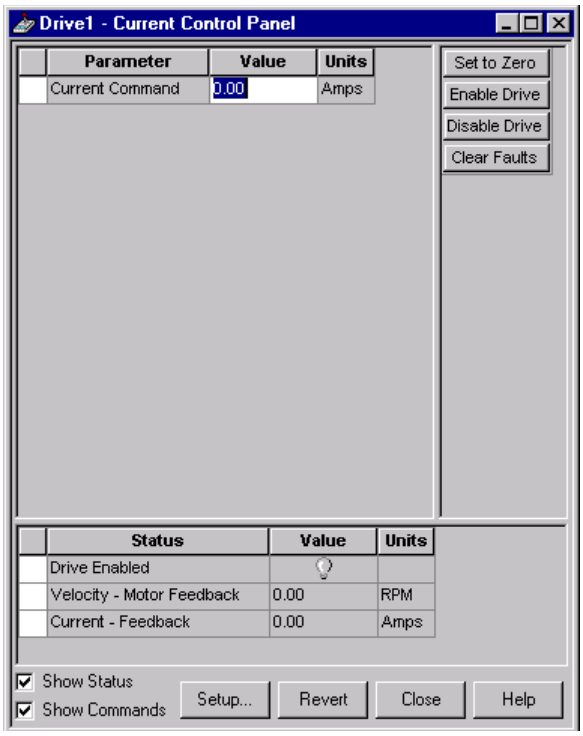
TIP Closing the window returns the drive to its normal operating mode, but the software is disabled. To make the drive operational, click the drive and then the Enable command as instructed in the Windows' message.

Customize the Velocity Control Panel window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window as shown on page 105, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Current Control Panel Window

The Properties window for the Current Control Panel looks like this.



Use the Current Control Panel window to directly set the drive's current command and monitor actual motor velocity or current. In support of these functions, you can also:

- zero the drive's current,
- enable or disable a drive, and monitor the drive's enabled or disabled status, or
- reset all drive faults.

The commands you execute override any motion commands originating from the drive's normal operation mode, set in the Ultra3000 Drive window.

ATTENTION: The Current Control Panel commands override the normal operation mode. The motor moves in response to Current Control Panel commands!

The Current Control Panel has these parameter, status, and direct commands:

Parameter	Description
Current Command	The current, in Amperes, that is sent to the motor when the Current Mode command executes, provided that the drive is online and enabled.

The status can be displayed from the Current Control Panel window of an online drive.

Status	Description
Drive Enabled	ON indicates that the power stage of the drive is enabled. For the power stage to be enabled: • the drive cannot have any faults, and • any digital inputs configured as a Drive Enabled must be active, and • the drive must be set to Enabled, in the Commands menu. Note: The Drive Enabled status has a value of 1 when ON, and 0 when OFF.
Velocity – Motor Feedback	The actual motor velocity.
Current – Feedback	The actual motor current.

These commands can be executed from a Current Control Panel window of an online drive:

Command	Description
Set to Zero	Sets the Current Command to zero.
Enable Drive	Enables the power stage of a drive.
Disable Drive	Disables the power stage of a drive.
Clear Faults	Resets all drive faults.

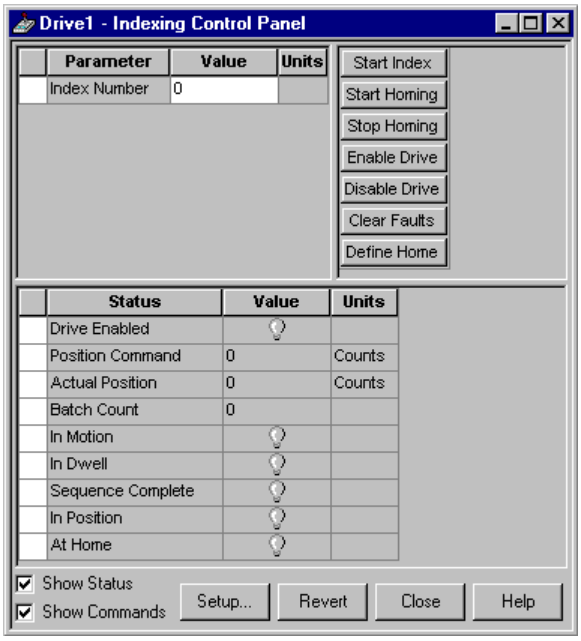
TIP Closing the window returns the drive to its normal operating mode, but the software is disabled. To make the drive operational, click the drive and then the Enable command as instructed in the Windows' message.

Customize the Current Control Panel window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window as shown on page 105, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Indexing Control Panel

The Properties window for the Indexing Control Panel looks like this.



TIP The Indexing Control Panel is available for online or offline Ultra drives having the indexing feature. For example, A drive type with a catalog number ending in X (for example, 2098-DSD-005X) will appear in the New Drive Select window.

The Indexing Control Panel permits the user to use one of sixty-four possible indexes, monitor the status of the selected index, and send direct commands to the selected drive.

Use the Indexing Control Panel window to:

- Start or stop the execution of an indexed motion command.
- Start or stop homing.
- Enable or disable a drive.
- Reset all drive faults.
- Define the motor's home position.

The commands you execute override any motion commands originating from the drive's normal operation mode, set in the Ultra3000 Drive window.

ATTENTION: The Indexing Control Panel commands override the normal operation mode. The motor moves in response to Indexing Control Panel commands!

The Indexing Control Panel has these parameter, status, and direct commands:

Parameter	Description
Index Number	The number (0…63) of the indexed motion command, configured in the Indexing window, that starts when you use the Start Index.

The status can be displayed from the Indexing window of an online drive:

Status	Description
Drive Enabled	ON (illuminated) indicates that the power stage of the drive is enabled. For the power stage to be enabled: • the drive cannot have any faults, and • any digital inputs configured as a Drive Enable must be active, and • the drive must be set to Enabled, in the Commands menu. Note: The Drive Enable status has a value of 1 when ON, and 0 when OFF.
Position Command	The motor's commanded position, relative to the Home position of zero.
Actual Position	The motor's actual position, relative to the Home position of zero.
Batch Count	The number of iterations remaining in the execution of the index.
In Motion	ON (illuminated) indicates the motor is moving in response to an indexed motion command. Note: The In Motion status has a value of 1 when ON, and 0 when OFF.
In Dwell	ON (illuminated) indicates the motor is holding position and waiting the commanded dwell time. Note: The In Dwell status has a value of 1 when ON, and 0 when OFF.
Sequence Complete	ON (illuminated) indicates that all iterations of the index have been completed. Note: The Sequence Complete status has a value of 1 when ON, and 0 when OFF.
In Position	ON (illuminated) indicates the position error has been less than the In Position Size setting for longer than the In Position Time setting, and the speed is less than the Zero Speed setting, as configured in the Ultra3000 Drive window. Note: The In Position status has a value of 1 when ON, and 0 when OFF.
At Home	ON (illuminated) indicates the position command value is zero, which is by definition the Home position. Note: The At Home status has a value of 1 when ON, and 0 when OFF.

These commands can be executed from the Indexing window of an online drive:

Command	Description
Start Index	Begins execution of the indexed motion command (0 - 63) specified in the Index Number parameter.
Start Homing	Begins execution of the homing sequence as defined in the Homing window.
Stop Homing	Stops execution of the homing sequence.
Enable Drive	Enables the power stage of a drive.
Disable Drive	Disables the power stage of a drive.
Clear Faults	Clears all drive faults.
Define Home	Sets the Motor encoder feedback to the Home Position as defined in the Homing window. Note: Absolute indexes cannot be executed until home has been defined.

TIP Closing the window returns the drive to its normal operating mode, but the software is disabled. To make the drive operational, click the drive and then the Enable command as instructed in the Windows' message.

Customize the Indexing Control Panel window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window as shown on page 105, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Drive Report

Use the Drive Report command to generate a text file in the Client Area. The text file lists the parameter settings for the selected Ultra drive. Once created, you can print a copy of the Drive Report.

To execute the Drive Report command, perform these steps.

1. In the Workspace window, click Ultra0 drive.
2. Right-click to display a pop-up menu, and then click Drive Report from the pop-up menu.

Use the Drive Report's text editor window to:

- display all the parameter settings for the selected Ultra3000 drive.
- print all the parameter settings for the selected Ultra3000 drive.

In addition to the Cut, Copy, Paste, Delete, Print, commands, these commands apply to the Drive Report text editor window:

Command	Description
Find	Search for text in the source (.c) or header (.h) file.
Find Next	Find the next occurrence of header file or source file text - sought by the previous Find command.
Replace	Search for and replace the text in a source (.c) or header (.h) file.
Select All	Select all the text in the selected source (.c) or header (.h) file.
Toggle Bookmark	Set or remove a bookmark (a blue dot) in a selected line of code for a source (.c) or header (.h) file.
Next Bookmark	Locate the next bookmark (a blue dot) appearing in a selected line of code for a source (.c) or header (.h) file.
Previous Bookmark	Locate a bookmark (a blue dot) that appears above the cursor in the selected source (.c) or header (.h) file.
Clear All Bookmarks	Remove all bookmarks (blue dots) that have been set in a source (.c) or header (.h) file.

Switching the SERCOS Interface

A SERCOS interface to the Ultra3000 may be activated and deactivated through Ultraware software. When the SERCOS interface is active, Ultraware software shows the drive as a SERCOS drive with a limited set of subtopics. An active SERCOS interface requires primary control and communication with the drive be assigned to the SERCOS controller. However, Ultraware software permits you to deactivate the SERCOS interface. If you deactivate the SERCOS interface, Ultraware software recognizes the drive with full communication and control capabilities, including reactivating SERCOS control and communication.

To Deactivate the SERCOS Interface

1. Right-click the SERCOS drive icon,  , and then click Deactivate Sercos from the pop-up menu.
2. Click OK to reset the drive as non-SERCOS drive.
3. Wait several seconds for the software to scan and recognize the drive.

When the SERCOS interface is deactivated, the drive may be configured through Ultraware software. Reactivating the SERCOS interface passes control of the drive from Ultraware software to the SERCOS controller.

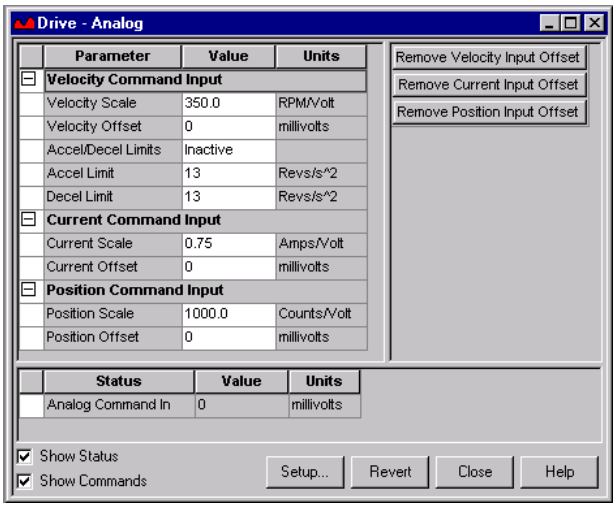
To Activate the SERCOS Interface

1. Right-click the drive icon,  , and then click Sercos Activation.
2. Click OK to reset drive as a SERCOS drive.
3. Verify the drive icon changes to a SERCOS drive.

When the SERCOS interface is activated, the drive is controlled by the SERCOS controller, and Ultraware software maps the drive with the SERCOS drive icon.

Understanding the Analog Window

The Properties window for the Analog branch looks like this.



Use the Analog window to:

- set Analog Velocity, Current and Position Command Input drive parameters for an online or offline drive,
- monitor the status of the incoming Analog Command for an online drive, and
- execute commands that remove Velocity, Current and Position Input Offsets for an online drive.

These parameters govern drive operations when the Operating Mode is set to Analog Velocity Input, Analog Position Input or Analog Current Input, in the window.

Parameter	Description
Velocity Command Input	
Velocity Scale	The drive's velocity input scale value. This value indicates the change in velocity per Volt of change in the Analog Command Input. Note: This parameter is stored on the drive as a percent of motor maximum speed. The range is -20…20 %/V. The default setting is 10%. The displayed units remain [velocity]/Volt, where velocity depends on the motor type (rotary or linear set in the Motor window, and the Units setting in the Ultra3000 drive window.
Velocity Offset	The drive's velocity input offset value. This value indicates the offset of the Analog Command Input. It has a range of -10000…10000 mV.
Accel/Decel Limits	Indicates the state of the Acceleration and Deceleration Limits, below, for the Analog Command Input in the drive, either: • Active • Inactive
Accel Limit	If Accel/Decel Limits is set to Active, this is the drive's acceleration limit when the drive is in Analog Velocity Input mode and the Analog Command Input changes. It has a range of 0…[(2^{31})-1] counts per second^2.

Parameter (Continued)	Description
Deceleration Limit	If Accel/Decel Limits is set to Active, this is the drive's deceleration limit when the drive is in Analog Velocity Input mode and the Analog Command Input changes. It has a range of 0…[(2^{31})-1] counts per second^2.
Current Command Input	
Current Scale	The drive's current input scale value. This value indicates the change in current per Volt of change in the Analog Command Input. Note: This parameter is stored on the drive in units of percent of peak current. The range, as a percentage, is -40…40 %/V. Peak current is the minimum of the drive intermittent current rating and the motor intermittent current rating. This peak current scaling is consistent with the scaling of the Positive and Negative Current limits. The default setting is 10%.
Current Offset	The drive's current input offset value. This value indicates the offset of the Analog Command Input. It has a range of -10,000…10,000 mV.
Position Command Input	
Position Scale	The drive's position input scale value. This value indicates the change in position per Volt of change in the Analog Command Input. It has a range of 32,767…- 32,767 counts/V.
Position Offset	The drive's position input offset value. This value indicates the offset of the Analog Command Input. It has a range of -10,000…10,000 mV.

You can edit Analog parameters for both an online and an offline drive. However, you can monitor status and execute direct commands (executed through the Ultraware interface) only for a Analog window that is the child of an online drive.

The status is displayed by default for an Analog window of an online drive:

Status	Description
Analog Command In	The Analog Command Input value before the scale and offset are applied.

These commands can be executed for an Analog window that is stored in the On-Line Drives branch:

Command	Description
Remove Velocity Input Offset	This command automatically measures the existing offset of the Analog Command Input, and resets the Velocity Offset value to eliminate the offset.
Remove Current Input Offset	This command automatically measures the existing offset of the Analog Command Input, and resets the Current Offset value to eliminate the offset.
Remove Position Input Offset	This command automatically measures the existing offset of the Analog Command Input, and resets the Position Offset value to eliminate the offset.

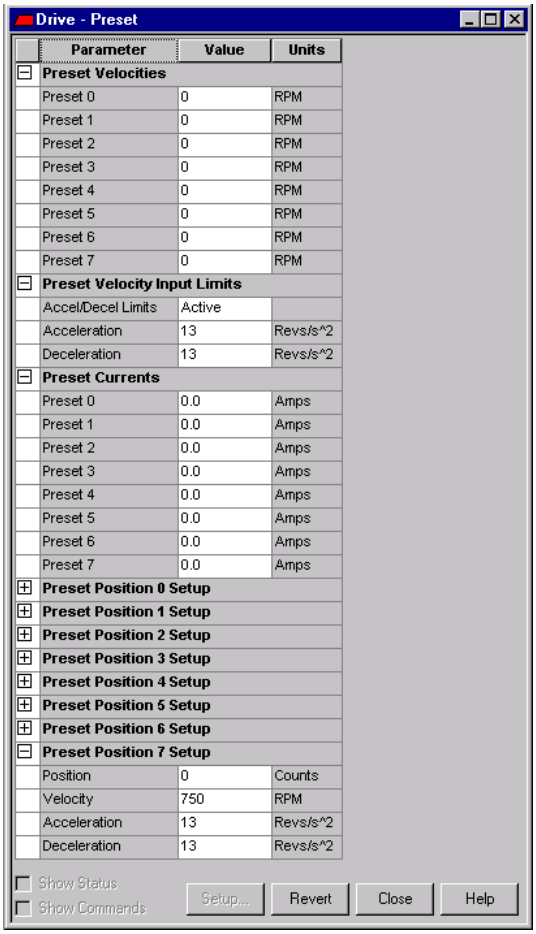
Customize the Analog window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.

- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window as shown on page 105, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Preset Window

The Properties window for Presets looks like this.



Use the Preset window to configure:

- up to eight preset velocity values
- up to eight preset current values, and
- up to eight preset position values.

Preset parameters control drive operation when the Operating Mode is set to Preset Position, Preset Velocity or Preset Current, in the Ultra3000 Drive window.

Note: Preset gearing parameters are set in the Follower window shown on page 64.

The drive uses the preset position value, preset velocity value, or preset current value selected by the Preset Select Lines 0, 1 and 2 as set in the Digital Inputs properties window.

The digital input's Preset Select Line binary values are as follows:

- Preset Select 0 = 1 if active, 0 if not.
- Preset Select 1 = 2 if active, 0 if not.
- Preset Select 2 = 4 if active, 0 if not.

If a Preset Select Line is not assigned to a digital input, the Preset Select Line is considered inactive.

If you want to use only a single gear ratio, only set the Gear Ratio for Preset 0, and do not assign the Preset Select 0, 1 or 2 to any digital inputs.

TIP Binary values for an active digital input's Preset Select Lines 3, 4 and 5 do not apply to this calculation.

The Preset window has no associated status or direct commands. The Preset window has these parameters:

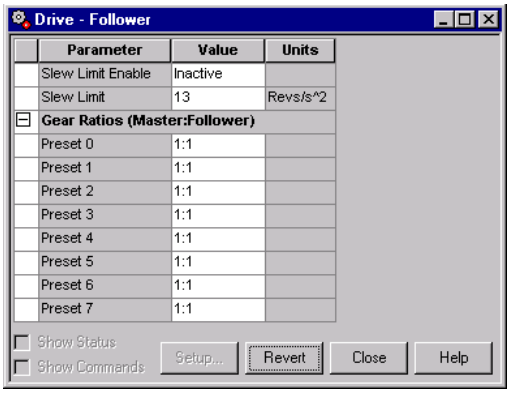
Parameter	Description
Preset Velocities	
Preset 0 through 7	The drive's preset velocity values.
Preset Velocity Input Limits	
Accel/Decel Limits	Indicates the state of the Acceleration and Deceleration Limits, below, for the drive Preset Velocity, either: • Active • Inactive
Acceleration	If Accel/Decel Limits is set to Active, this is the drive's acceleration limit when: • the drive is in Preset Velocity operation mode (as set in the Ultra3000 Drive window) and • changes in the Preset Select Line 0, 1 or 2 settings result in a change to a higher Preset Velocity value. This value has a range of 0 …2,147,483,647 counts per second^2.
Deceleration	If Accel/Decel Limits is set to Active, this is the drive's deceleration limit when: • the drive is in Preset Velocity operation mode (as set in the Basic Drive Setup window) and • changes in the Preset Select Line 0, 1 or 2 settings result in a change to a lower Preset Velocity value. This value has a range of 0…2,147,483,647 counts per second^2.
Preset Currents	
Preset 0 through 7	The drive's preset current values.

Parameter	Description
Preset Position 0 – 7 Setup	
Position	Type the fixed position to where the motor should travel. It has a range of - 2,147,483,647…2,147,483,647 counts.
Velocity	Type the commanded velocity used to move to the preset position. It has a range of 0…2,147,483,647 counts per second.
Acceleration	Type the acceleration rate used to change to a higher velocity. The value has a range of 0…2,147,483,647 counts per second^2.
Deceleration	Type the deceleration rate used to change to a lower velocity. The value has a range of 0…2,147,483,647 counts per second^2.

Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Follower Window

The Properties window for Followers looks like this.



Use the Follower window to configure up to eight preset gear ratios.

Follower parameters control drive operation when the Operating Mode is set to one of these follower types:

- Follower: Master Encoder
- Follower: Step / Direction
- Follower: Step Up / Step Down

in the Ultra3000 Drive window.

The drive uses the preset gear ratio (0 – 7) reflecting the cumulative binary values of the Preset Select Lines 0, 1 and 2 that are selected in the Digital Inputs window. The digital input Preset Select Line binary values are as follows:

- Preset Select 0 = 1 if active, 0 if not.
- Preset Select 1 = 2 if active, 0 if not.
- Preset Select 2 = 4 if active, 0 if not.

If a Preset Select Line is not assigned to a digital input, the Preset Select Line is considered inactive.

TIP Binary values for an active digital input's Preset Select Lines 3, 4 and 5 do not apply to this calculation.

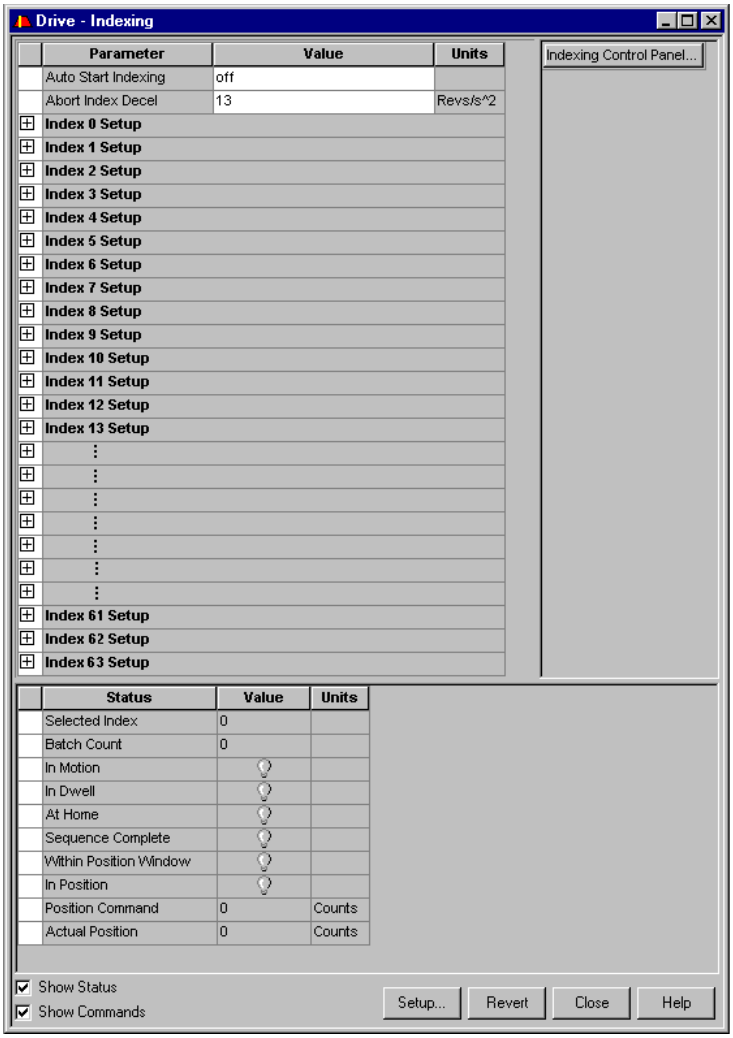
The Follower window has no associated status or direct commands. The Follower window has these parameters:

Parameter	Description
Slew Limit Enable	Indicate whether the drive's Slew Limit is: • Active • Inactive
Slew Limit	The drive acceleration limit when the master changes speed. It has a range of 0…2,147,483,647 counts per second^2.
Gear Ratios (Master:Follower)	
Preset 0 – 7	Eight preset drive gear ratios. Each preset value represents the ratio of the counts of master input counts to motor encoder counts. The master input counts value has a range of 1…32,767 counts, and the motor encoder counts value has a range of - 32,767…32,767 counts.

Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Indexing Window

The Properties window for Indexing looks like this.



Use the Indexing window to:

- configure up to sixty-four indexes (0 – 63), and
- open the Indexing Control Panel where you can:
  - start and stop execution of the index command
  - start and stop homing
  - enable or disable a drive, and
  - monitor the execution of an index.

An index controls drive operation by executing preconfigured motion commands.

An index controls drive operation when Operating Mode is set to Indexing, in the Ultra3000 Drive window. The drive uses the index whose number (0 – 63) reflects the cumulative binary values of the Preset Select Lines 0, 1, 2, 3, 4 and 5, that are selected in the Digital Inputs window.

The digital input Preset Select Line binary values are as follows:

- Preset Select 0 = 1 if active, 0 if not.
- Preset Select 1 = 2 if active, 0 if not.
- Preset Select 2 = 4 if active, 0 if not.
- Preset Select 3 = 8 if active, 0 if not.
- Preset Select 4 = 16 if active, 0 if not.
- Preset Select 5 = 32 if active, 0 if not.

If a Preset Select Line is not assigned to a digital input, the Preset Select Line is considered inactive.

These parameters, status and commands apply to Indexing:

Parameter	Description
Auto Start Indexing	When this field is set to ON, the drive begins executing the selected index whenever the drive enables.
Abort Index Deceleration	The deceleration used to stop motion when the Stop Index input terminates an index move.
Index 0 to 63 Setup	
Mode	The type of move commanded: • Absolute: moves from its starting position to the specified Position, below. Note: The axis must be homed before the drive can execute an absolute index • Incremental: moves from its starting position the specified Distance, below. • Jog: moves from its starting position a distance not to exceed the specified Maximum Distance, below. • Registration: moves from its starting position the specified Distance, below, provided that the Registration Sensor input is not detected. If the Registration Sensor input is detected, the move is adjusted so that the end position is determined by the Registration Distance setting, below. The Registration Distance value must be larger than the deceleration distance, or the move is not adjusted.
Distance	For Incremental and Registration mode moves, the relative distance the motor travels. It has a range of -2,147,483,647…2,147,483,647 counts.
Absolute Direction	For Absolute mode moves, the direction of travel when Position Rollover is Enabled. • Bi-directional: moves to the desired position using shortest path. (default) • Forward Uni-directional: moves to the desired position going forward. • Reverse Uni-directional**:** moves to the desired position going reverse.
Position	For Absolute mode moves, the fixed position to which the motor travels. It has a range of -2,147,483,647…2,147,483,647 counts.
Maximum Distance	For Jog mode moves, the maximum distance the motor travels. It has a range of -2,147,483,647…2,147,483,647 counts.
Batch Count	The number of times the indexed move must execute. If it is set to 0, the indexed moves continuously execute. It has a range of 0…65,535.

Parameter	Description
Dwell	The amount of time the drive holds position before beginning the next index. It has a range of 0…65,535 ms.
Registration Distance	For Registration mode moves, the relative distance the motor travels once a registration digital input is detected. It has a range of 0…2,147,483,647 counts.
Velocity	The commanded velocity used when executing the index. It has a range of 0…2,147,483,647 counts per second.
Acceleration	The acceleration rate used to change to a higher velocity. The value has a range of 0…2,147,483,647 counts per second.^{2}.
Deceleration	The deceleration rate used to change to a lower velocity. The value has a range of 0…2,147,483,647 counts per second.^{2}.
Next Index	The number (0…63) of the next indexed move to execute when Action When Complete is not set to Stop.
Action When Complete	The drive's action when the index has completed • Start next immediately: commands execution of the Next Index move without additional input, but after the scheduled Dwell. • Start next on input: commands execution of the Next Index move the next time the Start Index input becomes active. • Start next without stopping: commands execution of the Next Index move without additional input and without the scheduled Dwell. • Stop: ends the execution of indexed move commands.

The status can be displayed from a Indexing window of an online drive:

Status	Description
Selected Index	The index currently being executed by the drive.
Batch Count	The number of iterations remaining in the execution of the index
In Motion	ON indicates the motor is moving in response to an indexed motion command. Note: The In Motion status has a value of 1 when ON, and 0 when OFF.
In Dwell	ON indicates the motor is holding position and waiting the commanded dwell time. Note: The In Dwell status has a value of 1 when ON, and 0 when OFF.
At Home	ON indicates the position command value is zero, which is by definition the Home position. Note: The At Home status has a value of 1 when ON, and 0 when OFF.
Sequence Complete	ON indicates that all iterations of the index have been completed. Note: The Sequence Complete status has a value of 1 when ON, and 0 when OFF.
Within Position Window	ON indicates position error has been less than the In Position Size setting for longer than the In Position Time setting.

Status	Description
In Position	ON indicates the position error has been less than the In Position Window Size setting for longer than the In Position Window Time setting, and the speed is less than the Zero Speed setting, as configured in the Ultra3000 Drive window. Note: The In Position status has a value of 1 when ON, and 0 when OFF.
Position Command	The motor's commanded position, relative to the Home position of zero.
Actual Position	The motor's actual position, relative to the Home position of zero.

This command can be executed from a Indexing window of an online drive:

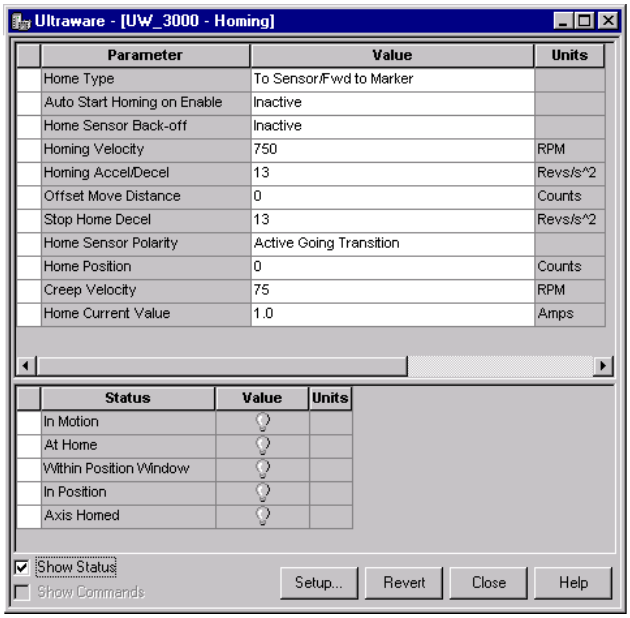
Command	Description
Index Control Panel	Opens the Indexing Control Panel window.

Customize the Indexing window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window as shown on page 105, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Homing Window

The Properties window for Homing looks like this.



Use the Homing window to configure the type of homing operation the drive performs.

TIP Homing operations are performed by issuing the Start Homing command from the Indexing Control Panel.

Homing has no associated status. Except for Copy and Paste, it has no direct commands.

TIP A homing operation is performed by issuing the Start Homing command in the Indexing Control Panel.

These parameters apply to Homing:

Parameter	Description
Home Type	The type of homing operation the drive performs: • Home Sensor: After the active-going edge of the sensor is detected, the drive moves the motor the Offset Move distance from the sensor edge, reversing if necessary. The final position becomes the new Home position. • Home to Current Value: The drive moves the motor at the Homing Velocity until the feedback current reaches the Home Current Value. After the Home Current Value is hit, the drive immediately stops the motor motion and moves the Offset Move Distance, reversing if necessary. The final position becomes the new Home position.

Parameter	Description
	• Home to Current Value/Back to Marker: After the Home Current Value is reached, the drive immediately reverses motor direction and looks for the marker. After the marker is detected, the drive moves the motor the Offset Move Distance from the marker, reversing if necessary. The final position becomes the new Home position. The Homing Velocity is used for the initial motion until the current value is reached. The Creep Velocity is used for all the remaining motion.
	• Home to Marker: After the marker is detected, the drive moves the motor the Offset Move Distance from the marker, reversing if necessary. The final position becomes the new Home position.
	• To Sensor/Back to Marker: After the active-going edge of the sensor is detected, the drive immediately reverses motor direction and looks for the inactive-going edge of the sensor. After the inactive-going edge of the sensor is detected, the drive looks for the marker. After the marker is detected, the drive moves the motor the Offset Move Distance from the marker, reversing if necessary. The final position becomes the new Home position. The Homing Velocity is used for the initial sensor search. After the motor decelerates to a stop when it finds the active-going sensor edge, the Creep Velocity is used for all the remaining motion. • To Sensor/Fwd to Marker: After the active-going edge of the sensor is detected, the drive looks for the marker. After the marker is detected, the drive moves the motor the Offset Move Distance from the marker, reversing if necessary. The final position becomes the new Home position.
Auto Start Homing on Enable	Causes the drive to begin the homing procedure automatically when the drive is enabled. Selections are: • Active: automatically starts homing every time the drive is enabled, and • Active After Reset Only: automatically starts homing when a drive is enabled, if the drive has not already been homed. • Inactive
Home Sensor Back-off	Causes the drive to move in the direction opposite the direction specified by the Homing Velocity setting, when the homing procedure is started with the Sensor input active. Motion continues in the reverse direction (moving at the Homing Accel, Homing Decel, and Homing Velocity settings), until the Sensor input is detected inactive, at which point the normal homing procedure takes over. • Active: automatically starts backoff when the input is detected. • Inactive: normal homing procedure occurs. Note: This does not apply if Home to Marker is selected as the Homing Type.
Homing Velocity	The commanded velocity used during homing. The sign of the this value (+/-) indicates the direction of motion during homing. It has a range of -2,147,483,647…22,147,483,647 rpm (rotary) or counts per second (linear).
Homing Accel/Decel	The rate of acceleration and deceleration used during homing. It has a range of 0…2,147,483,647 revolutions per second^2 or counts per second.^{2}.
Offset Move Distance	The distance the motor position is from the marker edge (or sensor edge for Sensor only Homing Type) after the homing sequence is complete. It has a range of -2,147,483,647…2,147,483,647 counts.

Parameter	Description
Stop Home Decel	The rate of drive deceleration (revolutions per second^2 or counts per second^2.) used when the Stop Homing command executes, or by activating a Digital Input set to Stop Homing.
Home Sensor Polarity	Specifies the digital input state that indicates to the drive the Home Sensor input is active: • Active-Going Transition, or • Inactive-Going Transition
Home Position	The home position when a homing procedure is completed. It has a range of -2,147,483,647…2,147,483,647 counts.
Creep Velocity	For the To Sensor, then Back to Marker Homing Type, the velocity used for all remaining homing motion after the motor decelerates to a stop when it finds the sensor edge.
Home Current Value	Specifies the feedback current at which the drive stops moving the motor at the Homing Velocity

The status can be displayed from a Homing window of an online drive:

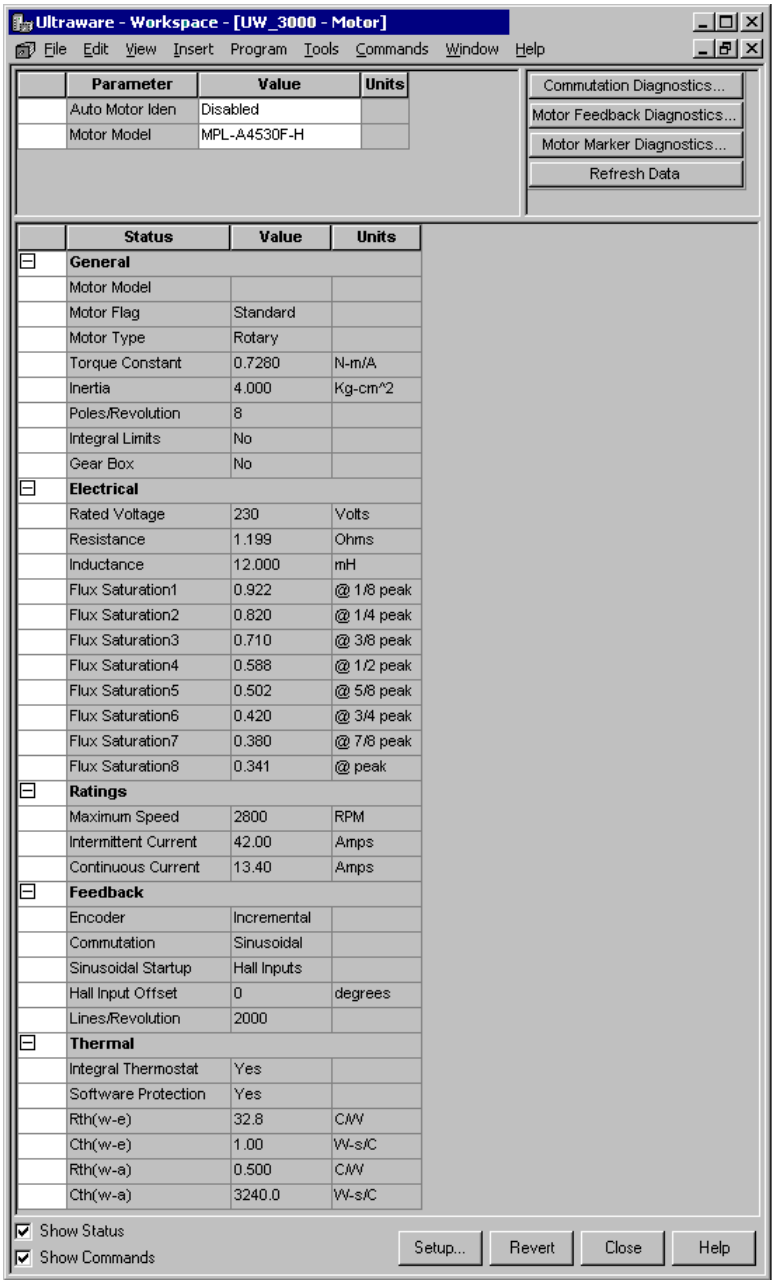
Status	Description
In Motion	ON indicates the motor is moving in response to an indexed motion command. Note: The In Motion status has a value of 1 when ON, and 0 when OFF.
At Home	ON indicates the position command value is zero, which is by definition the Home position. Note: The At Home status has a value of 1 when ON, and 0 when OFF.
Within Position Window	ON indicates that the position error has been less than the In Position Size setting for longer than the In Position Time setting in the Ultra3000 Drive window. Note: The Within Position Window status has a value of 1 when ON, and 0 when OFF.
In Position	ON indicates the position error has been less than the In Position Size setting for longer than the In Position Time setting, and the speed is less than the Zero Speed setting, as configured in the Ultra3000 Drive window. Note: The In Position status has a value of 1 when ON, and 0 when OFF.
Axis Homed	ON indicates that the homing routine has completed. Note: The Axis Homed status has a value of 1 when ON, and 0 when OFF.

Customize the Homing window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Motor Window

The Properties window for Motors looks like this.



Use the Motor window to:

- Pair a motor with an online or offline Ultra3000 drive. Once you select a motor, the status values associated with the selected motor appears in the Status pane of this window.
- Monitor the status that relate to the selected motor.
- Perform diagnostics on the motor.

TIP Diagnostics commands are not available for a SERCOS drive.

These parameters, status, and commands apply to motors:

Parameter	Description
Auto Motor Iden	Select: • Enabled: Causes the drive to read motor parameters from an intelligent encoder, or • Disabled: Causes the drive to read motor parameters from a Motor Model selected, below.
Motor Model	(Only if Auto Motor Iden is disabled.) The model name of the selected motor. Only listed motor models are valid. Note: Ultraware software ships with a Motor Configuration utility that lets you create custom motor configurations. Use that utility to add customized motor selections to the Motor Model list. Click Start, then click Programs, Ultraware and Motor Configuration from the pop-up menus.
Total Moving Mass	(Only for linear motors) The moving mass of the motor and load combined. Note: The Motor Model list may not include any linear motors. You can add linear (or other) motors using the Motor Configuration utility, referenced in the Motor Model section, above.
Self Sensing Current	(Only for motors with Self Sensing startup.) The percent of the motors rated peak current to use for self-sensing startup. This value may need to be adjusted when the motor is moving a high inertia load.

The status is displayed by default for the Motor branch of an online drive

Status	Description
General:	
Motor Model	The model name for the motor being used by the drive. If Auto Motor Iden is enabled, this displays the motor model obtained from the motor.
Motor Flag	Either: • Automatic – indicates the drive automatically determines the motor settings by communicating with the encoder. • Standard – indicates a motor whose status settings come preconfigured by Ultraware software. • Custom – indicates a user-configured motor that was added to the Motor Model list, above, using the utility that ships with Ultraware software.
Motor Type	The type of motor selected: • Linear • Rotary
Torque Constant	(Only for rotary motors) The sinusoidal force constant, in Newton meters/Ampere (N-m/A).
Force Constant	(Only for linear motors) The sinusoidal force constant, in Newtons/Ampere (N/A).
Inertia	Rotor inertia, in Kilogram-centimeter squared (kg-cm^2).
Mass	(Only for linear motors) Rotor mass, in Kilograms (kg).
Total Moving Mass	(Only for linear motors) The moving mass of the motor and load combined, in Kilograms (kg).
Poles/Revolution	The number of motor poles per revolution.
Electrical Cycle	(Only for linear motors) The distance between motor poles, or Magnet Pitch * 2, in meters.

Status	Description
Integral Limits	Indicates whether the motor provides built in feedback for travel limits: • Yes • No
Gear Box	(Only for rotary motors) Indicates whether the motor has built-in gearbox.
Electrical:	
Rated Voltage	Voltage rating of the motor in Volts.
Resistance	The phase-to-phase resistance of the motor stator, in Ohms.
Inductance	The phase-to-phase inductance of the motor stator, in milliHenries (mH).
Flux Saturation at: 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 7/8, and 8/8 (100%) of the motor peak current	Eight separate values that specify the level of flux saturation in the motor at the specified fraction of maximum current level.
Ratings	
Maximum Speed	Maximum motor output shaft speed, in revolutions per minute (rpm) for rotary motors, and meter per second (mps) for linear motors.
Intermittent Current	Maximum intermittent current of the motor in peak Amperes.
Continuous Current	Continuous current rating of the motor in peak Amperes.
Feedback	
Encoder	The encoder type: • Incremental • Sine/Cosine
Commutation	The type of commutation: • Brush • Trapezoidal • Sinusoidal
Sinusoidal Startup	The type of startup for sinusoidal commutation: • Self-Sensing • Hall Inputs
Hall Input Offset	Hall Input offset, from standard Rockwell Automation orientation, in electrical degrees.
Lines/Revolution	Encoder lines per revolution of the output shaft. Note: This parameter is visible only if the Type is Rotary.
Lines/Meter	Encoder lines per meter of travel. Note: This parameter is visible only if the Type is Linear.
Thermal	
Integral Thermostat	Indicates whether the motor has a built-in thermostat. Settings are: Yes or No.
Software Protection	Indicates whether the motor thermal protection software is activated. Settings are: Yes or No.
Rth(w-e)	Thermal resistance from the winding to the encoder, in degrees centigrade/watt (°C/Watt). Note: This setting applies and is visible only if Software Protection is set to Yes.

Status	Description
Cth(w-e)	Thermal capacitance from the winding to the encoder, in Watt-seconds per degree centigrade (Watt-second/°C). Note: This setting applies and is visible only if Software Protection is set to Yes.
Rth(w-a)	Thermal resistance from the winding to ambient, in degrees centigrade/watt (°C/Watt). Note: This setting applies and is visible only if Software Protection is set to Yes.
Cth(w-a)	Thermal capacitance from the winding to ambient, in Watt-seconds per degree centigrade (Watt-second/°C). Note: This setting applies and is visible only if Software Protection is set to Yes.

These commands can be executed for a Motor window of an online Ultra3000 drive.

Command	Description
Commutation Diagnostics	Verify motor commutation.
Motor Feedback Diagnostics	Verify a motor's position feedback signals.
Motor Marker Diagnostics	Verify the operation of the motor marker signal.
Refresh Data	Reads the motor definition information from the motor database and reapplies it to the drive. Note: This command is useful when a motor definition in the motor database has been changed.

IMPORTANT The commutation diagnostics should only be performed when the motor under test is not connected to a load. The presence of an inertial or frictional load may cause erroneous test results.

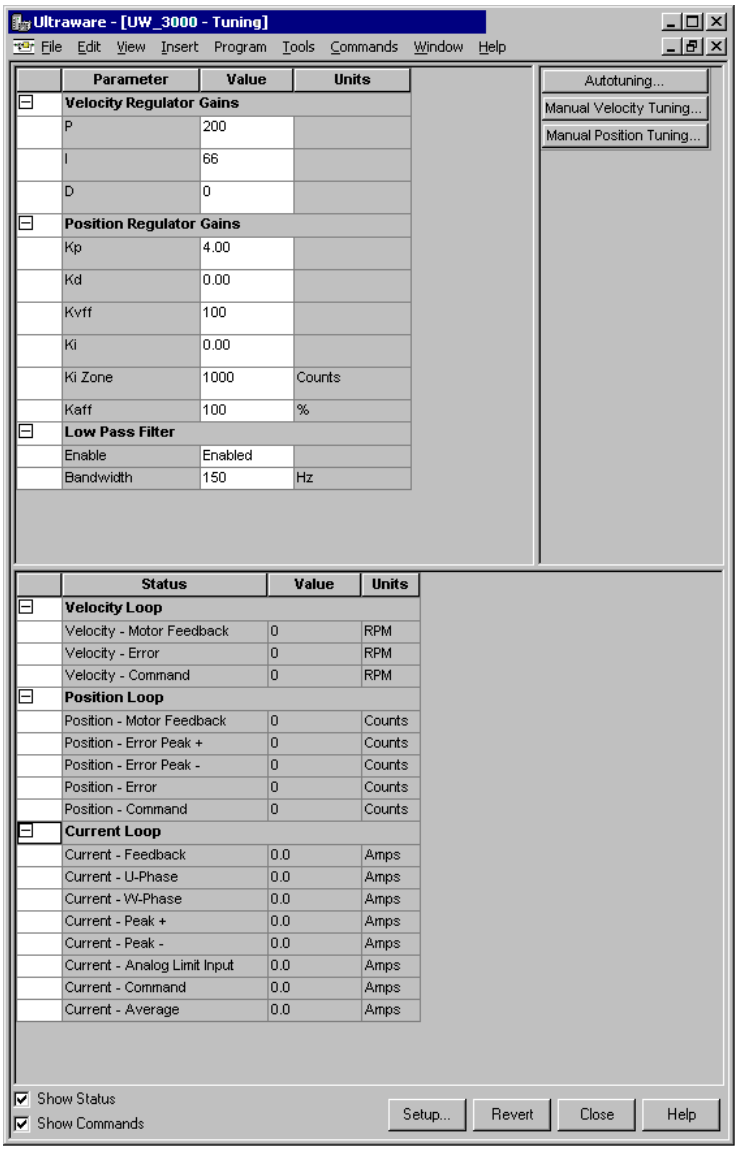
TIP Commutation Diagnostics, Motor Feedback Diagnostics, or Motor Marker Diagnostics commands place the drive in a special override mode that lets wiring and motor settings to be verified. Diagnostic commands are not available for a SERCOS drive.

Customize the Motor window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window as shown on page 105, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Tuning Window

The Properties window for the Tuning branch looks like this.



Use the Tuning window to:

- Configure Velocity and Position Regulator Gains that are used in tuning.
- Monitor Velocity, Position and Current loop status.
- Open windows where you can execute commands for autotuning, manual position tuning and manual velocity tuning.

Ultraware software uses a nested digital servo control loop, consisting of an outer position regulator (using proportional, integral, derivative and feedforward gains), around an inner velocity regulator (using its own set of proportional, integral and derivative gains).

Together, these regulators provide software control over the servo dynamics, and stabilize the servo system.

These parameters, status, and commands apply to this window:

Parameter	Description
Velocity Regulator Gains	
P	Proportional gain for the velocity loop. The P gain generates a control signal proportional to the velocity error. It has a range of 0…4000. Note: Increasing the P gain improves response time and increases the stiffness of the system. Too high a P gain value causes instability; too low a P gain value results in loose or sloppy system dynamics.
I	Integral gain for the velocity loop. The I gain generates a control signal proportional to the integral of the velocity error. It has a range of 0…4000. Note: I gain improves the steady-state velocity performance of the system. Increasing the integral gain generally increases the ultimate positioning accuracy of the system. However excessive integral gain results in system instability.
D	Derivative gain value for the velocity loop. The D gain generates a control signal proportional to measured acceleration. It has a range of -1000…1000. Note: Positive D gain reduces velocity overshoot, and negative D gain should be used only in systems that exhibit mechanical resonance.
Position Regulator Gains	
Kp	Proportional gain for the position loop. The Kp gain generates a control signal proportional to the position error. It has a range of 0…32. Note: Increasing the Kp gain improves response time and increases the stiffness of the system. Too high a Kp gain value causes instability; too low a Kp gain value results in loose or sloppy system dynamics.
Kd	Derivative gain for the position loop. The Kd gain generates a control signal proportional to measured velocity. It has a range of 0…32. Note: Kd gain provides damping to the position loop, and can reduce overshoot.
Kvff	Velocity Feedforward gain for the position loop. The Kvff gain generates a feed forward signal proportional to the commanded speed. It has a range of 0…200. Note: Kvff gain reduces position following error. However high values can cause position overshoot.
Ki	Integral gain for the position loop. Ki gain generates a control signal proportional to the integral of the position error. It has a range of 0…32. Note: Ki gain improves the steady-state positioning performance of the system and eliminates steady-state positioning errors. It affects the ability to reject load disturbances. Increasing the integral gain generally increases the ultimate positioning accuracy of the system. However excessive integral gain results in system instability.
Ki Zone	The region, in counts, around the commanded position where integral gain is active. If the position error is greater than Ki Zone, the integrator is not active. It has a range of 0…32767 counts.
Kaff	Acceleration Feedforward gain for the position loop. The Kaff gain generates a feed forward signal proportional to the commanded acceleration. It has a range of 0 …200. Note: Kaff gain reduces position following error. However high values can cause position overshoot.

Parameter	Description
Low Pass Filter	
Enable	Enable or disable the drive's low pass filter. Selections are: • Enabled • Disabled
Bandwidth	The connected drive's low pass filter's bandwidth. This value indicates the cutoff frequency of the low pass filter. It has a range of 1…992 Hz. Note: This filter reduces noise generated by encoder resolution or mechanical resonance in the system.

The status is displayed by default for the Tuning branch of an online drive:

Status	Description
Velocity Loop	
Velocity – Motor Feedback	Actual motor velocity.
Velocity – Error	The difference between commanded motor velocity (Velocity – Command) and actual motor velocity (Velocity — Motor Feedback).
Velocity – Command	The commanded motor velocity.
Position Loop	
Position – Motor Feedback	Actual motor position.
Position – Error Peak +	The positive peak Position Error.
Position – Error Peak -	The negative peak Position Error.
Position Error	The difference between commanded motor position (Position – Command) and actual motor position (Position — Feedback).
Position – Command	The commanded motor position.
Current Loop	
Current – Feedback	The actual current in the motor producing torque in a rotary motor or force in a linear motor.
Current – U Phase	The current through the U-Phase of the motor.
Current – W Phase	The current through the W-Phase of the motor.
Current – Peak +	The positive peak current, as recorded by the peak detection algorithm.
Current – Peak -	The negative peak current, as recorded by the peak detection algorithm.
Current – Analog Limit Input	Current limit value specified by the analog current limit input.
Current – Command	The commanded current.
Current – Average	The average value of Current — Command.

These commands can be executed for a Motor branch of an online drive:

Command	Description
Autotuning	Opens the Autotuning window.
Manual Velocity Tuning	Opens the Manual Velocity Tuning window
Manual Position Tuning	Opens the Manual Position Tuning window.

Customize the Tuning window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window as shown on page 105, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Autotuning Window

Use the Autotuning window to configure autotuning parameters, start and stop autotuning for an online drive, and monitor the Drive Enable status.

During autotuning, the drive executes an internal tuning algorithm and sets appropriate gains automatically. The user sets the desired tuning command parameters and selects the Start Autotune button to begin autotuning.

ATTENTION: The motor shaft moves during the tuning process! Refer to the Hardware and Installation manual for tuning details.

TIP Closing the window returns the drive to its normal operating mode, but the software is disabled. To make the drive operational, click the drive and then the Enable command as instructed in the Windows' message.

These parameters, status, and commands apply to this window:

Parameter	Description
Autotune Settings	
Motor Direction	The direction the motor rotates during tuning: • Bi-Directional, • Forward Only, or • Reverse Only.
Maximum Distance	The maximum distance the motor turns when performing autotuning. The autotune distance should be set as large as the application permits, so that the autotune algorithm is able to collect sufficient data to compute new tuning gains. It has a range of 1…2,147,483,647 counts.
Step Current	The current the drive commands when performing autotuning, in percent of the lesser of either the drive peak current or the motor peak current. The autotune current is normally set at 10%, but may need to be increased in the presence of large inertias or high friction. In these systems, higher settings make sure that the autotune algorithm is able to collect sufficient data to compute new tuning gains. It has a range of 1…100%.

Parameter	Description
Velocity Regulator Gains	
P	Proportional gain for the velocity loop. The P gain generates a control signal proportional to the velocity error. It has a range of 0…4000. Note: Increasing the P gain improves response time and increases the stiffness of the system. Too high a P gain value causes instability; too low a P gain value results in loose or sloppy system dynamics.
I	Integral gain for the velocity loop. The I gain generates a control signal proportional to the integral of the velocity error. It has a range of 0…4000. Note: I gain improves the steady-state velocity performance of the system. Increasing the integral gain generally increases the ultimate positioning accuracy of the system. However excessive integral gain results in system instability.
D	Derivative gain value for the velocity loop. The D gain generates a control signal proportional to measured acceleration. It has a range of -1000…1000. Note: Positive D gain reduces velocity overshoot, and negative D gain should be used only in systems that exhibit mechanical resonance.

The status is displayed by default for an Ultra3000 drive in the Autotuning window of the Tuning branch:

Status	Description
Drive Enabled	ON indicates the power stage of the drive is enabled. As a precondition, all software and hardware enable inputs must be active, and the drive cannot have any faults. Note: Drive Enable has a value of 1 when ON, and a value of 0 when OFF.
Autotune Complete	ON indicates the autotune completed successfully.
Autotune Failed	ON indicates the autotune failed.

These commands can be executed on an online drive using the Autotuning window of the Tuning branch:

Command	Description
Start Autotune	Begins autotuning.
Stop Autotune	Stops autotuning.
Clear Faults	Attempts to clear all drive faults.

Customize the Autotuning window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Revert to return parameter settings to the values they held when you opened this window.

Manual Position Tuning Window

Use the Manual Position Tuning window to configure manual position tuning parameters, start and stop manual position tuning for an online drive, and monitor the Drive Enable status.

During manual position tuning, the drive commands an internal step position waveform and the user sets the gains manually. The user sets the desired tuning command parameters and selects the Start Tuning button to begin manual position tuning.

ATTENTION: The motor shaft moves during the tuning process. Ensure that the motor is properly mounted and guarded.

TIP Closing the window returns the drive to its normal operating mode, but the software is disabled. To make the drive operational, click the drive and then the Enable command as instructed in the Windows' message.

The following parameters, status, and commands apply to this window:

Parameter	Description
Manual Position Tuning Settings	
Motor Direction	The direction the motor rotates during tuning: • Bi-Directional, • Forward Only, or • Reverse Only.
Distance	The the amplitude of the drive's commanded position step. It has a range of 1…32,767 counts.
Time	The period of the drive's commanded position step. It has a range of 1…32,767 ms.
Position Regulator Gains	
Kp	Proportional gain for the position loop. The Kp gain generates a control signal proportional to the position error. It has a range of 0…32 in/min/mil. Note: Increasing the P gain improves response time and increases the stiffness of the system. Too high a P gain value causes instability; too low a P gain value results in loose or sloppy system dynamics.
Kd	Derivative gain for the position loop. The Kd gain generates a control signal proportional to measured velocity. It has a range of 0…32. Note: Kd gain provides damping to the position loop, and can reduce overshoot.
Kff	Feedforward gain for the position loop. The Kff gain generates a feed forward signal proportional to the commanded speed. It has a range of 0…200. Note: Kff gain reduces position following error. However high values can cause position overshoot.

Parameter	Description
Ki	Integral gain for the position loop. Ki gain generates a control signal proportional to the integral of the velocity error. It has a range of 0…32. Note: Ki gain improves the steady-state positioning performance of the system and virtually eliminates steady-state positioning errors. It affects the ability to reject load disturbances. Increasing the integral gain generally increases the ultimate positioning accuracy of the system. However excessive integral gain results in system instability.
Ki Zone	The region, in counts, around the commanded position where integral gain is active. If the position error is greater than Ki Zone, the integrator is reset. It has a range of 0…32,767 counts.
Velocity Regulator Gains	
P	Proportional gain for the velocity loop. The P gain generates a control signal proportional to the velocity error. It has a range of 0…4000. Note: Increasing the P gain improves response time and increases the stiffness of the system. Too high a P gain value causes instability; too low a P gain value results in loose or sloppy system dynamics.
I	Integral gain for the velocity loop. The I gain generates a control signal proportional to the integral of the velocity error. It has a range of 0…4000. Note: I gain improves the steady-state velocity performance of the system. Increasing the integral gain generally increases the ultimate positioning accuracy of the system. However excessive integral gain results in system instability.
D	Derivative gain value for the velocity loop. The D gain generates a control signal proportional to measured acceleration. It has a range of -1000…1000. Note: Positive D gain reduces velocity overshoot, and negative D gain should be used only in systems that exhibit mechanical resonance.

The following status is displayed by default for an Ultra3000 drive in the Manual Position Tuning window of the Tuning branch:

Status	Description
Drive Enabled	ON indicates the power stage of the drive is enabled. As a precondition, all software and hardware enable inputs must be active, and the drive cannot have any faults. Note: Drive Enable has a value of 1 when ON, and a value of 0 when OFF.

The following commands can be executed on an online drive using the Manual Position Tuning window of the Tuning branch:

Command	Description
Start Tuning	Begins manual position tuning.
Stop Tuning	Stops manual position tuning.
Clear Faults	Attempts to clear all drive faults.

Customize the Manual Position Tuning window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Revert to return parameter settings to the values they held when you opened this window.

Manual Velocity Tuning Window

Use the Manual Velocity Tuning window to configure manual velocity tuning parameters, start and stop manual velocity tuning for an online drive, and monitor the Drive Enable status.

During manual velocity tuning, the drive commands an internal step velocity waveform and the user sets the gains manually. The user sets the desired tuning command parameters and selects the Start Tuning button to begin manual velocity tuning.

ATTENTION: The motor shaft moves during the tuning process. Ensure that the motor is properly mounted and guarded.

TIP Closing the window returns the drive to its normal operating mode, but the software is disabled. To make the drive operational, click the drive and then the Enable command as instructed in the Windows' message.

The following parameters, status, and commands apply to this window:

Parameter	Description
Manual Velocity Tuning Settings	
Motor Direction	The direction the motor rotates during tuning: • Bi-Directional, • Forward Only, or • Reverse Only.
Velocity	The the amplitude of the drive's commanded velocity step. It has a range of 1…2,147,483,647 counts per second.
Time	The period of the drive's commanded velocity step. It has a range of 1…32,767 ms.
Velocity Regulator Gains	

Parameter	Description
P	Proportional gain for the velocity loop. The P gain generates a control signal proportional to the velocity error. It has a range of 0…4000. Note: Increasing the P gain improves response time and increases the stiffness of the system. Too high a P gain value causes instability; too low a P gain value results in loose or sloppy system dynamics.
I	Integral gain for the velocity loop. The I gain generates a control signal proportional to the integral of the velocity error. It has a range of 0…4000. Note: I gain improves the steady-state velocity performance of the system. Increasing the integral gain generally increases the ultimate positioning accuracy of the system. However excessive integral gain results in system instability.
D	Derivative gain value for the velocity loop. The D gain generates a control signal proportional to measured acceleration. It has a range of -1000…1000. Note: Positive D gain reduces velocity overshoot, and negative D gain should be used only in systems that exhibit mechanical resonance.
Low Pass Filter	
Enable	Enable or disable the drive's low pass filter. Selections are: • Enabled • Disabled
Bandwidth	The connected drive's low pass filter's bandwidth. This value indicates the cutoff frequency of the low pass filter. It has a range of 1…992 Hz. Note: Bandwidth reduces noise generated by encoder resolution or mechanical resonance in the system.

The following status is displayed by default for an Ultra3000 drive in the Manual Velocity Tuning window of the Tuning branch:

Status	Description
Drive Enabled	ON indicates the power stage of the drive is enabled. As a precondition, all software and hardware enable inputs must be active, and the drive cannot have any faults. Note: Drive Enable has a value of 1 when ON, and a value of 0 when OFF.

The following commands can be executed on an online drive using the Manual Velocity Tuning window of the Tuning branch:

Command	Description
Start Tuning	Begins manual velocity tuning.
Stop Tuning	Stops manual velocity tuning.
Clear Faults	Attempts to clear all drive faults.

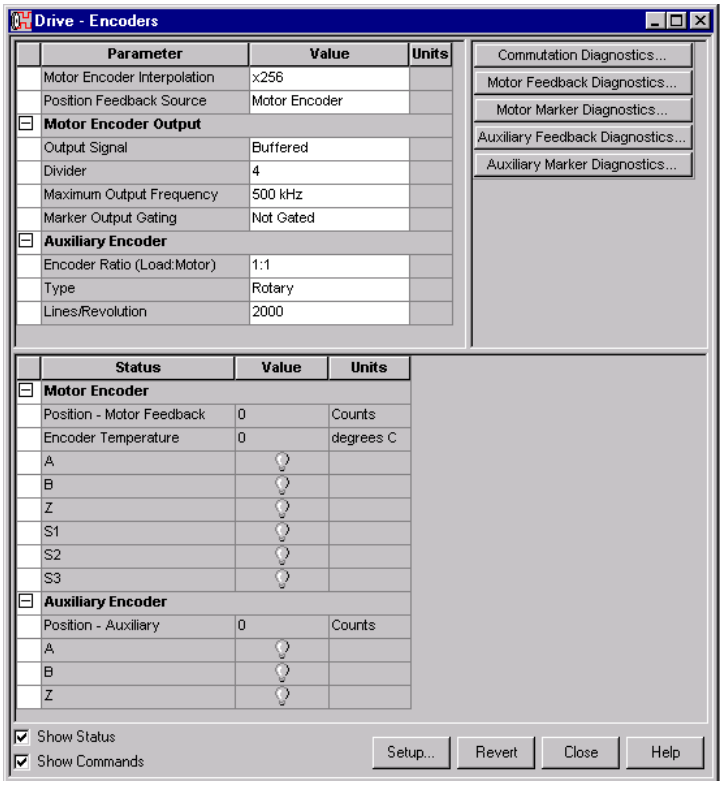
Customize the Manual Velocity Tuning window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.

- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Encoders Window

The Properties window for Encoders looks like this.



Use the Encoders window to describe the motor and auxiliary encoders. Doing this configures the motor encoder and optional auxiliary encoder.

This window has these parameters:

Parameter	Description
Motor Encoder Interpolation	The amount of interpolation to be used with sine/cosine encoders: • x4 • x8 • x16 • x32 • x64 • x128 • x256 • x512 • x1024 For example, if a Stegmann encoder outputs 1024 cycles per revolution and Encoder interpolation is set to x256, the drive will use 262144 (1024 x 256) counts per revolution as the effective feedback.
Position Feedback Source	The source for position loop feedback: • Motor Encoder • Auxiliary Encoder
Motor Encoder Output	
Output Signal	Specifies the type of encoder output from the drive: • Buffered: The encoder input is passed through the drive directly, without interpolation or division. • Divided: The encoder input is divided and output. See Divider. • Interpolated: The interpolated encoder counts are output.
Divider	Type the amount of division used for generating output encoder signals. For example, if the Divider is set to 4, the encoder output frequency is 1/4th the encoder input frequency. Note: This parameter is active only if Divided is selected as the Output Signal.
Maximum Output Frequency	The encoder output frequency limit: • 500 kHz • 1 MHz • 4 MHz • 8 MHz Note: This parameter is active only if Divided or Interpolated is selected as the Output Signal.
Marker Output Gating	Permits the drive to produce and use a more precise marker signal. The options are: • Not Gated: The drive uses and outputs the normal marker input as received from the encoder. • Gated with A and B: The marker output of the drive is the logical And of the marker input from the encoder and the A and the B inputs. This produces a more precise marker signal for homing.
Auxiliary Encoder	
Encoder Ratio (Load:Motor)	Type the ratio of encoder counts between the load encoder and the motor encoder. Note: This parameter is active only if the Position Feedback Source is selected to be the Auxiliary Encoder.
Type	The type of auxiliary encoder: • Rotary • Linear
Lines/Revolution	Encoder lines per revolution. Note: This parameter is visible only if the Type is Rotary.
Lines/Meter	Encoder lines per meter of travel. Note: This parameter is visible only if the Type is Linear.

The following status is displayed by default for an Encoders window of an online drive:

Status	Description
Motor Encoder	
Position – Motor Feedback	Actual motor position (in selected units).
Encoder Temperature	Measured temperature of the motor encoder in degrees C. Note: This parameter is visible only if the Auto Motor Iden is enabled.
A	A input channel of the motor encoder
B	B input channel of the motor encoder
Z	Z input channel of the motor encoder
S1	Hall input S1 of the motor encoder
S2	Hall input S2 of the motor encoder
S3	Hall input S3 of the motor encoder
Auxiliary Encoder	
Position – Auxiliary	Actual auxiliary encoder position (in selected units).
A	A input channel of the auxiliary encoder
B	B input channel of the auxiliary encoder
Z	Z input channel of the auxiliary encoder

The following commands can be executed on an online drive using the Encoders window:

Command	To
Commutation Diagnostics	Verify motor commutation
Motor Feedback Diagnostics‘	Verify a motor's position feedback signals.
Motor Marker Diagnostics	Verify the operation of the motor marker signal.
Auxiliary Feedback Diagnostics	Verify the operation of the auxiliary feedback signals.
Auxiliary Motor Marker Diagnostics	Verify the operation of the motor marker signal.

Customize the Encoders window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window as shown on page 105, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Motor Diagnostics

Provides a set of diagnostic tests for verification of an online encoder and motor.

Opening any Diagnostic window places the drive in a special override mode that lets wiring and settings to be verified. See Diagnostic Testing Procedure on page 3-94 for the diagnostic test procedure. The drive must be re-enabled after the diagnostic testing is complete.

Commutation Diagnostics

Use the Commutation Diagnostics window to verify motor commutation.

IMPORTANT The commutation diagnostics should be performed only when the motor under test is not connected to a load. The presence of an inertial or frictional load may cause erroneous test results.

The Commutation Diagnostics window has these parameters, status, and commands:

Parameter	Description
Test Current	The percentage Value for the Test Current. Note; The value is based on a percentage of the maximum current rating assigned to the specific motor in the Ultraware motor database.

Statuses	Description
Test Status	Indicates the current status of the Commutation Diagnostics. Possible displays include: • Idle • Test in Progress • Test Success • Test Failure
Test Results	• " " (blank), indicates test has not yet been performed. • Test Aborted by User • Test Distance Reached • Marker Found • Wiring Changes Recommended • Feedback Resolution Error • Encoder Alignment Error
Measured Feedback Resolution	Displays the Counts/Electrical Cycle recorded during the test.
Expected Feedback Resolution	Displays the Counts/Electrical Cycle assigned to the specific motor in the Ultraware motor database.

Statuses	Description
S1 Connection	Possible values are: • " " (blank), nothing to report • No Changes Required • Move to S1 Input • Move to S2 Input • Move to S3 Input • Move to A Input • Move to B Input • Move to U Input • Move to V Input • Move to W Input
S2 Connection	
S3 Connection	
A Connection	
B Connection	
U Connection	
W Connection	
Hall Offset	Offset in 30 degree increments (0, 30, 60, …330).

Command	Description
Start Test	Turns the oscilloscope trigger ON.
Stop Test	Turns the oscilloscope trigger OFF.

Motor Feedback Diagnostics

Use the Motor Feedback Diagnostics window to verify a motor's position feedback signals.

The Motor Feedback Diagnostics window has these parameters, status, and commands:

Parameter	Description
Test Distance	The encoder count Value for the Test Distance. The value should be scaled according to the existing logic for scaling the Position - Motor Feedback.

Statuses	Description
Test Status	Indicates the current status of the Motor Feedback diagnostics. Possible displays include: • Idle • Test in Progress • Test Success • Test Failure
Test Results	Possible displays include: • " " (blank), nothing to report, • Test Aborted by User • Test Distance Reached • Marker Found • Wiring Changes Recommended • Feedback Resolution Error • Encoder Alignment Error
Position - Motor Feedback	Displays the Counts/Electrical Cycle recorded during the test.
A	ON indicates a master encoder A output signal is present.
B	ON indicates a master encoder B output signal is present.
Start Test	Turns testing ON.
Stop Test	Turns testing OFF.

Motor Marker Diagnostics

Use the Motor Marker Diagnostics window to verify the operation of the motor marker signal.

The Motor Marker Diagnostics window has these parameters, status, and commands:

Parameter	Description
Test Distance	The encoder count Value for the Test Distance. The value should be scaled according to the existing logic for scaling the Position - Motor Feedback. Testing is started and stopped by clicking the appropriate Test button: • Start Test • Stop Test

Status	Description
Test Status	Possible displays include: • Idle • Test in Progress • Test Success • Test Failure
Test Results	Possible displays include: • blank (nothing to report), • Test Aborted by User • Test Distance Reached • Marker Found • Wiring Changes Recommended • Feedback Resolution Error • Encoder Alignment Error
Position - Motor Feedback	Displays the Counts/Electrical Cycle recorded during the test.
Marker Position	Displays the Counts/Electrical Cycle recorded during the test.
A	ON indicates the presence of the master encoder's A output signal.
B	ON indicates the presence of the master encoder's B output signal.
Marker	ON indicates the presence of the master encoder's B output signal.
Test Status	Possible displays include: • Idle • Test in Progress • Test Success • Test Failure

Command	Description
Start Test	Turns testing ON.
Stop Test	Turns testing OFF.

Auxiliary Feedback Diagnostics

Use the Auxiliary Feedback Diagnostics window to verify the operation of the auxiliary feedback signals.

The Auxiliary Feedback Diagnostics window has these parameters, status, and commands:

Parameter	Description
Test Distance	The encoder count Value for the Test Distance. The value should be scaled according to the existing logic for scaling the Position - Motor Feedback. Testing is started and stopped by clicking the appropriate Test button: • Start Test • Stop Test

Status	Description
Test Status	Possible displays include: • Idle • Test in Progress • Test Success • Test Failure
Test Results	Possible displays include: • blank (nothing to report), • Test Aborted by User • Test Distance Reached • Marker Found • Wiring Changes Recommended • Feedback Resolution Error • Encoder Alignment Error
Position - Auxiliary	Displays the Counts/Electrical Cycle recorded during the test.
A	ON indicates the presence of the master encoder's A output signal.
B	ON indicates the presence of the master encoder's B output signal.

Command	Description
Start Test	Turns testing ON.
Stop Test	Turns testing OFF.

Auxiliary Motor Marker Diagnostics

Use the Auxiliary Marker Diagnostics window to verify the operation of the motor marker signal.

The Auxiliary Marker Diagnostics window has these parameters, status, and commands:

Parameter	Description
Test Distance	The encoder count Value for the Test Distance. The value should be scaled according to the existing logic for scaling the Position - Motor Feedback. Testing is started and stopped by clicking the appropriate Test button: • Start Test • Stop Test

Status	Description
Test Status	Possible displays include: • Idle • Test in Progress • Test Success • Test Failure
Test Results	Possible displays include: • blank (nothing to report), • Test Aborted by User • Test Distance Reached • Marker Found • Wiring Changes Recommended • Feedback Resolution Error • Encoder Alignment Error
Position - Motor Feedback	Displays the Counts/Electrical Cycle recorded during the test.
Marker Position	Displays the Counts/Electrical Cycle recorded during the test.
A	ON indicates the presence of the master encoder's A output signal.
B	ON indicates the presence of the master encoder's B output signal.

Command	Description
Start Test	Turns testing ON.
Stop Test	Turns testing OFF.

Diagnostic Testing Procedure

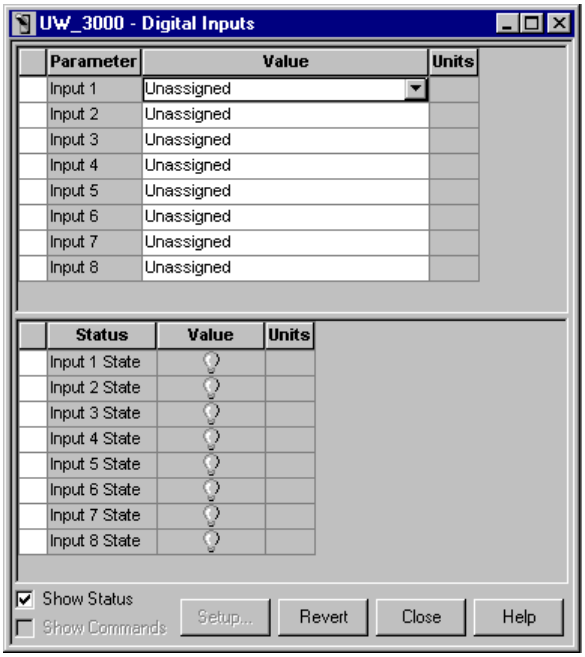
Diagnostic testing places the drive in a special diagnostics mode, that requires re-enabling of the drive after the test is complete.

Perform testing as follows:

1. Open a Diagnostics window from either the Encoder or Motor windows.
2. Click Start Test to start this test.
3. Test Status reports the test status as the test progresses:
4. Test Results and Recommended Changes displays the information in the tables above.
5. Click Stop Test to halt the test.
6. Close the window.
7. Click the drive in the workspace and then Commands/Enabled (or click Enable in the toolbar) to re-enable the drive.

Understanding the Digital Inputs Window

The Properties window for Digital Inputs looks like this.



Use the Digital Inputs window to:

- assign digital inputs, and
- monitor the status of digital inputs.

Selecting a function in the Value selection box causes that function to become active when the associated Digital Input becomes active.

For a SERCOS drive, the function of the digital inputs is predetermined. A customized property window is displayed for SERCOS drives, that lets you unassign the Drive Enable function for Input 1. The status area is also customized to display the predetermined input functions.

ATTENTION: By default, Input 1 is assigned the function Drive Enable. If you change the assignments so that Drive Enable is not assigned to any input, the drive automatically enables at system powerup.

Be aware that, in this case, the motor may start moving when powered up.

TIP Preset Selects 0 through 5 are a special case. Instead of activating a function, Preset Selects 0 through 5 contribute a binary value when a digital input becomes active. The drive sums the binary values and uses the resulting integer to determine the Preset Position, Preset Velocity, Preset Current, Preset Follower Gearing Ratio or Index to use.

The digital input Preset Select binary values are as follows:

- Preset Select 0 = 1 if active, 0 if not.
- Preset Select 1 = 2 if active, 0 if not.
- Preset Select 2 = 4 if active, 0 if not.
- Preset Select 3 = 8 if active, 0 if not.
- Preset Select 4 = 16 if active, 0 if not.
- Preset Select 5 = 32 if active, 0 if not.

If a Preset Select is not assigned to a digital input, the Preset Select is considered inactive.

The drive uses only the Preset Select 0, 1 and 2 binary values (yielding values 0 – 7) when the drive's Operation mode is set to Preset Position, Preset Velocity, Preset Current and Preset Follower (Gearing Ratio).

The drive uses all six Preset Select binary values (yielding values 0 – 63) when the drive's Operation mode is set to Indexing.

There are no commands associated with the Digital Inputs parameter window. This window has these parameters and statuses:

Parameter	Description
Input 1 – 8	The drive's digital input assignments:
	• Define Home: A transition to an active state causes the present motor position to be selected as Home position. This means that the position command is set to the Home Position, and the position feedback is simultaneously set to its appropriate value, according to the position error.
	• Define Position: When this input becomes active, it sets the Position parameter, for the Preset Position # Setup selected in the Preset Select configuration (0…5), equal to the current drive position.
	• Disable Serial Communications: An active input inhibits the drive's communication port operation.
	• Drive Enable: An active state enables the power electronics to control the motor.
	 **WARNING:** By default, Input 1 is assigned the function Drive Enable. If you change the assignments so that Drive Enable is not assigned to any input, the drive automatically enables on powerup. Be aware that, in this case, the motor may start moving when powered up.
	• Fault Reset: A transition to an active state resets any detected drive faults.
	• Follower Enable: An active state lets the position loop to track the position command when the drive Operation Mode is set to a Follower mode in the Ultra3000 Drive window.
	• Forward Enable: An active state permits forward commands.

Parameter	Description
	• Home Sensor: An active state indicates to a homing sequence that the sensor has been seen.
	• Integrator Inhibit: An active state zeros the velocity loop integrator.
	• Negative Overtravel: An active state causes the drive to begin decelerating the motor to bring it to a controlled stop in the distance defined by the Negative Decel Distance as entered in the drive window. The Negative HW Overtravel Input output is set. The drive will not respond to further commands to move in the negative direction, but can be instructed to move in the positive direction to clear the negative overtravel condition.
	• Operation Mode Override: When active, the drive uses the Operation Mode Override as the command source. When inactive, the drive uses the Operation Mode setting as the command source.
	• Pause Homing: An active state temporarily pauses a homing sequence by decelerating to a stop. The state of the input is continuously monitored to determine if the motion should be stopped or if it may continue.
	• Pause Index: An active state temporarily pauses an indexing sequence by decelerating to a stop. The state of the input is continuously monitored to determine if the motion should be stopped or if it may continue.
	• Position Strobe: An inactive state freezes the state of the motor encoder outputs. A transition to an active state causes the drive to output a continuous sequence of encoder counts until the absolute position is reached on an external counter. This input is used in conjunction with the Tracking output function.
	• Positive Overtravel: An active state causes the drive to begin decelerating the motor to bring it to a controlled stop in the distance defined by the Positive Decel Distance as entered in the drive window. The Positive HW Overtravel Input output is set. The drive will not respond to further commands to move in the positive direction, but can be instructed to move in the negative direction to clear the positive overtravel condition.
	• Preset Select 0 to 5: Used in combination to assign a Preset Current, Preset Velocity, Preset Position, Preset Follower Gearing Ratio or Index. Refer to the binary preset explanation, beginning on page. Note: The drive uses only Preset Select 0, 1 and 2 (yielding values 0-7) when selecting a Preset Position, Preset Velocity, Preset Current or Preset Follower (Gearing Ratio).
	• Registration Sensor: A transition to an active state adjusts a registration indexing move in progress. If the Registration Sensor input is seen, the move is adjusted so that the end position is the amount specified by the Registration Distance parameter after the position where the Registration Sensor input was seen. Note: The Registration Distance must be larger than the distance required to stop, or the move is not adjusted.
	• Remove Command Offset: A transition to an active state causes the offset of the analog COMMAND input to be measured (after averaging), and sets the Current COMMAND Input Offset, Position COMMAND Input Offset and Velocity COMMAND Input Offset parameters to the negative of this value.
	• Reset Drive: A transition to an active state causes the drive to do a drive reset. If Ultraware software is displaying the drive when this occurs, it may report a loss of communication with the drive.

Parameter	Description
	• Reverse Enable: An active state permits reverse motion.
	• Start Homing: A transition to an active input state causes the to initiate the homing routine.
	• Start Indexing: A transition to an active input state begins an indexing move.
	• Stop Homing: A transition to an active state terminates a homing sequence.
	• Stop Indexing: A transition to an active state terminates an indexing move.
Note: The Input value displays Not Assigned if there is nothing selected, Multiple if there are multiple functions selected, or the name of the function if only one is selected.	

The following status is displayed by default for an Ultra3000 drive in the Digital Inputs window:

Status	Description
Input 1 – 8 State	The current state, or condition, of each digital input is depicted by a light bulb icon, as follows: • ON: a bright light bulb • OFF: a darkened light bulb.

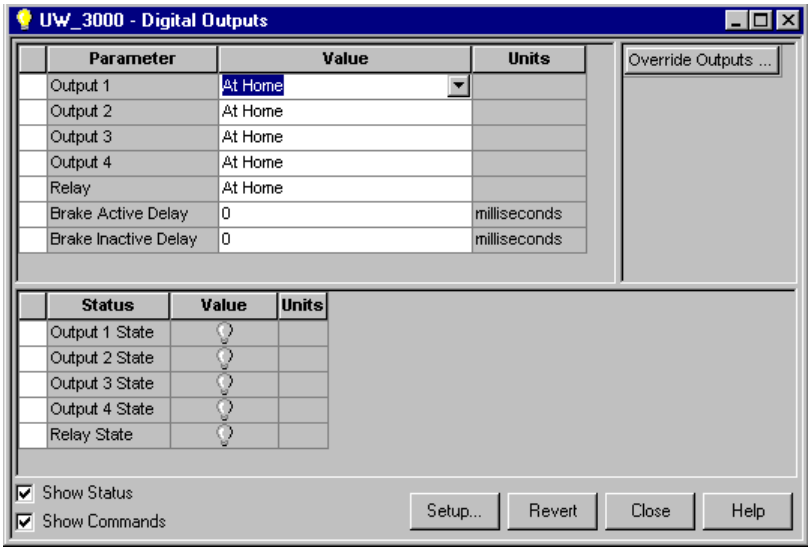
No commands are associated with the Digital Inputs window.

Customize the Digital Inputs window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Setup to open the Monitor Setup window as shown on page 105, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Digital Outputs Window

The Properties window for Digital Outputs looks like this



Use the Digital Outputs window to:

- assign functions to digital outputs,
- set both active and inactive brake delays,
- monitor the status of digital outputs and the digital relay, and
- open other windows where you can override the state of digital outputs and the relay.

The following parameters are associated with this window:

Parameter	Description
Output 1 – 4	The functions to be assigned to each digital output (1 – 4): Note: If multiple functions are assigned to a digital output, the output is active if any of the assigned functions would make it active. The assignments are logically OR'd to determine the output state.
	• At Home: An active state indicates that the position command is equal to the Home Position.
	• At Index 0 Position: An active state indicates the commanded motor position is equal to the position defined by Index 0. This output functions only after the axis has been homed.
	• At Index 1 Position: An active state indicates the commanded motor position is equal to the position defined by Index 1. This output functions only after the axis has been homed.
	• Axis Homed: An active state indicates that the homing routine has completed.
	• Brake: Used to control a motor brake. An active state releases the motor brake. The Brake signal is the same as the Drive Enabled signal, with the addition of the turn-on and turn-off delays specified by the Brake Active Delay and Brake Inactive Delay.

Parameter	Description
Output 1 – 4 (cont.)	• DC Bus Charged: An active state indicates that the DC bus is energized.
	• Drive Enabled: An active state indicates that the power stage of the drive is enabled. For the power stage to be enabled, all software and hardware enable inputs must be active, and the drive cannot have any faults.
	• End of Sequence: An active state indicates all iterations of the index move have been completed.
	• Fault Disable: An active state indicates that a fault has occurred that caused the drive to disable.
	• Forward Overtravel: An active state indicates the positive soft limit, as defined in the Drive window under Position Limits, has been exceeded, or the positive overtravel hardware input has become active, or the motor's positive integral limit (if this signal exists) has been reached.
	• In Dwell: An active state indicates the motor is holding position in an index move and waiting for the commanded dwell time.
	• In Motion: An active state indicates an index move is active and the motor is moving.
	• In-Position: An active state indicates that the position error has been less than the In Position Window Size setting for longer than the In Position Time setting, and the speed is less than the Zero Speed setting in the Ultra3000 Drive window.
	• Neg HW Overtravel Input: An active state indicates an integral motor overtravel switch has been encountered in the negative travel direction.
	• Negative Current Limit: An active state indicates the drive's negative current is being limited as set in the Drive window.
	• Pos HW Overtravel Input: An active state indicates an integral motor overtravel switch has been encountered in the positive travel direction.
	• Posn Compare 1: An active state indicates the condition defined in the drive window, under Position Functions, for Posn Compare 1 is true.
	• Posn Compare 2: An active state indicates the condition defined in the drive window, under Position Functions, for Posn Compare 2 is true.
	• Positive Current Limit: An active state indicates the drive's positive current is being limited as set in the Drive window.
	• Ready: An active state indicates the drive is operational and does not have a fault.
	• Registered: An active output state indicates the Registration Sensor has been detected and the move has been adjusted, for this iteration of the index. Note: The Registration Distance must be larger than the distance required to stop or the move is not adjusted.
	• Reverse Overtravel: An active state indicates the negative soft limit, as defined in the Drive window under Position Limits, has been exceeded, or the negative overtravel hardware input has become active, or the motor's negative integral limit (if this signal exists) has been reached.
	• Startup Commutation Done: An active state indicates that the drive has completed its commutation initialization algorithm.

Parameter	Description
Output 1 – 4 (cont.)	• Tracking: An inactive state indicates that the absolute encoder position has been output and the encoder outputs are now tracking the motor encoder inputs. This input is used in conjunction with the Position Strobe input function.
	• Up to Speed: An active output state indicates motor velocity feedback is greater than the Up to Speed setting in the Ultra3000 Drive window.
	• Within Position Window: An active output state indicates that the position error has been less than the Position Functions In Position Size setting for longer than the Position Functions In Position Time setting in the Ultra3000 Drive window.
	• Within Speed Window: An active output state indicates that the velocity error is less than the In Speed Window setting in the Ultra3000 drive window.
	• Zero Speed: An active output state indicates that the speed is less than the Zero Speed setting in the Ultra3000 drive window.
Relay	The function to be assigned to the relay. The selections are the same as for the Digital Outputs.
Brake Active Delay	The time delay between enabling the drive and activating the Brake output, that releases the motor brake. Negative values indicate the time that the function is activated before enabling the drive. The value has a range of -32,767…32,767 ms.
Brake Inactive Delay	The time delay between disabling the drive and deactivating the Brake output, that applies the motor brake. Negative values indicate the time that the Brake output is deactivated before disabling the drive. The value has a range of -32,767…32,767 ms. Note: If a drive fault occurs when a negative value is assigned to the Brake Inactive Delay parameter, the drive is disabled and the Brake output is activated simultaneously.

The following status is displayed by default for an Ultra3000 Drive in the Digital Outputs window:

Status	Description
Output 1 – 4 State	The current state, or condition, of each digital output is depicted by a light bulb icon, as follows: • ON: a bright light bulb • OFF: a darkened light bulb.
Relay State	The current state, or condition, of the Relay is depicted by a light bulb icon, as follows: • ON: a bright light bulb • OFF: a darkened light bulb.

The following command can be executed for a Digital Outputs window of an online drive:

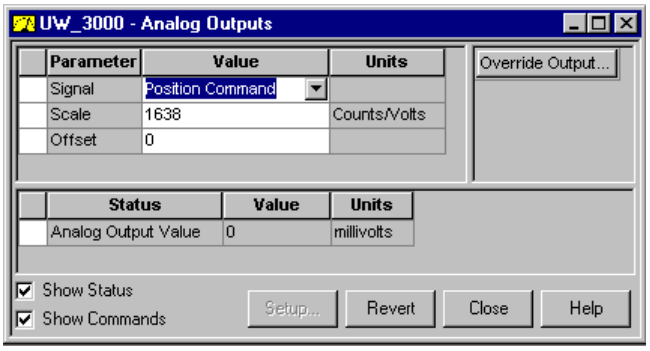
Command	Description
Override Outputs	Opens the Override Outputs window where you can: • place individual outputs in override mode or normal mode • turn outputs in override mode on or off • monitor the state of the outputs

Customize the Digital Outputs window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window as shown on page 105, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Analog Outputs Window

The Properties window for Analog Outputs looks like this.



Use the Analog Outputs window to assign drive signals to analog outputs, monitor the status of Analog Output, and open a window where you can monitor and override the analog output value.

The Analog Outputs parameters window has these parameters:

Parameter	Description
Signal	The drive signal to be assigned to the analog output: • Unassigned: No signals assigned to the output. • Current Average: The average value of Current Command. • Current Command: The commanded current to the motor. • Current Feedback: The actual current sent to the motor • Position Command: The commanded motor position. • Position Error: The difference between commanded and actual motor position. • Position Feedback: The output of the position control loop. • Velocity Command: The commanded motor velocity. • Velocity Error: The difference between commanded and actual motor velocity. • Velocity Feedback: The output of the velocity control loop.
Scale	The output scale in units per volt. It is dependent on the signal selected. The value is reset to 0 whenever the signal selection is changed.
Offset	The offset for the analog output. It has a range of -10,000…10,000 mV.

The following status is displayed by default for an Ultra3000 drive in the Analog Outputs window:

Status	Description
Analog Output Value	The Analog value, in millivolts, presently being output.

The following command can be executed for a Analog Outputs window of an online drive:

Command	Description
Override Output	Opens the Analog Output Control window, where you can: • edit the value of the analog output • monitor the voltage level of the analog output.

Customize the Analog Outputs window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Monitor

The Monitor tool lets you set and display all or any combination of drive status settings for a selected Ultra3000 online drive. The Monitor tool works just like the status pane of a branch's Properties window.

Use this window to:

- View a collection of statuses.
- Open the Monitor Setup window, to program status settings to display in this window.
- Load a monitor previously saved.
- Save a monitor for later use.

This window has these commands:

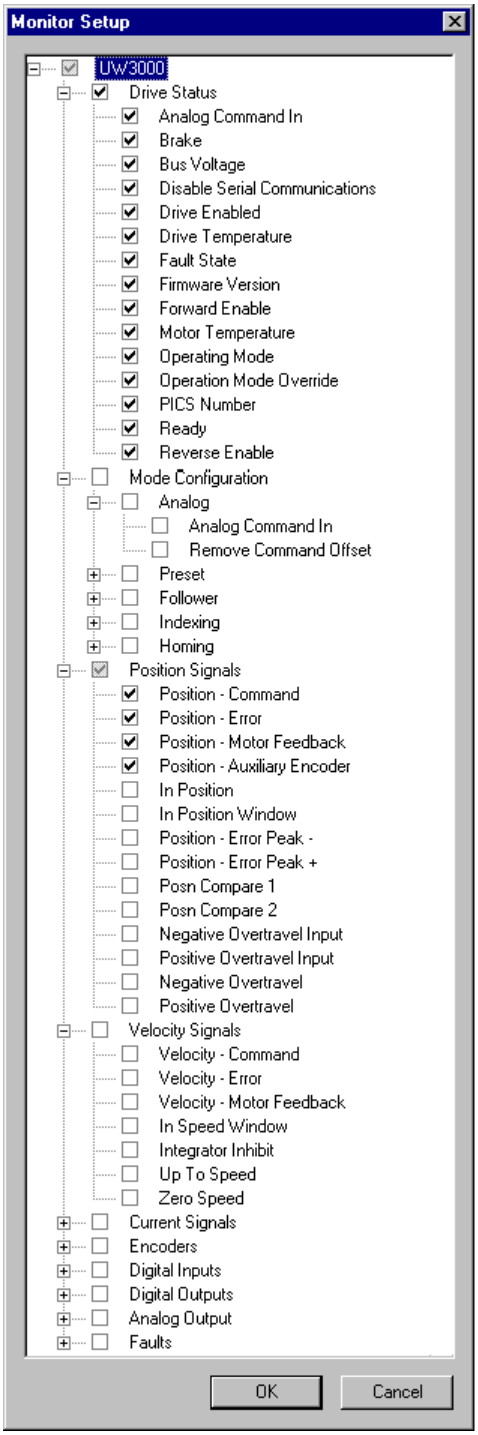
Command	Description
Format	The format for displaying integer values in the monitor: • Decimal (Range: 0…2,147,483,647) • Hexadecimal, or • Binary Note: Do not create negative numbers in the Hexadecimal or Binary format.
Reset Peaks	Resets peak value parameters to zero. For example, Position Error Peak -, Position Error Peak +, Current Peak -, Current Peak +.
Load	Opens the Monitor Load dialog box, where you can: • Load a previously saved monitor from the list. • Delete an existing monitor from the list. • Save as default an existing monitor to automatically load each time you open the Monitor window.
Save	Opens the Monitor Save dialog box, where you can: • Save a monitor, under a new or existing name, for later use. • Delete an existing monitor from the list. • Save as default an existing monitor to automatically load each time you open the Monitor window.
Setup	Opens the Monitor Setup window, where you set the drive status to display in this window. Refer to Understanding Ultra3000 Status on page 118 for a detailed list of drive status selections.

To monitor your drives:

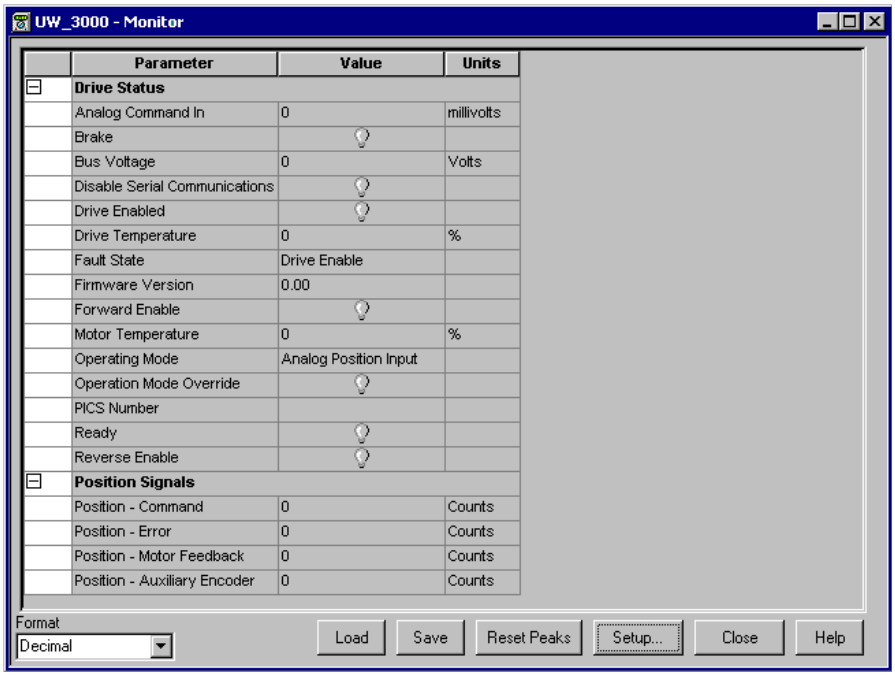
1. Double-click the Monitor icon in the Workspace window. The Monitor window appears in the Client Area.
2. Click Setup to open the Monitor Setup window, where you can customize the display of the Monitor window for the selected online Ultra3000 drive. The window displays a tree diagram with all the status settings that can be monitored for the selected drive.

   Refer to Understanding Ultra3000 Status on page 118 for a detailed list of drive status selections.

3. Place a checkmark in the checkbox to the left of a status item to monitor it.
   - If you place a check mark beside a parent item, all its child items become checked and their status is displayed.
   - If you remove a check mark from a parent item, check marks are removed from all its child items and their status are not displayed.
   - If you place a check mark next to some - but not all - child items, the parent item is checked, but dimmed.

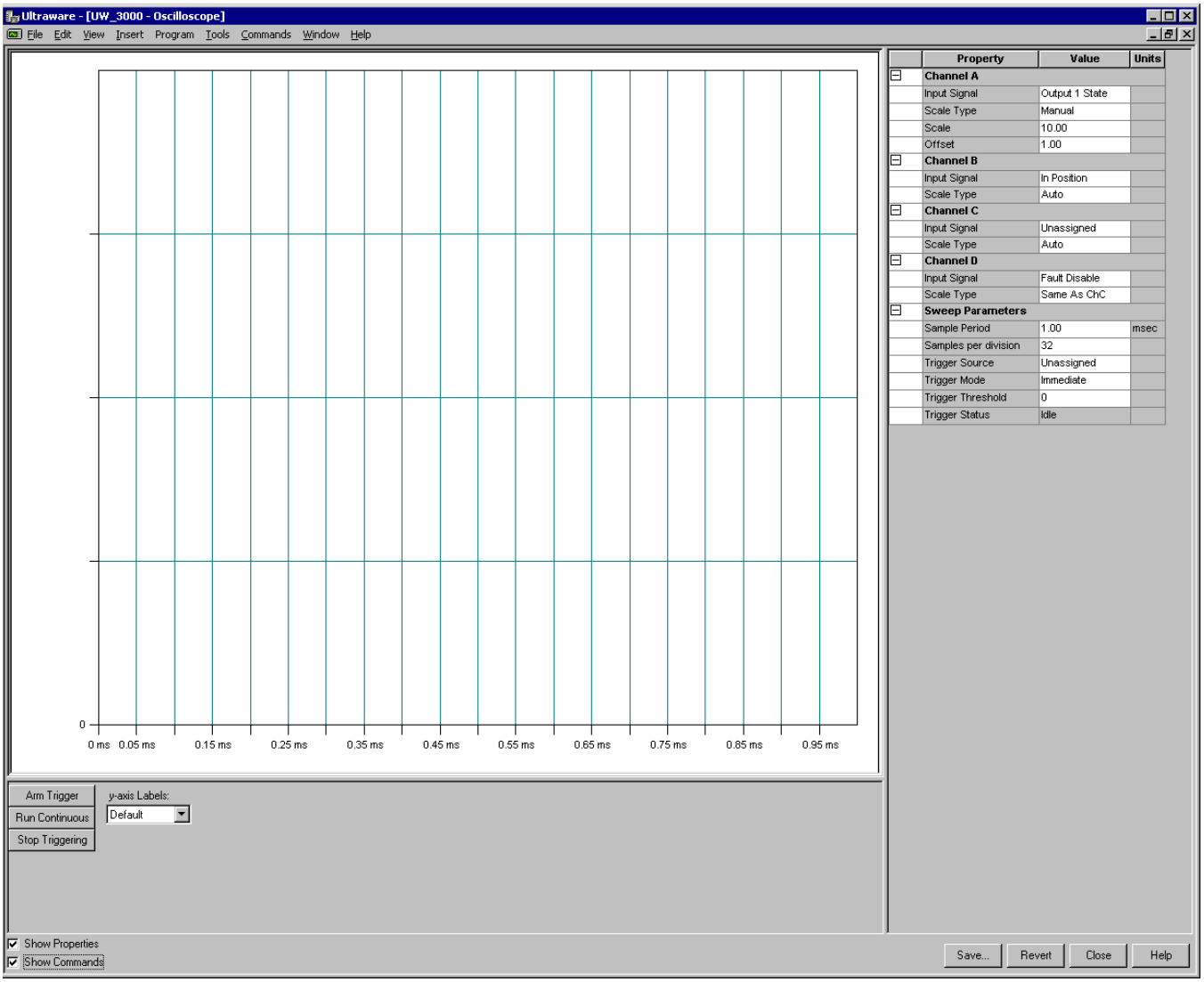


4. After you have finished selecting the status you wish to monitor, click OK to close the Monitor Setup window.
5. The Monitor window now displays all the selected statuses:



Understanding the Oscilloscope Window

The Properties window for the Oscilloscope looks like this



Use the Oscilloscope window to trace one of four drive signals by:

- Configuring the oscilloscope by selecting a the drive signal to trace.
- Executing commands that run the oscilloscope's tracing function continuously or in response to the configured trigger.
- Monitoring the oscilloscope as it traces the selected drive signal.

The Oscilloscope window has these parameters and commands associated with it:

Parameter	Description
Channel A, B, C and D	
Input Signal	The drive signal to assign to the selected Channel (A, B, C or D) from the Channel Setup dialog box that opens when you click the down arrow to the right of this input box. Note: The resolution of this signal may be confusing if Velocity Feedback is selected. See the topic Velocity Motor Feedback Resolution for information on how resolution is derived for various motor and feedback combinations.
Scale Type	Scale Types are: • Auto • Manual • Same As ChA (available for Channels B,C and D) • Same As ChB (available for Channels C and D), or • Same as ChC (available for Channel D only)
Scale	The amplitude of the selected channel input signal that can be displayed between gridlines of the oscilloscope, in the units of the drive signal. It is dependent on the signal selected. If the Scale is left at its default value of 0, The data automatically scales to fit the graph. Note: Visible only if Scale Type is Manual.
Offset	The trace offset for the selected Channel Input. Its range depends on the signal selected. A value of zero places the zero value of the signal at the middle grid line. A nonzero offset shifts the trace up or down so that the offset value is positioned at the middle grid line. Note: Visible only if Scale Type is Manual.
Sweep Parameters	
Sample Period	The time, in milliseconds, between samples that constitute a trace. The horizontal resolution of the oscilloscope is 128 samples. (For example, selecting a sample period of 1.0 ms results in 128 ms of data being displayed.) Note: The Sample Period has a resolution of 0.125 ms.
Samples per Division	Number of samples per division. For example, 32 samples per division will result in 4 horizontal divisions.
Trigger Source	The drive signal that sets off the trigger and begins tracing the selected channel signal, upon the occurrence of the Trigger Mode at the Trigger Threshold. See Input Signal for a list of available Trigger Source selections.
Trigger Mode	The event that triggers oscilloscope tracing: • Immediate: begins tracing immediately when the selected drive signal becomes active. • Rising Edge: begins tracing when the selected Trigger Source value increases above the Trigger Threshold value. • Falling Edge: begins tracing when the selected Trigger Source value decreases below the Trigger Threshold value.
Trigger Threshold	The value of the Trigger Source drive signal that begins tracing. Trigger Mode selections are: • Rising Edge • Falling Edge.
Trigger Status	The current status of the oscilloscope trigger: • Idle • Awaiting Trigger • Collecting Data

Parameter	Description
Oscilloscope Display	
Y-axis Labels	The labels to display on the y-axis: • Default: One reference point for each channel is displayed. • Channel A • Channel B • Channel C • Channel D
Legend	Displays the color of the trace for each input signal or channel. Click the color rectangles displayed in the legend to modify a color.

The following commands can be executed for the Oscilloscope window of an online drive:

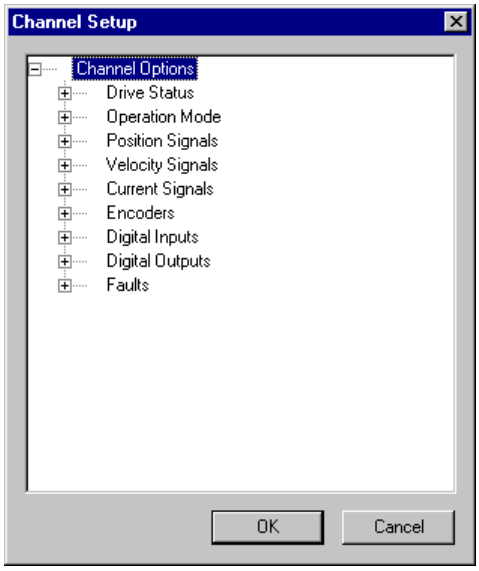
Command	Description
Arm Trigger	Turns the oscilloscope trigger ON.
Run Continuous	Runs the oscilloscope continuously, circumventing the trigger.
Stop Triggering	Turns the oscilloscope trigger OFF.

Customize the Oscilloscope window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Properties to display or hide the Properties pane.
- Click Show Commands to display or hide the Commands pane.
- Click Save to save the oscilloscope data to a tab delimited file on your PC, that can be read by spreadsheet or presentation software. Information saved includes the Oscilloscope data points from one or more channels.
- Click Revert to return parameter settings to the values they held when you opened this window.

Channel Setup Window

The collapsed Properties window for the Channel Setup looks like this



Use this window to:

- Assign a specific Input Signal to the selected Channel in the Oscilloscope window for an Ultra3000 drive, or
- Assign no Input Signal to the selected channel in the Oscilloscope window for an Ultra3000 drive.

Much like the Monitor window, this window lets you to customize the display for the selected online Ultra3000 drive. The window displays a tree diagram with all the status settings that can be monitored for the selected drive.

TIP Refer to Understanding Ultra3000 Status on page 118 for a detailed list of drive status selections.

To assign a specific input signal, or status, to the selected channel:

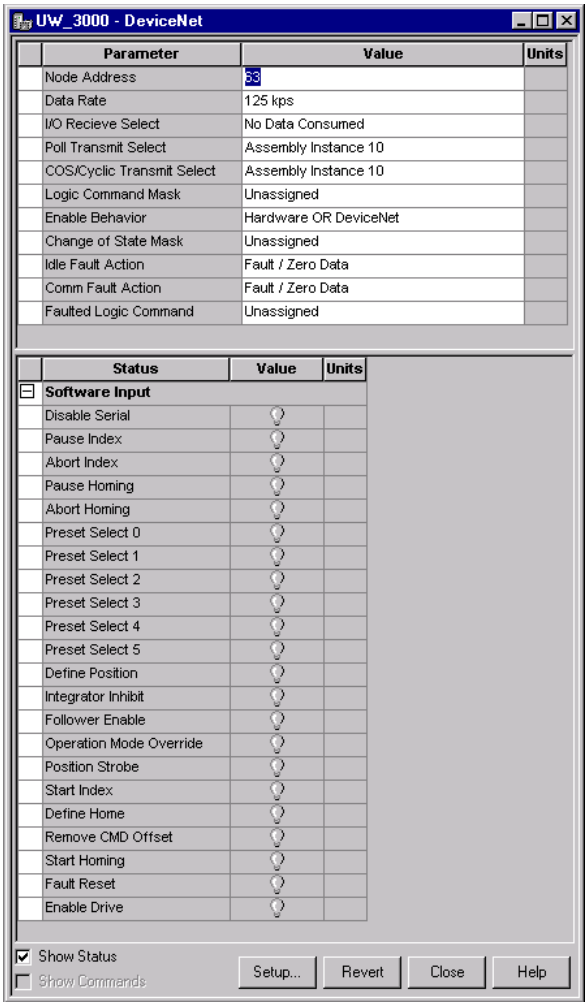
1. Open the tree control to the desired branch by clicking on one or more + (plus) signs.
2. Place a check mark in the box next to the desired input signal, or status.
3. Click OK. The selected input signal appears in the selected Channel in the Oscilloscope window.

To assign no input signal, or status, to the selected channel:

1. Be sure no check marks appear next to any input signal or status.
2. Click OK. The word Unassigned appears in the selected Channel in the Oscilloscope window.

Understanding Ultra3000 with DeviceNet

The Properties window for DeviceNet looks like this.



Use the DeviceNet window to:

- configure a Ultra3000 drive with the Node Address = PGM, and
- define message formats to transmit and receive.

The DeviceNet window has these parameters and statuses:

Parameter	Description
Node Address	Node address used for DeviceNet communication. This value is used only if the rotary switch on the front panel is configured for PGM.
Data Rate	Data rate used for DeviceNet communication. This value is used only if the rotary switch on the front panel is configured for PGM. The options are: • 125 kps • 250 kps • 500 kps • Autobaud
I/O Receive Select	Selects the output (consumed) assembly that is updated when a polled, change of state, or cyclic I/O message is received by the drive. The options are: • No Data Consumed • Assembly Instance 1 • Assembly Instance 2 • Assembly Instance 3 • Assembly Instance 4 • Assembly Instance 5 • Assembly Instance 6 • Assembly Instance 7 • Assembly Instance 8 • Assembly Instance 9 Note: Refer to the Ultra3000 DSD with DeviceNet Reference Manual, publication 2098-RM001 for information on these options.
Poll Transmit Select	Selects the input (produced) assembly that is transmitted by the drive over a polled I/O messaging connection. The options are: • Assembly Instance 10 • Assembly Instance 11 • Assembly Instance 12 • Assembly Instance 13 • Assembly Instance 14 • Assembly Instance 15 • Assembly Instance 16 • Assembly Instance 17 • Assembly Instance 18 Note: Refer to the Ultra3000 DSD with DeviceNet Reference Manual, publication 2098-RM001 for information on these options.
COS/Cyclic Transmit Select	Selects the input (produced) assembly that is transmitted by the drive over a change of state or cyclic I/O messaging connection. The options are: • Assembly Instance 10 • Assembly Instance 13 • Assembly Instance 15 Note: Refer to the Ultra3000 DSD with DeviceNet Reference Manual, publication 2098-RM001 for information on these options.

Parameter	Description
Logic Command Mask	Specifies the digital inputs functions that can be overridden. Check the items that can be overridden. The digital input functions are: • Define Home • Define Position • Disable Serial Communications • Drive Enable • Fault Reset • Follower Enable • Integrator Inhibit • Operation Mode Override • Pause Homing • Pause Index • Position Strobe • Preset Select 0 • Preset Select 1 • Preset Select 2 • Preset Select 3 • Preset Select 4 • Preset Select 5 • Remove Command Offset • Reset Drive • Start Homing • Stop Indexing • Stop Homing • Start Indexing
Enable Behavior	Drive enable logic configuration. The options are: • Hardware OR DNet Input • Both
Change of State Mask	The change of state mask is used with change of state I/O messaging. If a particular option is selected in 'Change of State Mask', then a change of state I/O message is produced whenever the corresponding bit in the I/O message changes value. Otherwise, a change of state I/O message is not produced. Check the options that should generate change of state I/O messages: • At Home • At Index 0 Position • At Index 1 Position • Axis Homed • Brake • DC Bus Charged • Drive Enabled • End of Sequence • In Motion • In Dwell • In Position • Negative Current Limit • Negative Hardware Overtravel • Negative Software Overtravel • Position Compare 1/Write Data Error • Position Compare 2/Write Data Busy • Positive Current Limit • Positive Hardware Overtravel • Positive Software Overtravel • Ready • Registered • Startup Commutation Done • Tracking • Up to Speed • Within Position Window • Within Speed Window • Zero Speed

Parameter	Description
Idle Fault Action	Determines the action the drive should take if the master sends a zero length I/O message to the drive, that may occur if a PLC (master) is set to program mode. The options are: • Fault / Zero Data • Fault / Hold Last Data • Zero Data • Hold Last Data • Fault Configuration Note: Refer to the Ultra3000 DSD with DeviceNet Reference Manual, publication 2098-RM001 for information on these options.
Comm Fault Action	Determines the action the drive should take if the drive detects a network failure while an I/O messaging connection is active. The options are: • Fault / Zero Data • Fault / Hold Last Data • Zero Data • Hold Last Data • Fault Configuration Note: Refer to the Ultra3000 DSD with DeviceNet Reference Manual, publication 2098-RM001 for information on these options.
Faulted Logic Command	Provides the logic command data to the drive when the drive receives an invalid I/O message or detects a network failure while an I/O messaging connection is active. Desired options include: • Define Home • Define Position • Disable Serial Communications • Drive Enable • Fault Reset • Follower Enable • Integrator Inhibit • Operation Mode Override • Pause Homing • Pause Index • Position Strobe • Preset Select 0 • Preset Select 1 • Preset Select 2 • Preset Select 3 • Preset Select 4 • Preset Select 5 • Remove Command Offset • Reset Drive • Start Homing • Stop Indexing • Stop Homing • Start Indexing

The following status is displayed by default for an Ultra3000 drive in the DeviceNet window:

Status	Description
Disable Serial	An active state indicates that serial communication have been disabled.
Pause Index	An active state indicates a temporary pause in a indexing sequence (decelerating to a stop). The state of the input is continuously monitored to determine if the motion should be stopped or if it may continue.
Abort Index	A transition to an active state abruptly terminates a indexing sequence.
Pause Homing	An active state indicates a temporary pause in a homing sequence (decelerating to a stop). The state of the input is continuously monitored to determine if the motion should be stopped or if it may continue.
Abort Homing	A transition to an active state abruptly terminates a homing sequence.
Preset Select 0 through Preset Select 5	Preset Selects 0 through 5 are a special case. Instead of activating a function, Preset Selects 0 through 5 contribute a binary value when a digital input becomes active. The drive sums the binary values and uses the resulting integer to determine the Preset Position, Preset Velocity, Preset Current, Preset Follower Gearing Ratio or Index to use. The digital input Preset Select binary values are as follows: • Preset Select 0 = 1 if active, 0 if not. • Preset Select 1 = 2 if active, 0 if not. • Preset Select 2 = 4 if active, 0 if not • Preset Select 3 = 8 if active, 0 if not • Preset Select 4 = 16 if active, 0 if not • Preset Select 5 = 32 if active, 0 if not If a Preset Select is not assigned to a digital input, the Preset Select is considered inactive. The drive uses only the Preset Select 0, 1 and 2 binary values (yielding values 0…7) when selecting a Preset Position, Preset Velocity, Preset Current and Preset Follower Gearing Ratio. The drive uses all six Preset Select binary values (yielding values 0…63) when selecting an Index. For help in determining a preset number, see the related topic Preset Select Examples.
Define Position	A transition to an active state sets the Position parameter, for the Preset Position # Setup selected by the Preset Select configuration (0…5), below, equal to the current drive position.
Integrator Inhibit	A transition to an active state zeros the velocity loop integrator.
Follower Enable	An active state permits the position loop to track the position command when the drive Operation Mode is set to a Follower mode in the Ultra3000 Drive window.
Operation Mode Override	When active, the drive uses the Operation Mode Override as the command source. When inactive, the drive uses the Operation Mode setting as the command source.
Position Strobe	An inactive state freezes the state of the motor encoder outputs. A transition to an active state causes the drive to output a continuous sequence of encoder counts until the absolute position is reached on an external counter. This input is used in conjunction with the Tracking output function.
Start Index	A transition to an active input state begins an indexing move.

Status	Description
Define Home	A transition to an active state selects the present motor position as the Home position. This means that the position command is set to the Home Position, and the position feedback is simultaneously set to its appropriate value, according to the position error.
Remove Command Offset	A transition to an active state measures the offset of the analog COMMAND input (after averaging), and sets the Current COMMAND Input Offset, Position COMMAND Input Offset and Velocity COMMAND Input Offset parameters to the negative of this value.
Start Homing	A transition to an active input state initiates the homing routine.
Fault Reset	A transition to an active state resets any detected drive faults.
Enable Drive	An active state enables the power electronics to control the motor. Note: The Input value displays Not Assigned if there is nothing selected, Multiple if there are multiple functions selected, or the name of the function if only one is selected.

No commands are associated with the DeviceNet window.

Customize the DeviceNet window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding Ultra3000 Status

The following Ultra3000 drive status settings can be displayed in the Monitor window and can be assigned as an Input Signal for a Channel in the Oscilloscope window as indicated in the table:

Status	Description	Non-SERCOS Drive		SERCOS Drive	
		Scope	Monitor	Scope	Monitor
Drive Status					
Analog Command In	Refer to Understanding the Analog Window on page 59	X	X		
Brake	Refer to Understanding the Digital Outputs Window on page 99	X	X	X	X
Bus Voltage	Refer to Understanding the Ultra3000 Drive Branch on page 41	X	X	X	X
Disable Serial Communications	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Drive Enabled	Refer to Understanding the Ultra3000 Drive Branch on page 41	X	X	X	X
Drive Temperature	Reports the percentage of the Drive Temperature Trip value, that is based on the drives continuous current rating and time. The Drive Temperature is an indication of the level of utilization of the drive's current capability. When the Drive Temperature reaches 100%, the IPM Fault occurs.	X	X	X	X
Fault State	Indicates Drive Ready if the drive is not faulted, or indicates the first fault that occurred to take the drive out of a normal operating mode.		X		X
Firmware Version	Refer to Understanding the Service Information Window on page 135		X		X
Forward Enable	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Motor Temperature	Reports the percentage of the Motor Temperature Trip value, that is based on the motors continuous current rating, thermal characteristics, and time. The Motor Temperature is an indication of the level of utilization of the motor's current capability. When the Motor Temperature reaches 100%, the Motor Filter fault occurs.	X	X	X	X
Operating Mode	Refer to Operation Modes on page 42				X

Status (Continued)	Description	Non-SERCOS Drive		SERCOS Drive	
		Scope	Monitor	Scope	Monitor
Operation Mode Override	Refer to Operation Mode Override on page 43	X	X		
PICS Number	Refer to Understanding the Service Information Window on page 135		X		X
Ready	Refer to Understanding the Digital Outputs Window on page 99	X	X		
Reverse Enable	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Analog					
Analog Command In	Refer to Understanding the Analog Window on page 59	X	X		
Remove Command Offset	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Preset					
Preset Select 0 through 5	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Define Position	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Follower					
Follower Enable	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Indexing					
Selected Index	Refer to Understanding the Indexing Window on page 66		X		
Batch Count	Refer to Understanding the Indexing Window on page 66		X		
Define Position	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Sequence Complete	Refer to Indexing Control Panel on page 54	X	X		
In Accel or Constant Velocity	ON indicates the drive is executing the acceleration or constant velocity portion of an index.	X	X		
In Decel	ON indicates the drive is executing the deceleration portion of an index.	X	X		
In Dwell	Refer to Indexing Control Panel on page 54	X	X		
In Motion	Refer to Indexing Control Panel on page 54	X	X		

Status (Continued)	Description	Non-SERCOS Drive		SERCOS Drive	
		Scope	Monitor	Scope	Monitor
At Index 0 Position	Refer to Understanding the Digital Outputs Window on page 99	X	X		
At Index 1 Position	Refer to Understanding the Digital Outputs Window on page 99	X	X		
Pause Index	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Registered	Refer to Understanding the Digital Outputs Window on page 99	X	X		
Registration Sensor	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Start Index	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Stop Index	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Define Position	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Homing					
Define Home	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Home Sensor	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Pause Homing	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Start Homing	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Stop Homing	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Axis Homed	ON indicates that the Home position has been set either by executing a Homing sequence, or by the Define Home input or Define Home command issued from Ultraware software.	X	X		

Status (Continued)	Description	Non-SERCOS Drive		SERCOS Drive	
		Scope	Monitor	Scope	Monitor
Position Signals					
Position - Command	Refer to Understanding the Tuning Window on page 77	X	X	X	X
Position - Error	Refer to Understanding the Tuning Window on page 77	X	X	X	X
Position - Motor Feedback	Refer to Understanding the Tuning Window on page 77	X	X	X	X
Position - Auxiliary Position	Refer to Understanding the Encoders Window on page 86			X	X
In Position	Refer to Understanding the Ultra3000 Drive Branch on page 41	X	X		
In Position Window	Refer to Understanding the Ultra3000 Drive Branch on page 41	X	X		
Position - Error Peak -	Refer to Understanding the Tuning Window on page 77	X	X		
Position - Error Peak +	Refer to Understanding the Tuning Window on page 77	X	X		
Position Compare 1	Refer to Understanding the Digital Outputs Window on page 99	X	X		
Position Compare 2	Refer to Understanding the Digital Outputs Window on page 99	X	X		
Negative Overtravel Input	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Positive Overtravel Input	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Negative Overtravel	ON indicates that the Negative Soft Limit as defined in Understanding the Ultra3000 Drive Branch on page 45 is being exceeded.	X	X		
Positive Overtravel	ON indicates that the Positive Soft Limit as defined in Understanding the Ultra3000 Drive Branch on Page 3-45 is being exceeded.	X	X		

Status (Continued)	Description	Non-SERCOS Drive		SERCOS Drive	
		Scope	Monitor	Scope	Monitor
Velocity Signals					
Velocity - Command	Refer to Understanding the Tuning Window on page 77	X	X	X	X
Velocity - Error	Refer to Understanding the Tuning Window on page 77	X	X	X	X
Velocity - Motor Feedback	Refer to Understanding the Tuning Window on page 77 Note: The resolution of this signal may be confusing when using the Oscilloscope. See the topic Velocity Motor Feedback Resolution for information on how resolution is derived for various motor and feedback combinations.	X	X	X	X
In Speed Window	Refer to Understanding the Ultra3000 Drive Branch on page 41	X	X		
Integrator Inhibit	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Up To Speed	Refer to Understanding the Ultra3000 Drive Branch on page 41	X	X		
Zero Speed	Refer to Understanding the Ultra3000 Drive Branch on page 41	X	X		
Current Signals					
Current - Analog Limit Input	Refer to Understanding the Tuning Window on page 77	X	X	X	X
Current - Average	Refer to Understanding the Tuning Window on page 77	X	X	X	X
Current - Command	Refer to Understanding the Tuning Window on page 77	X	X	X	X
Current - Feedback	Refer to Understanding the Tuning Window on page 77	X	X	X	X
Neg Current Limit	Refer to Understanding the Ultra3000 Drive Branch on page 41	X	X	X	X
Current - Peak -	Refer to Understanding the Tuning Window on page 77	X	X	X	X
Current - Peak +	Refer to Understanding the Tuning Window on page 77	X	X	X	X
Pos Current Limit	Refer to Understanding the Ultra3000 Drive Branch on page 41	X	X	X	X

Status (Continued)	Description	Non-SERCOS Drive		SERCOS Drive	
		Scope	Monitor	Scope	Monitor
Motor Output					
Position Strobe	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Tracking	Refer to Understanding the Digital Outputs Window on page 99	X	X		
Motor Input					
Position Motor Feedback	Refer to Understanding the Encoders Window on page 86		X		X
Encoder Temperature	Refer to Understanding the Encoders Window on page 86		X		
A	Refer to Understanding the Encoders Window on page 86	X	X	X	X
B	Refer to Understanding the Encoders Window on page 86	X	X	X	X
Z	Refer to Understanding the Encoders Window on page 86	X	X	X	X
Negative Overtravel	ON indicates that the Negative Soft Limit as defined in Understanding the Ultra3000 Drive Branch on Page 3-45 is being exceeded.	X	X		
Positive Overtravel	ON indicates that the Positive Soft Limit as defined in Understanding the Ultra3000 Drive Branch on Page 3-45 is being exceeded.	X	X		
S1	Refer to Understanding the Encoders Window on page 86	X	X	X	X
S2	Refer to Understanding the Encoders Window on page 86	X	X	X	X
S3	Refer to Understanding the Encoders Window on page 86	X	X	X	X
Thermostat	ON indicates that the motor has an integral thermostat, and that it has tripped due to excessive current or ambient temperature. When the motor's thermostat input is tripped, the Motor Overtemp fault occurs.	X	X	X	X
Startup Commutation Complete	Refer to Understanding the Digital Outputs Window on page 99	X	X		

Status (Continued)	Description	Non-SERCOS Drive		SERCOS Drive	
		Scope	Monitor	Scope	Monitor
Auxiliary Input					
Position - Auxiliary	Refer to Understanding the Encoders Window on page 86	X	X		X
A	Refer to Understanding the Encoders Window on page 86	X	X	X	X
B	Refer to Understanding the Encoders Window on page 86	X	X	X	X
Z	Refer to Understanding the Encoders Window on page 86	X	X	X	X
Digital Inputs					
Input 1 through 8 State	Refer to Understanding the Digital Inputs Window on page 95	X	X		
Drive Enable	Refer to Understanding the Digital Inputs Window on page 95			X	X
Home Sensor [1]	Refer to Understanding the Digital Inputs Window on page 95			X	X
Registration Sensor 1 [1]	Refer to Understanding the Digital Inputs Window on page 95			X	X
Registration Sensor 2 [1]	Refer to Understanding the Digital Inputs Window on page 95			X	X
Positive Overtravel [1]	Refer to Understanding the Digital Inputs Window on page 95			X	X
Negative Overtravel [1]	Refer to Understanding the Digital Inputs Window on page 95			X	X

[1] Digital I/O on the SERCOS drives often is dedicated. The Oscilloscope uses the digital I/O variable selections rather than the drive function selections for these signals

- Home Sensor = Digital Input 2
- Registration Sensor 1 = Digital Input 3
- Registration Sensor 2 = Digital Input 4
- Positive Overtravel = Digital Input 7
- Negative Overtravel = Digital Input 8

Digital Outputs					
Output 1 through 4 State	Refer to Understanding the Digital Outputs Window on page 99.	X	X		
Relay State	Refer to Understanding the Digital Outputs Window on page 99.		X		
Brake	Refer to Understanding the Digital Outputs Window on page 99.				X

Status (Continued)	Description	Non-SERCOS Drive		SERCOS Drive	
		Scope	Monitor	Scope	Monitor
Analog Output					
Analog Output Value	Refer to Understanding the Analog Outputs Window on page 103.		X		
Faults					
Fault Disable	Refer to Understanding the Digital Outputs Window on page 99.	X	X		
Fault Reset Input	Refer to Understanding the Digital Inputs Window on page 95.	X	X		

Understanding the Faults Window

The Properties window for the Faults display looks like this.

Use the Faults window to:

- Set fault limits
- Monitor fault statuses
- Execute the Clear Faults command
- Open a window where you can review the drive's fault history
- Enable or disable user faults.

The Faults window has these parameters, status, and commands associated with it:

Parameter	Description
User Current Fault	The level, in amperes, that generates a fault when exceeded by the average current level. The drive automatically protects itself and the motor from average currents that exceed their ratings, and this protection cannot be disabled. This value is only needed if a lower average current fault is desired (For example, if another part of a machine would overheat). It has a range of 0…256A. Note: Not available for a SERCOS drive.
User Velocity Fault	The minimum velocity that causes the User Velocity fault. The drive automatically protects the motor from exceeding its ratings, and this protection cannot be disabled. This value is only needed if a lower velocity fault is desired. (For example, if another part of a machine could be damaged.) Note: Not available for a SERCOS drive.
User Velocity Fault Enable	Enable or disable User Velocity Fault detection. • Enabled: turns on User Velocity Fault detection by the drive. • Disabled: turns off User Velocity Fault detection by the drive. Note: Not available for a SERCOS drive.
Velocity Error Fault Limit	The minimum velocity error that triggers the Velocity Error fault.
Velocity Error Fault Time	The minimum time that the velocity error must be greater than the Velocity Error Fault Limit to cause a Following Error fault. It has a range of 0…65,535 ms.
Following Error Limit	The minimum position error that triggers the Following Error fault. Note: Not available for a SERCOS drive.
Following Error Time	The minimum time during that the position error must be greater than the Following Error Fault Limit to cause a Following Error fault. It has a range of 0…65,535 ms. Note: Not available for a SERCOS drive.

The Faults window displays the status of these faults:

Status	Description	Possible Cause(s)	Suggested Action
Note: The value of status that are 'ON' = 1. The value of status that are OFF = 0.			
01: Non-Volatile Memory Endurance Exceeded	A section of non-volatile memory is used to assist in tracking absolute position when the drive is connected to a motor with absolute feedback. This fault occurs when the total number of memory writes to this area exceeds the maximum value. Note: This fault can only be generated for systems with absolute feedback.	Range of motion and number of home position definitions during the product life exceeds the maximum value.	This is an unrecoverable fault, the drive must be sent back to the factory.
02: Position Change	This fault is generated if the change in position command or position feedback exceeds half the machine cycle size during a position loop update. This effectively limits the velocity to half the machine cycle size per millisecond. Note: This fault can only be generated when the machine cycle position rollover is enabled	The velocity command or feedback exceeds half the machine cycle length per millisecond.	Increase machine cycle size or reduce velocity profile. Note: This error only applies to firmware versions prior to 1.10.
03: Absolute Feedback	This fault is generated if the motor position exceeds +/- 2047 revolutions from the home position, but can only be generated in firmware versions 1.00 and 1.02. Note: This fault can only be generated when the system includes absolute feedback.	The motor position exceeds -2047…2047 revolutions from the home position	• Decrease application range of motion. • Upgrade firmware.
04: Motor Overtemp	ON indicates the motor thermostat has tripped.	Motor thermostat trips due to high motor ambient temperature, excessive current, or both a high temperature and excessive current.	• Operate within (not above) the continuous torque rating for the ambient temperature (40ºC maximum). • Lower ambient temperature, increase motor cooling.
		Motor wiring fault	Check motor wiring.
		Incorrect motor selection	Verify the proper motor has been selected.

Status	Description	Possible Cause(s)	Suggested Action
05: IPM Fault	ON indicates that a fault was detected in the Integrated Power Module that resides in the Ultra3000 drive.	Motor cables shorted	Disconnect motor power cables from the drive. If faults stop, then either replace cable or try to find the short.
		Motor winding shorted internally.	Verify by disconnecting motor from drive and then try to turn by hand. If difficult to turn by hand, the motor needs to be repaired or replaced.
		Ultra3000 temperature too high.	• Check for clogged vents or defective fan. • Ensure cooling is not restricted by insufficient space around the unit.
		Operation above continuous power rating.	• Verify ambient temperature is not too high. Operate within the continuous power rating. • Increase Motion Time or program dwell periods. • Reduce acceleration rates.
		Ultra3000 has a bad IPM output, short circuit, or overcurrent,	Check continuity from the DC bus to U, V, and W outputs. If continuity exists, check for conductive materials between terminals.
06: SERCOS overtravel	ON indicates the SERCOS Limit indicator is lit.	SERCOS Limit exceeded.	Troubleshoot SERCOS by checking wiring and verifying motion profile.
07: Encoder channel line B break	ON indicates a wiring error with channel line B.	Motor wiring fault.	Check motor encoder channel line B wiring.
08: Encoder channel line A break	ON indicates a wiring error with channel line A.	Motor wiring fault.	Check motor encoder channel line A wiring.
09: Bus Undervoltage	ON indicates the DC Bus is below normal operating voltage.	Low AC line/AC power input. 100 VAC minimum for safe Ultra3000 operation.	• Verify voltage level of the DC Bus. The Bus should be 1.414*VAC level. • Check AC power source for glitches or line drop. • Install an uninterruptible power supply (UPS) on your VAC input.

Status	Description	Possible Cause(s)	Suggested Action
10: Bus Undervoltage	ON indicates the DC Bus is below normal operating voltage.	Excessive regeneration of power. When the drive is driven by an external mechanical power source, it may regenerate too much peak energy through the drive's power supply. The system faults to save itself from an overload.	• Change the deceleration or motion profile. • Use a larger system (motor and Ultra3000). • Use an Active Shunt.
		Excessive AC input voltage.	Verify input is below 264 VAC.
		Output short circuit.	Disconnect the power line from the drive and then do continuity check from the positive and negative poles of the DC Bus to each of the motor output phases U,V, and W. If a continuity exists, check for wire fibers between terminals, or send drive in for repair.
		Motor cabling wires shorted together.	Disconnect motor power cables from the drive. If faults stop, then either replace cable or try to find the short.
10: Bus Overvoltage (cont.)		Internal motor winding short circuit.	Verify by disconnecting motor from drive and then try to turn by hand. If difficult to turn by hand, the motor needs to be repaired or replaced.
11: Illegal Hall State	ON indicates there is a problem with the motor's Hall Effect sensors.	Incorrect phasing.	Check the Hall phasing.
		Incorrect wiring	• Verify the Hall wiring.
			• Verify power supply to encoder.
12: Home Search Failed	ON indicates that the home position was not found.	Home sensor or marker is outside the overtravel limit.	• Check wiring • Reposition the overtravel limits or home sensor.
13: Home Position Outside Limits	ON indicates that the home position exceeds a hardware overtravel limit value.	Home sensor, marker or final home position exceeds a hardware overtravel limit.	• Reposition the overtravel limits or home sensor. • Adjust the final home position.
14: Net communication	ON indicates DeviceNet communication network is broken.	DeviceNet communication network is broken.	Troubleshoot DeviceNet.
15: Electrical Cycle	(For linear motors only) ON indicates there is a problem with the motor's maximum line count.	Electrical cycle length exceeds maximum lines per electrical cycle.	Replace the linear motor/encoder.
16: SERCOS Overtravel	ON indicates SERCOS overtravel limit exceeded.	Programmed overtravel limit has been exceeded.	• Verify motion profile. • Verify overtravel settings are appropriate.

Status	Description	Possible Cause(s)	Suggested Action
17: User Current	ON indicates the User Current Fault level, input above, has been exceeded.	User-specified average current level exceeded.	• Increase User Current Level and Time to a less restrictive setting. • Increase the time period for motion to occur.
18: Overspeed	ON indicates the motor speed has exceeded 125% of maximum rated speed.	Motor exceeded 125% of the-specified maximum rated speed.	• Check cables for noise. • Check motor wiring; • Retune drive & motor combination. • Use an actual oscilloscope to check encoder phasing.
19: Following Error	ON indicates the Following Error Limit, set above, has been exceeded.	Position error limit exceeded.	• Retune the drive, starts by setting the feed forward gain to 100%. • Increase the Following Error Limit, above. • If in Follower Mode, increase the Slew Limit (in the Follower window).
20: Motor Encoder State	ON indicates the motor encoder encountered an illegal transition.	[2] Motor encoder encountered an illegal transition.	• Replace the motor/ encoder. • Use shielded cables with twisted pair wires. • Route the feedback away from potential noise sources. • Check the system grounds. • Ensure digital filtering of encoder signals is enabled.
21: Auxiliary Encoder State	ON indicates the auxiliary encoder encountered an illegal transition.	Auxiliary encoder encountered an illegal transition	• Use shielded cables with twisted pair wires. • Route the encoder cable away from potential noise sources. • Bad encoder - replace encoder. • Check the ground connections.
		Set a time violation interval on a Step/ Direction or CW/CCW input command.	Check input timing to determine if the auxiliary encoder timing requirements are met.
22: Motor Filter	ON indicates the internal filter protecting the motor from overheating has tripped.	Motor overheated	• Reduce acceleration rates. • Reduce duty cycle (ON/OFF) of commanded motion. • Increase time permitted for motion. • Check system tuning. • Use larger Ultra3000 and motor.

Status	Description	Possible Cause(s)	Suggested Action
23: Thermal Protect Filter	ON indicates the internal filter protecting the drive from overheating has tripped.	Drive overheated	• Reduce acceleration rates. • Reduce duty cycle (ON/OFF) of commanded motion. • Increase time permitted for motion. • Check system tuning. • Use larger Ultra3000 and motor.
		Operation above continuous power rating.	• Verify ambient temperature is not too high. Operate within the continuous power rating. • Increase Motion Time or program dwell periods.
24: Velocity Error	ON indicates that the velocity error exceeds the Velocity Error Fault Limit for a length of time greater than the Velocity Error Fault Time value.	Velocity error limit exceeded.	• Increase Velocity Error Fault Limit or Velocity Error Fault Time value or both. • Reduce Acceleration. • Retune the drive.
25: Sensor Not Assigned	ON indicates that homing or registration motion was attempted without a sensor assigned.	Homing or registration motion attempted without a sensor assigned.	Assign a sensor to a digital input.
26: User Velocity	ON indicates the User Velocity Fault level, above, has been exceeded.	User-specified velocity level exceeded.	Increase User Velocity Fault Level and Time to a less restrictive setting.
27: Axis Not Homed	ON indicates that an absolute move was tried, before Home position was defined.	Absolute positioning attempted without homing.	Define the Home position.
28: Motor Parameter Error	ON indicates that a parameter loaded from a smart encoder or a SERCOS blob is incompatible with the drive.	Connection to an improperly programmed or incompatible smart encoder.	Use a different motor
		An attempt to load a SERCOS blob for a motor that is not supported by the drive.	Load a different SERCOS motor blob.
29: Excessive Output Frequency	Interpolated encoder output frequency exceeds maximum user specified limit. Note: This fault can only be generated when the encoder output is synthesized by the Ultra3000.	Encoder output frequency exceeds the maximum user specified value. This applies only when the encoder output is synthesized by the drive.	• Increase the encoder output maximum frequency parameter. • Decrease the encoder interpolation parameter. • Increase the encoder output divider parameter. • Reduce motor speed.
30: Encoder Communication	ON indicates lose of communication with an intelligent encoder.	Communication was not established with an intelligent encoder.	• Verify motor selection. • Verify motor encoder wiring.
31: Encoder Data	ON indicates encoder data is corrupted.	Encoder data is corrupted.	Replace the motor/ encoder.

Status	Description	Possible Cause(s)	Suggested Action
32: Excessive Interpolated Feedback Frequency	ON indicates Sine/ Cosine frequency of encoder exceeds maximum value. Note: This fault can only be generated when the encoder output is synthesized by the Ultra3000.	Encoder output frequency exceeds the maximum value.	• Reduce motor speed. • Use encoder with lower resolution (before interpolation).
33: Absolute Position Exceeds Position Rollover	ON indicates motion is commanded to a position outside the position rollover range. The position rollover range is [0. machine cycle size - 1]. Note: This fault can only be generated when the machine cycle position rollover is enabled.	An absolute index is initiated that specifies a position outside the position rollover range. A homing cycle is initiated with the home position outside the position rollover range. A define home is initiated with the home position outside the position rollover range. A preset position is initiated that specifies a position outside the position rollover range. The home position parameter is changed to a value outside the position rollover range, the system has absolute feedback and the drive is reset or power cycled.	Set motion command to a position within the position rollover range.
34: Ground Short Circuit	ON indicates the motor ground is shorted.	Wiring fault Motor internal ground short Internal malfunction	Disconnect motor power cable from drive and enable drive with current limit set to 0. • If fault remains, call your A-B representative. • If fault clears, a wiring fault or an fault internal to the motor exists.
35: Soft-Starting Fault	ON indicates a soft fault at startup.	Low AC input voltage Internal malfunction	Check AC input voltage on all phases. Call your A-B representative.

Status	Description	Possible Cause(s)	Suggested Action
36: Power Module Overtemperature	ON indicates an overtemperature condition in the power module.	Excessive heat in power circuitry.	• Reduce acceleration rates. • Reduce duty cycle (ON/OFF) of commanded motion. • Increase time permitted for motion. • Use large Ultra3000 and motor. • Check motor tuning.
37: AC Input Phase Loss	ON indicates incorrect power phasing.	Loss of one or more phases of power.	Check AC input voltage on all phases.
39:Self-sensing Commutation Startup Error	ON indicates a self-sensing commutation error was encountered during startup	Motion required for self-sensing start-up commutation was obstructed. Incorrect line count, pole count or electrical cycle length.	• Verify that there are no impediments to motion at startup, such as hard limits. • Increase self-sensing current if high friction or load conditions exist. • Verify the line count, pole count, or electrical cycle length motor parameters. • Swap any two motor connections and verify the motor feedback counts in the correct direction during positive motor movement.

The Faults window has these commands:

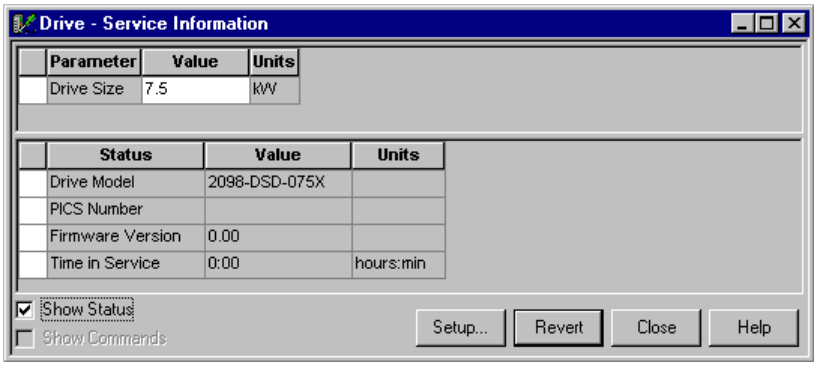
Command	Description
Fault History	Opens the Fault History window, where you can view a list of the last 20 fault events that occurred since the drive was powered-up.
Clear Faults	Clears all drive faults.

Customize the Faults window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Service Information Window

The Service Information window looks like this.



Use the Service Information window to:

- Modify the size of an offline drive file before transferring the configuration to an online drive.
- Display and monitor service information about the drive.
- Display the firmware revision of the drive.

The following parameters and status apply to the Service Information window:

Parameter	Description
Drive Size:	Change the power rating in kW of an offline drive. Invalid no drive selected 0.5 500W 230V 2098-DSD-005-x 1 1kW 230V 2098-DSD-010-x 2 2kW 230V 2098-DSD-020-x 3 3kW 230V 2098-DSD-030-x 7.5 7.5kW 230V 2098-DSD-075-x 15 15kW 230V 2098-DSD-150-x 3(HV) 3kW 460V 2098-DSD-HV030-x 5(HV) 5kW 460V 2098-DSD-HV050-x 10(HV) 10kW 460V 2098-DSD-HV100-x 15(HV) 15kW 460V 2098-DSD-HV150-x 22(HV) 22kW 460V 2098-DSD-HV220-x
Status	**Description**
Drive Model	The model number of the drive. This is the number you selected from the Select New Drive dialog box after executing the Insert Ultra3000 command.
PICS Number	A unique identifier assigned to each drive.
Firmware Version	The revision of the selected On-Line drive's firmware in the format XX.YY, where: • XX = major revision • YY = minor revision
Time In Service	Total time (hours and minutes) the drive has been powered-up.

Customize the Service Information window for your Ultra3000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Setup button to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Configuring the Ultra5000 Drive

Introduction

This chapter describes how to program your Ultra5000 drive to any operational mode.

The following Ultra5000 drive features are described:

- move, jog, cam, and gearing functions
- programmable digital and analog I/O
- position regulation through motion branch commands
- programmable drive status displays

Also described are the program, archive, and global variable commands that permit complex movements to be programmed on a single drive, and copied to multiple drives.

Configuring the Ultra5000 Drive

Every Ultra5000 drive in the Workspace window has these child items or branches:

- Motion
- Jog
- Move
- Cam
- Gear
- Motor
- Tuning
- Encoders
- Digital Inputs
- Digital Outputs
- Analog Inputs
- Analog Outputs
- Oscilloscope
- Monitor
- Programs
- Archives
- Global Variables
- Faults
- Service Information

An Ultra5000 drive with a DeviceNet interface has these additional child item or branch in the Workspace window:

- DeviceNet

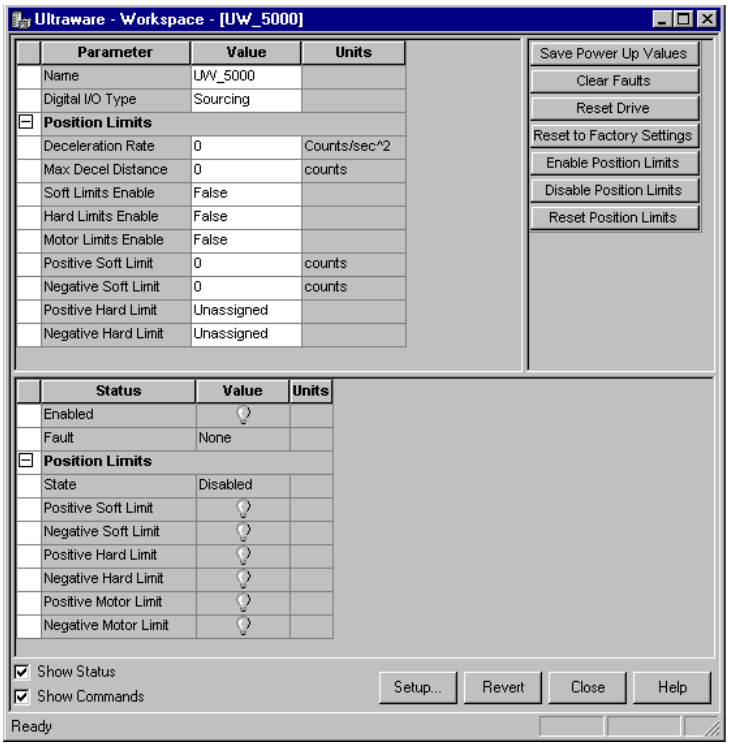
Except for the Motion, Monitor, Programs, Archives and Global Variable items, all of a drive's child branches can and must be configured in a Properties window.

Configuring Properties for the Ultra5000 Drive

To configure the properties for an Ultra5000 drive's child branches:

1. In the Workspace window, click the drive branch to configure.
2. Do one of these:
   - Click Properties from the Edit menu.
   - Right-click the drive in the Workspace, and click Properties from the pop-up menu.
   - Double-click the drive branch.

   A Properties window, such as the Drive Properties window displayed below, appears for the selected drive branch.



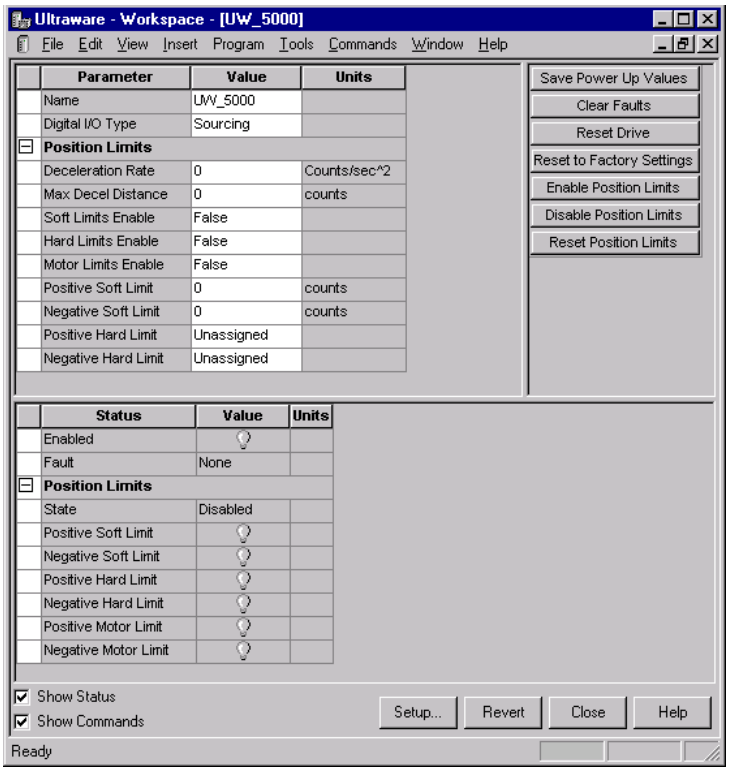
3. To configure properties for the selected drive branch, use the features of the Properties window as follows.

Section	Description
Parameters	Located in the upper left part of the Properties window. Type or click values in the parameter fields to configure the settings of the selected drive branch.
Commands	Located in the upper right part of the Properties window. Click any button to issue the associated command. Click Show Commands to display command buttons. Not every drive branch has associated commands.
Status	Located beneath the Parameters and Commands sections. By default, these fields display the online status of the selected drive branch. Click Setup, to open a window where you can customize the status to be displayed. Status fields are read-only. Click Show Status, to display the status section.
Show Status	Click to display the status for the selected drive branch. Status values are displayed only for online drives.
Show Commands	Click to display commands for the selected drive branch. Commands can be executed only for online drives. This selection is dimmed if no commands are associated with the selected drive branch.
Setup	Opens the Monitor Setup window, where you can customize the status display. Refer to Ultra5000 Status on page 199 for more information about using the Monitor window.
Revert	Click Revert to return parameter settings to the values they had when you first opened this window.
Close	Closes the window.
Help	Click Help to get online help for this window.

The remainder of this chapter describes the process of entering and editing drive configuration settings, the status displayed by default for each drive branch when the drive is online, and the commands available to a user for each drive branch when the drive is online.

Understanding the Ultra5000 Drive Branch

The Properties window for the Ultra5000 Drive branch looks like this.



Use this window to configure an Ultra5000 drive by:

- editing the drive name
- specifying the type of digital I/O used by the drive
- monitoring faults and other drive status
- executing commands that:
  - save current working values as power-up values,
  - clear all runtime faults,
  - enable or disable position limits, or
  - reset the drive.

You can edit parameters for both an online and an offline drive. However, you can monitor status and execute direct commands (executed through the Ultraware interface, rather than through a compiled, loaded and executed program) only for an Ultra5000 drive in the On-Line Drives branch.

The following parameters apply to the Ultra5000 Drive branch.

Parameter	Description
Name	The name of the selected Ultra5000 drive. It must: • be at least one, but not more than eight, characters in length, • be unique within its branch of the tree, and • not contain a space or backslash (\), forward slash (/), colon (:), asterisk (*), question mark (?), double quote ("), greater than symbol (>), less than symbol (<) or pipe (|).
Digital I/O Type	Click the digital I/O type: • Sinking: Digital Inputs should be connected to ground, so current flows from the drive when the input is ON. Digital Outputs should be connected to a 24 volt power supply, so current flows into the drive when the output is ON. • Sourcing: Digital Inputs should be connected to a 24 volt power supply, so current flows into the drive when the input is ON. Digital Outputs should be connected to ground, so current flows from the drive when the output is ON.
Position Limits	
Deceleration Rate	When a limit is detected, the drive uses this deceleration rate to bring the axis to a stop, unless doing so would violate the Max Decel Distance (see below). If necessary to stay within the Max Decel Distance, the drive calculates a greater deceleration rate.
Max Decel Distance	When a limit is detected, the drive brings the axis to a stop within this distance.
Soft Limits Enable	Set this to True to enable detection of soft limit violations. The Position Limits (see below) must also be enabled for soft limit violations to be detected.
Hard Limits Enable	Set this to True to enable detection of hard limit violations. The Position Limits (see below) must also be enabled for hard limit violations to be detected. The inputs to use for positive and negative hard limits must be set (see below) for the hard limits to be detected.
Motor Limits Enable	Set this to True to enable detection of motor integral limit violations. The Position Limits (see below) must also be enabled for motor limit violations to be detected. The motor limits only work when using a motor that supports integral limits.
Positive Soft Limit	The position, in counts, when a positive soft limit violation is detected by the drive. This is the point where the drive begins decelerating the axis.
Negative Soft Limit	The position, in counts, when a negative soft limit violation be detected by the drive. This is the point where the drive begins decelerating the axis.
Positive Hard Limit	The selected digital input to use to indicate a positive hard limit violation. The drive begins decelerating the axis when the input becomes active. Select:
Negative Hard Limit	The selected digital input to use to indicate a negative hard limit violation. The drive begins decelerating the axis when the input becomes active. Select:

Drive status is displayed by default for an Ultra5000 Drive in the On-Line Drives branch of the Workspace window.

Status	Description
Enabled	When the drive is Enabled, this status shows an ON light bulb.
Fault	This displays the fault status of the selected online Ultra5000 drive: • 0 = None • 4 = Motor Over Temp • 5 = IPM • 9 = Bus Under Voltage • 10 = Bus Over Voltage • 11 = Illegal Hall State • 17 = User Current • 18 = Overspeed • 19 = Following Error • 20 = Motor Encoder State • 21 = Auxiliary Encoder State • 22 = Motor Filter • 23 = IPM Filter • 24 = Velocity Error • 26 = User Velocity • 29 = Excess Output Frequency • 39 = Self Sensing Startup Failed [2] 58 = Excessive CPU Load
Drive Address	Displays the node address of a online drive. Note: This status is not available when a drive is offline.
Position Limits	
State	The display is one of these options: • Disabled – Position Limits are not being monitored. • Enabling – The drive is transitioning from the Disabled state to Running. • Running – The drive is monitoring position limits. • Stopping – The drive has detected a limit violation and is decelerating the motor. • Stopped – The motor has been stopped in response to a limit violation. The drive does not permit commanded motion until the Position Limits are reset. • Resetting – The drive is transitioning from the Stopped state to Running.
Positive Soft Limit	When a Positive Soft Limit violation has been detected, this status shows an ON light bulb.
Negative Soft Limit	When a Negative Soft Limit violation has been detected, this status shows an ON light bulb.
Positive Hard Limit	When a Positive Hard Limit violation has been detected, this status shows an ON light bulb.
Negative Hard Limit	When a Negative Hard Limit violation has been detected, this status shows an ON light bulb.
Positive Motor Limit	When a Positive Motor Limit violation has been detected, this status shows an ON light bulb.
Negative Motor Limit	When a Negative Motor Limit violation has been detected, this status shows an ON light bulb.

The following commands apply to the Ultra5000 Drive window.

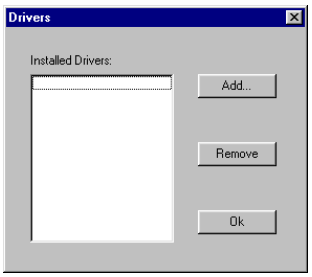
Command	Description
Save Power Up Values	Saves the current working values as power-up values for the selected online drive and for all of its children. Not every current working value is saved as a power-up value for the selected online drive and its children. The working values for parameters that usually change each time they are used (for example, Jog Velocity) are not saved.
Clear Faults	Clears all faults and resets the Fault Status to 0 for the selected online drive.
Reset Drive	Resets, or reboots, the hardware and firmware for a drive.
Reset to Factory Settings	Resets the drive configuration to the factory settings.
Enable Position Limit	This causes the drive to start monitoring the position limits. The state transitions to Running.
Disable Position Limit	This causes the drive to stop monitoring the position limits. The state transitions to Disabled.
Reset Position Limit	After a position limit violation, the position limits enter the Stopped state. The drive will not permit commanded motion in this state. Pressing this button lets the drive respond to commanded motion to back off of the limit condition.

Customize the window for your Ultra5000 Drive branch by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Installing Drivers

The Ultra5000 drive can automatically load and run special executable files, commonly known as Drivers, at powerup. To install drivers, click Drivers in the Ultra5000 drive's context menu. The following dialog box appears:



- The Installed Drivers list shows all of the currently installed drivers.
- The Add button brings up a file selection dialog box, from which you choose an .exe file to install as a driver.
- The Remove button removes the currently selected driver from the list.

If firmware is to be installed see Upgrading Drive Firmware on page 22.

Drive Report

Use the Drive Report command to generate a text file in the Client Area. The text file lists the parameter settings for the selected Ultra drive. Once created, you can print a copy of the Drive Report.

To execute the Drive Report command, perform these steps.

1. In the Workspace window, click Ultra500 drive.
2. Right-click to select Drive Report from the pop-up menu.

Use the Drive Report's text editor window to:

- Display all the parameter settings for the selected Ultra5000 drive.
- Print all the parameter settings for the selected Ultra5000 drive.

In addition to the Cut, Copy, Paste, Delete, Print, commands, these commands apply to the Drive Report text editor window.

Command	Description
Find	Search for text in the source (.c) or header (.h) file.
Find Next	Find the next occurrence of header file or source file text - sought by the previous Find command.
Replace	Search for and replace the text in a source (.c) or header (.h) file.
Select All	Select all of the text in the selected source (.c) or header (.h) file.

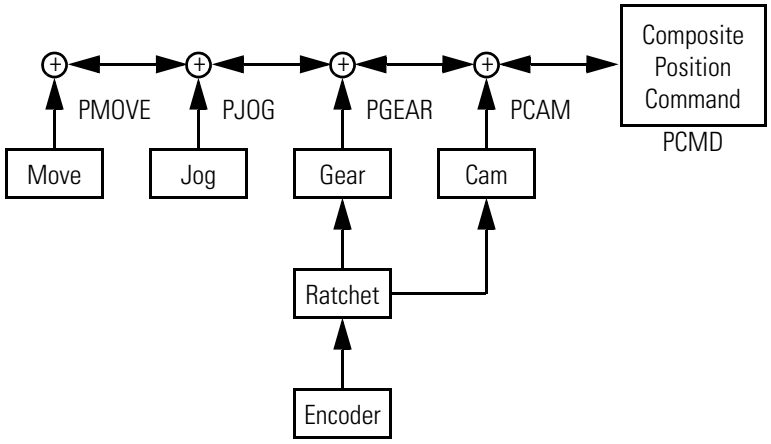
Command	Description
Toggle Bookmark	Set or remove a bookmark (a blue dot) in a selected line of code for a source (.c) or header (.h) file.
Next Bookmark	Locate the next bookmark (a blue dot) appearing in a selected line of code for a source (.c) or header (.h) file.
Previous Bookmark	Locate a bookmark (a blue dot) that appears above the cursor in the selected source (.c) or header (.h) file.
Clear All Bookmarks	Remove all bookmarks (blue dots) that have been set in a source (.c) or header (.h) file.

Understanding the Motion Branch

The Ultra5000 drive's Motion branch is the parent to the branches – Jog, Move, Gear and Cam – that are the sources of position commands that generate motion for the Ultra5000 drive.

The following diagram illustrates the generation of the position command that is sent to the position regulator. Each of the three sources is independent. If a source is the only position command source, it operates alone. If there a multiple position command sources, they are added together in the order set forth in these diagram. The resulting composite position command is the sum of the position commands from the three different sources:

Composite Position Command = PMOVE + PJOG + PGEAR + PCAM

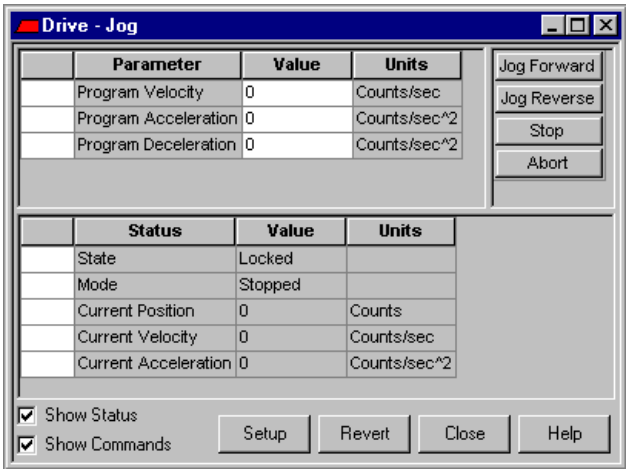


You can copy the Motion branch and paste it into another Ultra5000 drive. Because a drive can contain only one Motion branch, pasting a Motion branch into a drive overwrites and replaces the recipient drive's pre-existing Motion branch.

Except for Copy and Paste, no parameters, status, or commands are associated with the Motion item.

Understanding the Jog Window

The Properties window for the Jog branch looks like this.



Use the Jog window to:

- set jog velocity, acceleration and deceleration parameters
- monitor status relating to a jog as it executes
- issue commands that start, stop and set the direction of a jog

You can edit parameters for both an online and an offline Jog branch. However, you can monitor status and execute direct commands (executed through the Ultraware interface, rather than through a compiled, loaded and executed program) only for a Jog branch that is the child of an online drive.

The following parameters apply to the Jog window.

Parameter	Description
Program Velocity	The commanded motor velocity, in counts per second.
Program Acceleration	The acceleration rate used when ramping-up to Program Velocity, in counts per second squared. Must be ≥ 0.
Program Deceleration	The deceleration rate used when ramping-down from Program Velocity to zero, in counts per second squared. Must be ≥ 0.

The following display is the default status for a Jog branch of an online drive.

Status	Description
State	Describes the relation between the jog's Program and Current Velocity, as follows: • Seeking, when the jog is accelerating or decelerating, or • Locked, when the jog's Current Velocity equals Program Velocity.
Mode	Describes the direction of the jog, as follows: • **Stopped**, when not jogging • **Forward**, when jogging forward • **Reverse**, when jogging in reverse.

Status	Description
Current Position	The position, in counts, generated by the current jog. This value is automatically reset to zero at drive powerup.
Current Velocity	The velocity command, in counts per second, generated by the current jog.
Current Acceleration	The acceleration command, in counts per second squared, generated by the current jog.

The following commands can be executed for a Jog branch that is in the On-Line Drives branch.

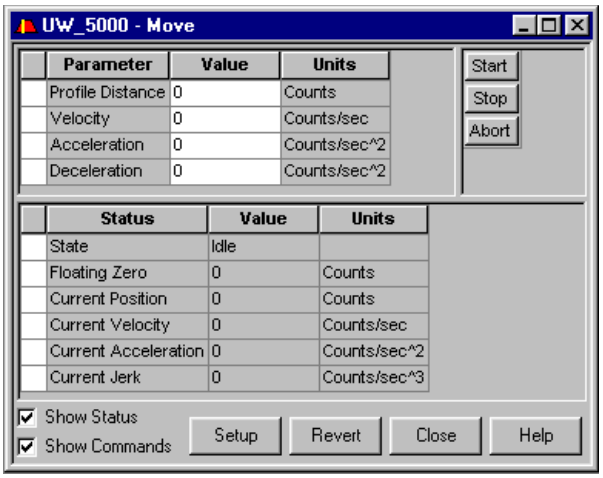
Command	Description
Jog Forward	Spins the motor at the Program Velocity in the forward direction.
Jog Reverse	Spins the motor at the Program Velocity in the reverse direction.
Stop	Brings the motor to a stop, using the Program Deceleration rate.
Abort	Brings the motor to an immediate stop.

Customize the Jog window for your Ultra5000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Move Window

The Properties window of the Move branch looks like this.



Use the Move window to:

- set move distance, velocity, acceleration and deceleration parameters,
- monitor status relating to a move as it executes, and
- issue commands that start, stop, reset and abort a move.

You can edit parameters for both an online and an offline Move branch. However, you can monitor status and execute direct commands (executed through the Ultraware interface, rather than through a compiled, loaded and executed program) only for a Move branch that is the child of an online drive.

The following parameters can be entered and edited in the Move window.

Parameter	Description
Profile Distance	The distance, in counts, that the motor is to move.
Velocity	The commanded motor velocity, in counts per second.
Acceleration	The acceleration rate used when ramping-up to the move's Velocity, in counts per second squared. Must be >= 0.
Deceleration	The deceleration rate used when ramping-down from the move's Velocity to zero, in counts per second squared. Must be >= 0.

The following display is the default status for a Move branch of an online drive.

Status	Description
State	Describes the relation between the move's Program and Current Velocity, as follows: • Idle: No move is in progress. • Profiling: The move is in progress. • Calculating: Preparing to move according to a corrected move command. • Correcting: Corrected move is in progress.
Floating Zero	In the event that the Current Position value is changed by the execution of a program (.exe) file, the value of this field changes so that the sum of Floating Zero and Current Position remains unchanged.
Current Position	The position, in counts, generated by the current move. This value is automatically reset to zero at drive powerup.
Current Velocity	The velocity command, in counts per second, generated by the current move.
Current Acceleration	The acceleration command, in counts per second squared, generated by the current move.
Current Jerk	The rate of change of acceleration, in counts per second squared.

The following commands can be executed for a Move branch of an online drive.

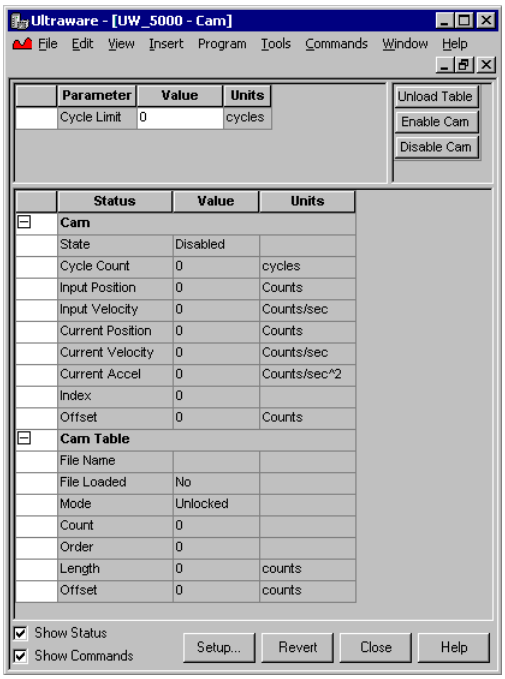
Command	Description
Start	Spins the motor, ramping up at the Acceleration rate to the set Velocity, and begins or resumes the move.
Stop	Brings the motor to a stop, using the set Deceleration rate.
Abort	Brings the motor to an immediate stop.

Customize the Move window for your Ultra5000 Drive by selecting one or more of these commands:

- Click the Show Status to display or hide the Status pane.
- Click the Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Cam Window

The Properties window for the Cam branch looks like this.



Use this window to monitor the status of the cam.

You may create or modify a cam profile with the Cam Table Editor, which is accessible as a context menu (right-click) from the Cam window. Refer to Cam Table Editor on page 155 for instructions on how to create and edit cam tables or their graphic plots.

There are no properties associated with the Cam window.

The following parameter can be entered and edited in the Cam window.

Parameter	Description
Cycle Limit	The number of cycles or times the cam wraps around to the beginning of the cam table after reaching the end. Once the Cycle Limit is reached, the cam is disabled. A Cycle Limit of zero indicates no limit.

The following display is the default status for a Cam branch of an online drive.

Status	Description
Cam	
State	The current state of the cam: • Enabled, or • Disabled
Cycle Count	The number of cycles completed since enabling the cam.
Input Position	The current master position value, in counts. This value rolls over to zero as it passes the Length value.

Status	Description
Input Velocity	The current master velocity value, in counts per second squared.
Current Position	The output position of the cam, in counts. This position always corresponds to the output position defined for the given Input Position in the cam table. If the cam ends at a non-zero output position, this value rolls back to zero (where all cams start), and the Offset cam status is incremented by the difference between the starting and stopping output positions for the cam table. The actual position command generated by the cam is the sum of the Offset and Current Position.
Current Velocity	The actual velocity command generated by the cam, in counts per second. This value is equal to the Input Velocity multiplied by the instantaneous cam table velocity. This is the rate of change of the cam position, in counts per count.
Current Acceleration	The actual acceleration command generated by the cam, in counts per second squared. This value is equal to the instantaneous cam table acceleration. This is the rate of change of the cam velocity, in counts per count per count, times the Input Velocity squared.
Index	The segment of the cam table used to calculate the cam output. This is determined by the Input Position. The index is zero based.
Offset	The value, in counts, necessary to adjust the cam between its final output position and the output position for the beginning of the next cam cycle. A cam wraps around to start again at its beginning, if there is a difference between the final and beginning output position of the cam table, the offset is adjusted by the difference, so the Current Position of the cam is always the actual output position described by the cam table.
Cam Table	
File Name	the filename describing the cam motion. Cam files are generated by Ultraware software when you insert a cam table under the Cam branch in the workspace. The cam files generated are stored in the drives flash file system under a directory named /Cam.dir. If a cam table is created with the default name of Table.cam, and loaded into drive memory, the File Name is /Cam.dir/Table.cam. User programs may set the File Name attribute to different paths.
File Loaded	The current cam memory load status: Yes – a cam file has been loaded into memory. No – a cam file is not loaded into memory. Note: The Filename attribute can be changed by a user program after a cam file is loaded, so the Filename displayed may not be the name of the file that is loaded.
Mode	The current mode of the cam: • Locked – the cam is active, and a different cam file cannot be loaded. • Unlocked – the cam table is inactive, and a cam file may be loaded into memory. The Cam Table is Locked whenever the Cam is enabled.
Count	The number of segments in the loaded cam table. A cam table is divided into segments that start at each point defined in the cam file. (Except the final point displayed in the Cam table interface is used only to define the end of the previous segment, not the start of a segment.)

Status	Description
Order	Each of the segments of an Ultra5000 cam table is defined by a polynomial equation, such as: Output position = A + B*(Input Position) + C*(Input Position)^2 +… The cam table Order is the highest order term in the right side of this equation. All of the segments in a cam table must have the same order. Cam files are generated as first order equations when the cam table is a linear type, and 5th order equations when the cam table is a polynomial type. A 5th order polynomial provides sufficient degrees-of-freedom to constrain the positions, velocities, and accelerations at the ends of each segment.
Length	The maximum value of Input Position in the cam table.
Offset	The ending output position defined in the cam table.

The following direct commands can be executed for a Cam branch of an online drive.

Command	Description
Unload Table	Unloads the cam file from memory. This command can be used to free drive resources, if necessary.
Enable Cam	Causes the cam to begin generating an output position. Note: A cam table file must be loaded to enable cam, or an Invalid State error occurs.
Disable Cam	Causes the cam to stop generating output, but the Current Position output is held constant at the current value.

Customize the Cam window for your Ultra5000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Inserting a Cam Table

To create a new Cam Table, perform these steps.

- Click the Cam branch for an Ultra5000 drive in the Workspace window and then click Cam Table from the Insert menu.
- Right-click the Cam branch, and then click Insert Table from the pop-up menu).

The Cam Table appears in the Workspace window beneath the Cam branch.

Importing a Cam Table

To load a cam table file from the local computer's file system and add it to the workspace under the Cam Table branch, perform these steps.

1. Click Cam branch for an Ultra5000 drive in the Workspace window.
2. Right-click Import Cam File from the pop-up menu.
3. Choose the cam file from a file selection dialog box.
4. Click OK.

Once imported, the original file on the local computer's file system is closed, and only editing changes the drive's copy.

Importing a CSV File

To load a cam file from the local computer's file system, in a Comma Separated Values (CSV) file format, and add it to the workspace under the Cam branch:

1. Click the Cam branch for an Ultra5000 drive in the Workspace window.
2. Right-click the cam branch and click Import CSV File from the pop-up menu.
3. Choose the CSV file from a file selection dialog box.
4. Click OK.

Once imported, the original file on the local computer's file system is closed, and only editing changes the drive's copy.

Cam Table branch

The cam table branch contains the definition of a cam table.

A cam table is stored on the drive as a cam file. The Cam Table Editor lets you edit the cam definition, and then save the file on the drive.

The Cam Table branch supports commands letting you Cut, Copy, and Delete cam tables, as well as the Load in Memory and Export Cam File commands. Drag and Drop techniques may also be used.

Cam Table Editor

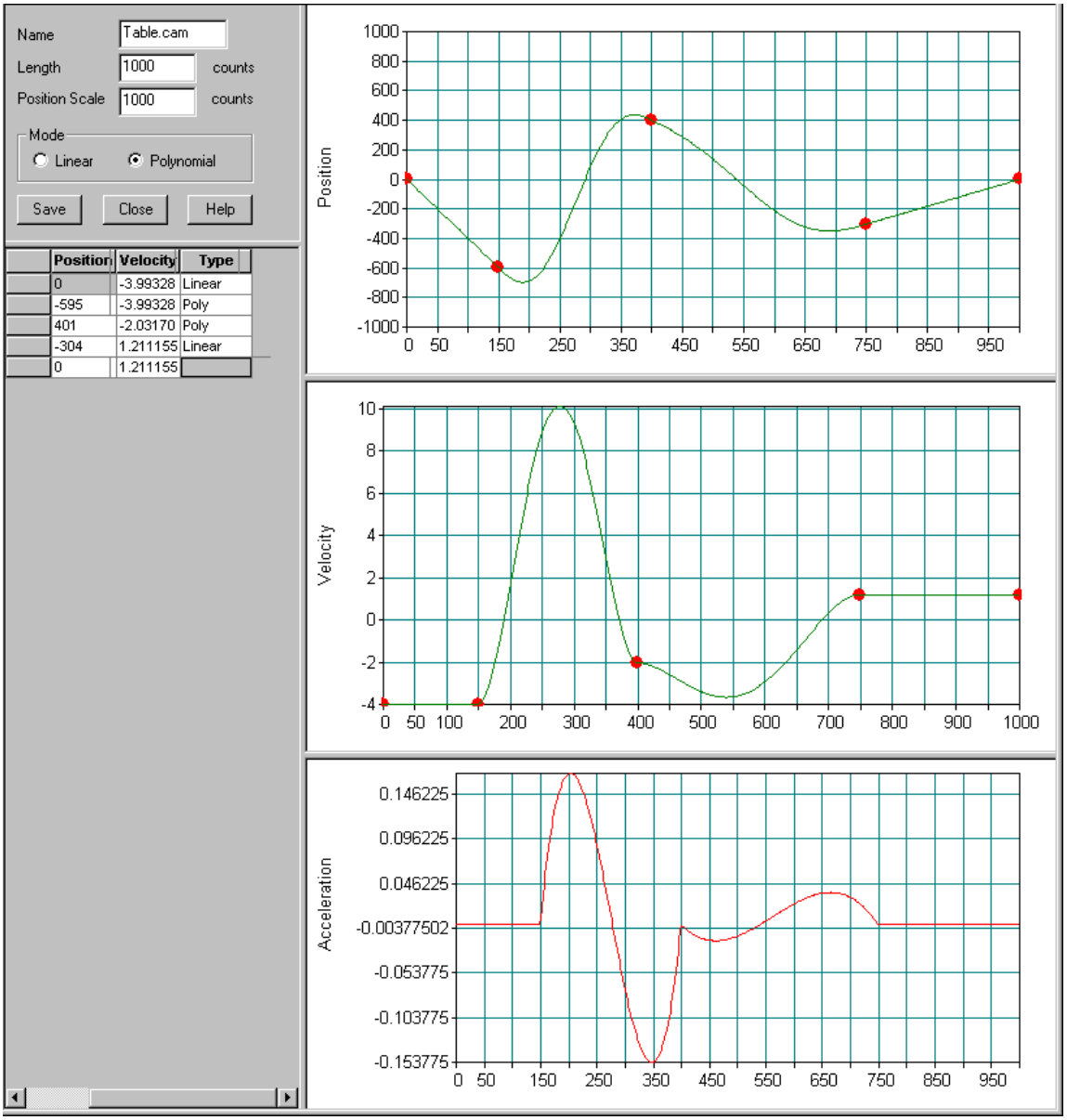
You may create or modify a cam profile with the Cam Table Editor.

- Set basic cam table attributes.
- Add, modify or remove cam table information for Input, Position or Velocity values.
- Graphically adjust Input and Position values for cam segments using the Position Profile Pane's context menu.

TIP The Cam Table Editor is accessible only after a cam table has been inserted or imported.

A cam table generated by Motion Library functions cannot be modified with the Cam Table Editor, it is read-only outside the C programming environment.

The Cam Table Editor (pictured) has panes that contain the parameters, properties, or attributes shown below and described on subsequent pages:



Properties Pane

The Properties pane, on the top left of the cam table, has these parameters and command buttons.

Parameter	Description
Name	The file name used to store the cam table. The name must end in .cam.
Length	The input value in counts of the last point in the cam table. When the length is changed, all of the input values in the cam table (and velocities if necessary) are adjusted to maintain the same overall cam shape.
Position Scale	Scales in counts the positions defined in the cam table. The initial default value for Position Scale is 1000 counts. This does not limit the positions that can be created in the table. However, when the Position Scale is changed, the positions of all points in the table are adjusted according to the ratio of the new and old position scales. For example, if Position Scale is changed from 1000 to 2000, a position of 600 counts would become 1200 counts.
Mode	Linear: This type of cam executes with linear (first order) curve segments. Velocity discontinuities are likely with this type of cam. However, this type of cam may be most appropriate for cam tables imported from a CSV file with lots of points. Polynomial: This type of cam executes with 5th order curve segments. There are no discontinuities in velocity or acceleration if all segments have polynomial type. If the cam has adjacent linear segments, then there will be discontinuities in velocity.

Command	Description
Save	Saves the current cam definition to a file on the associated drive.
Close	Closes the cam table editing window. Note: If the cam table has been changed but not saved, Ultraware software prompts the user with the opportunity to save the cam file to the drive.
Help	Displays the online help topic for the cam table editing window.

Table Pane

The Table pane, on the left but below the Properties Pane, contains values for these parameters in each segment of a cam.

Parameter	Description
Input	The position on the x-axis for each point of the cam. Each input on the cam has a specific input value in counts. The initial input value is 0 and the default final input value is 1000.
Position	The position on the y-axis for each point of the cam. Each input on the cam has a specific position value in counts. The initial (and typically the final) position value is 0.
Velocity	(Displayed only for Polynomial Mode cam tables.) The instantaneous velocity in units of (output position counts per input count) per input count for the specific point of the cam. By default, an instantaneous velocity of 0 is set for each point added to a polynomial type segment and the velocity for each point added to a linear type segment is calculated. • A positive velocity value increases the initial acceleration of the cam segment, and consequently results in reduced velocity at the end of the cam segment. • A negative velocity value decreases the initial acceleration of the cam segment, and consequently results in higher velocity at the end of the cam segment.
Type	(Displayed only for Polynomial Mode cam tables.) The type of cam segment following the point. • Linear • Polynomial

The Table pane below the Properties contains the cam table point information.

- Input, Position, and Velocity values are displayed for polynomial mode cam tables, but
- only Input and Position values are displayed for linear mode cam tables.

Position Profile Pane

The Position Profile Pane on the top right, displays the cam positions in an editable graph. The cam table points in this view can be dragged to adjust both their Input and Position values.

Right-click this pane to open a context menu in which you can modify the position profile with these commands.

Parameter	Description
Add Point	Adds a point to the cam table at the location under the mouse cursor.
Delete Point	Deletes the point under the mouse cursor from the cam table.
Dwell Segment	Sets the velocity of the cam segment under the cursor to have zero velocity. The position of the segment end point is adjusted to be equal to the beginning point of the segment.
Constant Velocity Segment	Sets the velocity of the cam segment under the cursor to a constant value. The positions of the segment endpoints are not adjusted. The velocity required to move from the beginning of the segment to the end is calculated as (change in Position) / (change in Input). This velocity is then set at the segment end points.

Velocity Profile Pane

The Velocity Profile Pane, on the right but below the Position Profile Pane, displays the cam velocity in an editable graph, but only the Velocity values may be adjusted in this graph, not the Input values. If the end point of the velocity profile is adjusted, the first point's velocity is automatically adjusted to have the same value.

The velocity profile is only editable for a polynomial mode cam. For a linear mode cam, the velocity of each segment is entirely determined by the location of points in the Position Profile. Velocities are displayed in units of output position counts per input count. To determine the actual output velocity of the cam, in counts per second, the velocities from the graph must be multiplied by the actual input velocity in counts per second.

Acceleration Profile Pane

The Acceleration Profile Pane, on the right bottom, displays the cam acceleration in a graph.

- For a polynomial mode came, Ultraware software constrains the accelerations to be zero at each segment endpoint.
- For a linear mode cam, the acceleration is zero within each segment, with essentially infinite acceleration at the transitions from segment to segment (unless two adjacent segments have the same velocity).

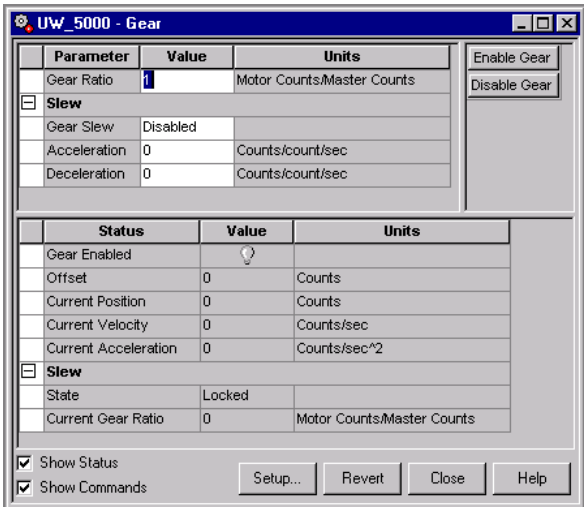
Accelerations are displayed in units of (output position counts per input count) per input count. To determine the actual output acceleration of the cam, in counts per second squared, the accelerations from the graph must be multiplied by the square of the actual input velocity in counts per second.

The following direct commands can be executed for a Cam Table branch of an online drive.

Command	Description
Load in Memory	Load in Memory makes the selected cam table the active cam table in the drive. When cam is enabled, the selected cam table begins executing.
Export Cam File	Copies a cam file from the local drive and export it to a computer file.

Understanding the Gear Window

The Properties window for the Gear branch looks like this.



Use the Gear window to:

- configure the drive's Gear Ratio. Gearing takes the position data provided by a master encoder and uses it to generate motion
- monitor status relating to gear-driven motion

You can edit parameters for both an online and an offline Gear branch. However, you can monitor status and execute direct commands (executed through the Ultraware interface, rather than through a compiled, loaded and executed program) only for a Gear branch that is the child of an online drive.

The following parameters can be entered and edited in the Gear window.

Parameter	Description
Gear Ratio	The number of counts the motor should move for each master encoder count received (in Motor Counts per Master Count). Floating point numbers are permitted.
Slew	
Gear Slew	Enabled – the gear ratio ramps up or ramps down using the acceleration and deceleration specified below. Disabled – the acceleration and deceleration are effectively infinite.
Accel	If the gear is enabled while the gear input is in motion, or the gear ratio is changed to a greater value. The gear ratio ramps up to the specified value at this rate.
Decel	If the gear is disabled while it is in motion, or the gear ratio is changed to a smaller value. The gear ratio ramps down to the specified value (or zero if disabling) at this rate.

The following display is the default status for a Gear branch of an online drive.

Status	Description
Gear Enabled	Light ON indicates the gear is enabled.
Offset	The floating point (or fractional) component of Current Position. Because Current Position is represented in whole counts, adding the Offset to Current Position yields actual position.
Current Position	The position, in counts, generated by gearing. This value is automatically reset to zero at drive powerup.
Current Velocity	The velocity command, in counts per second, generated by gearing.
Current Acceleration	The acceleration command, in counts per second squared, generated by gearing.
Slew	
State	While the gear ratio is ramping up or down, this displays Seeking. Once the gear ratio has reached the target value, this displays Locked.
Current Gear Ratio	The current effective gear ratio is displayed while the slew State = Seeking The user entered Gear Ratio is displayed when the slew State = Locked, or if slew is disabled.

The following commands can be executed for a Gear branch of an online drive.

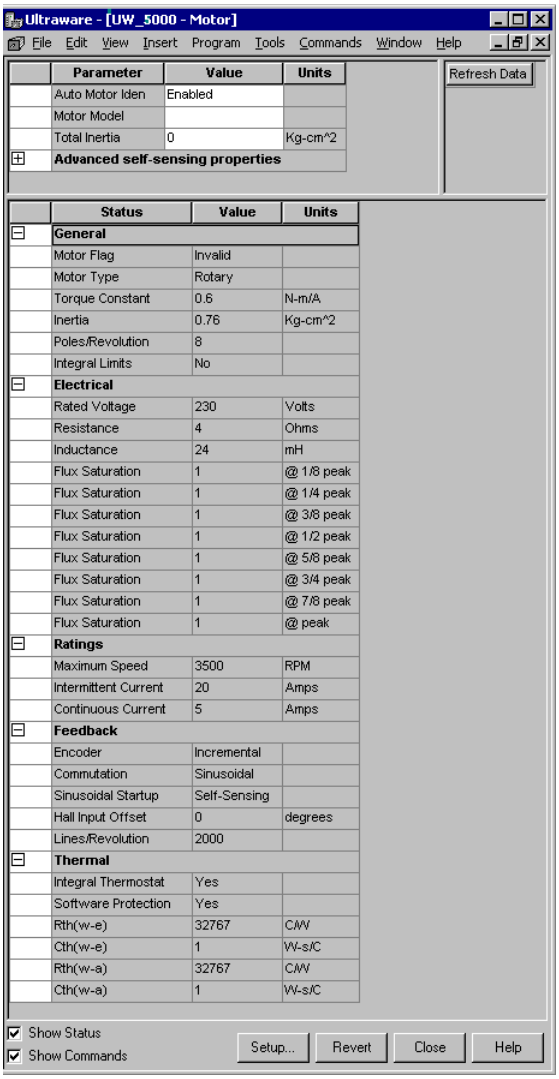
Command	Description
Enable Gear	Causes the gear to begin generating output - and motion - in response to input received from the Master Encoder (or ratchet).
Disable Gear	Causes the gear to stop generating output.

Customize the Gear window for your Ultra5000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Motor Window

The Properties window for the Motor branch looks like this.



Use the Motor window to:

- Enter a motor for the associated online or offline drive. The status values associated with the motor appears in the Status pane of this window.
- Monitor the status that relate to the selected motor.
- Perform diagnostics on an online motor/encoder.

You can edit parameters for both an online and an offline Motor branch. However, you can monitor status only for a Motor branch that is the child of an online drive.

The following parameters can be entered and edited in the Motor window.

Parameter	Description
Auto Motor Iden	Select: • Enabled: Causes the drive to read motor parameters from an intelligent encoder, or • Disabled: Causes the drive to use motor parameters for a Motor Model selected below.
Motor Model	The model name of the selected motor. Only listed motor models are valid. Ultraware software ships with a utility that lets you create custom motor configurations. Use that utility to add customized motor selections to the Motor Model list.
Total Inertia	(For rotary motors) The total inertia of the motor and load combined.
Total Moving Mass	(Only for linear motors) The moving mass of the motor and load combined. Note: The Motor Model list may not include any linear motors. You can add linear (or other) motors using the Motor Configuration utility, referenced in the Motor Model section, above.
Self Sensing Current	(Only for motors with self-sensing startup.) The percent of the motors rated peak current to use for self-sensing startup. This value may need to be adjusted when the motor is moving a high inertia load.
Advanced Self Sensing Properties	
Lock Time	(Only for motors with self-sensing startup.) The amount of time the drive uses to build up the current to the Self Sensing Current level specified above.
Lock Delay	(Only for motors with self-sensing startup.) The amount of time the motor must be in the locked position after reaching the full Self Sensing Current.
Move Direction	(Only for motors with self-sensing startup.) • Forward – indicates the motor moves only in the positive direction during self-sensing startup. • Negative – indicates the motor moves only in the negative direction during self-sensing startup.
Move Time	(Only for motors with self-sensing startup.) The amount of time the drive uses for the verification move during self-sensing startup.
Move Delay	(Only for motors with self-sensing startup.) The amount of time the drive holds the final position after the verification move during self-sensing startup.

The following display is the default status for a Motor branch of an online drive.

Status	Description
General	
Motor Flag	Either: • Automatic – indicates the drive automatically determines the motor settings by communicating with the encoder. • Standard – indicates a motor whose status settings come preconfigured. • Custom – indicates a user-configured motor that was added to the Motor Model list, above, using the Ultraware utility.
Motor Type	The type of motor selected: • Linear • Rotary

Status	Description
Torque Constant	(Only for rotary motors) The sinusoidal force constant, in Newton meters/Ampere (N-m/A).
Force Constant	(Only for linear motors) The sinusoidal force constant, in Newtons/Ampere (N/A).
Inertia	Rotor inertia, in Kilogram-centimeter squared (kg-cm^2).
Mass	(Only for linear motors) Rotor mass, in Kilograms (kg).
Poles/Revolution	The number of motor poles per revolution.
Electrical Cycle	(Only for linear motors) The distance between motor poles, in Meters.
Integral Limits	Indicates whether the motor provides built in feedback for travel limits: • Yes • No
Electrical	
Rated Voltage	Voltage rating of the motor in Volts
Resistance	The phase-to-phase resistance of the motor stator, in milliHenries (mH).
Inductance	The phase-to-phase inductance of the motor stator, in milliHenries (mH).
Flux Saturation at 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 7/8 and 8/8 (100%) of the motor peak current.	Eight separate status values that specify the level of flux saturation in the motor at the specified fraction of maximum current level. A value of 1.0 indicates no flux saturation.
Ratings	
Maximum Speed	Maximum motor speed, in revolutions/minute (rpm).
Intermittent Current	Maximum intermittent current of the motor in Amperes.
Continuous Current	Continuous current rating of the motor in Amperes.
Feedback	
Encoder	The encoder type: • Incremental • Sine/Cosine • SRS/SRM (only displayed offline). When a motor with this encoder type is selected for an online drive, Auto Motor Iden is set to true, and the Encoder indicates Sine/Cosine.)
Commutation	The type of commutation: • Brush • Trapezoidal • Sinusoidal
Sinusoidal Startup	The type of startup for sinusoidal commutation: • Self-Sensing • Hall Inputs • Serial (only displayed offline). When a motor with this start-up type is selected for an online drive, Auto Motor Iden is set to true, and the Sinusoidal Startup indicates Self-Sensing.)
Hall Input Offset	Hall Input offset, from standard Rockwell Automation orientation, in electrical degrees.
Lines/Revolution	Encoder lines per revolution. Note: This parameter is visible only if the Type is Rotary.
Lines/Meter	Encoder lines per meter of travel. Note: This parameter is visible only if the Type is Linear.

Status	Description
Thermal	
Integral Thermostat	Indicates whether the motor has a built-in thermostat. Settings are: Yes or No.
Software Protection	Indicates whether the motor thermal protection software is activated. Settings are: Yes or No.
Rth(w-e)	Thermal resistance from the winding to the encoder, in degrees centigrade/watt (°C/Watt). Note: This setting applies and is visible only if Software Protection is set to Yes.
Cth(w-e)	Thermal capacitance from the winding to the encoder, in Watt-seconds per degree centigrade (Watt-second/°C). Note: This setting applies and is visible only if Software Protection is set to Yes.
Rth(w-a)	Thermal resistance from the winding to ambient, in degrees centigrade/watt (°C/Watt). Note: This setting applies and is visible only if Software Protection is set to Yes.
Cth(w-a)	Thermal capacitance from the winding to ambient, in Watt-seconds per degree centigrade (Watt-second/°C). Note: This setting applies and is visible only if Software Protection is set to Yes.

The following command can be executed for a Motor window of an online Ultra5000 drive.

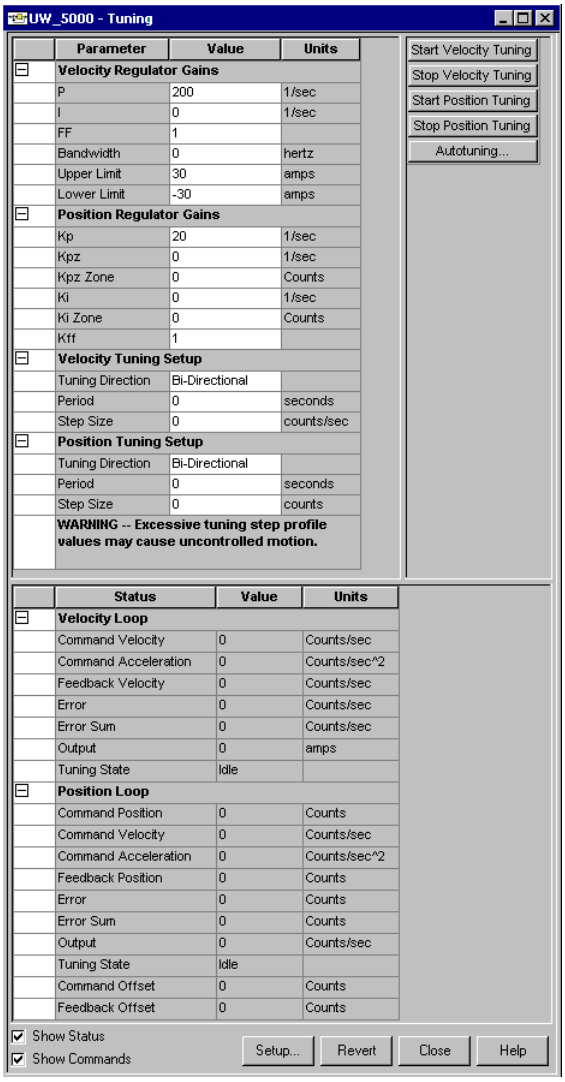
Command	Description
Refresh Data	Reads the motor definition information from the motor database and reapplies it to the drive. Note: This command is useful when a motor definition in the motor database has been changed.

Customize the Motor window for your Ultra5000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Tuning Window

The Properties window for the Tuning branch looks like this.



Use the Tuning window to configure, monitor and execute commands for position and velocity tuning.

ATTENTION: Excessive tuning step profile values may cause uncontrolled motion. Refer to the appropriate Hardware and Installation manual listed in Additional Resources on page 12 for tuning details.

Ultraware software uses a nested digital servo control loop consisting of:

- an outer position loop (or regulator), using proportional, integral and feedforward gains, around
- an inner velocity loop (or regulator), using its own set of proportional, integral and feedforward gains.

Together, these gain regulators provide software control over the servo dynamics, and let the servo system stabilize.

You can edit parameters for both an online and an offline Tuning branch. However, you can monitor status and execute direct commands (executed through the Ultraware interface, rather than through a compiled, loaded and executed program) only for a Tuning branch that is the child of an online drive.

The following parameters can be entered and edited in the Tuning window.

Parameter	Description
Velocity Regulator Gains	
P	Proportional gain for the velocity loop. Must be >= 0. Increasing the P gain improves response time and increases the stiffness of the system. Too high a P gain value causes instability; too low a P gain value results in loose or sloppy system dynamics.
I	Integral gain for the velocity loop. Must be >= 0. I gain improves the steady-state velocity performance of the system. Increasing the integral gain generally increases the ultimate positioning accuracy of the system. However excessive integral gain results in system instability.
FF	Acceleration feedforward gain. Must be >= 0. FF gain reduces velocity following error. However, high values can cause velocity overshoot.
Bandwidth	Lowpass output filter bandwidth. Valid values range from 0…2000 Hz. Bandwidth reduces noise generated by encoder resolution or mechanical resonance in the system. Setting to zero disables filtering.
Upper Limit	The maximum positive current the drive may output to the motor, in amperes. Must be >= 0.
Lower Limit	The maximum negative current the drive may output to the motor, in amperes. Must be <= 0.
Position Regulator Gains	
Kp	Proportional gain for the position loop. Must be >= 0. Increasing the Kp gain improves response time and increases the stiffness of the system. Too high a Kp gain value causes instability; too low a Kp gain value results in loose or sloppy system dynamics.
Kpz	Proportional gain for the position loop, when the position error falls within the Kpz Zone (defined below). Must be >= 0.
Kpz Zone	Enter the region, in counts, around Command Position where Kpz is used in place of Kp as the position loop proportional gain value. Must be >= 0.
Ki	Integral gain for the position loop. Must be >= 0. Ki gain improves the steady-state positioning performance of the system and virtually eliminates steady-state positioning errors. Increasing the integral gain generally increases the ultimate positioning accuracy of the system. However excessive integral gain results in system instability.
Ki Zone	Enter the region, in counts, around Command Position where integral gain is active. Must be >= 0.

Parameter	Description
Kff	Velocity feedforward gain for the position loop. Must be >= 0. Note: Kff gain reduces position following error. However high values can cause position overshoot.
Velocity Tuning Setup	
Tuning Direction	Click a tuning direction: • Bi-Directional to tune the drive using an alternating step-input to create alternately forward and reverse directional motion, • Forward Only to tune the drive using a step-input to create only forward motion, or • Reverse Only to tune the drive using a step-input to create only reverse motion.
Period	The time, in seconds, the drive turns at a given velocity.
Step Size	The amplitude of the velocity input, in pulses per second (pps), sent to the drive for the given period. In Bi-Directional tuning, the amplitude alternates polarity (+ or - sign).
	**ATTENTION:** Excessive tuning step profiles values may cause uncontrolled motion. Refer to the appropriate Hardware and Installation manual listed in Additional Resources on page 12 for tuning details.
Position Tuning Setup	
Tuning Direction	The tuning direction: • Bi-Directional to tune the drive using an alternating step-input to create alternately forward and reverse directional motion, • Forward Only to tune the drive using a step-input to create only forward motion, or • Reverse Only to tune the drive using a step-input to create only reverse motion.
Period	The time, in seconds, the drive holds its present step position.
Step Size	The number of pulses the drive moves in a single direction. In Bi-Directional tuning, the direction alternates.
	**ATTENTION:** Excessive tuning step profiles values may cause uncontrolled motion. Refer to the appropriate Hardware and Installation manual listed in Additional Resources on page 12 for tuning details.

The following display is the default status for a Tuning branch of an online drive.

Status	Description
Velocity Loop	
Command Velocity	The command velocity input to the velocity loop.
Command Acceleration	The command acceleration input to the velocity loop.
Feedback Velocity	The feedback velocity returned from the motor to the velocity loop.
Error	The difference between Command Velocity and Feedback Velocity.
Error Sum	The velocity error summation used by integral gain.
Output	The generated output from the velocity loop.

Status	Description
Tuning State	The state of the Tuning branch. Displays include: Running, Stopping, and Idle.
Position Loop	
Command Position	The command position input to the position loop.
Command Velocity	The command velocity input to the position loop.
Command Acceleration	The command acceleration input to the position loop.
Feedback Position	The feedback position returned from the motor to the position loop.
Error	The difference between Command Position and Feedback Position.
Error Sum	The position error summation used by integral gain.
Output	The generated output from the position loop.
Tuning State	Displays Idle or Tuning depending on whether a Stop or Start tuning command is selected.
Command Offset	Offsets the Command Position value displayed on the Oscilloscope to prevent the command trace from incrementing ('walking') off the display.
Feedback Offset	Offsets the Feedback Position value displayed on the Oscilloscope to prevent the feedback trace from incrementing ('walking') off the display.

The following commands can be executed for a Tuning branch of an online drive.

Command	Description
Start Velocity Tuning	Drives the motor with a square (or step) wave. The shape of the wave is determined by the commanded Step Size velocity (in pulses per second) and the selected Tuning Direction.
Stop Velocity Tuning	Stops velocity tuning.
Start Position Tuning	Drives the motor with a square (or step) wave. The shape of the wave is determined by the commanded Step Size position (in pulses) and the selected Tuning Direction.
Stop Position Tuning	Stops position tuning.
Autotuning	Opens the autotuning window.

Customize the Tuning window for your Ultra5000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Autotuning Window

Use the Autotuning window to

- configure autotuning parameters,
- start autotuning for an online drive, and
- monitor autotuning status.

To access the Autotuning window, do one of these:

- Click Autotuning, from the Commands menu.
- Right-click the Tuning icon, and then click Commands and Autotuning from the pop-up menu.
- Right-click the Tuning icon, and then click Properties from the pop-up menu. Then click Autotuning in the Tuning window.

During autotuning, the drive executes an internal tuning algorithm and sets appropriate gains automatically. The user sets the desired tuning command parameters and selects the Start Autotune button to begin autotuning.

ATTENTION: The motor shaft moves during the tuning process! Refer to the appropriate Hardware and Installation manual listed in Additional Resources on page 12 for tuning details.

The following parameters, status and commands apply to this window.

Parameter	Description
Autotune Settings	
Autotuning Direction	The direction in which the motor rotates during tuning: • Bi-Directional, • Forward Only, or • Reverse Only.
Maximum Distance	The maximum distance the motor turns when performing autotuning. The autotune distance should be set as large as the application permits, so that the autotune algorithm is able to collect sufficient data to compute new tuning gains. It must be ≥ 0.
Maximum Velocity	The maximum turning velocity of the motor during autotuning. It has a range of 1…100% of maximum motor velocity.
Step Current	The current the drive will command when performing autotuning. The autotune current is normally set at 10% of the motor rated peak current, but may need to be increased in the presence of large inertias or high friction. In these systems, higher settings will make sure that the autotune algorithm will be able to collect sufficient data to compute new tuning gains. It has a range of 1…100%.

Parameter	Description
Bandwidth Filter	Enabled: sets the autotuning algorithm to the Velocity Loop Bandwidth parameter appropriately for the Velocity Loop P-Gain value. Disabled: sets the Bandwidth to zero, or no filtering.
Velocity I Gain	Enabled: sets the autotuning algorithm to the Velocity Loop IGain parameter. Disabled: sets the IGain to zero.
Response	This property determines how tight the drive is tuned. A value of 2 indicates a critically damped system. Values between 0.7 and 1.4 generally result in desirable results. It has a range from 0…2.

The following status is displayed by default for an Ultra5000 drive in the Autotuning window of the Tuning branch.

Status	Description
Autotuning State	Describes the current state of the autotuning process, as follows: • Idle, when tuning is inactive, or has completed successfully. • Running, while the drive is moving the motor to determine the response. • Complete, when the autotuning algorithm has completed successfully. (Note, this status displays momentarily, before returning to the idle state.) • Failed, when the autotuning algorithm was unable to finish.
Total Inertia	For rotary motors, the total moving inertia of the motor and attached load, as calculated by the autotuning algorithm.
Total Motion Mass	For linear motors, the total moving mass of the motor and attached load, as calculated by the autotuning algorithm.
Velocity Regulator Gains	
P	Proportional gain for the velocity loop. Must be >= 0. Note: Increasing the P gain improves response time and increases the “stiffness” of the system. Too high a P gain value causes instability; too low a P gain value results in “loose” or “sloppy” system dynamics.
I	Integral gain for the velocity loop. Must be >= 0. Note: I gain improves the steady-state velocity performance of the system. Increasing the integral gain generally increases the ultimate positioning accuracy of the system. However excessive integral gain results in system instability.
FF	Acceleration feedforward gain. Must be >= 0. Note: FF gain reduces velocity following error. However, high values can cause velocity overshoot.
Bandwidth	Lowpass output filter bandwidth. Valid values range from 0…2000 Hz. Note: Bandwidth reduces noise generated by encoder resolution or mechanical resonance in the system. Setting to zero disables filtering.
Lower Limit	Input the maximum positive current the drive may output to the motor, in amperes. Must be >= 0.
Upper Limit	Input the maximum positive current the drive may output to the motor, in amperes. Must be >= 0.

Status	Description
Position Regulator Gains	
Kp	Proportional gain for the position loop. Must be >= 0. Note: Increasing the Kp gain improves response time and increases the "stiffness" of the system. Too high a Kp gain value causes instability; too low a Kp gain value results in "loose" or "sloppy" system dynamics.
Kpz	Proportional gain for the position loop, when the position error falls within the Kpz Zone (defined below). Must be >= 0.
Kpz Zone	Enter the region, in counts, around Command Position where Kpz will be used in place of Kp as the position loop proportional gain value. Must be >= 0.
Ki	Integral gain for the position loop. Must be >= 0. Note: Ki gain improves the steady-state positioning performance of the system and virtually eliminates steady-state positioning errors. Increasing the integral gain generally increases the ultimate positioning accuracy of the system. However excessive integral gain results in system instability.
Ki Zone	Enter the region, in counts, around Command Position where integral gain is active. Must be >= 0.
Kff	Velocity feedforward gain for the position loop. Must be >= 0. Note: Kff gain reduces position following error. However high values can cause position overshoot.

These commands can be executed on an online drive using the Autotuning window of the Tuning branch.

Command	Description
Start Autotune	Begins autotuning.
Clear Faults	Attempts to clear all drive faults.

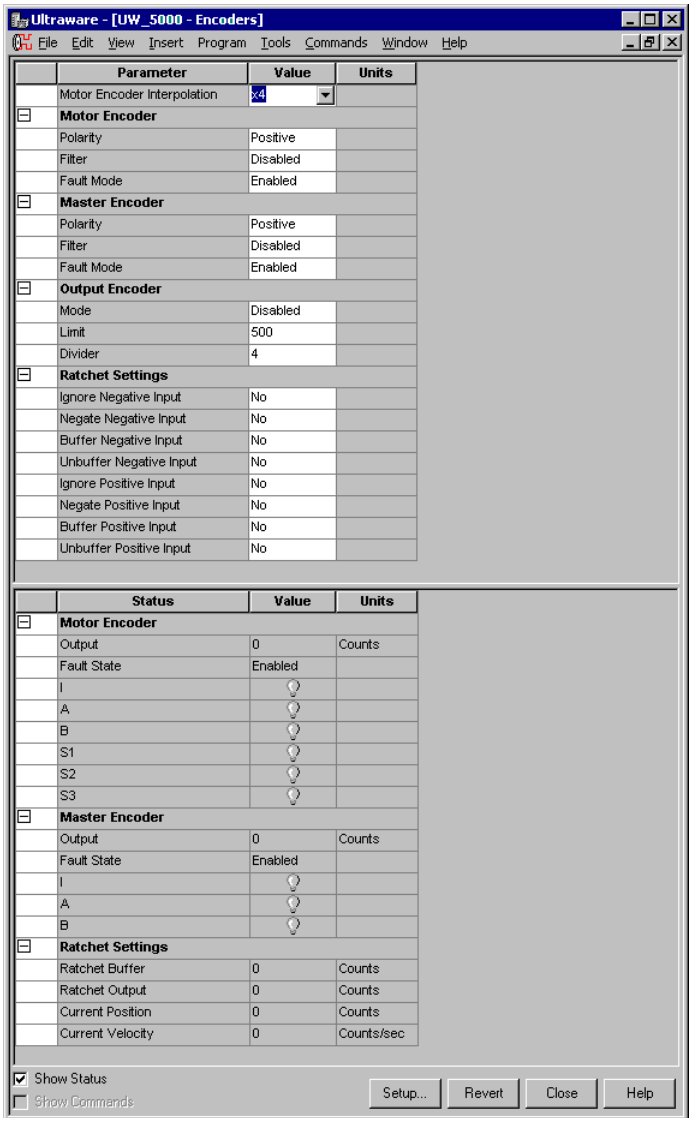
TIP Closing this window results in a display message stating:
This will return the drive to its normal operating mode. The drive will be software disabled to prevent unexpected motion. Select the drive in the workspace and execute the Commands/Enabled menu (or click the Enable toolbar button) to re-enable the drive.

Customize the Autotuning window for your Ultra5000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to access the Monitor Setup window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Encoders Window

The Properties window for the Encoders branch looks like this.



Use the Encoders window to configure a motor encoder and master encoder.

You can edit parameters for both an online and an offline Encoders branch. However, you can monitor status only for an Encoders branch that is the child of an online drive.

The following parameters can be entered and edited in the Encoders window.

Parameter	Description
Motor Encoder Interpolation:	The amount of interpolation to be used with sine/cosine encoders: • 4 • x8 • x16 • x32 • x64 • x128 • x256 • x512 • x1024 For example, if a Stegmann encoder outputs 1024 cycles per revolution and Encoder interpolation is set to x256, the drive will use 262144 (1024 x 256) counts per revolution as the effective feedback.
Motor Encoder	
Polarity	The Motor Encoder's polarity: • Positive – turning the motor in a clockwise direction (as viewed from the shaft end) increases the feedback position (in counts). • Negative – turning the motor in a clockwise direction (as viewed from the shaft end) decreases the feedback position (in counts).
Filter	The state of the motor encoder filter: • Disabled • Enabled Note: The filter reduces the upper limit of the rate at which feedback pulses are recognized. You man need to enable feedback in a noisy environment, or when a long encoder cable is used.
Fault Mode	The state of fault checking for the motor encoder at powerup: • Disabled • Enabled
Master Encoder	
Polarity	The Master Encoder's polarity: • Positive – turning the motor in a clockwise direction (as viewed from the shaft end) increases the feedback position (in counts). • Negative – turning the motor in a clockwise direction (as viewed from the shaft end) decreases the feedback position (in counts).
Filter	The state of the master encoder filter: • Disabled • Enabled Note: The filter reduces the upper limit of the rate at which feedback pulses are recognized. You man need to enable feedback in a noisy environment, or when a long encoder cable is used.
Fault Mode	The state of fault checking for the master encoder at powerup: • Disabled • Enabled

Parameter	Description
Output Encoder	
Mode	Specify how to configure the auxiliary encoder connection of the drive: Disabled: The auxiliary encoder connection is used as an input. The Aux Encoder firmware object contains the position as read from the input. Hardware: The auxiliary encoder connection are used for output. The Encoder Output object is configured to directly pass the motor encoder position to the output as well as the Aux Encoder firmware object. Software: The auxiliary encoder connection is used for output. The Encoder Output object is configured to pass the software filtered motor encoder position to the output as well as the Aux Encoder firmware object. The Divider and Limit properties, listed below, are used to perform the filtering in this mode.
Limit	Maximum Output Frequency: The encoder output frequency limit. Note: This parameter is active only if Software is selected as the Output Mode.
Divider	Type the amount of division used for generating output encoder signals. For example, if the Divider is set to 4, the encoder output frequency is 1/4th the encoder input frequency. Note: This parameter is active only if Software is selected as the Output Mode.
Ratchet Settings	If Yes is set:
Ignore Negative Input	Negative direction master encoder input generates NO motor movement.
Negate Negative Input	Master encoder input in a negative direction generates motor movement in a positive direction. Note: Selecting Ignore Negative Input, above, overrides this selection.
Buffer Negative Input	Negative direction master encoder input is accumulated in a buffer without generating motor movement. Note: This selection is often used together with Unbuffer Positive Input, below.
Unbuffer Negative Input	Negative direction master encoder input is used first to reduce the accumulated positive directional buffer then, only after this buffer is reduced to zero, does it generate motor movement in the negative direction. Note: This assumes Buffer Negative Input, above, is not selected.
Ignore Positive Input	Positive direction master encoder input generates NO motor movement.

Parameter	Description
Negate Positive Input	Master encoder input in a positive direction generates motor movement in a negative direction. Note: Selecting Ignore Positive Input, above, overrides this selection.
Buffer Positive Input	Positive direction master encoder input is accumulated in a buffer without generating motor movement. Note: This selection is often used together with Unbuffer Negative Input, above.
Unbuffer Positive Input	Positive direction master encoder input is used first to reduce the accumulated negative directional buffer then, only after this buffer is reduced to zero, generates motor movement in the positive direction. Note: This assumes Buffer Positive Input, above, is not selected.

The following status is displayed by default for an Encoders branch of an online drive.

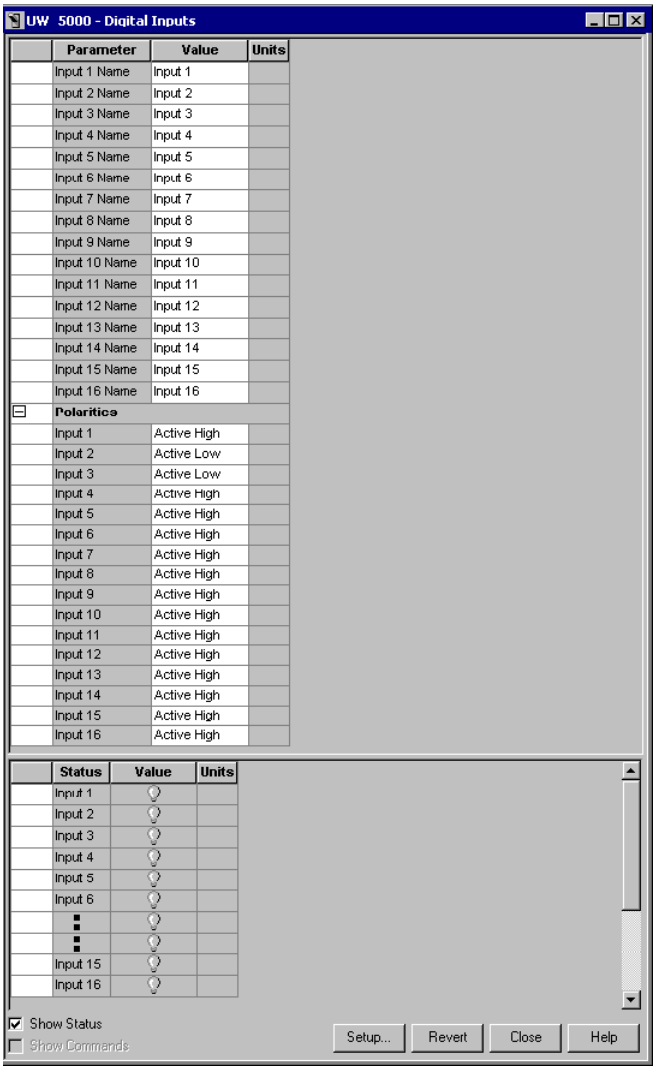
Status	Description
Motor Encoder	
Output	The motor encoder's output, in counts
Fault State	The current state of fault checking for the motor encoder
I	The motor encoder's index
A	The motor encoder's Channel A
B	The motor encoder's Channel B
S1	The motor encoder's Hall Input 1
S2	The motor encoder's Hall Input 2
S3	The motor encoder's Hall Input 3
Master Encoder	
Output	The master encoder's output, in counts.
Fault State	The current state of fault checking for the master encoder
I	The master encoder's index
A	The master encoder's Channel A
B	The master encoder's Channel B
Ratchet Settings	
Ratchet Buffer	The accumulated value, in counts, stored in the buffer when negative or positive input is set to buffer or unbuffer. This value is automatically re-set to zero at drive powerup.
Ratchet Output	The position, in counts, generated by the ratchet. This value is automatically re-set to zero at drive powerup.
Current Position	The position, in counts, generated by the ratchet. This value is automatically reset to zero at powerup.
Current Velocity	The velocity command, in counts per second, generated by the ratchet.

Customize the Encoders window for your Ultra5000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Digital Inputs Window

The Properties window for the Digital Inputs branch looks like this.



Use the Digital Inputs window to name, and monitor the status of up to sixteen digital inputs.

You can edit parameters for both an online and an offline Digital Inputs branch. However, you can monitor status settings only for a Digital Inputs branch that is the child of an online drive.

The following parameters can be entered and edited in the Digital Inputs window.

Parameter	Description
Input 1 – 16 Name	Type in the name of the input. The default value is a number from 1 to 16.
Input 1 – 16 Polarities	The desired polarity for each input. • Active High: The input is considered "on" when a positive voltage is detected at the input. • Active Low: The input is considered "on" when no voltage is detected at the input. This is especially useful when configuring an input as a hardware limit, with a normally closed switch. In this case, setting the input's polarity to Active Low opens the switch when the limit is hit, which causes the drive to detect the hard limit.

The following display is the default status for a Digital Inputs branch of an online drive.

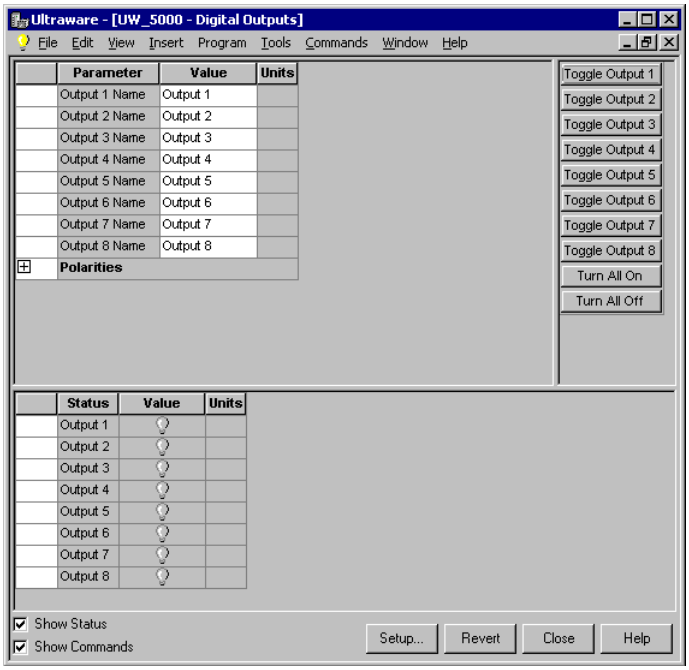
Status	Description
Input 1 – 16 State	The current state, or condition, of each digital input is depicted by a light bulb icon, as follows: • ON: A bright light bulb • OFF: A darkened light bulb.

Customize the Digital Inputs window for your Ultra5000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Digital Outputs Window

The Properties window for the Digital Outputs branch looks like this



Use the Digital Outputs window to name, monitor, and toggle the status of the eight digital outputs.

You can edit parameters for both an online and an offline Digital Outputs branch. However, you can monitor status, and execute direct commands (executed through the Ultraware interface, rather than through a compiled, loaded and executed program) only for a Digital Outputs branch that is the child of an online drive.

The following parameters can be entered and edited in the Digital Outputs window.

Parameter	Description
Output 1 – 8 Name	Type in the name of the output. The default value is a number from 1 to 8.
Output 1 – 8 Polarities	The desired polarity for each output. Active High: The output is turned ON by applying a positive voltage to the output. Active Low: The output is turned ON by setting the voltage at the output to zero.

The following display is the default status for a Digital Outputs branch of an online drive.

Status	Description
Output 1 – 8 State	The current state, or condition, of each digital output is depicted by a light bulb icon, as follows: • ON: A bright light bulb • OFF: A darkened light bulb.

The following commands can be executed in the Digital Outputs window of an online drive.

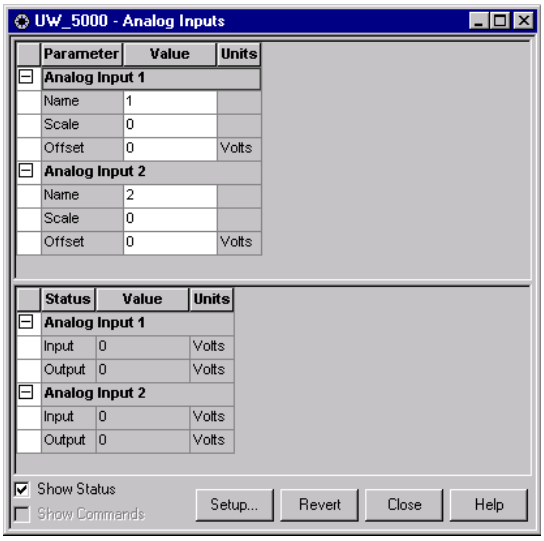
Command	Description
Toggle Output 1 – 8	Changes the state of the selected digital output from ON to OFF, or OFF to ON.
Turn All On	Transitions all Output to ON.
Turn All Off	Transitions all Output to OFF.

Customize the Digital Outputs window for your Ultra5000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Analog Inputs Window

The Properties window for the Analog Inputs branch looks like this.



Use the Analog Inputs window to:

- name two (2) analog inputs
- set the scale (gain adjustment) and offset for each analog input
- monitor the status of each analog input

You can edit parameters for both an online and an offline Analog Inputs branch. However, you can monitor status settings only for an Analog Inputs branch that is the child of an online drive.

The following parameters can be entered and edited in the Analog Inputs window.

Parameter	Description
Name	The name of the input.
Scale	A value multiplied by the Output 1 (or 2) Input voltage value.
Offset	A value added to the product of the Gain multiplied by the Output 1 (or 2) Input voltage value.

The following status is displayed by default for an Analog Inputs branch of an online drive.

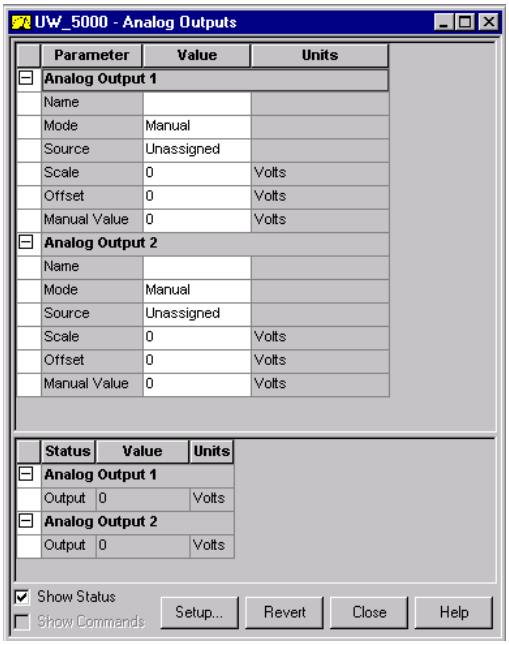
Status	Description
Input	The scaled value of the analog Input 1 (or Input 2). This value equals the voltage read at the analog input multiplied by the gain value, summed with the offset.
Output	The scaled value of the analog Output 1 (or Output 2). This value equals the voltage read at the analog input multiplied by the gain value, summed with the offset.

Customize the Analog Inputs window for your Ultra5000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Analog Outputs Window

The Properties window for Analog Outputs looks like this.



Use the Analog Outputs window to:

- name two (2) analog outputs
- configure the operation of each analog output, including its respective gain and offset
- manually set the voltage for each analog output, and
- monitor the status of each analog output

You can edit parameters for both an online and an offline Analog Outputs branch. However, you can monitor the status only for an Analog Outputs branch that is the child of an online drive.

The following parameters can be entered and edited in the Analog Outputs window.

Parameter	Description
Name	The name of the analog output.
Mode	The mode of the analog output. • Manual – The voltage at the output is determined by the Manual Value setting of the output, along with its scale and offset. • Auto – The voltage at the output is determined by the Source setting of the output, along with its scale and offset.
Source	The drive parameter whose value determines the output voltage when in Auto mode.

Parameter	Description
Scale	A value multiplied by the Output 1 (or 2) Input voltage value.
Offset	A value added to the product of the Gain multiplied by the Output 1 (or 2) Input voltage value.
Manual Value	The voltage value input to the Analog Output when in Manual mode, before the Scale and Offset values are applied.

The following status is displayed by default for an Analog Inputs branch of an online drive.

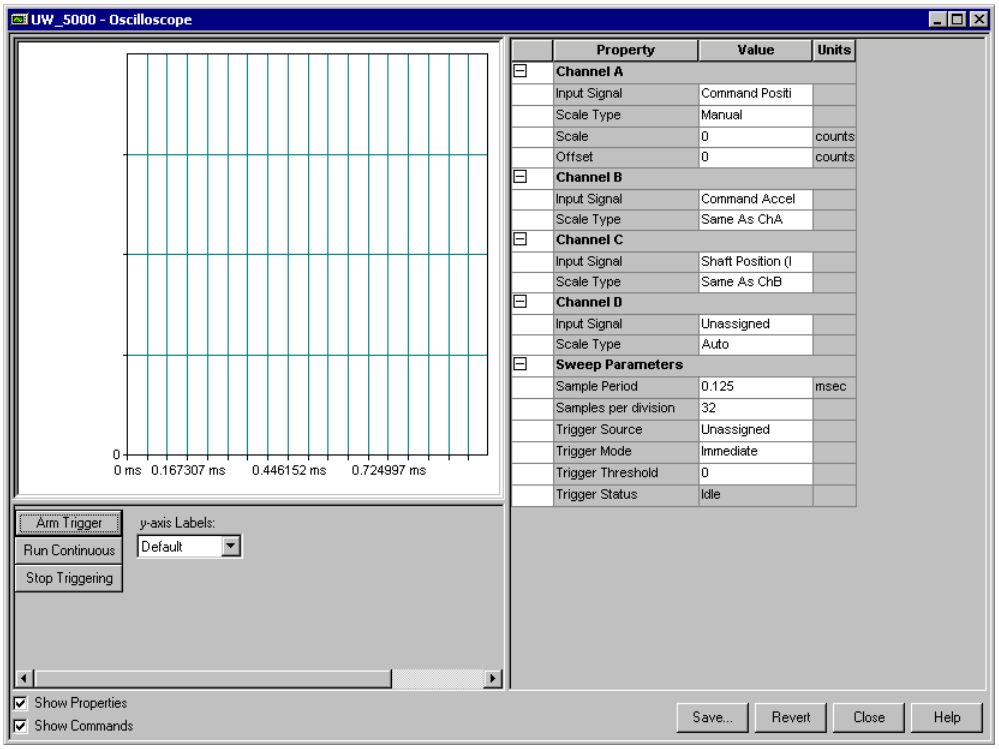
Status	Description
Output	The Analog Output 1 (or 2) output voltage value after the Scaled and Offset values are applied.

Customize the Analog Outputs window for your Ultra5000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Oscilloscope Window

The Properties window for the Oscilloscope looks like this



Use the Oscilloscope window to trace one of four drive signals by:

- Configuring the oscilloscope by selecting a the drive signal to trace.
- Executing commands that run the oscilloscope's tracing function continuously or in response to the configured trigger.
- Monitoring the oscilloscope as it traces the selected drive signal.

The Oscilloscope window has these parameters and commands associated with it.

Parameter	Description
Channel A, B, C and D	
Input Signal	Assign a drive signal to the selected Channel (A, B, C or D) from the Channel Setup dialog box that opens when you click the down arrow to the right of this input box. Note: The resolution of this signal may be confusing if Velocity Feedback is selected. See the topic Velocity Motor Feedback Resolution for information on how resolution is derived for various motor and feedback combinations.
Scale Type	Scale Types are: • Auto • Manual • Same As ChA (available for Channels B,C and D) • Same As ChB (available for Channels C and D) • Same as ChC (available for Channel D only)

Parameter	Description
Scale	The amplitude of the selected channel input signal that can be displayed between gridlines of the oscilloscope, in the units of the drive signal. It is dependent on the signal selected. If the Scale is left at its default value of 0, The data is autoscaled to fit the graph. Note: Visible only if Scale Type is Manual.
Offset	The trace offset for the selected Channel Input. Its range depends on the signal selected. A value of zero places the zero value of the signal at the middle grid line. A nonzero offset shifts the trace up or down so that the offset value is positioned at the middle grid line. Note: Visible only if Scale Type is Manual.
Sweep Parameters	
Sample Period	The time, in milliseconds, between samples that constitute a trace. The horizontal resolution of the oscilloscope is 128 samples. (For example, selecting a sample period of 1.0 ms results in 128 mS of data being displayed.) Note: The Sample Period has a resolution of 0.125 ms.
Samples per Division	Number of samples per division. For example, 32 samples per division results in 4 horizontal divisions.
Trigger Source	The drive signal that sets off the trigger and begins tracing the selected channel signal, upon the occurrence of the Trigger Mode at the Trigger Threshold. See Input Signal for a list of available Trigger Source selections.
Trigger Mode	Event trigger for oscilloscope tracing: • Immediate: begins tracing immediately when the selected drive signal becomes active. • Rising Edge: begins tracing when the selected Trigger Source value increases above the Trigger Threshold value. • Falling Edge: begins tracing when the selected Trigger Source value decreases below the Trigger Threshold value.
Trigger Threshold	The value of the Trigger Source drive signal that begins tracing. Trigger Mode selections are: • Rising Edge • Falling Edge.
Trigger Status	The current status of the oscilloscope trigger: • Idle • Awaiting Trigger • Collecting Data
Oscilloscope Display	
Y-axis Labels	Labels to display on the y-axis: • Default – One reference point for each channel is displayed. • Channel A • Channel B • Channel C • Channel D
Legend	Displays the color of the trace for each input signal or channel. Click the color rectangles displayed in the legend to modify a color.

The following commands can be executed for the Oscilloscope window of an online drive.

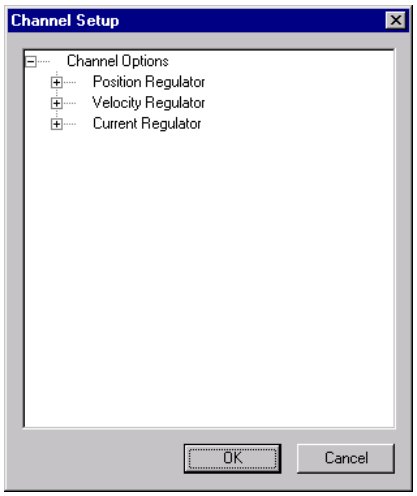
Command	Description
Arm Trigger	Turns the oscilloscope trigger ON.
Run Continuous	Runs the oscilloscope continuously, circumventing the trigger.
Stop Triggering	Turns the oscilloscope trigger OFF.

Customize the Oscilloscope window for your Ultra5000 Drive by selecting one or more of these commands:

- Click Show Properties to display or hide the Properties pane.
- Click Show Commands to display or hide the Commands pane.
- Click Save to save the oscilloscope data to a tab delimited file on your PC, which can be read by spreadsheet or presentation software. Information saved includes the Oscilloscope data points from one or more channels.
- Click Revert to return parameter settings to the values they held when you opened this window.

Channel Setup Window

The collapsed Properties window for the Channel Setup looks like this



Use this window to:

- Assign a specific Input Signal to the selected Channel in the Oscilloscope window for an Ultra5000 drive, or
- Assign no Input Signal to the selected channel in the Oscilloscope window for an Ultra5000 drive.

Much like the Monitor window, this window lets you customize the display for the selected online Ultra5000 drive. The window displays a tree diagram with all the status settings that can be monitored for the selected drive.

Channel Option
Position Regulator
Command Position (PReg)
Command Velocity (PReg)
Feedback Position (PReg)
Error (PReg)
Output (PReg)
Tune Command (PReg)
Tune Feedback (PReg)
Velocity Regulator
Command Position (VReg)
Command Velocity (VReg)
Feedback Position (VReg)
Error (VReg)
Output (VReg)
Tune Command (VReg)
Tune Feedback (VReg)
Current Regulator
Shaft Position (IReg)
Shaft Angle (IReg)
Sine (IReg)
Cosine (IReg)
Loop Gain (IReg)
Average Current (IReg)
U Phase Current (IReg)
W Phase Current (IReg)
U Phase Voltage (IReg)
V Phase Voltage (IReg)
W Phase Voltage (IReg)
Torque Command (IReg)
Torque Feedback (IReg)
Torque Error (IReg)
Torque Output (IReg)
Field Feedback (IReg)
Field Error (IReg)
Field Output (IReg)

To assign a specific input signal, or status, to the selected channel:

1. Click one or more + (plus) signs to open the tree control to the desired branch.
2. Place a check mark in the box next to the desired input signal, or status.
3. Click OK to display the selected input signal as the channel in the Oscilloscope window.

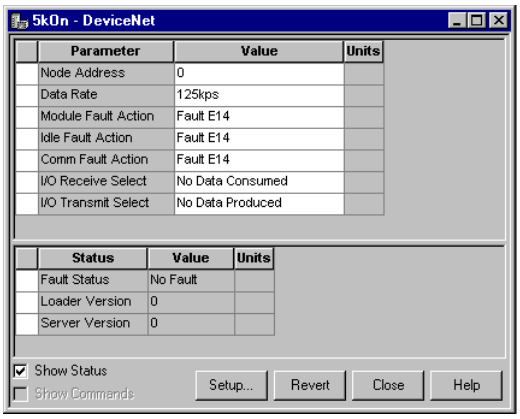
To assign no input signal, or status, to the selected channel:

1. Be sure no check marks appear next to any input signal, or status.
2. Click OK.

   The word Unassigned appears in the selected Channel in the Oscilloscope window.
3. Click OK to display Unassigned as the channel in the Oscilloscope window.

Understanding Ultra5000 with DeviceNet

The Properties window for DeviceNet looks like this.



Use the DeviceNet window to:

- configure a Ultra5000 drive with the Node Address = PGM, and
- define message formats to transmit and receive.

The DeviceNet window has these parameters and statuses.

Parameter	Description
Node Address	Node address used for DeviceNet communication. This value is only used if the rotary switch on the front panel is configured for PGM.
Data Rate	Data rate used for DeviceNet communication. This value is only used if the rotary switch on the front panel is configured for PGM. The options are: • 125 kps • 250 kps • 500 kps • Autobaud
I/O Receive Select	Selects the output (consumed) assembly that is updated when a polled, change of state, or cyclic I/O message is received by the drive. The options are: • No Data Consumed • Assembly Instance 1 • Assembly Instance 2 • Assembly Instance 3 • Assembly Instance 4 • Assembly Instance 5 • Assembly Instance 6 • Assembly Instance 7 • Assembly Instance 8 Note: Refer to the Ultra5000 IPD with DeviceNet Reference Manual, publication 2098-RM002 (Ultra5000 IPD with DeviceNet Reference Manual, publication 2098-RM002) for information on these options.

Parameter	Description
I/O Transmit Select	Selects the input (produced) assembly that is transmitted by the drive over a polled I/O messaging connection. The options are: • Assembly Instance 9 • Assembly Instance 10 • Assembly Instance 11 • Assembly Instance 12 • Assembly Instance 13 • Assembly Instance 14 • Assembly Instance 15 • Assembly Instance 16 Note: Refer to the Ultra5000 IPD with DeviceNet Reference Manual, publication 2098-RM002 (Ultra5000 IPD with DeviceNet Reference Manual, publication 2098-RM002) for information on these options.
Faults:	
Module Fault	Determines the action the drive should take if it can not communicate with the DeviceNet module. The options are: • DeviceNet Fault E14 • Ignore Note: Refer to the Ultra5000 IPD with DeviceNet Reference Manual, publication 2098-RM002 (Ultra5000 IPD with DeviceNet Reference Manual, publication 2098-RM002) for information on these options.
Idle Fault	Determines the action the drive should take if the master sends a zero length I/O message to the drive, which may occur if a PLC (master) is set to program mode. The options are: • DeviceNet Fault E14 • Ignore Note: Refer to the Ultra5000 IPD with DeviceNet Reference Manual, publication 2098-RM002 (Ultra5000 IPD with DeviceNet Reference Manual, publication 2098-RM002) for information on these options.
Comm Fault	Determines the action the drive should take if the drive detects a network failure while an I/O messaging connection is active. The options are: • DeviceNet Fault E14 • Ignore Note: Refer to the Ultra5000 IPD with DeviceNet Reference Manual, publication 2098-RM002 (Ultra5000 IPD with DeviceNet Reference Manual, publication 2098-RM002) for information on these options.

The following status is displayed by default for an Ultra5000 drive in the DeviceNet window.

Status	Description
Fault Status	Indicates the last module's fault status. This value defaults to No Fault on powerup and reset. The status are: • No Fault • Idle Fault • Comm Fault
Loader Version	Indicates the current version of DNetLoad.exe
Server Version	Indicates the current version of DnetServ.exe

No commands are associated with the DeviceNet window.

Customize the DeviceNet window for your Ultra5000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Monitoring Your Ultra5000 Drive

The Monitor tool lets you display all or any combination of drive status settings for a selected Ultra5000 online drive. The Monitor tool works just like the status pane of a branch's Properties window.

Use this window to:

- Display the status settings that have been selected for display in the Monitor Setup window.
- Open the Monitor Setup window, in which you can display the drive status.

This window has these commands.

Command	Description
Format	The format for displaying integer values in the monitor: • Decimal • Binary • Hexadecimal
Load	Opens the Monitor Load dialog box, where you can: • Load a previously saved monitor from the list. • Delete an existing monitor from the list. • Save as default an existing monitor to automatically load each time you open the Monitor window.
Save	Opens the Monitor Save dialog box, where you can: • Save a monitor, under a new or existing name, for later use. • Delete an existing monitor from the list. • Save as default an existing monitor to automatically load each time you open the Monitor window.
Reset Peaks	Resets peak value parameters to zero. For example, Position Error Peak -, Position Error Peak +, Current Peak -, Current Peak +.
Setup	Opens the Monitor Setup window, where you can display the drive status. Refer to Ultra5000 Status on page 199 for a detailed list of drive status selections.

To monitor your drives, perform these steps.

1. Double-click the Monitor icon in the Workspace window. The Monitor window appears in the Client Area.
2. Click Setup to open the Monitor Setup window as shown on page 197. You can customize the display of the Monitor window for the selected online Ultra5000 drive. The window displays a tree diagram with all the status settings that can be monitored for the selected drive.

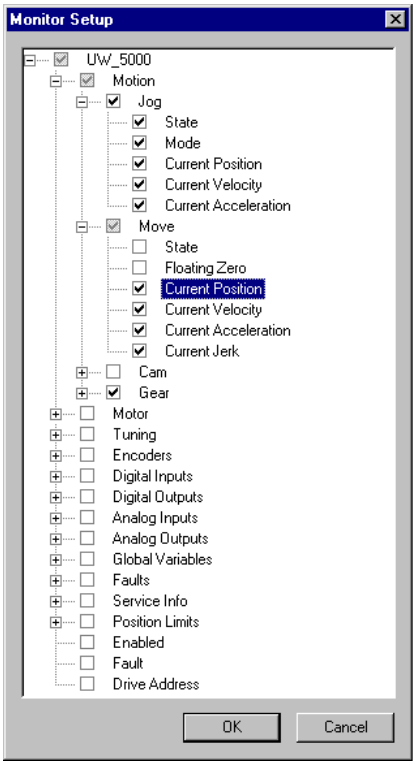
   Refer to Ultra5000 Status on page 199 for a detailed list of drive status selections.

- Place a check mark in the checkbox to the left of a status item to monitor it.

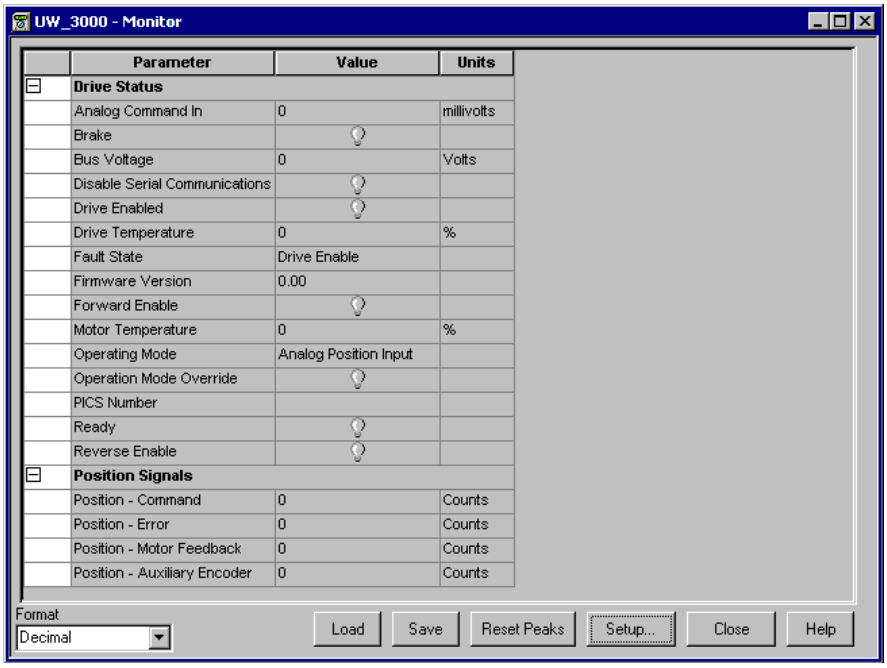
TIP If you place a check mark beside a parent item, all its child items become checked and their status is displayed.

If you remove a check mark from a parent item, check marks are removed from all its child items and their status are not displayed.

If you place a check mark next to some, but not all, child items, the parent item is checked, but dimmed.



3. The Monitor window now displays all the selected statuses:



Ultra5000 Status

The following Ultra5000 drive status and position loop settings can be displayed in the Monitor window as shown below.

Status
UW_5000 (Drive)
Enabled
Fault
Jog
State
Mode
Current Position
Current Velocity
Current Acceleration
Move
State
Floating Zero
Current Position
Current Velocity
Current Acceleration
Current Jerk
Cam
State
Cycle Count
Input Position
Input Velocity
Current Position
Current Velocity
Current Accel
Index
Offset
File Name
File Loaded
Mode
Count
Order
Length
Offset
Gear
Gear Enabled
Offset

Status
Current Position
Current Velocity
Current Acceleration
Slew
State
Current Gear Ratio
General
Motor Flag
Motor Type
Torque Constant
Inertia
Poles/Revolution
Integral Limits
Electrical
Rated Voltage
Resistance
Inductance
Flux Saturation 1
Flux Saturation 2
Flux Saturation 3
Flux Saturation 4
Flux Saturation 5
Flux Saturation 6
Flux Saturation 7
Flux Saturation 8
Ratings
Maximum Speed
Intermittent Current
Continuous Current
Feedback
Encoder
Commutation
Sinusoidal Startup
Hall Input Offset
Lines/Meter (Linear), or Lines/Revolution (Rotary)
Thermal
Integral Thermostat
Software Protection

Status
Rth(w-e)
Cth(w-e)
Rth(w-a)
Cth(w-a)
Autotuning
Autotuning State
Total Inertia
Total Motion Mass
Velocity Regulator Gains
P
I
FF
Bandwidth
Upper Limit
Lower Limit
Position Regulator Gains
Kp
Kpz
Kpz Zone
Ki
Ki Zone
Kff
Motor Encoder
Output
Fault State
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A
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S1
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Ratchet Buffer

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Analog Output 1 and 2
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5: IPM Fault
9: Bus Undervoltage
10: Bus Overvoltage
11: Illegal Hall State
17: User Current
18: Overspeed
19: Following Error
20: Motor Encoder State
21: Auxiliary Encoder State
22: Motor Filter
23: Thermal Protect Filter
24: Velocity Error
26: User Velocity
29: Excessive Output Frequency
34: Ground Short Circuit
35: Soft-Starting Fault
36: Power Module Overtemperature
39: Self Sensing Startup Error
58: Excessive CPU Load
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Boot Firmware Version
FPGA Version

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Rated Current
Peak Current
Service Clock
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State
Positive Soft Limit
Negative Soft Limit
Positive Hard Limit
Negative Hard Limit
Positive Motor Limit
Negative Motor Limit

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Command Position
Command Velocity
Command Acceleration
Feedback Position
Error
Error Sum
Output
Tuning State
Command Offset
Feedback Offset
Velocity Loop
Command Velocity
Command Acceleration
Feedback Velocity
Error
Error Sum
Output
Tuning State
Velocity Loop
Command Velocity
Command Acceleration
Feedback Velocity

Position Loop (Continued)
Error
Error Sum
Output
Tuning State
Current Loop
User Current Fault
User Current Fault Enable
Average Current
Torque Command
Torque Error
Torque Feedback
Torque Output

Understanding the Programs Branch

The Programs branch contains executable program (.exe) files the Ultra5000 drive can run. It can be found in the Workspace window's On-Line Drives branch or an Ultraware file. If the Programs branch is in:

- the On-Line Drives branch, the Programs branch serves as a platform from which you can run a selected child executable program (.exe) file by issuing the Run, Stop and Kill commands.
- an Ultraware file, the Programs branch is merely a container for its child executable program (.exe) files.

IMPORTANT An executable program (.exe) file is created for a Project in an Ultraware file in the Workspace window using the Build command, it must be moved to the Programs branch of an On-Line drive before it can be executed.

You can copy the Programs branch and paste it into another Ultra5000 drive. Because a drive can contain only one Programs branch, pasting a Programs branch into a drive overwrites and replaces the recipient drive's pre-existing Programs branch.

Understanding the Archives Branch

The Ultra5000 drive's Archives branch is a container that can hold these types of files:

- A Project file, including its child header files and source files
- An individual header file
- An individual source file

TIP You cannot copy an executable program file to an Archives branch.

The Archives branch lets you attach project, source and header files to a drive so they follow the drive and are available to troubleshoot or recompile your program.

The Archives branch has no parameters or statuses. Except for Paste, no other commands are associated with this item.

Understanding the Files Branch

The Ultra5000 drive's Files branch is a container that can hold any file:

The Files branch accesses drive memory to store electronic files.

The following direct commands can be executed from the Files branch.

Command	Description
Add New	Lets the user to copy a file to memory in the local drive.

Right-click a file in the Files branch, and then click Export from the pop-up menu to display the The Save As dialog box. This lets you to save a file from the Ultra5000 drive to a storage device.

Clicking with the right mouse button also lets you to access the Cut, Copy, and Delete commands.

Understanding the Global Variables Branch

The Ultra5000 drive's Global Variables container, or branch, holds all the Global Variables that have been declared for the parent online or offline Ultra5000 drive.

A Global Variable is created using the Insert Variable command. The name and value parameters of a Global Variable can be edited in the Global Variable window.

You can copy the Global Variables container and paste it into another Ultra5000 drive. Because a drive can contain only one Global Variables container, pasting a Global Variables container into another drive overwrites and replaces the recipient drive's pre-existing Global Variables container.

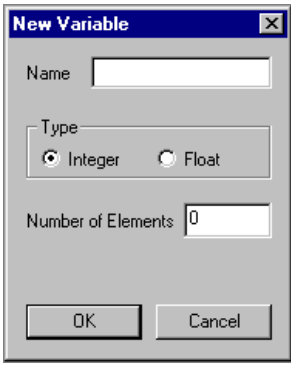
The Global Variables container has no parameters or statuses. Except for the Insert Variable, and Paste commands, no other commands are associated with the Global Variables container.

Creating a new Global Variable

To create a new Global Variable, perform these steps.

1. Click the Global Variables branch for an Ultra5000 drive in the Workspace window.
2. Click Variable in the Insert menu (or place the cursor on the Global Variables branch and right-click Insert Variable from the pop-up menu).

   The New Variable dialog box opens.



3. Enter this information in the New Variable dialog box.

Property	Description
Name	Type the variable or array name.
Type	The variable type: • Long Int • Float
Number of Elements	Type an integer, from 1 to 200. The total number of elements from all global variables cannot exceed 8191.

IMPORTANT Ultraware software automatically assigns each global variable an instance number. When viewed online, the read-only field Array Instance N appears at the top of a global variable's properties window. This instance number must be used to access and use a global variable from a user-created program. The instance number can change when a global variable is copied or moved to another drive.

4. Click OK.

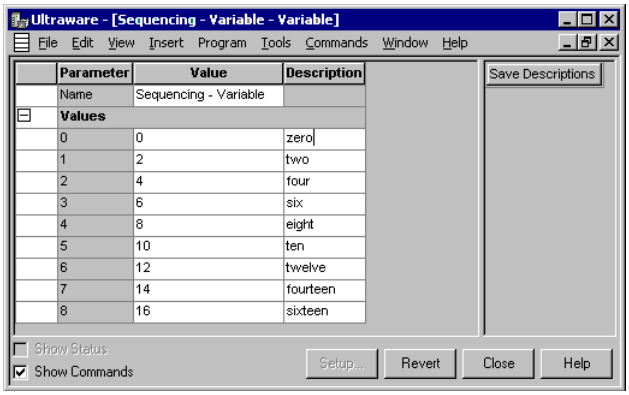
Once a Global variable has been created, its name appears in the Workspace window beneath the Global Variables branch.

Editing an Existing Global Variable

To edit a previously created Global Variable residing in the Workspace window, perform these steps.

- Click Properties in the Edit Menu.
- Right-click the Global Variable, and then click Properties from the pop-up menu.

The Global Variable window opens.



These parameters and commands apply to a Global Variable properties, and can be edited.

Parameter	Description
Array Instance N	(Only visible for online drives) The global variable's instance number. This is a read-only field. Note: This instance number must be used to access and use a global variable from a user-created program. This number can change when the global variable is copied or moved to another drive.
Name	The name of the Global Variable, as set in the New Variable dialog box.
Value	For a single element Global Variable, the assigned value of the variable and a short description of the variable.
Values	For a Global Variable array, with more than one element, this consists of a table with: • the element number (beginning with zero), • the assigned value of that element, and • a short description of the variable. Note: The total number of elements from all global variables cannot exceed 8191.
Commands	**Description**
Save Descriptions	Saves the description for each element of the Global Variable Array. Note: Descriptions are automatically saved when the Global Variable Property window is closed.

Click Revert to return parameter settings to the values they held when you opened this window.

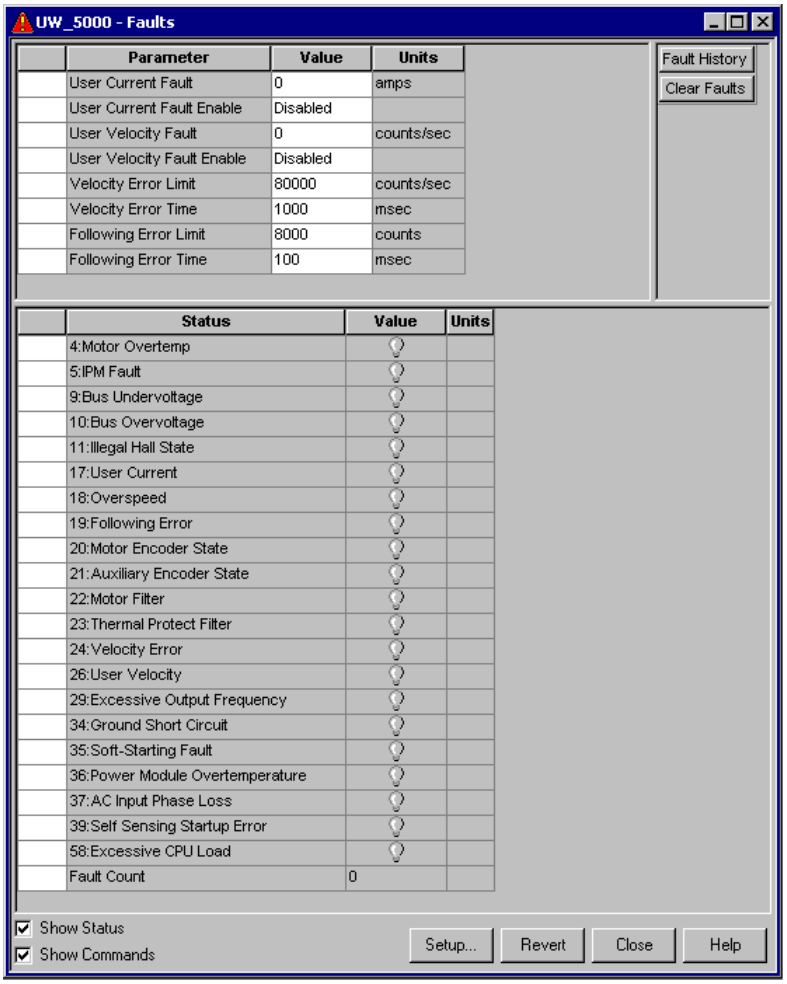
Click Close to save your settings and exit the Global Variable window.

You can copy the Global Variables container, including all its child variables, and paste it into another Ultra5000 drive. Because a drive can contain only one Global Variables container, pasting a Global Variables container into another drive ovewrites and replaces the recipient drive's pre-existing Global Variables container.

The Global Variables container has no parameters or statuses. Except for the New Variable, Copy, and Paste commands, no other commands are associated with the Global Variables container.

Understanding the Faults Window

The Properties window for the Faults branch looks like this.



Use the Faults window to:

- set fault limits,
- monitor fault statuses,
- execute the Clear Faults command,
- open a window where you can review the drive's fault history, and
- Enable and Disable user faults.

The Faults window has these parameters, status, and commands:

The following parameters can be entered and edited in the Faults window.

Parameter	Description
User Current Fault	The level, in amperes, that generates a fault when exceeded by the average current level. The drive always protects itself and the motor from average currents that exceed their ratings. This value is needed only if a lower average current fault is desired (For example, if another part of a machine would overheat).
User Current Fault Enable	The status of the User Current Fault detection: • Enabled: turns on User Current Fault detection by the drive, or • Disabled: turns off User Current Fault detection by the drive.
User Velocity Fault	The minimum velocity which causes the User Velocity fault. The drive always protects the motor from exceeding its ratings. This value is needed only if a lower velocity fault is desired. (For example, if another part of a machine could be damaged.)
User Velocity Fault Enable	The state of the User Velocity Fault: • Enabled: turns on User Velocity Fault detection by the drive, or • Disabled: turns off User Velocity Fault detection by the drive.
Velocity Error Limit	The minimum velocity error that triggers the Velocity Error fault.
Velocity Error Time	The minimum time which the velocity error must be greater than the Velocity Error Fault Limit to cause a Velocity Error fault.
Following Error Limit	The minimum position error that triggers the Following Error fault.
Following Error Time	The minimum time during which the position error must be greater than the Following Error Fault Limit to cause a Following Error fault.

The following status is displayed by default for the Faults branch of an online drive.

Status	Description	Possible Cause	Suggested Action
Note: The value of status that are 'ON' = 1. The value of status that are OFF = 0.			
04: Motor Overtemp	ON indicates the motor thermostat has tripped.	Motor thermostat trips due to high motor ambient temperature, excessive current, or both.	• Operate within (not above) the continuous torque rating for the ambient temperature (40°C maximum). • Lower ambient temperature, increase motor cooling.
		Motor wiring error	Check motor wiring.
		Incorrect motor selection	Verify the proper motor has been selected.

Status	Description	Possible Cause	Suggested Action
05: IPM Fault	ON indicates that a fault was detected in the Integrated Power Module which resides in the Ultra5000 drive.	Motor cables shorted	Disconnect motor power cables from the drive. If faults stop, then either replace cable or try to find the short.
		Motor winding shorted internally.	Verify by disconnecting motor from drive and then try to turn by hand. If difficult to turn by hand, the motor needs to be repaired or replaced.
		Ultra5000 temperature too high.	• Check for clogged vents or defective fan. • Ensure cooling is not restricted by insufficient space around the unit.
		Operation above continuous power rating.	• Verify ambient temperature is not too high. Operate within the continuous power rating. • Increase Motion Time or dwell periods. • Reduce acceleration rates.
		Ultra5000 has a bad IPM output, short circuit, or overcurrent,	Check continuity from the DC bus to U, V, and W outputs. If continuity exists, check for conductive materials between terminals.
09: Bus Undervoltage	ON indicates the DC Bus is below normal operating voltage.	Low AC line/AC power input. 100 VAC minimum for safe Ultra5000 operation.	• Verify voltage level of the DC Bus. The Bus should be 1.414*VAC level. • Check AC power source for glitches or line drop. • Install an uninterruptible power supply (UPS) on your VAC input.
	ON indicates the DC Bus is below normal operating voltage.	Excessive regeneration of power. When the drive is driven by an external mechanical power source, it may regenerate too much peak energy through the drive's power supply. The system faults to save itself from an overload.	• Change the deceleration or motion profile. • Use a larger system (motor and Ultra5000). • Use an Active Shunt.
		Excessive AC input voltage.	Verify input is below 264 VAC.

Status	Description	Possible Cause	Suggested Action
10: Bus Overvoltage		Output short circuit.	Disconnect the power line from the drive and then do continuity check from the positive and negative poles of the DC Bus to each of the motor output phases U,V, and W. If a continuity exists, check for wire fibers between terminals, or send drive in for repair.
		Motor cabling wires shorted together.	Disconnect motor power cables from the drive. If faults stop, then either replace cable or try to find the short.
		Internal motor winding short circuit.	Verify by disconnecting motor from drive and then try to turn by hand. If difficult to turn by hand, the motor needs to be repaired or replaced.
11: Illegal Hall State	ON indicates there is a problem with the motor's Hall Effect sensors.	Incorrect phasing.	Check the Hall phasing.
		Incorrect wiring	• Verify the Hall wiring. • Verify power supply to encoder.
17: User Current	ON indicates the User Current Fault level, input above, has been exceeded.	User-specified average current level exceeded.	• Increase User Current Level and Time to a less restrictive setting. • Increase motion time interval.
18: Overspeed	ON indicates the motor speed has exceeded 125% of maximum rated speed.	Motor exceeded 125% of the-specified maximum rated speed.	• Check cables for noise. • Check motor wiring; • Retune drive & motor combination. • Use an actual oscilloscope to check encoder phasing.
19: Following Error	ON indicates the Following Error Limit, set above, has been exceeded.	Position error limit exceeded.	• Retune the drive, starts by setting the feed forward gain to 100%. • Increase the Following Error Limit, above. • If in Follower Mode, increase the Slew Limit (in the Follower window).

Status	Description	Possible Cause	Suggested Action
20: Motor Encoder State	ON indicates the motor encoder encountered an illegal transition.	Motor encoder encountered an illegal transition.	• Replace the motor/ encoder. • Use shielded cables with twisted pair wires. • Route the feedback away from potential noise sources. • Check the system grounds. • Ensure digital filtering of encoder signals is enabled.
21: Auxiliary Encoder State	ON indicates the auxiliary encoder encountered an illegal transition.	Auxiliary encoder encountered an illegal transition	• Use shielded cables with twisted pair wires. • Route the encoder cable away from potential noise sources. • Bad encoder - replace encoder. • Check the ground connections.
		Set a time violation interval on a Step/ Direction or CW/CCW input command.	Check input timing to determine if the auxiliary encoder timing requirements are met.
22: Motor Filter	ON indicates the internal filter protecting the motor from overheating has tripped.	Motor overheated	• Reduce acceleration rates. • Reduce duty cycle (ON/OFF) of commanded motion. • Increase time permitted for motion. • Check system tuning. • Use larger Ultra5000 and motor.
23: Thermal Protect Filter	ON indicates the internal filter protecting the drive from overheating has tripped.	Drive overheated	• Reduce acceleration rates. • Reduce duty cycle (ON/OFF) of commanded motion. • Increase time permitted for motion. • Check system tuning. • Use larger Ultra5000 and motor.
		Operation above continuous power rating.	• Verify ambient temperature is not too high. Operate within the continuous power rating. • Increase Motion Time or dwell periods.
24: Velocity Error	ON indicates that the velocity error exceeds the Velocity Error Fault Limit for a length of time greater than the Velocity Error Fault Time value.	Velocity error limit exceeded.	• Increase Velocity Error Fault Limit or Velocity Error Fault Time value or both. • Reduce Acceleration. • Retune the drive.

Status	Description	Possible Cause	Suggested Action
26: User Velocity	ON indicates the User Velocity Fault level, above, has been exceeded.	User-specified velocity level exceeded.	• Increase User Velocity Fault Level and Time to a less restrictive setting.
29: Excess Output Frequency	ON indicates the motor encoder output frequency exceeds the maximum value. Note: This fault can be generated only when the encoder output is synthesized by the Ultra5000.	Encoder output frequency exceeds the maximum value.	• Increase the encoder output Limit parameter. • Decrease the encoder interpolation parameter. • Increase the encoder output divider parameter. • Reduce motor speed.
Fault Count	Displays the number of fault encountered.	—	—
34: Ground Short Circuit	ON indicates the motor ground is shorted	Wiring error	Check motor power wiring.
		Motor internal ground short	Replace motor.
		Internal malfunction	Disconnect motor power cable from drive and enable drive with current limit set to 0. If fault remains, call your A-B representative. If fault clears, a wiring error or an error internal to the motor exists.
35: Soft Starting Fault	ON indicates a soft fault at startup.	Low AC input voltage	Check AC input voltage on all phases.
		Internal malfunction	Call your A-B representative
36: Power Module Overtemperature	ON indicates an overtemperature condition in the power module.	Excessive heat in power circuitry.	• Reduce acceleration rates. • Reduce duty cycle (ON/OFF) of commanded motion. • Increase time permitted for motion. • Use larger Ultra5000 and motor.
37: AC Input Phase Loss	ON indicates incorrect power phasing.	Loss of one or more phases of power.	Check AC input voltage on all phases.

Status	Description	Possible Cause	Suggested Action
36: Power Module Overtemperature	ON indicates a self-sensing error was encountered during startup	Motion required for self-sensing startup was obstructed.	• Verify that there are no impediments to motion at startup, such as hard limits. • Increase self-sensing current if high friction or load conditions exist. • Check motor or encoder wiring using wiring diagnostics.
58: Excessive CPU Load	Scheduled processes running on the drive have overrun the CPU time available to them.	User functions added to sequencer frames are taking too long to execute.	Reduce the length of user functions added to sequencer frames.
		Built in firmware code has encountered an error.	Reset the drive.

The following commands can be executed in the Faults window of an online drive.

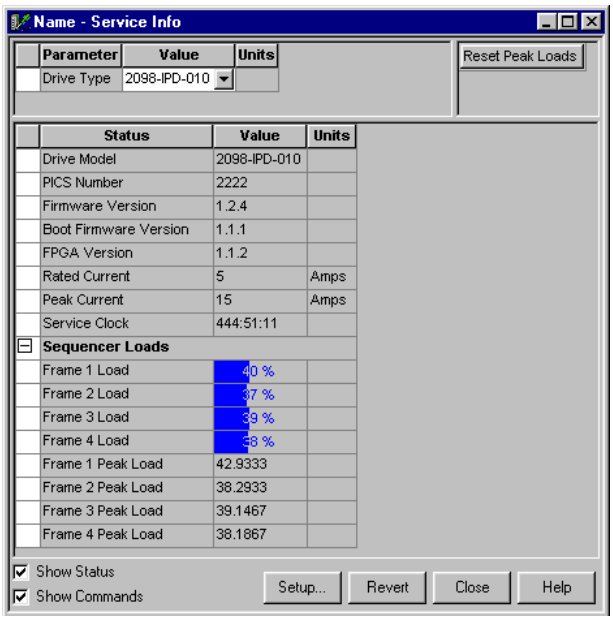
Command	Description
Fault History	Opens the Fault History window, where you can view a list of fault events that occurred since the drive was powered-up.
Clear Faults	Clears all drive faults.

Customize the Faults window for your Ultra5000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Service Information Window

The Properties window for the Service Information branch of Ultra5000 drives, firmware revision 1.2 or higher, looks like this.



Use the Service Information window to:

- Set the Drive Type parameter.
- Display and monitor service information about the drive.
- Display the firmware revisions of the drive.

The following parameters can be entered in the window.

Parameter	Description
Drive Type	The model number of an online drive as assigned at the factory. Off-line Ultra5000 drives do not have a specific model. • Invalid: prevents the drive from being enabled. • 2098-IPD-005 • 2098-IPD-010 • 2098-IPD-020 • 2098-IPD-030 • 2098-IPD-050 • 2098-IPD-100 • 2098-IPD-150 • 2098-IPD-HV030 • 2098-IPD-HV050 • 2098-IPD-HV100 • 2098-IPD-HV150 • 2098-IPD-HV220 Note: the drive uses the selection to: • decide when to signal an IPM Filter fault, and • properly scale the feedback from the power stage of the drive. The output of the velocity regulator stage of the drive is limited by the selected drive type.

The following status is displayed by default.

Status	Description
Drive Model	The model number of the drive. (Only displayed for online drives). This number is set at the factory.
PICS Number	A unique identifier assigned to each drive.
Firmware Version	The revision of the firmware on the drive.
Boot Firmware Version	The revision of the boot firmware on the drive.
FPGA Version	The revision of the firmware containing the FPGA image and the burn in self test code.
Rated Current	The maximum current the drive can continuously produce without faulting.
Peak Current	The maximum current the drive can on an intermittent basis.
Service Clock	The hours and minutes the drive has been powered-up.
Sequencer Loads	
Frame Load 1	A visual graph showing the percentage of available CPU time (125 microseconds = 100%) actually used in each Frame Load (1 - 4).
Frame Load 2	
Frame Load 3	
Frame Load 4	
Frame 1 Peak Load	The Peak Frame Load (1 - 4) since the peaks were reset.
Frame 2 Peak Load	
Frame 3 Peak Load	
Frame 4 Peak Load	

The Properties window for the Service Information branch of older Ultra5000 drives, firmware revision 1.1.5 or earlier, displays these information.

Status	Description
Drive Type	The type of Ultra5000 drive: • Invalid: prevents the drive from being enabled. • 2098-IPD-005 • 2098-IPD-010 • 2098-IPD-020 • 2098-IPD-030 • 2098-IPD-050 • 2098-IPD-100 • 2098-IPD-150 • 2098-IPD-HV030 • 2098-IPD-HV050 • 2098-IPD-HV100 • 2098-IPD-HV150 • 2098-IPD-HV220 Note: the drive uses the selection to: • decide when to signal an IPM Filter fault, and • properly scale the feedback from the power stage of the drive. The output of the velocity regulator stage of the drive is limited by the selected drive type.

The following commands can be executed in the Service Information window of an online drive.

Command	Description
Reset Peak Loads	Resets each of the Frame Peak Loads (1-4) to zero percent.

Customize the Service Information window for your Ultra5000 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Setup to open the window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Notes:

Configuring the Kinetix 3 Drive

Introduction

This chapter describes how to configure your Kinetix 3 drive to any operational mode.

Also described are these Kinetix 3 drive interface options:

- Analog velocity or current control
- Position following using encoder or step controls
- Indexing with or without homing

Configuring the Kinetix 3 Drive

Each Kinetix 3 drive in the Workspace window has these child branches or windows:

- Operation Modes
  - Analog
  - Preset
  - Follower
  - Indexing
  - Homing
- Motor
- Tuning
- Encoders
- Digital Inputs
- Digital Outputs
- Analog Outputs
- Monitor
- Oscilloscope
- Faults
- Service Information

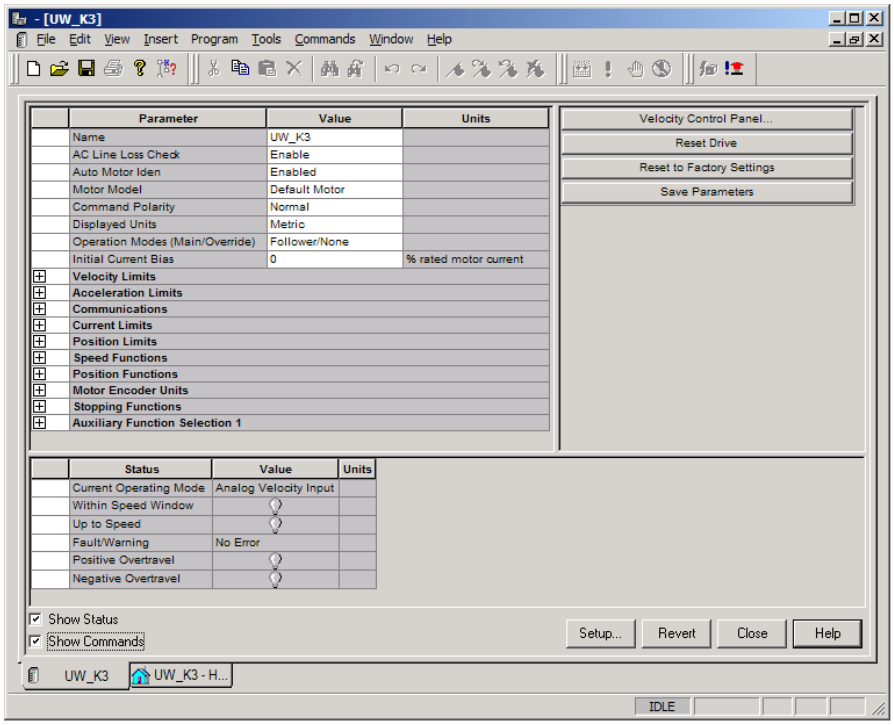
Except for the Monitor windows, all of a drive's child branches can and must be configured in a Properties window.

Configuring Properties for the Kinetix 3 Drive

To configure the properties for a Kinetix 3 drive or one of its child branches, follow these steps.

1. In the Workspace window, enter the drive branch to configure.
2. Do one of these options:
   - Click Properties in the Edit menu.
   - Right-click and select Properties from the pop-up menu.
   - Double-click the drive branch.

A Properties window, such as the Drive Properties window displayed below, appears for the selected drive branch.



3. To configure properties for the selected drive branch, use the features of the Properties window as follows.

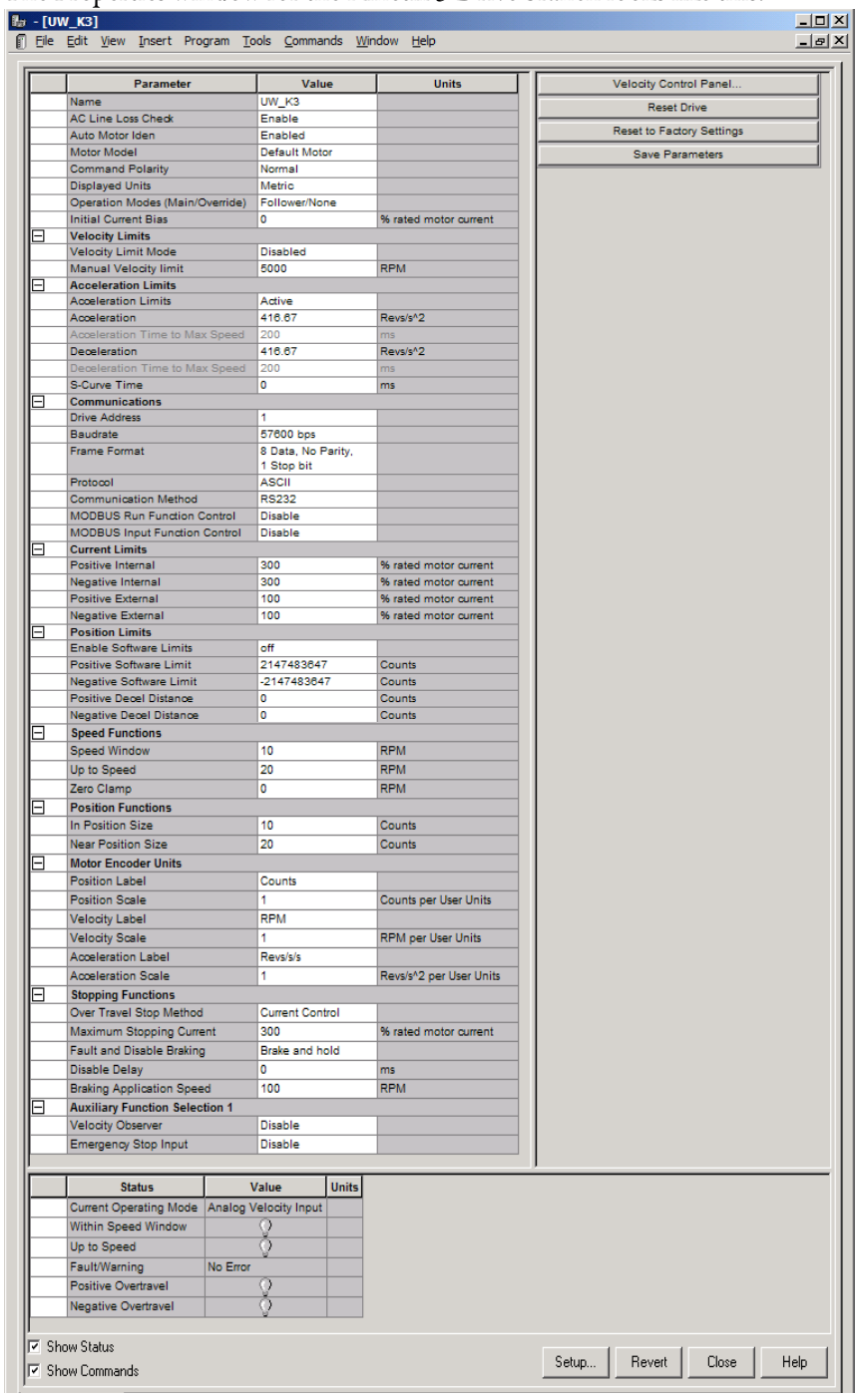
Section	Description
Parameters	Located in the upper left part of the Properties window. Enter values in the parameter fields to configure the settings of the selected drive branch.
Commands	Located in the upper right part of the Properties window. Click any command to issue that command. Select Show Commands, below, to display command buttons. Not every drive branch has associated commands.
Status	Located beneath the Parameters and Commands sections. These default fields display the online status of the selected drive branch. Click Setup to open a window where you can customize the status to be displayed. Status fields are read-only. Select Show Status to display the status section. Note: Status values for offline drives may not be meaningful.
Show Status	Displays the status for the selected drive branch.
Show Commands	Displays commands for the selected drive branch. Commands can be executed only for online drives. This selection is dimmed, if no commands are associated with the selected drive branch.
Setup	Opens the Monitor Setup window, where you can customize the status display. Refer to Understanding the Monitor Window on page 275 for more information about using the Monitor window.

Section	Description
Revert	Returns parameter settings to the values they had when you first opened this window.
Close	Closes the window.
Help	Click Help to get online help for this window.

The remainder of this chapter describes the process of entering and editing drive configuration settings, the status that are displayed by default for each drive branch when the drive is online, and the commands available to a user for each drive branch when the drive is online.

Understanding the Kinetix 3 Drive Branch

The Properties window for the Kinetix 3 Drive branch looks like this.



Use the Kinetix 3 Drive Branch window to:

- configure the parameters for an offline or an online drive.
- monitor the status of an online drive.
- execute commands that clear faults, reset the drive, or reset the EEPROM.
- open the Control Panel windows, where you can issue commands that control drive motion.

You can edit parameters for both an online and an offline drive. However, you can monitor status, and execute direct commands only for a Kinetix 3 drive in the On-Line Drives branch. Direct commands are so named because they execute directly through the Ultraware interface.

The following parameters apply to the Kinetix 3 Drive window.

Parameter	Description
Name	The name of the selected Kinetix 3 drive must: • be at least one, but not more than thirty-two, characters in length • be unique within its branch of the tree • not contain a space or backslash (\), forward slash (/), colon (:), asterisk (*), question mark (?), double quote ("), greater than symbol (>), less than symbol (<) or pipe (|)
AC Line Loss Check Select	The type of AC line loss: • Enable: drive monitors the AC inputs for line loss by a: 50 - 400W Drive and enables a single-phase open check. 0.8 - 1.5kW Drive and enables a 3-phase open check. • Disable: drive ignores the checking for AC line loss. • Single-phase input: Drive monitors the AC inputs for line loss by a 0.8 - 1.5kW Drive and enables a 3-phase open check.
Auto Motor Iden	The type of Automatic Motor Identification: • Disabled: Causes the drive to use the motor parameters supplied for the Motor Model selected below. • Enabled: Causes the drive to read motor parameters from an intelligent encoder.
Motor Model	Predefined motor types.
Command Polarity	 **ATTENTION:** Changing this parameter will cause instability if the drive is in a stable position or in a velocity loop. The type of polarity of the command signal: • Normal: The sign of the external command signal to the drive is not inverted. • Inverted: The sign of the external command signal to the drive is inverted.
Displayed Units	The unit of measure for position, velocity, and acceleration: • Metric: units for rotary motors are counts (position), rpm (velocity), revolutions per second^2 (acceleration); units for linear motors are meters (position), meter per second (velocity), and meter per second^2 (acceleration). • English: units for rotary motors are counts (position), rpm (velocity), revolutions per second^2 (acceleration); units for linear motors are inches (position), inches per second(velocity), and inches per second^2 (acceleration). • User: measurements in terms defined by the user in the Units section, below.

Parameter	Description
Operation Modes (Main/Override)	The combination of operation modes used when the Operation Mode Override digital input is active or inactive. The available operation modes include: • Analog Current Input: A +/- 10 Volt analog input provides the current command. • Analog Velocity Input: A +/- 10 Volt analog input provides the velocity command. • Follower: A position command is provided by external step and direction, step up/down, or quadrature encoder inputs. • Preset Velocity: Preset velocities provides the velocity command. Up to 7 Preset Velocity values can be set in the Preset window. The combination of Velocity Direction and Preset Select 1, 2 and 3 define the basis of motion in the Digital Inputs window. Preset Select 1, 2 and 3 determine the speed (Preset Velocity 1…7) of the velocity command, and Velocity Direction determines the direction of the movement. See Understanding the Digital Inputs Window for more information about how to assign Preset Select functions to a Digital Input. • Indexing: Up to 64 indexes can be configured in the Indexing window. The combination of Preset Select 0, 1, 2, 3, 4 and 5, in the Digital Inputs window, determines which Index (0…63) is selected. See Understanding the Digital Inputs Window for more information about how to assign a Preset Select to a Digital Input.
Initial Current Bias	Percent of rated motor current applied to the motor to help support vertical loads during initial operation. The range is -100…100%. The default is 0%.
Velocity Limits	
Velocity Limit Mode	The method for limiting the motor velocity within the motor's rated maximum velocity. The drive will never exceed the motor's rated maximum velocity. This setting can be used to restrict the motor velocity further. The available limits include: **ATTENTION:** When current mode is selected for drive operation, the drive will switch to velocity mode to restrict the speed as necessary. • Disabled: No additional velocity limits in effect. • Manual Limit: Motor velocity is limited to value specified for Manual Velocity Limit. • Analog Input: Motor velocity is limited to the velocity command from the Analog Velocity Input. Note: When the selected Operation Mode is Analog Velocity Input, the command defines its own limit.
Manual Velocity Limit	Specifies a velocity value that will not be exceeded when the Velocity Limit Mode is set to Manual Limit or Manual and Analog. The range is 1…6000 rpm. The default is 5000.

Parameter	Description
Acceleration Limits	
Acceleration Limits Mode	Sets the state of the Acceleration and Deceleration Limits in the drive, as shown below. For the Analog Velocity and Preset Velocity operation modes, the setting is either Active or Inactive.
	Acceleration: If Acceleration Limits is set to Active, this is the drive's acceleration limit when the drive is in Analog Velocity Input mode and the Analog Command Input changes or Preset Velocity Mode, and the preset selection changes. The range depends on the maximum motor speed. It must be greater than zero, but no more than the acceleration required to reach the maximum motor speed from zero in one millisecond.
	Acceleration Time to Max Speed: A read-only property of Acceleration that is displayed as a time unit. The range depends on the maximum motor speed. It must be greater than zero, but no more than the acceleration required to reach the maximum motor speed from zero in one millisecond.
	Deceleration: If Acceleration Limits is set to Active, this is the drive's deceleration limit when the drive is in Analog Velocity Input mode and the Analog Command Input changes or Preset Velocity Mode, and the preset selection changes. The range depends on the maximum motor speed. It must be greater than zero, but no more than the acceleration required to reach the maximum motor speed from zero in one millisecond.
	Deceleration Time to Max Speed: A read-only property of Deceleration that is displayed as a time unit. The range depends on the maximum motor speed. It must be greater than zero, but no more than the deceleration required to reach zero from the maximum motor speed in one millisecond.

Parameter	Description
Communications	
	Drive Address: The drive's communication port address - an integer from 1 to 247 - used in multiple axis applications. For single axis applications, this value is usually set to 1. The drive must be reset before it will recognize an edited drive address. Note: Communication port parameters can be set in the PC Communications Setup dialog box, that is opened by selecting the menu commands Tools > Serial Port.
	Baudrate: The communication speed. • 9600 bps • 1400 bps • 19200 bps • 38400 bps • 56000 bps • 57600 bps
	Frame Format: The serial communication information of Data bit, Parity bit and Stop bit. 1.5 Stop bits is not supported. • 8 Data, No Parity, 1 Stop bit • 8 Data, Even Parity, 1 Stop bit • 8 Data, Odd Parity, 1 Stop bit • 8 Data, No Parity, 2 Stop bit • 8 Data, Even Parity, 2 Stop bit • 8 Data, Odd Parity, 2 Stop bit
	Protocol: The default protocol type. • ASCII • MODBUS-RTU
	Communication Method: The communication method. • RS232 • RS485
	MODBUS Run Function Control: Selects the Modbus protocol as the Run Function Control. • Disable • Enable
	MODBUS Input Function Control: Selects the Modbus protocol as the Input Function Control. • Disable • Enable
Current Limits	During runtime, the drive limits positive current to: The lesser of the Positive Internal Current Limit, or the Positive External Current Limit. If the assigned digital input is active, the Intermittent Current rating of the drive (a fixed value, hard-coded into the drive), or the Intermittent Current rating of the motor (stored in the motor database). • Positive Internal: The positive current limit value of the drive. The range is 0…500% of the motor's continuous current rating. The default is 300%. • Negative Internal: The negative current limit value of the drive. The range is 0 …500%of the motor's continuous current rating. The default is 300%. • Positive External: A positive current limit only in effect when the Current Limit – Positive signal is active in the Digital Inputs window. The range is 0…500% of the motor's continuous current rating. The default is 100%. • Negative External: A negative current limit only in effect when the Current Limit – Negative signal is active in the Digital Inputs window. The range is 0…500% of the motor's continuous current rating. The default is 100%.

Parameter	Description
Position Limits	Sets available Software Overtravel Limits: Off: Turns off software overtravel limit checking. On: Causes the drive to compare the motor feedback position to the Positive and Negative Software Limits, below, to determine if the drive has exceeded an overtravel limit. • Positive Software Limit: If the motor feedback position is greater than this value, the drive has exceeded the software overtravel limit. The range is -2,147,483,647…2,147,483,647 counts. The default is 2,147,483,647. • Negative Software Limit: If the motor feedback position is less than this value, the drive has exceeded the software overtravel limit. The range is -2,147,483,647…2,147,483,647 counts. The default is -2,147,483,647. • Positive Decel Distance: The stopping distance when the drive encounters a positive overtravel limit. The range is 0…2,147,483,647 counts. The default is 0. • Negative Decel Distance: The stopping distance when the drive encounters a negative overtravel limit. The range is 0…2,147,483,647 counts. The default is 0.
Speed Functions	Sets available Speed Functions: • Speed Window: If the Within Speed Window signal is assigned to a digital output and the speed error is within this value, the assigned output is turned ON. The range is 0…1000 rpm (millimeters per second for linear motors). The default is 10. • Up to Speed: Up to Speed signal is assigned to a digital output and the motor speed is higher than this speed, the assigned output is turned ON. The range is 1…5000 rpm (millimeters per second for linear motors). The default is 20. • Zero Clamp: An Analog Speed Command less than the Zero Clamp speed is ignored and the commanded motor speed is set to 0 (zero) rpm. The range is 0…5000rpm (millimeters per second for linear motors). The default is 0.
Position Functions	Sets available Position Functions: • In Position Size: If the In Position signal is assigned to a digital output and the position error is within this value, the assigned output is turned ON. The range is 0…2500 counts. The default is 10. • Near Position Size: If the Near Position signal is assigned to a digital output and the position error is within this value, the assigned output is turned ON. The range is 0…2500 counts. The default is 20.

Parameter	Description
Motor Encoder Units	Sets available Motor Encoder Units: • Position Label: When User is selected for Displayed Units, this is the user-defined label for position values relating to the motor encoder. Limited to 16 characters in length. • Position Scale: When User is selected for Displayed Units, this is the user-defined conversion factor used to convert position values into user units relative to the motor encoder. In counts per user unit • Velocity Label: When User is selected for Displayed Units, this is the user-defined conversion factor used to convert velocity values into user units relative to the motor encoder. In counts per second per user unit. • Velocity Scale: When User is selected for Displayed Units, this is the user-defined conversion factor used to convert velocity values into user units relative to the motor encoder. In rpm per user unit • Acceleration Label: When User is selected for Displayed Units, this is the user-defined conversion factor used to convert velocity values into user units relative to the motor encoder. In rpm per user unit. • Acceleration Scale: When User is selected for Displayed Units, this is the user-defined conversion factor used to convert acceleration values into user units relative to the motor encoder. This is displayed in revolutions per second^2 per user unit.
Stopping Functions	Sets available Stopping Functions: • Over Travel Stop Method: The method used to bring the motor to a stop when an overtravel condition occurs: Current Control: The Maximum Stopping Current is applied to reduce the measured speed to zero. Dynamic Brake: The motor windings are shorted together and connected to the positive DC bus to reduce the measured speed to zero. • Maximum Stopping Current: Current is applied to motor in order to bring the axis to a stop in the event of an overtravel condition. • Fault and Disable Braking: A method used to bring the axis to zero speed by use of the internal, dynamic brake relay in the event of a fault or disable condition. Note: This selection affects the operation of the drive soft-start circuitry, because the hardware is shared. Brake and Hold: The motor windings are shorted together and connected to the positive DC bus whenever the drive is faulted or disabled. Brake and Release: If the motor speed is non-zero when the drive faults or changes to a disabled state, the motor windings are shorted together and connected to the positive DC bus until zero speed is reached, and then are disconnected. Note: In this mode, at zero speed, the soft-start circuitry is operational only when control power is absent. Free Stop: The motor windings are not shorted together and the motor coasts to a stop. Note: In this mode, the soft-start circuitry is operational only when control power is absent. Free Stop and Hold: The motor windings are not shorted together until the motor has coasted to a stop. • Disable Delay: The time from when the Drive Disable command is received to when the motor power is removed. The range is 0 to 1000 ms. The default is 0. • Braking Application Speed: Motor feedback speed below which the drive engages the motor brake signal, when the drive is disabled. The range is 0 …1000 rpm (millimeters per second for linear motors). The default is 100.

Parameter	Description
Auxiliary Function Selection1	Enables or disables Auxiliary Function Selections: Velocity Observer: Enable or Disable the velocity observeration. Emergency Stop Input: Enable or Disable the emergency stop input.
Statuses	
Creates a custom program to monitor and display the drive Status: ON status have a value of 1, and OFF status have a value of 0.	
Current Operating Mode	Displays the currently configured operating mode, based on the Operation Modes property, above, and the Operation Mode Override digital input state. One of: • Analog Current Input: a +/- 10 volt analog input provides the current command. • Analog Velocity Input: a +/- 10 volt analog input provides the velocity command. • Follower: a position command is provided by external step and direction, step up/down, or quadrature encoder inputs. • Preset Velocity: Preset velocities provides the velocity command. Up to 7 Preset Velocity values can be set in the Preset window. The binary value (resulting from combining Preset Select 1, 2 and 3) in the Digital Inputs window, determines which Preset Velocity (1…7) is used for the velocity command. See Understanding the Digital Inputs Window for more information about how to assign Preset Select functions to a Digital Input. • Indexing: Up to 64 indexes can be configured in the Indexing window. The combination of Preset Select 0, 1, 2, 3, 4 and 5, in the Digital Inputs window, determines which Index (0 - 63) is selected. See Understanding the Digital Inputs Window for more information about how to assign Preset Select functions to a Digital Input.
Within Speed Window	ON indicates motor velocity feedback falls within the range of programmed velocity +/- the Speed Window value. Note: The Within Speed Window is visible only when a non-positioning operation mode is active.
Up to Speed	ON indicates motor velocity feedback is greater than the Up to Speed value.
Fault/Warning	Displays the fault status of an on-Line Kinetix 3 drive. The status may be: • No Error • A fault listed in status area of the Faults window, or • a drive warning. Drive warnings include: Absolute Encoder Low Battery Voltage: The voltage of the external battery used by the absolute encoder is low. Abnormal Initial Status of Absolute Encoder: The state of the motor encoder when the drive is powered-on is invalid. This may occur when the motor is rotating at over 100 rpm. Over Current Command: The commanded analog current is greater than maximum value. Over (external) Speed Command: The commanded analog velocity is greater than the maximum value. I/O Setup Warning: The Digital Inputs or Outputs are not set up properly. This may indicate multiple functions have been improperly assigned to a single input.
Positive Overtravel	ON indicates the drive is in an overtravel condition, and the Digital Input assigned to Overtravel - Positive is inactive. No commanded motion in the positive direction will be permitted until the overtravel condition is cleared.

Parameter	Description
Negative Overtravel	ON indicates the drive is in an overtravel condition, and the Digital Input assigned to Overtravel - Negative is inactive. No commanded motion in the negative direction will be permitted until the overtravel condition is cleared.
Auxiliary Function Selection 1	
Velocity Observer	Enable or Disable the velocity observeration.
Emergency Stop Input	Enable or Disable the emergency stop input.

The following display is the default status for a Kinetix 3 drive in the On-Line Drives branch of the Workspace window.

Status	Description
Note: All ON status have a value of 1; all OFF status have a value of 0.	
Drive Enabled	ON indicates the power stage of the drive is enabled. As a precondition, all software and hardware enable inputs must be active, and the drive cannot have any faults.
In Position	ON indicates position error has been less than the In Position Size setting for longer than the In Position Time setting, and the speed is less than the Zero Speed setting.
In Position Window	ON indicates position error has been less than the In Position Size setting for longer than the In Position Time setting.
Up To Speed	ON indicates motor velocity feedback is greater than the Up To Speed setting.
In Speed Window	ON indicates motor velocity feedback falls within the range of programmed velocity +/- the Speed Window value.
Zero Speed	ON indicates the motor velocity feedback value is less than the Zero Speed setting.
Pos Current Limit	ON indicates the current of the drive is limited by the Positive Current Limit, above.
Neg Current Limit	ON indicates the current of the drive is limited by the negative Current Limit, above.
Bus Power	ON indicates power is applied to the DC Bus.
Bus Voltage	The present measure of Bus voltage.

The following commands can be executed for a Kinetix 3 Drive window that is in the On-Line Drives branch. These commands are explained in these sections.

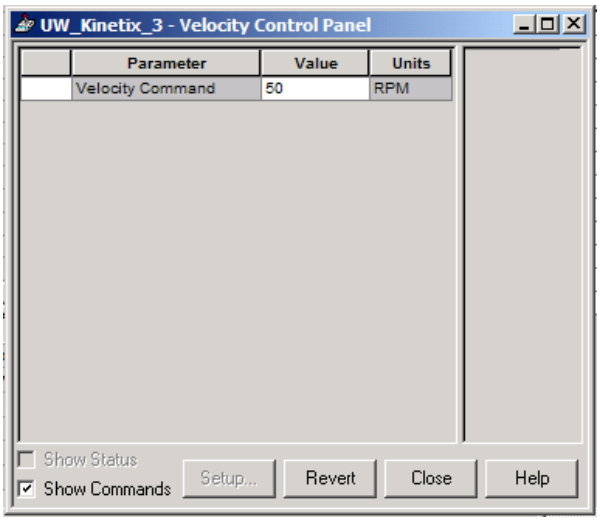
Command	Description
Velocity Control Panel	Opens the Velocity Control Panel window. Refer to Velocity Control Panel Window on page 234 for more information about how to set a drive's velocity command and monitor its motor velocity or current.
Reset Drive	Resets, or reboots, the hardware and firmware for a drive.
Reset to Factory Setting	Resets a drive's parameters by reinitializing them to factory default settings. Stored faults and the Time in Service clock remain unchanged
Save Parameters	Saves the current working values as power-up values in the flash memory for the selected online drive and all of its children.
Setup Wizard	Provides a quick way to perform the minimal configuration necessary for a new Kinetix 3 drive. Refer to Using the Setup Wizard on page 236 for more information about this wizard.

Customize the window for your Kinetix 3 Drive branch by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup button to open the Refer to Monitor Setup Window on page 276, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Velocity Control Panel Window

The Properties window for the Velocity Control Panel looks like this.



Use the Velocity Control Panel window to directly set the drive's velocity in a temporary velocity mode.

The commands you execute override any motion commands originating from the drive's normal operation mode, set in the Kinetix 3 Drive window.

ATTENTION: The Velocity Control Panel commands override the normal operation mode. The motor moves in response to Velocity Control Panel commands!

ATTENTION: The Jog Forward and Jog Reverse commands of the Velocity Control Panel are not changed by the Command Polarity selection in the Kinetix 3 Drive Window. They perform the command as though the Command Polarity were set to Normal.

The Velocity Control Panel has these parameters, status, and direct commands.

Parameter	Description
Velocity Command	The speed at which the motor turns when the Jog Forward or Jog Reverse command executes, provided that the drive is online and enabled. Note: The drive ramps up, or ramps down, to the commanded velocity at the rate of acceleration set in the Acceleration input box.
Acceleration	Displays the maximum rate of acceleration (or deceleration) the drive uses to ramp up (or down) to the commanded velocity when velocity changes.

The following commands can be executed from the Velocity Control Panel window of an online drive.

Command	Description
Jog Forward	Moves the motor at the Velocity Command level in the forward direction (increasing encoder count).
Jog Reverse	Moves the motor at the Velocity Command level in the reverse direction (decreasing encoder count).
Jog Enable	Brings the motor to a stop, using the Program Deceleration rate.

TIP Closing the window returns the drive to its normal operating mode, but with the software disabled. Select the drive and then execute an Enable command as instructed in the Windows' message to make the drive operational.

Customize the Velocity Control Panel window for your Kinetix 3 drive by selecting one or more of these commands.

- Click Show Commands to display or hide the Commands pane.
- Click Revert to return parameter settings to the values they held when you opened this window.

Using the Setup Wizard

The Kinetix 3 Setup Wizard helps you to perform the minimal configuration necessary on a new Kinetix 3 drive.

Perform these steps to open and run the Setup Wizard.

1. In the Workspace window, click an online Kinetix 3 drive.
2. Do one of these steps to access the Setup Wizard.
   - Click Setup Wizard in the Commands menu.
   - Right-click Commands and Setup Wizard from the pop-up menus.
   - Connect to an online Kinetix 3 drive to receive a prompt to run the Setup Wizard.

     The prompt can be disabled.

   The Setup Wizard initially sets a small subset of the drive parameters. This step makes sure that the other drive parameters are set to reasonable defaults.

   IMPORTANT As you step through the wizard, you modify parameters stored in the drive. If you decide to cancel the wizard midway through these steps, the Kinetix 3 drive will not return to the same state it was before starting the wizard.

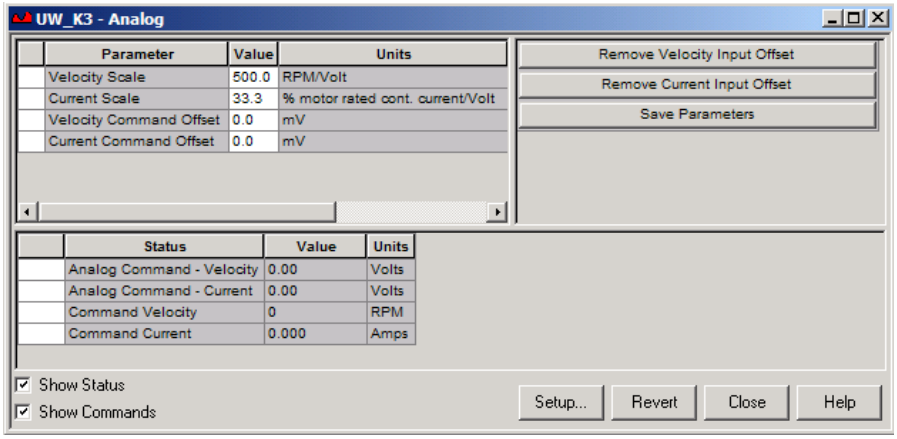
   We recommend you perform a Reset to Factory Setting to the Kinetix 3 drive anytime you cancel the Setup Wizard before completing all of the steps.

3. Click the type of Controller attached to your Kinetix 3 drive, or click Other.
4. Click the Operation Mode for the Kinetix 3.

   The wizard simplifies this decision by filtering the available operation modes based on the drive controller that is connected to the Kinetix 3 drive.
5. Enter the operating parameters required for the selected operation mode.
6. Click your motor.
7. Tune the Kinetix 3 drive.

Understanding the Analog Window

The Properties window for the Analog branch looks like this.



Use the Analog window to:

- set Analog Velocity, and Current Position Command Input drive parameters for an online or offline drive,
- monitor the status of the incoming Analog Command for an online drive, and
- execute commands that remove Velocity, and Current Input Offsets for an online drive.

These parameters govern drive operations when the Operating Mode is set to Analog Velocity Input or Analog Current Input.

Parameter	Description
Velocity Command Input:	
Velocity Scale	The drive's velocity input scale value. This value indicates the change in velocity per Volt of change in the Analog Command Input. The range is 0…1000 rpm (millimeters per second for linear motors). The default is 100.
Current Scale	The drive's current input scale value. This value indicates the change in current per Volt of change in the Analog Command Input. Note: This parameter is stored on the drive in units of percent of motor rated continuous current/Volt. The range, as a percentage, is 0 …100%/V. The default setting is 33.3%/V.
Velocity Command Offset	The offset of the Analog Velocity Command Input in millivolts. The range is -1000 …1000 mV
Current Command Offset	The offset of the Analog Command Input in mV. The range is -1000 to 1000 miV.
Position Command Input:	
Position Scale	The drive's position input scale value. This value indicates the change in position per Volt of change in the Analog Command Input. The range is -32767…32767 counts/V.
Position Offset	The drive's position input offset value. This value indicates the offset of the Analog Command Input. The range is -10000…1000 mV.

You can edit Analog parameters for both an online and an offline drive. However, you can monitor status, and execute direct commands (executed through the Ultraware interface) only for a Analog window that is the child of an online drive.

The following status is displayed by default for an Analog window of an online drive.

Status	Description
Analog Command Velocity	The voltage at the Analog Velocity command input.
Analog Command Current	The voltage at the Analog Current command input.
Command Velocity	The commanded velocity
Command Current	The commanded current

The following commands can be executed for an Analog window that is in the On-Line Drives branch.

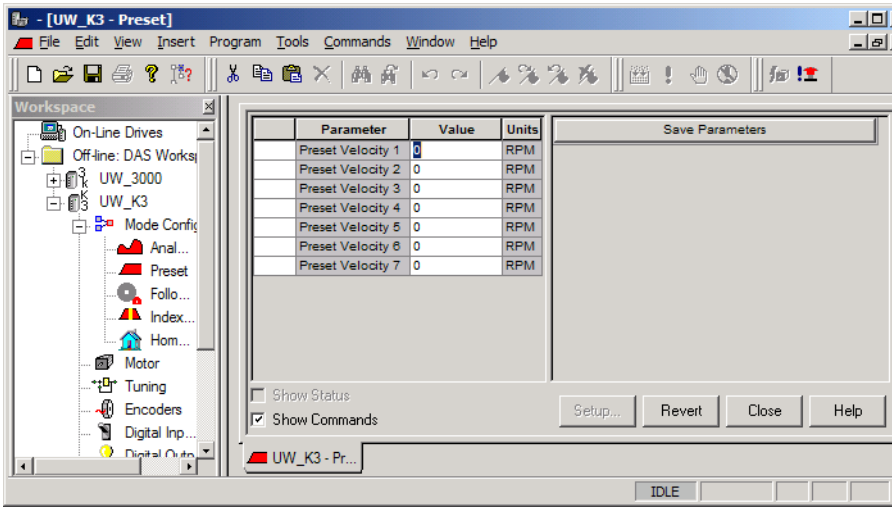
Command	Description
Remove Velocity Input Offset	This command automatically measures the existing offset of the Analog Command Input, and resets the Velocity Offset value to eliminate the offset.
Remove Current Input Offset	This command automatically measures the existing offset of the Analog Command Input, and resets the Current Offset value to eliminate the offset.
Save Parameters	Saves the current working values as power-up values in the flash memory for the selected On-Line drive and all of its children.

Customize the Analog window for your Kinetix 3 drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup window as shown on page 275, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Preset Window

The Properties window for Presets looks like this.



Use the Preset window to configure up to seven preset velocity values.

Preset parameters control drive operation when the Operating Mode is set to Preset Velocity in the Kinetix 3 Drive window.

TIP Preset gearing parameters are set in the Follower window as described in Understanding the Follower Window on page 241.

The drive uses the preset position value, preset velocity value, or preset current value selected by the Preset Select Lines 0, 1 and 2 as set in the Digital Inputs properties window.

The digital input's Preset Select Line binary values are as follows:

- Preset Select 1 = 1 if active, 0 if not active.
- Preset Select 2 = 2 if active, 0 if not active.
- Preset Select 3 = 4 if active, 0 if not active.

TIP Velocity Direction in the Digital Inputs window, selects the direction of motion.

If a Preset Select is not assigned to a digital input, the Preset Select is considered inactive. If all of the Preset Select inputs are inactive, the drive sets the commanded velocity to zero.

The Preset window has no associated status or direct commands. The Preset window has these parameters and direct commands.

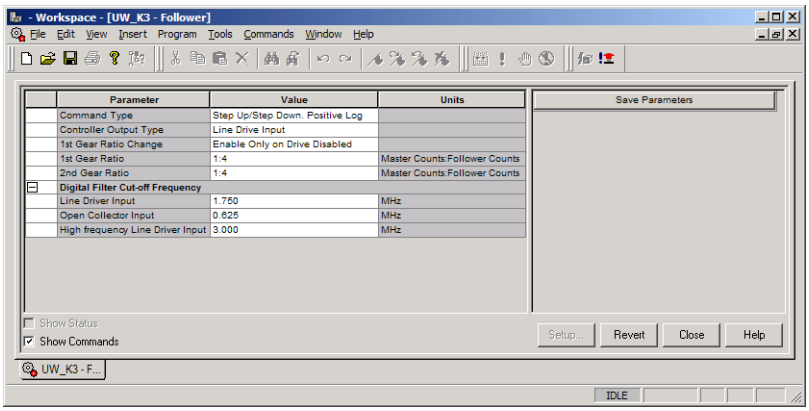
Parameter	Description
Preset Velocities	
Preset 1 through 7	The drive's preset velocity values. The range is -6000…6000 rpm (millimeters per second for linear motors). Note: The drive will ramp up, or ramp down, to the selected velocity at the rate of acceleration set in the Acceleration Limits in the Kinetix 3 Drive window.

Command	Description
Save Parameters	Type the fixed position to which the motor should travel. The range is - 2147483647… 2147483647 counts.

Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Follower Window

The Properties window for Followers looks like this.



Use the Follower window to configure preset gear ratios and associated cut-off frequencies.

Follower parameters control drive operation when the Operating Mode is set to one of these options in the Kinetix 3 Drive window.

- Follower: Auxiliary Encoder
- Follower: Step / Direction
- Follower: Step Up / Step Down
- Preset Select 2 = 4 if active, 0 if not.

The Follower window has no associated statuses. The Follower window has these parameters, and direct commands.

Parameter	Description
Command Type	Select: • Auxiliary Encoder: A quadrature encoder provides a position command signal input to the drive. • Step/Direction: Step and Direction inputs provide a position command signal input to the drive. • Step Up/Step Down: Step Up and Step Down inputs provide a position command signal input to the drive
Controller Output Type	The host controller output type from these options: • Line Drive Input: The controller has differential TTL/CMOS outputs. The maximum input frequency is 900 kpps. • Open Collector Input: The controller has single-ended transistor outputs. The maximum input frequency is 300 kpps. • High Frequency Line Driver Input: The controller has differential TTL/CMOS outputs. The maximum input frequency is 3.0 mpps.
1st Gear Ratio Change	The time when a gear ratio value will change. • Enable Only on Drive Disabled • Always Enable

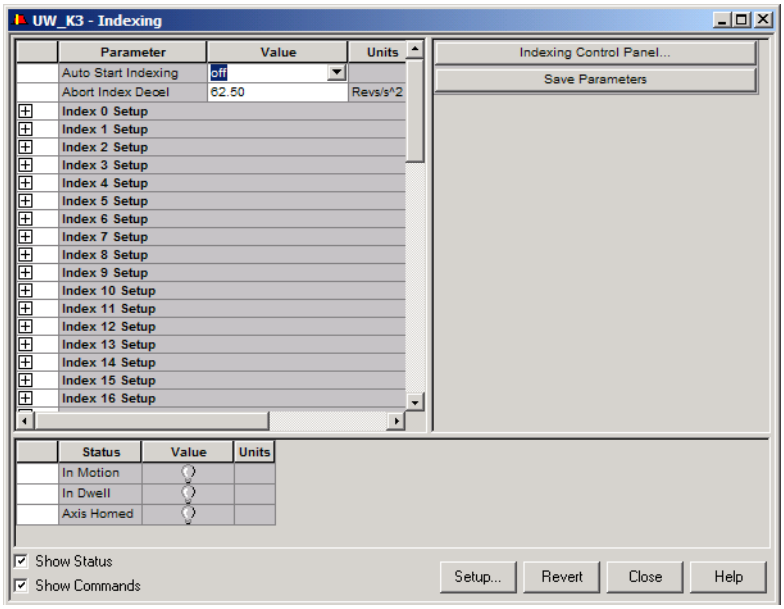
Parameter	Description
1st Gear Ratio	Specifies the 1st ratio of counts between the master input counts and the motor encoder counts (for example 1:4). The range of the ratio value is 1:1… 1:6,553,5:65,535.
2nd Gear Ratio	Specifies the 1st ratio of counts between the master input counts and the motor encoder counts (for example 1:4). The range of the ratio value is from 1:1…1:6,553,5:65,535.
Digital Filter Cut-off Frequency	The cutoff frequency of the low pass digital filter applied to the pulse command input. • Line Driver Input: The range is 0.525, 0.562, 0.625, 0.750, 1.000, 1.500, 1,750, and 3.000 MHz. Default is 1.750 MHz • Open Collector Input: The range is 0.525, 0.562, 0.625, 0.750, 1.000, 1.500, 1,750, and 3.000 MHz. Default is 0.625 MHz • High Frequency Line Driver Input: The range is 0.525, 0.562, 0.625, 0.750, 1.000, 1.500, 1,750, and 3.000 MHz. Default is 3.000 MHz

Command	Description
Save Parameters	Saves the current working values as power-up values in flash memory for the selected On-Line drive and all of its children.

Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Indexing Window

The Properties window for Indexing looks like this.



Use the Indexing window to:

- configure up to sixty-four indexes (0 – 63), and
- open the Indexing Control Panel where you can:
  - start and stop execution of the index command
  - start and stop homing
  - enable or disable a drive, and
  - monitor the execution of an index.

An index controls drive operation by executing preconfigured motion commands.

An index controls drive operation when Operating Mode is set to Indexing, in the Kinetix 3 Drive window. The drive uses the index whose number (0 – 63) reflects the cumulative binary values of the Preset Select Lines 0, 1, 2, 3, 4 and 5, that are selected in the Digital Inputs window.

The digital input Preset Select Line binary values are as follows:

- Index Select 0 = 1 if active, 0 if not.
- Index Select 1 = 2 if active, 0 if not.
- Index Select 2 = 4 if active, 0 if not.
- Index Select 3 = 8 if active, 0 if not.
- Index Select 4 = 16 if active, 0 if not.
- Index Select 5 = 32 if active, 0 if not.

If a Preset Select Line is not assigned to a digital input, the Preset Select Line is considered inactive.

The following parameters, status, and commands apply to Indexing.

Parameter	Description
Auto Start Indexing	When this field is set to ON, the drive begins executing the selected index whenever the drive enables.
Abort Index Deceleration	The deceleration used to stop motion when the Stop Index input terminates an index move.
Index 0 to 63 Setup	
Mode	The type of move commanded: • Absolute: moves from its starting position to the specified Position, below. Note: The axis must be homed before the drive can execute an absolute index • Incremental: moves from its starting position the Distance specified below.
Distance or Position	For Incremental and Registration mode moves, the relative distance the motor travels. The range is -2,147,483,647…2,147,483,647 counts.
Dwell	The amount of time the drive holds position before beginning the next index. The range is 0…65,535 ms.
Velocity	The commanded velocity used when executing the index. The range is 0…2,147,483,647 counts per second.
Acceleration	The acceleration rate used to change to a higher velocity. The range is 0…2,147,483,647 counts per second^2.
Deceleration	The deceleration rate used to change to a lower velocity. The range is 0…2,147,483,647 counts per second^2.
Next Index	The number (0…63) of the next indexed move to execute when Action When Complete is not set to Stop.
Action When Complete	The drive's action when the index has completed: • Start next immediately: commands execution of the Next Index move without additional input, but after the scheduled Dwell. • Start next on input: commands execution of the Next Index move the next time the Start Index input becomes active. • Start next without stopping: commands execution of the Next Index move without additional input and without the scheduled Dwell. • Stop: ends the execution of indexed move commands.

The following status can be displayed from a Indexing window of an online drive.

Status	Description
In Motion	ON indicates the motor is moving in response to an indexed motion command. Note: The In Motion status has a value of 1 when ON, and 0 when OFF.
In Dwell	ON indicates the motor is holding position and waiting the commanded dwell time. Note: The In Dwell status has a value of 1 when ON, and 0 when OFF.
Axis Homed	ON indicates the position command value is complete, which is by definition the Home position. Note: The At Home status has a value of 1 when ON, and 0 when OFF.

The following command can be executed from a Indexing window of an online drive.

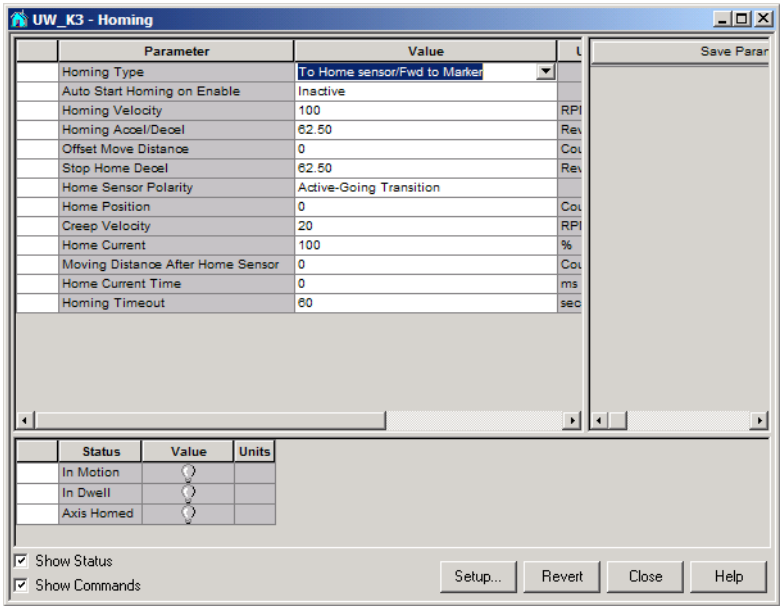
Command	Description
Save Parameters	Save the current parameters to Flash memory.

Customize the Indexing window for your Kinetix 3 drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup Window on page 276, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Homing Window

The Properties window for Homing looks like this.



Use the Homing window to configure the type of homing operation the drive performs.

TIP Homing operations are performed by issuing the Start Homing command from the Indexing Control Panel.

Homing has no associated statuses. Except for Copy and Paste, and it has no direct commands.

The following parameters apply to Homing.

Parameter	Description
Home Type	The type of homing operation the drive performs: • To Home sensor / Back to Marker: When homing is started, the motor moves toward the homing direction at homing velocity until it detects the home sensor. At that time, the motor decelerates and stops, and moves toward reverse direction at creep velocity. When it loses the signal input from home sensor and meets the first marker, it is decelerated and stops, and returns to the position where it detects the active going edge of the first marker. • To Limit/Back to Marker: This procedure is the same as the To Home sensor / Back to Marker, except that the physical overtravel is used instead of the home sensor input. The physical overtravel fault is disabled while homing. • To Home sensor / Fwd to Marker: When homing is started, the motor moves toward the homing direction at homing velocity until it detects the home sensor. At that time, the velocity decelerates to the creep velocity. The creep velocity is maintained until it detects the active going edge of marker, and then it stops and moves backward to the position where it detects the active going edge of marker.

Parameter	Description
	• To Home sensor / Move / Back to Marker: If the distance is very short between the home sensor and marker, it may fail to detect the first marker. To prevent this, this method has one additional parameter that defines a minimum distance in which to detect a Marker. The minimum distance is defined as a time in the 'moving distance after home sensor'. After it detects the home sensor input, velocity is decelerated to the creep velocity, and the creep velocity is maintained until the marker is detected. After the marker is detected, the motor moves back to the position.
	• To Limit / Fwd to Marker: This procedure is the same as the To Home sensor / Fwd to Marker, except that the physical overtravel is used instead of home sensor input. The physical overtravel fault is disabled while homing. • Home to Current Value: When homing starts, the motor moves in the homing direction at the homing velocity until it detects a stopper. The motor stops when the motor current is maintained higher than the home current for the home current time after the home current. • Home to Current Value / Back to Marker: This procedure is similar to Home to Torque Value, but this method moves backward until the marker is detected when the motor torque is maintained higher than the home current for the home current time after the home current. After the marker is detected, the motor is decelerated and stops, and returns to the position where the marker is detected. • Home to Marker: This mode does not need extra sensors, such as home sensor or physical overtravel. When the homing starts, it moves in the homing direction at the creep velocity. When it detects the marker, it stops with deceleration, and then moves back to the position where the marker is detected. • Home to Present Position: The position when a Start Homing signal is input as the new home. If the Auto Start Homing function is enabled, the position when the drive is enabled becomes the new home.
Auto Start Homing on Enable	Causes the drive to begin the homing procedure automatically when the drive is enabled. Selections are: • Active: automatically starts homing every time the drive is enabled, and • Active After Reset Only: automatically starts homing when a drive is enabled, if the drive has not already been homed. • Inactive
Home Sensor Back-off	Causes the drive to move in the direction opposite the direction specified by the Homing Velocity setting, when the homing procedure is started with the Sensor input active. Motion continues in the reverse direction (moving at the Homing Accel, Homing Decel, and Homing Velocity settings), until the Sensor input is detected inactive, at which point the normal homing procedure takes over. • Active: automatically starts backoff when the input is detected. • Inactive: normal homing procedure occurs. Note: This does not apply if Home to Marker is selected as the Homing Type.
Homing Velocity	The commanded velocity used during homing. The sign of the this value (+/-) indicates the direction of motion during homing. The range is -2,147,483,647…2,147,483,647 rpm (rotary) or counts per second (linear).

Parameter	Description
Homing Accel/Decel	The rate of acceleration and deceleration used during homing. The range is 0…2,147,483,647 revolutions per second^2 or counts per second^2.
Offset Move Distance	The distance the motor position is from the marker edge (or sensor edge for Sensor only Homing Type) after the homing sequence is complete. The range is -2,147,483,647…2,147,483,647 counts.
Stop Home Decel	The rate of drive deceleration (revolutions per second^2 or counts per second^2.) used when the Stop Homing command executes, or by activating a Digital Input set to Stop Homing.
Home Sensor Polarity	Specifies the digital input state which indicates to the drive that the Home Sensor input is active: • Active-Going Transition, or • Inactive-Going Transition
Home Position	The home position when a homing procedure is completed. The range is -2,147,483,647…2,147,483,647 counts.
Creep Velocity	For the To Sensor, then Back to Marker Homing Type, the velocity used for all remaining homing motion after the motor decelerates to a stop when it finds the sensor edge.
Home Current Value	Specifies the feedback current at which the drive stops moving the motor at the Homing Velocity

The following status can be displayed from a Homing window of an online drive.

Status	Description
In Motion	ON indicates the motor is moving in response to an indexed motion command. Note: The In Motion status has a value of 1 when ON, and 0 when OFF.
In Dwell	ON indicates the motor is holding position and waiting the commanded dwell time. Note: The In Dwell status has a value of 1 when ON, and 0 when OFF.
Axis Homed	ON indicates that the homing routine has completed. Note: The Axis Homed status has a value of 1 when ON, and 0 when OFF.

The following commands can be performed from a Homing window of an online drive.

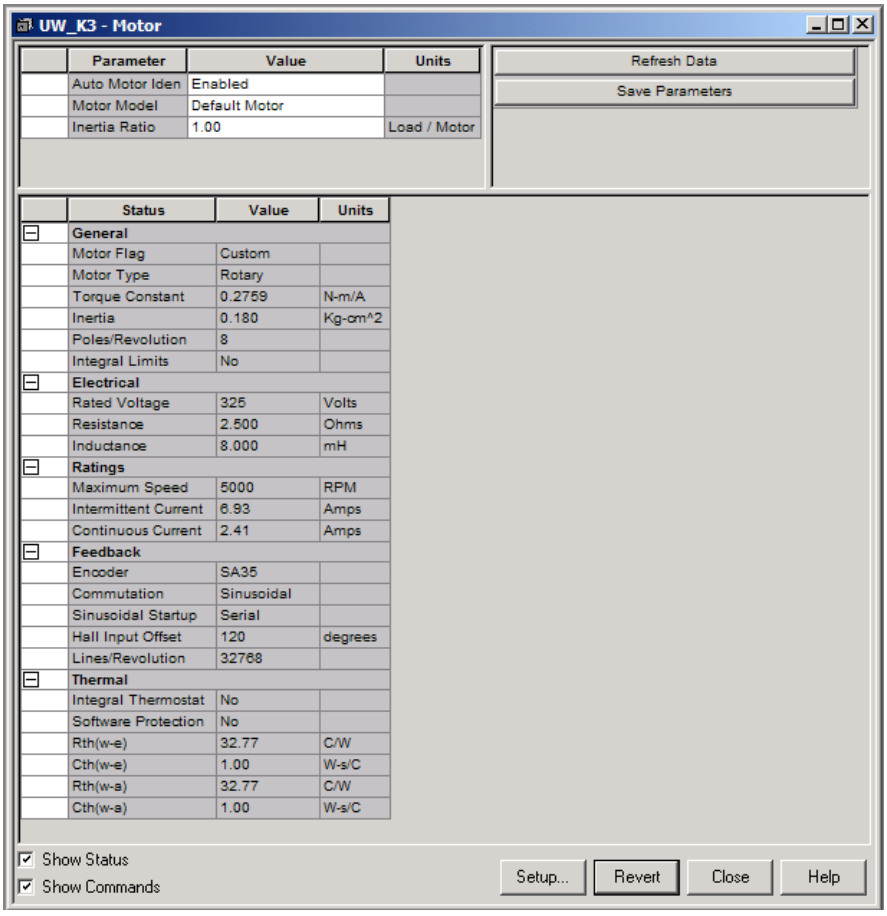
Command	Description
Save Parameters	Saves the current parameters to flash memory.

Customize the Homing window for your Kinetix 3 drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Setup to open the Monitor Setup Window on page 276, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Motor Window

The Properties window for Motors looks like this.



Use the Motor window to:

- Choose a motor for the associated online or offline Kinetix 3 drive. Once you select a motor, the status values associated with the selected motor appears in the Status pane of this window.
- Monitor the status settings that relate to the selected motor.

The following parameters, status, and commands apply to motors.

Parameter	Description
Auto Motor Iden	Select: • Enabled: Causes the drive to read motor parameters from an intelligent encoder, or • Disabled: Causes the drive to read motor parameters from a Motor Model selected, below.
Motor Model	The model name for the motor being used by the drive. If Auto Motor Iden is: • Enabled, this displays the motor model obtained from the motor. • Disabled, this displays the model name of the selected motor. Only listed motor models are valid. Note: Ultraware software ships with a Motor Configuration utility that lets you create custom motor configurations. Use that utility to add customized motor selections to the Motor Model list. Click Start, then Programs>Ultraware>Motor Configuration from pop-up menus.
Inertia Ratio	(Only for linear motors) The moving mass of the motor and load combined. Note: The Motor Model list may not include any linear motors. You can add linear (or other) motors using the Motor Configuration utility, referenced in the Motor Model section, above.
Built-In Type Motor Configuration	
Motor Model	Specifies a motor that is predefined in the Kinetix 3 Driver.

The following status is displayed by default for the Motor branch of an online drive.

Status	Description
General	
Motor Model	The model name for the motor being used by the drive. If Auto Motor Iden is enabled, this displays the motor model obtained from the motor.
Motor Flag	Either: • Standard – indicates a motor whose status settings come preconfigured. • Custom – indicates a user-configured motor that was added to the Motor Model list, above, using the Ultraware utility.
Motor Type	The type of motor selected: • Linear • Rotary
Torque Constant	(Only for rotary motors) The sinusoidal force constant, in Newton meters/Ampere (N-m/A).
Force Constant	(Only for linear motors) The sinusoidal force constant, in Newtons/Ampere (N/A).
Inertia	Rotor inertia, in Kilogram-centimeter squared (kg-cm^2).
Mass	(Only for linear motors) Rotor mass, in Kilograms (kg).
Mass	(Only for linear motors) The moving mass of the motor and load combined, in Kilograms (kg).
Poles/Revolution	The number of motor poles per revolution.

Status (Continued)	Description
Electrical Cycle	(Only for linear motors) The distance between motor poles, or Magnet Pitch * 2, in meters.
Integral Limits	Indicates whether the motor provides built in feedback for travel limits: • Yes • No
Electrical	
Rated Voltage	Voltage rating of the motor in Volts.
Resistance	The phase-to-phase resistance of the motor stator, in Ohms.
Inductance	The phase-to-phase inductance of the motor stator, in milliHenries (mH).
Ratings	
Maximum Speed	Maximum motor output shaft speed, in: • revolutions per minute (rpm) for rotary motors, • meter per second (mps) for linear motors.
Intermittent Current	Maximum intermittent current of the motor in peak Amperes.
Continuous Current	Continuous current rating of the motor in peak Amperes.
Feedback	
Encoder	The encoder type: • Incremental • SA35
Commutation	The type of commutation: • Brush • Trapezoidal • Sinusoidal
Sinusoidal Startup	The type of startup for sinusoidal commutation: • Self-Sensing Note: The Kinetix 3 does not support self-sensing startup. • Hall Inputs • Serial
Hall Input Offset	Hall Input offset, from standard Rockwell Automation orientation, in electrical degrees.
Lines/Revolution	Encoder lines per revolution of the output shaft. Note: This parameter is visible only if the Type is Rotary.
Lines/Meter	Encoder lines per meter of travel. Note: This parameter is visible only if the Type is Linear.
Thermal	
Integral Thermostat	Indicates whether the motor has a built-in thermostat. Settings are: Yes or No.
Software Protection	Indicates whether the motor thermal protection software is activated. Settings are: Yes or No.
Rth(w-e)	Thermal resistance from the winding to the encoder, in degrees centigrade/watt (°C/Watt). Note: This setting applies and is visible only if Software Protection is set to Yes.

Status (Continued)	Description
Cth(w-e)	Thermal capacitance from the winding to the encoder, in Watt-seconds per degree centigrade (Watt-second/°C). Note: This setting applies and is visible only if Software Protection is set to Yes.
Rth(w-a)	Thermal resistance from the winding to ambient, in degrees centigrade/watt (°C/Watt). Note: This setting applies and is visible only if Software Protection is set to Yes.
Cth(w-a)	Thermal capacitance from the winding to ambient, in Watt-seconds per degree centigrade (Watt-second/°C). Note: This setting applies and is visible only if Software Protection is set to Yes.

The following commands can be executed for a Motor window of an online Kinetix 3 drive.

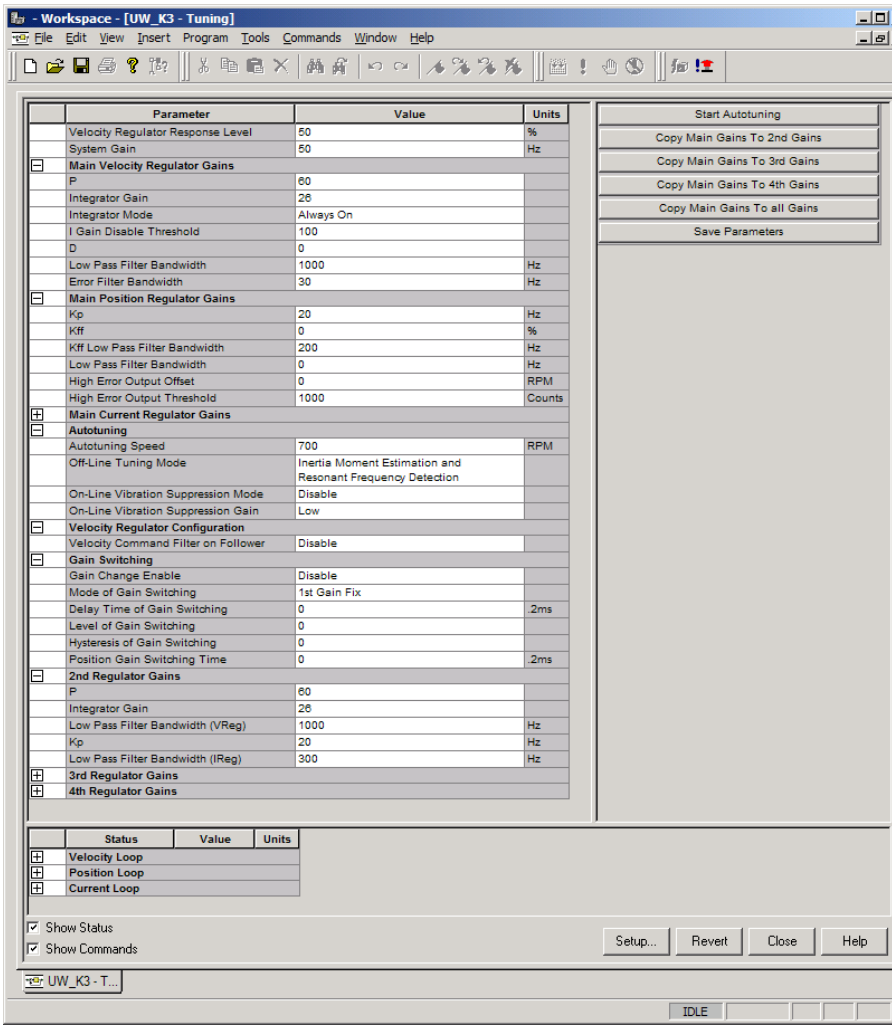
Command	Description
Refresh Data	Reads the motor definition information from the motor database and reapplies it to the drive. Note: This command is useful when a motor definition in the motor database has been changed.
Save Parameters	Saves the values currently selected in flash memory for the selected online drive and all of its children.

Customize the Motor window for your Kinetix 3 drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup Window on page 276, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Tuning Window

The Properties window for the Tuning branch looks like this.



Use the Tuning window to:

- Configure Velocity, Position, and Current Regulator Gains.
- Configure and execute autotuning.
- Configure an alternative set of gains, that can be activated by a digital input.
- Monitor Velocity, Position and Current loop statuses.

  The Inertia Ratio in the Motor window is the most fundamental property to adjust for proper tuning. The Inertia Ratio can be set automatically by running the Autotuning command, or entered manually if it is known. One of these should be done as the first step in tuning.

The following parameters, status, and commands apply to this window.

Parameter	Description
Parameters	
Velocity Regulator Response Level	The Velocity Regulator Response Level defines maximum system gain percentage (%) recommended by the drive based on the inertia ratio determined by auto tuning. The range is 0 …150. The default is 50.
System Gain	System Gain is the same as the Bandwidth of overall velocity control loop of the servo drive. The range is 0…500. The default is 50.
Velocity Regulator Gains	
P	Proportional gain for the velocity loop. The P gain generates a control signal proportional to the velocity error. The range is 0…10,000. Note: Increasing the P gain improves response time and increases the stiffness of the system. Too high a P gain value causes instability; too low a P gain value results in loose or sloppy system dynamics.
Integrator Gain	Integral gain for the velocity loop. The integrator generates a control signal proportional to the integral of the velocity error. Note: Integral Time improves the steady-state velocity performance of the system. Decreasing the integral time generally increases the ultimate positioning accuracy of the system. However, too low of an integral time results in system instability. There are two ways for the Kinetix 3 velocity loop integrator to be held in its current state: • If an input is assigned the Integrator Inhibit function, The integrator will be held when the input is active. • If the Integrator Inhibit function is not assigned to an input, the Integrator Mode and Integrator Hold Threshold can be used to control when the integrator is held.
Integrator Mode	The conditions for using the Integrator: • Always On: The integrator is always used. • High Current Disable: Holds the integrator if the current command exceeds the Integrator Hold Threshold. • Velocity Command Disable: Holds the integrator if the velocity command exceeds the Integrator Hold Threshold. • Position Error Disable: Holds the integrator if the position error exceeds the Integrator Hold Threshold. • Automatic Disable: Velocity controller is Automatically changed from PI Controller to P Controller.
D	Derivative gain value for the velocity loop. The D gain generates a control signal proportional to the derivative of the velocity error. The range is 0…1000. Note: D gain reduces velocity overshoot.
Low Pass Filter Bandwidth	The velocity loop's low pass filter bandwidth. This value indicates the cutoff frequency of the pass filter that is applied to the velocity command input to the regulator. The range is 0…10,000 Hz. Note: If this value is set to 0, the low pass filter is disabled.
Error Filter Bandwidth	This value indicates the cutoff frequency of the pass filter that is applied to the velocity differential error to the regulator. The range is 0…2,500 Hz. The default is 30 Hz.

Parameter	Description
Main Position Regulator Gains	
Kp	Proportional gain for the position loop. The Kp gain generates a control signal proportional to the position error. The range is 0…700. Note: Increasing the Kp gain improves response time and increases the stiffness of the system. Too high a Kp gain value causes instability; too low a Kp gain value results in loose or sloppy system dynamics.
Kff	Feedforward gain for the position loop. The Kff gain generates a feed forward signal proportional to the commanded speed. The range is 0…100% of the commanded speed. Note: Kff gain reduces position following error. However high values can cause position overshoot.
Kvff	Velocity Feedforward gain for the position loop. The Kvff gain generates a feed forward signal proportional to the commanded speed. The range is 0…200. Note: Kvff gain reduces position following error. However high values can cause position overshoot.
Low Pass Filter Bandwidth	This value indicates the cutoff frequency of the pass filter that is applied to the position command. The range is 0…2,500 Hz. The default is 0 Hz.
High Error Output Offset	An additional velocity command to be added in to the velocity speed command when the position error exceeds a threshold, specified below. The range is 0…450 rpm or millimeters per second.
High Error Output Threshold	Minimum position error, in counts, at which the High Error Output Offset, specified above, will be added to the velocity command. The range is 0 to 50,000 counts. The default is 1000.
Main Current Regulator Gains:	
Gain	Adjusting this gain adjusts the overall response of the current regulator. It can be set to Low, Medium, or High. Normally this gain should be left at the High Setting for best performance, but a lower setting will reduce audible noise at the expense of bandwidth.
Low Pass Filter Bandwidth	The current loop's low pass filter bandwidth. The value indicates the cutoff frequency of the low pass filter applied to the current command input of the regulator. This filter reduces noise generated by encoder resolution or mechanical resonance in the system. The range is 0…10,000 Hz. Note: If this value is set to 0, the low pass filter is disabled.
1st Resonant Frequency Suppression Filter	Set this to the 1st resonant frequency of the load to suppress vibration or noise. This parameter is useful if a specific frequency needs to be eliminated. The range is 0…10,000 Hz. The default is 10,000 Hz.
2nd Resonant Frequency Suppression Filter	Set this to the 2nd resonant frequency of the load to suppress vibration or noise. This parameter is useful if a specific frequency needs to be eliminated. The range is 0…10,000 Hz. The default is 10,000 Hz.
1st Resonant Frequency Suppression Filter Width	Set up the notch width of 1st resonance suppressing filter in 20 steps. The higher the value, the larger the notch width. The range is 0…20. The default is 10.
2nd Resonant Frequency Suppression Filter Width	Set up the notch width of 2nd resonance suppressing filter in 20 steps. The higher the value, the larger the notch width. The range is 0…20. The default is 10.
2nd Resonant Frequency Suppression Filter Depth	Set up the notch depth of 2nd resonance suppressing filter. The higher the value, the shallower the notch depth and the smaller the phase delay. The range is 0…100. The default is 100.

Parameter	Description
Autotuning:	
Autotuning Speed	Motor speed to use when performing the Autotuning function. The range is 200…900 (rpm rotary or millimeters per second linear).
Off-LineTuning Mode	• Inertia Moment Estimation: Servo drives automatically detect and set only the load inertia ratio, and automatically set two basic gains as being suitable for Inertia Ratio. Therefore, it is recognized that the response quality of servomotor is improved at the same time. • Inertia Moment Estimation and Resonant Frequency Detection: Servo drive automatically detects and sets load inertia ratio (mass ratio for linear motors), friction coefficient, and resonant frequency. • Resonant Frequency Detection: Intercepts vibration of load system using resonant frequency that is automatically detected by auto tuning. Resonant frequency of load system becomes the setting value for resonance suppression filter.
On-Line Vibration Suppression Mode	• Disable: Disables the online vibration suppression function. • Normal and High Velocity: Enables the online vibration suppression function and more delicately it responses to load change and respond quickly. • Slow Velocity without Initial Value: Enables the online vibration suppression function and more delicately it responses to load change and respond slowly.
On-Line Vibration Suppression Gain	• low:This value indicates the velocity observation gain is low. • high: This value indicates the velocity observation gain is high.
Velocity Regulator Configuration:	
Velocity Command Filter on Follower	• Disable: Disables the Velocity Command Filter in the Follower mode. • Enable: Enables the Velocity Command Filter in the Follower mode.
Gain Switching:	
Gain Change Enable	• Disable: Disables the Gain Change. • Enable: Enables the Gain Change.
Mode of Gain Switching	• 1st Gain Fix: Fixed to the 1st gain • 2nd Gain Fix: Fixed to the 2nd gain • Digital Input (G-SEL): 2nd gain selection when the gain switching input is turned on. • Torque command: 2nd gain selection when the toque command is larger than the control settings (level of gain control switching and hysteresis of control switching) • Velocity Command: 2nd gain selection when the command speed is larger than the control settings (level of gain control switching and hysteresis of control switching) • Position Error: 2nd gain selection when the positional deviation is larger than the control settings (level of gain control switching and hysteresis of control switching) • Position Command: 2nd gain selection when more then one command pulse exists within a 200 µs interval. • In-Position: 2nd gain selection when the value in the positional deviation counter exceeds the range of the positioning completer. • Velocity: 2nd gain selection when the motor actual speed exceeds the control values (level of gain control switching and hysteresis of control switching). Switches to the 2nd gain while the position command exists. • Position Command and Speed: Switches to the 1st gain when no-position command status lasts for the delay time of gain switching [x 200 µs] and the speed falls slower than the control settings of the gain control switching level and hysteresis of control switching

Parameter	Description
Delay Time of Gain Switching	This value indicates the delay time when changing form from 2nd gain to 1st gain in 0.2 ms units.
Level of Gain Switching	This value indicates the switching level when changing form from 2nd gain to 1st gain.
Hysteresis of Gain Switching	This value indicates the hyteresis width to be operated above/ below the switching level.
Position Gain Switching Time	This value indicates the step by step switching time to tho position gain while changing the 1st gain to 2nd gain in 0.2 ms units.
2nd Regulator Gains	The drive uses these tuning values when the Alternate Gain Select function is assigned to an input, and that input is active. • P: See the P Gain description in the Main Velocity Regulator Gains section above. • Integrator Time: See Integrator Time description in the Main Velocity Regulator Gains section, above. • Low Pass Bandwidth(VReg): See Low Pass Filter Bandwidth description in the Main Velocity Regulator Gains section, above. • Kp: See Kp Gain description in the Main Position Regulator Gains section, above. • Low Pass Bandwidth(IReg): See Low Pass Filter Bandwidth description in the Main Current Regulator Gains section, above.
3rd Regulator Gains	The drive uses these tuning values when the Alternate Gain Select function is assigned to an input, and that input is active. • P: See the P Gain description in the Main Velocity Regulator Gains section above. • Integrator Time: See Integrator Time description in the Main Velocity Regulator Gains section, above. • Low Pass Bandwidth(VReg): See Low Pass Filter Bandwidth description in the Main Velocity Regulator Gains section, above. • Kp: See Kp Gain description in the Main Position Regulator Gains section, above. • Low Pass Bandwidth(IReg): See Low Pass Filter Bandwidth description in the Main Current Regulator Gains section, above.
4th Regulator Gains	The drive uses these tuning values when the Alternate Gain Select function is assigned to an input, and that input is active. • P: See the P Gain description in the Main Velocity Regulator Gains section above. • Integrator Time: See Integrator Time description in the Main Velocity Regulator Gains section, above. • Low Pass Bandwidth(VReg): See Low Pass Filter Bandwidth description in the Main Velocity Regulator Gains section, above. • Kp: See Kp Gain description in the Main Position Regulator Gains section, above. • Low Pass Bandwidth(IReg): See Low Pass Filter Bandwidth description in the Main Current Regulator Gains section, above.

The following status is displayed by default for the Tuning branch of an online drive.

Status	Description
Velocity Loop	
Command Velocity	The commanded motor velocity.
Feedback Velocity	The actual motor velocity.
Error	The difference between the commanded motor velocity and the actual motor velocity.
Position Loop	
Master Position	The motor position command before scaling by the Gear Ratio, in units of master counts.

Status	Description
Follower Position	The actual motor position.
Error	The difference between the commanded master position and the follower position.
Current Loop	
Current Command	The commanded current.

The following commands can be executed for a Motor branch of an online drive.

Command	Description
Start Autotuning	Begins the Autotuning procedure.
Copy Main Gains to Alternate	This command sets the values in the Alternate Gain Values section by copying the corresponding values from the Main Gains section. This provides you with a one-step process to tune your system by storing the main gains, adjusting the transferred gains, and to then storing the adjusted gains as Alternate Gains.
Save Parameters	Saves the current working values as power-up values in flash memory for the selected On-Line drive and all of its children.

Customize the Tuning window for your Kinetix 3 drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup Window on page 276, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Autotuning Window

Use the Autotuning window to configure autotuning parameters, start and stop autotuning for an online drive, and monitor the Drive Enable status.

During autotuning, the drive executes an internal tuning algorithm and sets appropriate gains automatically. The user sets the desired tuning command parameters and selects the Start Autotune button to begin autotuning.

ATTENTION: The motor shaft moves during the tuning process! Refer to the Hardware and Installation manual for tuning details.

TIP Closing the window returns the drive to its normal operating mode, but the software is disabled. Select the drive and execute an Enable command and instructed in the Windows' message to make the drive operational.

The following parameters, status, and commands apply to this window.

Parameter	Description
Autotune Settings	
Motor Direction	The direction in which the motor rotates during tuning: • Bi-Directional, • Forward Only, or • Reverse Only.
Maximum Distance	The maximum distance the motor turns when performing autotuning. The autotune distance should be set as large as the application permits, so that the autotune algorithm is able to collect sufficient data to compute new tuning gains. The range is 1…2,147,483,647 counts.
Step Current	The current the drive commands when performing autotuning, in percent of the lesser of either the drive peak current or the motor peak current. The autotune current is normally set at 10%, but may need to be increased in the presence of large inertias or high friction. In these systems, higher settings make sure that the autotune algorithm is able to collect sufficient data to compute new tuning gains. The range is 1…100%.
Velocity Regulator Gains	
P	Proportional gain for the velocity loop. The P gain generates a control signal proportional to the velocity error. The range is 0…4000. Note: Increasing the P gain improves response time and increases the stiffness of the system. Too high a P gain value causes instability; too low a P gain value results in loose or sloppy system dynamics.
I	Integral gain for the velocity loop. The I gain generates a control signal proportional to the integral of the velocity error. The range is 0…4000. Note: I gain improves the steady-state velocity performance of the system. Increasing the integral gain generally increases the ultimate positioning accuracy of the system. However excessive integral gain results in system instability.
D	Derivative gain value for the velocity loop. The D gain generates a control signal proportional to measured acceleration. The range is -1000…1000. Note: Positive D gain reduces velocity overshoot, and negative D gain should be used only in systems that exhibit mechanical resonance.

The following information is the default status for a Kinetix 3 drive in the Autotuning window of the Tuning branch.

Status	Description
Drive Enabled	ON indicates the power stage of the drive is enabled. As a precondition, all software and hardware enable inputs must be active, and the drive cannot have any faults. Note: Drive Enable has a value of 1 when ON, and a value of 0 when OFF.
Autotune Complete	ON indicates the autotune completed successfully.
Autotune Failed	ON indicates the autotune failed.

The following commands can be executed on an online drive using the Autotuning window of the Tuning branch.

Command	Description
Start Autotune	Begins autotuning.
Stop Autotune	Stops autotuning.
Clear Faults	Attempts to clear all drive faults.

Customize the Autotuning window for your Kinetix 3 drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Revert to return parameter settings to the values they held when you opened this window.

Manual Position Tuning Window

Use the Manual Position Tuning window to configure manual position tuning parameters, start and stop manual position tuning for an online drive, and monitor the Drive Enable status.

During manual position tuning, the drive commands an internal step position waveform and the user sets the gains manually. The user sets the desired tuning command parameters and selects the Start Tuning button to begin manual position tuning.

ATTENTION: The motor shaft moves during the tuning process. Ensure that the motor is properly mounted and guarded.

TIP Closing the window returns the drive to its normal operating mode, but software disabled. Select the drive and execute an Enable command as instructed in the Windows' message to make the drive operational.

The following parameters, status, and commands apply to this window.

Parameter	Description
Manual Position Tuning Settings	
Motor Direction	The direction in which the motor rotates during tuning: • Bi-Directional, • Forward Only, or • Reverse Only.
Distance	The the amplitude of the drive's commanded position step. The range is 1…32,767 counts.
Time	The period of the drive's commanded position step. The range is 1…32,767 ms.
Position Regulator Gains	

Parameter	Description
Kp	Proportional gain for the position loop. The Kp gain generates a control signal proportional to the position error. The range is 0…32 in/min/mil. Note: Increasing the P gain improves response time and increases the stiffness of the system. Too high a P gain value causes instability; too low a P gain value results in loose or sloppy system dynamics.
Kd	Derivative gain for the position loop. The Kd gain generates a control signal proportional to measured velocity. The range is 0…32. Note: Kd gain provides damping to the position loop, that can reduce overshoot.
Kff	Feedforward gain for the position loop. The Kff gain generates a feed forward signal proportional to the commanded speed. The range is 0…200. Note: Kff gain reduces position following error. However high values can cause position overshoot.
Ki	Integral gain for the position loop. Ki gain generates a control signal proportional to the integral of the velocity error. The range is 0…32. Note: Ki gain improves the steady-state positioning performance of the system and virtually eliminates steady-state positioning errors. It affects the ability to reject load disturbances. Increasing the integral gain generally increases the ultimate positioning accuracy of the system. However excessive integral gain results in system instability.
Ki Zone	The region, in counts, around the commanded position where integral gain is active. If the position error is greater than Ki Zone, the integrator is reset. The range is 0…32,767 counts.
Velocity Regulator Gains	
P	Proportional gain for the velocity loop. The P gain generates a control signal proportional to the velocity error. The range is 0…4000. Note: Increasing the P gain improves response time and increases the stiffness of the system. Too high a P gain value causes instability; too low a P gain value results in loose or sloppy system dynamics.
I	Integral gain for the velocity loop. The I gain generates a control signal proportional to the integral of the velocity error. The range is 0…4000. Note: I gain improves the steady-state velocity performance of the system. Increasing the integral gain generally increases the ultimate positioning accuracy of the system. However excessive integral gain results in system instability.
D	Derivative gain value for the velocity loop. The D gain generates a control signal proportional to measured acceleration. The range is is -1000…1000. Note: Positive D gain reduces velocity overshoot, and negative D gain should be used only in systems that exhibit mechanical resonance.

The following display is the default status for a Kinetix 3 drive in

The following display is the default status for a Kinetix 3 drive in the Manual Position Tuning window of the Tuning branch.

Status	Description
Drive Enabled	ON indicates the power stage of the drive is enabled. As a precondition, all software and hardware enable inputs must be active, and the drive cannot have any faults. Note: Drive Enable has a value of 1 when ON, and a value of 0 when OFF.

The following commands can be executed on an online drive using the Manual Position Tuning window of the Tuning branch.

Command	Description
Start Tuning	Begins manual position tuning.
Stop Tuning	Stops manual position tuning.
Clear Faults	Attempts to clear all drive faults.

Customize the Manual Position Tuning window for your Kinetix 3 drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Revert to return parameter settings to the values they held when you opened this window.

Manual Velocity Tuning Window

Use the Manual Velocity Tuning window to configure manual velocity tuning parameters, start and stop manual velocity tuning for an online drive, and monitor the Drive Enable status.

During manual velocity tuning, the drive commands an internal step velocity waveform and the user sets the gains manually. The user sets the desired tuning command parameters and selects the Start Tuning button to begin manual velocity tuning.

ATTENTION: The motor shaft moves during the tuning process. Ensure that the motor is properly mounted and guarded.

TIP Closing the window returns the drive to its normal operating mode, but software is disabled. Select the drive and execute an Enable command as instructed in the message to make the drive operational.

The following parameters, status, and commands apply to this window.

Parameter	Description
Manual Velocity Tuning Settings	
Motor Direction	The direction in which the motor rotates during tuning: • Bi-Directional, • Forward Only, or • Reverse Only.
Velocity	The the amplitude of the drive's commanded velocity step. The range is 1…2,147,483,647 counts per second.
Time	The period of the drive's commanded velocity step. The range is 1…32,767 ms.
Velocity Regulator Gains	
P	Proportional gain for the velocity loop. The P gain generates a control signal proportional to the velocity error. The range is 0…4000. Note: Increasing the P gain improves response time and increases the stiffness of the system. Too high a P gain value causes instability; too low a P gain value results in loose or sloppy system dynamics.
I	Integral gain for the velocity loop. The I gain generates a control signal proportional to the integral of the velocity error. The range is 0…4000. Note: I gain improves the steady-state velocity performance of the system. Increasing the integral gain generally increases the ultimate positioning accuracy of the system. However excessive integral gain results in system instability.
D	Derivative gain value for the velocity loop. The D gain generates a control signal proportional to measured acceleration.The range is -1000…1000. Note: Positive D gain reduces velocity overshoot, and negative D gain should be used only in systems that exhibit mechanical resonance.
Low Pass Filter	
Enable	Enable or disable the drive's low pass filter. Selections are: • Enabled • Disabled
Bandwidth	The connected drive's low pass filter's bandwidth. This value indicates the cutoff frequency of the low pass filter. The range is 1…992 Hz. Note: Bandwidth reduces noise generated by encoder resolution or mechanical resonance in the system.

The following display is the default status for a Kinetix 3 drive in the Manual Velocity Tuning window of the Tuning branch.

Status	Description
Drive Enabled	ON indicates the power stage of the drive is enabled. As a precondition, all software and hardware enable inputs must be active, and the drive cannot have any faults. Note: Drive Enable has a value of 1 when ON, and a value of 0 when OFF.

The following commands can be executed on an online drive using the Manual Velocity Tuning window of the Tuning branch.

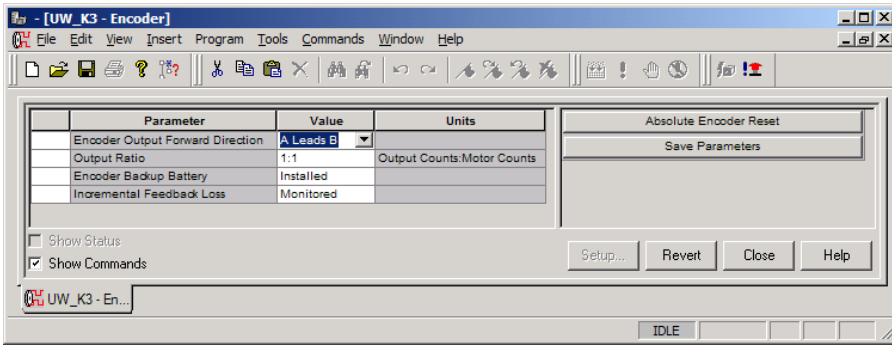
Command	Description
Start Tuning	Begins manual velocity tuning.
Stop Tuning	Stops manual velocity tuning.
Clear Faults	Attempts to clear all drive faults.

Customize the Manual Velocity Tuning window for your Kinetix 3 drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Encoders Window

The Properties window for Encoders looks like this.



Use the Encoders window to:

- configure the motor encoder,
- execute a command that will reset an absolute encoder position to zero.

This window has these parameters and direct commands.

Parameter	Description
Encoder Output Forward Direction	The order of the A and B signals for the encoder output: • A Leads B • B Leads A
Output Ratio	The ratio of encoder output counts to motor encoder counts received from the motor. The range is of 1…65,535.
Encoder Backup Battery	The encoder back-up battery, if installed in the drive, powers an SA35 type encoder that maintains an absolute multi-turn position. Without a battery, an SA35 type encoder operates as a single turn absolute encoder. You must configure this setting to let the drive know if the battery is not present. Select: • Installed • Not Installed Note: This parameter is visible only if the motor has an SA35 type encoder.
Incremental Feedback Loss	In electrically noisy conditions, or with long feedback cables, the drive may experience an incremental encoder cable open fault, although the cable is OK. Under these conditions, this parameter can be used to avoid nuisance faults. **ATTENTION:** If the incremental encoder feedback is lost and this fault is ignored, the drive may cause abrupt or extreme motion. Select: • Monitored: to monitor for incremental encoder feedback loss, and fault the drive if it is detected. • Ignored: to not check for incremental encoder feedback loss.

The following commands can be executed on an online drive using the Encoders window.

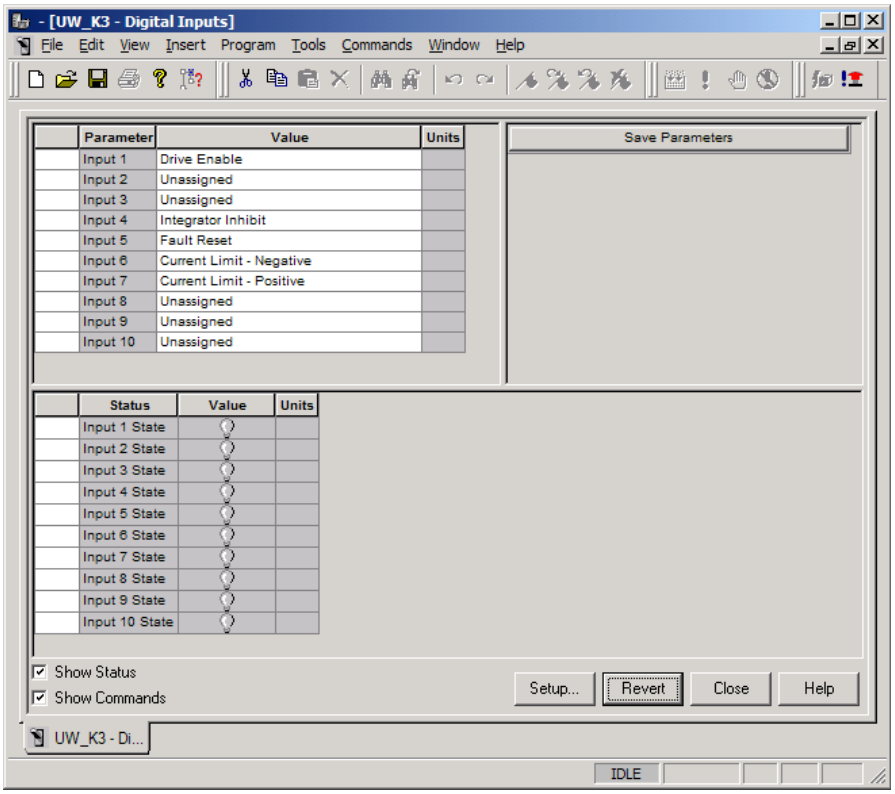
Command	Description
Absolute Encoder Reset	Zeros the Absolute Rotations and the Position Error. This function will set the absolute position of the drive to zero.
Save Parameters	Saves the current working values as power-up values in flash memory for the selected On-Line drive and all of its children.

Customize the Encoders window for your Kinetix 3 drive by selecting one or more of these commands:

- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup Window on page 276, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Digital Inputs Window

The Properties window for Digital Inputs looks like this.



Use the Digital Inputs window to:

- assign functions to digital inputs, and
- monitor the status of digital inputs.

Selecting a function in the Value selection box causes that function to become active when the associated Digital Input becomes active.

WARNING: By default, Input 1 is assigned the function Drive Enable. If you change the assignments so that Drive Enable is not assigned to any input, the drive automatically enable on powerup. Be aware that, in this case, the motor may start moving on powerup.

This may result in abrupt and unexpected motion.

Failure to observe this precaution could result in damage to the machine, severe bodily injury, or the loss of life.

TIP Index Input 1 through 64 serve a unique purpose. Instead of activating a function, Index Input 1 through 64 are combined to produce a binary value that defines which digital input becomes active. The drive sums the binary values and uses the resulting integer to determine which Index will be used.

The digital input index Select binary values are as follows:

- Preset Select 0 = 1 if active, 0 if not.
- Preset Select 1 = 2 if active, 0 if not.
- Preset Select 2 = 4 if active, 0 if not.
- Preset Select 3 = 8 if active, 0 if not.
- Preset Select 4 = 16 if active, 0 if not.
- Preset Select 5 = 32 if active, 0 if not.

If a Index Input is not assigned to a digital input, the Index Input is considered inactive.

There are no commands associated with the Digital Inputs parameter window.

The Digital Inputs window has these parameters and statuses.

<table>
<tr><th>Parameter</th><th colspan="2">Description</th></tr>
<tr><td rowspan="6">Input 1…10</td><td colspan="2">The drive's digital input assignments:</td></tr>
<tr><td colspan="2">• Unassigned: The digital input is not used.
• Alternate Gain Select: When this input is active, the drive uses the Alternate Gain Values instead of the Main values.
• Current Limit - Negative: When this input is active, the Negative External current limit, as entered in the Kinetix 3 Drive window, is in effect.
• Current Limit - Positive: When this input is active, the Positive External current limit, as entered in the Kinetix 3 Drive window, is in effect.
• Drive Enable: An active state enables the power electronics to control the motor.</td></tr>
<tr><td>  </td><td>WARNING: By default, Input 1 is assigned the function Drive Enable. If you change the assignments so that Drive Enable is not assigned to any input, the drive automatically enables on powerup. Be aware that, in this case, the motor may start moving on powerup.
This may result in abrupt and unexpected motion.
Failure to observe this precaution could result in damage to the machine, severe bodily injury, or the loss of life.</td></tr>
<tr><td colspan="2">• Fault Reset: A transition to an active state resets any detected drive faults.
• Integrator Inhibit: An active state zeros the velocity loop integrator.</td></tr>
</table>

Parameter	Description
	• Operation Mode Override: When active, the drive uses the Operation Mode Override as the command source. When inactive, the drive uses the Operation Mode setting as the command source. • Overtravel - Negative: An inactive state causes the drive to begin decelerating the motor to bring it to a stop using the Over Travel Stop Method as entered in the Drive window. The drive will not respond to further commands to move in the negative direction, but can be instructed to move in the positive direction to clear the negative overtravel condition. • Overtravel - Positive: An inactive state causes the drive to begin decelerating the motor to bring it to a stop using the Over Travel Stop Method as entered in the Drive window. The drive will not respond to further commands to move in the Positive direction, but can be instructed to move in the negative direction to clear the positive overtravel condition. • Pause Follower: In follower mode, while this input is active, the drive will ignore any master counts coming into the drive. • Position Strobe: This signal lets a controller obtain the absolute position of the motor. • Velocity Direction: Used in combination with the Preset Select inputs to assign a Preset Velocity. When the input is active, the Preset Velocity is set to a negative value. When the input is inactive (or not assigned), the Preset Velocity is treated as a positive value. • Preset Select 1…63: Used in combination, along with Preset Direction to assign a Preset Velocity. See the explanation in Tip preceding this table. • Reset Mutilturn Data: If a motor with an absolute encoder is attached to the drive, a transition to an active state resets the absolute rotation value stored in the encoder to zero. After the absolute rotations is reset, the Motor Feedback Position will display a number representing between 0 and 1 revolution of the motor. The Reset Mutilturn Data function does not affect the partial revolution data. • Zero Speed Clamp Enable: When this function is assigned to an input, the Zero Clamp velocity, as set in the drive window, is used only when the input is active. If the function is not assigned to an input, the Zero Clamp velocity is always used • Position Clear: An active state causes the drive to clear position command, position feedback, and position error. • Moving Enable: An active state causes the drive to control motor rotation start or stop by using terminal signal in velocity control mode. • Analog Speed Command Enable: An active state causes the drive to can be used to change the motor speed using analog velocity input voltage without changing the control mode In Multi-step velocity Mode. • 2nd Electronic Gear Bank Selection: An active state causes the drive to switch between two electronic gear ratios in follower control mode • Home Sensor: An active state indicates to a homing sequence that the sensor has been seen. • Start Homing: A transition to an active input state causes the to initiate the homing routine. • Stop Indexing: A transition to an active input state causes the to initiate the indexing stop routine.

Parameter	Description
	• Pause Indexing: A transition to an active input state causes the to initiate the indexing pause routine. • Index Select 0 Input:Used in combination to assign index. See the explanation in Tip preceding this table. • Index Select 1 Input: • Index Select 2 Input: • Index Select 3 Input: • Index Select 4 Input: • Index Select 5 Input: • Stop Homing: A transition to an active input state causes the to initiate the homing routine. • Start Indexing: A transition to an active input state begins an indexing move. • Gain Bank Select: An active state causes the drive to use the 2nd and 4th Alternate Gain Values instead of the 1st and 3rd Main Gain values.
Note: The Input value displays Not Assigned if there is nothing selected, Multiple if there are multiple functions selected, or the name of the function if only one is selected.	

The following display is the default status for a Kinetix 3 drive in the Digital Inputs window.

Status	Description
Input 1 – 8 State	The current state, or condition, of each digital input is depicted by a light bulb icon, as follows: • ON: a bright light bulb • OFF: a darkened light bulb.

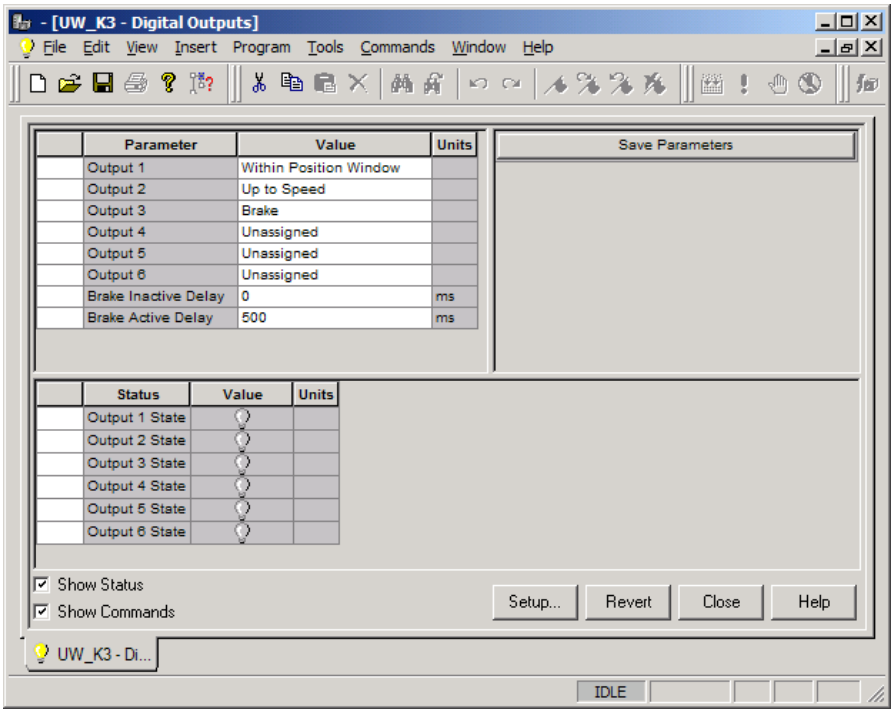
No commands are associated with the Digital Inputs window.

Customize the Digital Inputs window for your Kinetix 3 drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Setup to open the Monitor Setup Window on page 276, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Digital Outputs Window

The Properties window for Digital Outputs looks like this.



Use the Digital Outputs window to assign these parameters:

- assign functions to digital outputs.
- set both active and inactive brake delays.
- monitor the status of the digital outputs and the digital relay.

The following parameters are associated with this window.

Parameter	Description
Output 1 – 6	The functions to be assigned to each digital output (1 – 4): Note: If multiple functions are assigned to a digital output, the output is active if any of the assigned functions would make it active. The assignments are logically OR'd to determine the output state. • Unassigned: The digital output is not used. • Within Position Window: An active output state indicates that the position error is less than the In Position Size setting in the Drive window. • Up to Speed: An active output state indicates motor velocity feedback is greater than the Up to Speed setting in the Drive window. • Brake: Used to control a motor brake. An active state releases the motor brake. The Brake signal will be offset from changes in the enable state of the drive by the Brake Active Delay, Brake Inactive Delay, and Disable Delay. • Within Speed Window: An active output state indicates that the velocity error is less than the Speed Window setting in the Drive window.

Parameter	Description
	• Current Limited: An active state indicates the drive current is being limited by the Current Limit - Positive or Current Limit - Negative value. • Velocity Limited: An active state indicates the motor speed is being limited by the velocity limit value. • Within Near Window: An active output state indicates that the position error is less than the Near Position Size setting in the Drive window. • Warning: An active state indicates the drive has encountered a condition that has generated a warning. The possible warnings are listed in the Drive window help topic, under the Fault/Warning status. • Absolute Position Valid: An active state indicates that the drive has a motor with an absolute encoder attached, and that the drive is able to properly read the position from the motor. • Ready: An active state indicates the drive is not faulted, and can be enabled. • In Motion: An active state indicates an index move is active and the motor is moving • In Dwell: An active state indicates the motor is holding position in an index move and waiting for the commanded dwell time • Axis Homed: An active state indicates that the homing routine has completed. • Index Select 0 Output: Each active state indicates the commanded motor position is equal to the position defined by Index 0…63 • Index Select 0 Output: • Index Select 1 Output: • Index Select 2 Output: • Index Select 3 Output: • Index Select 4 Output: • Index Select 5 Output: • Index Select 6 Output: • End of Sequence: An active state indicates all iterations of the index move have been completed.
Brake Active Delay	• The time delay between enabling the drive and activating the brake output, that releases the motor brake. The range is 0…10,000 ms.
Brake Inactive Delay	• The time delay between disabling the drive and deactivating the brake output, which applies the motor brake. The range is 0…10,000 ms.

The following display is the default status for a Kinetix 3 drive in the Digital Outputs window.

Status	Description
Output 1 – 6 State	The current state, or condition, of each digital output is depicted by a light bulb icon, as follows: • ON: a bright light bulb • OFF: a darkened light bulb.

The following command can be executed for a Digital Outputs window of an online drive.

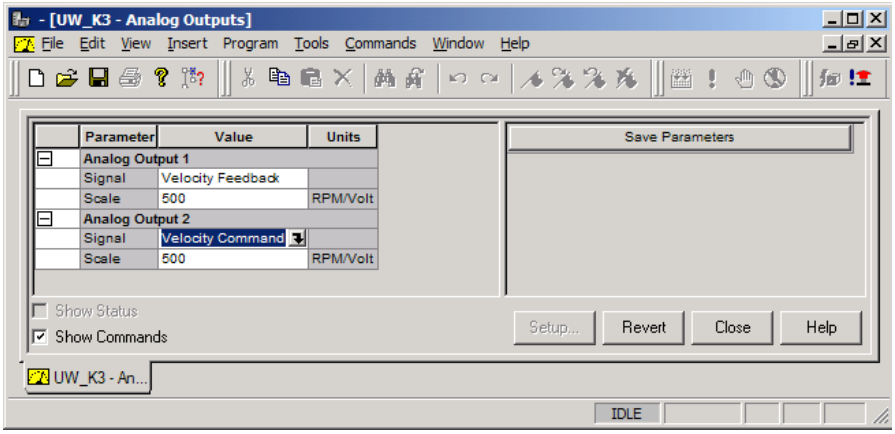
Command	Description
Save Parameters	Saves the current working values as power-up values in flash memory for the selected On-Line drive and all of its children.

Customize the Digital Outputs window for your Kinetix 3 drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the Monitor Setup Window on page 276, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Analog Outputs Window

The Properties window for Analog Outputs looks like this.



Use the Analog Outputs window to assign drive signals to analog outputs.

The Analog Outputs parameters window has these parameters.

Parameter	Description
Analog Output 1	
Signal	Sets the drive signal assigned to the output. Click the down arrow to the right of this input box to open the Channel Setup dialog.
Scale	The output scale in units per volt. It is dependent on the signal selected.
Analog Output 2	
Signal	Sets the drive signal assigned to the output. Click the down arrow to the right of this input box to open the Channel Setup dialog.
Scale	The output scale in units per volt. It is dependent on the signal selected.

The following commands can be executed on an online drive using the Analog Outputs window.

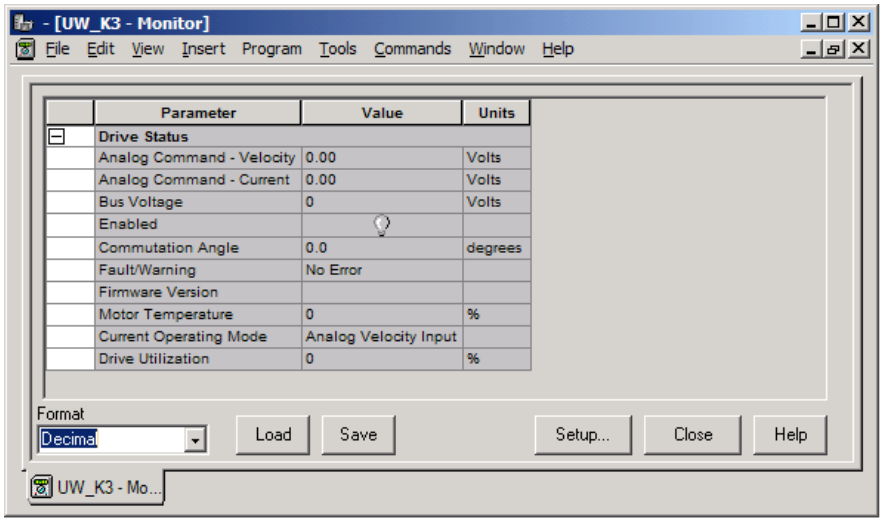
Command	Description
Save Parameters	Saves the current working values as power-up values in flash memory for the selected On-Line drive and all of its children.

Customize the Analog Outputs window for your Kinetix 3 drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Monitor Window

The Properties window for the Monitor looks like this.



The Monitor tool lets you display any combination of drive status settings for an online Kinetix 3 drive. The Monitor tool is similar to the status pane of the branch Properties window.

Use this window to:

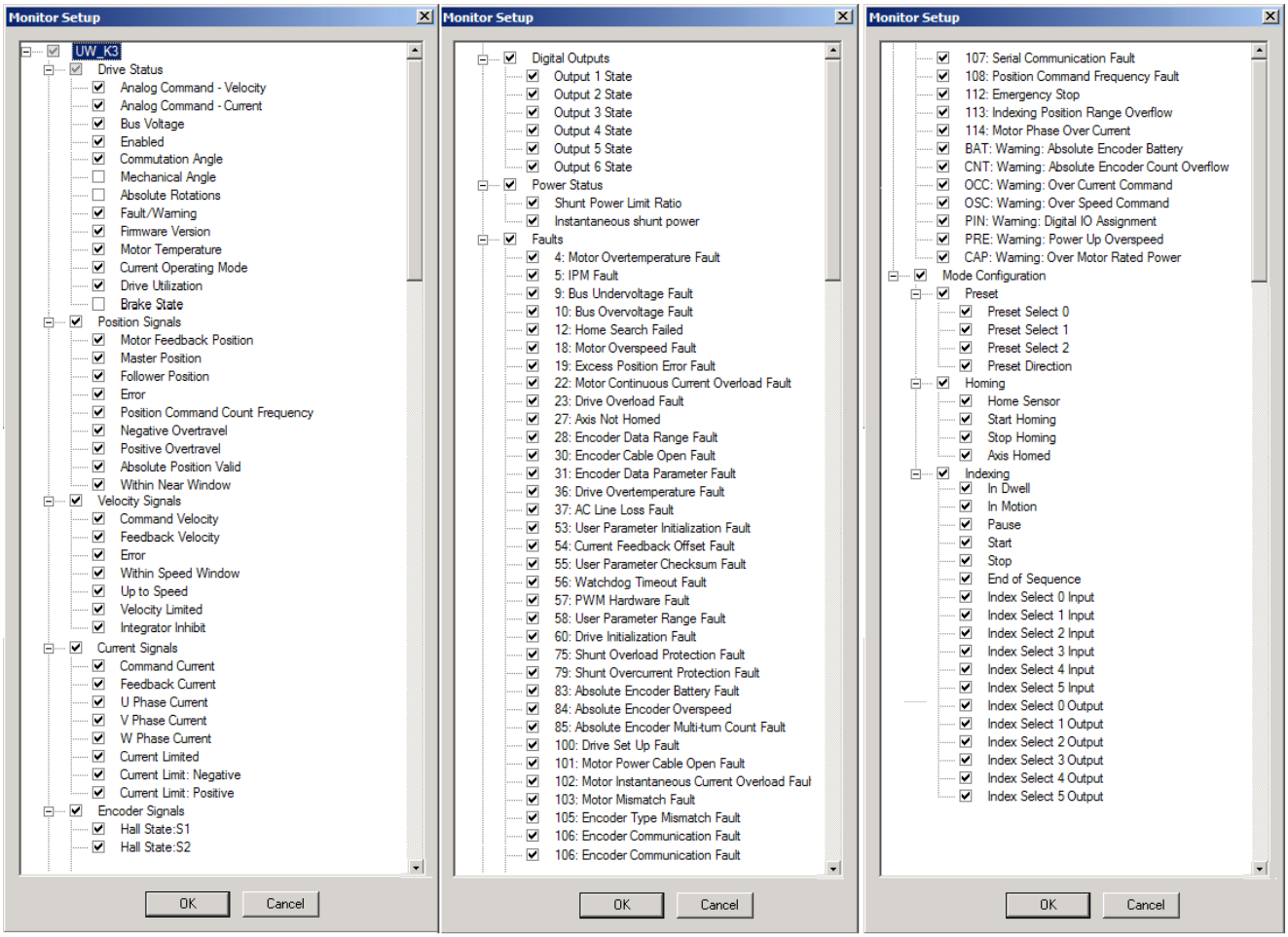
- View a collection of statuses.
- Open the Monitor Setup window, where you can set the drive status to display in this window.
- Load a monitor previously saved.
- Save a monitor for later use.

This window has these commands.

Command	Description
Format	The format for displaying integer values in the monitor: • Decimal (The range is -2,147,483,647…2,147,483,647.) • Hexadecimal, or • Binary Note: Do not create negative numbers in the Hexadecimal or Binary format.
Load	Opens the Monitor Load dialog, where you can program what is displayed in the Monitor window.
Save	Opens the Monitor Save dialog, where you can save a monitor.
Setup	Opens the Monitor Setup window, where you can program the drive status to display in the Monitor window.

Monitor Setup Window

The expanded Properties window for the Monitor Setup looks like this.



Use this window to assign a specific Input Signal or Status to be displayed in the Monitor window for a Kinetix 3 drive.

This dialog box displays a tree diagram with all the status settings that can be monitored for the selected drive.

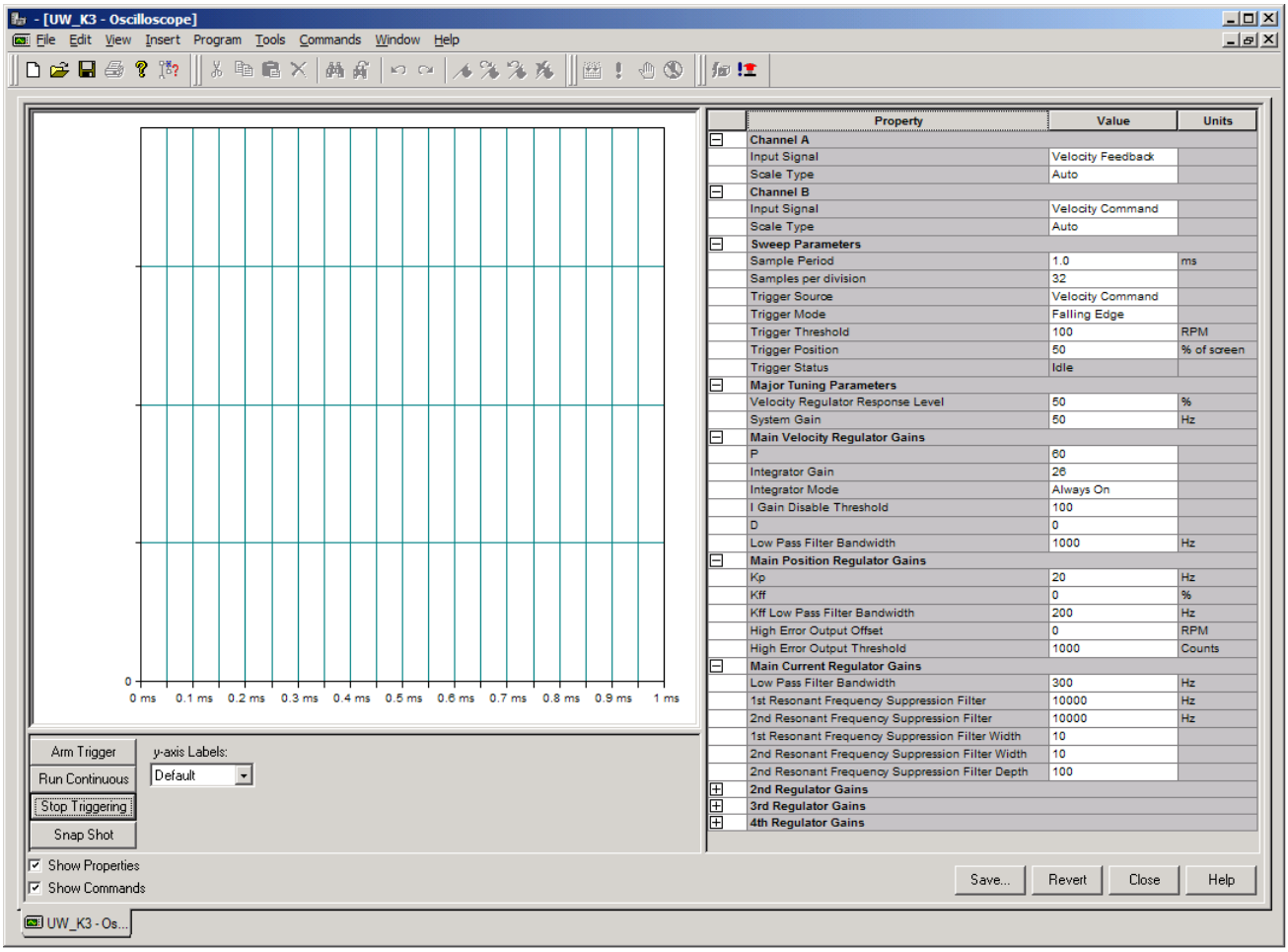
- Place a check mark in the checkbox to the left of a status item to monitor it.
- If you place a check mark beside a parent item, all of its child items become checked and their status will be displayed.
- If you remove a check mark from a parent item, check marks will be removed from all its child items and their status settings will not be displayed.
- If you place a check mark next to some - but not all - child items, the parent item will be checked, but dimmed.

The Monitor Setup window, much like the Oscilloscope window, lets you customize the display for the selected online Kinetix 3 drive. The window displays a tree diagram with all the status settings that can be monitored for the selected drive.

Refer to Understanding Kinetix 3 Status Displays on page 282 for a detailed list of drive status selections.

Understanding the Oscilloscope Window

The Properties window for the Oscilloscope looks like this.



Use the Oscilloscope window to trace one of four drive signals by:

- Configuring the oscilloscope by selecting a the drive signal to trace.
- executing commands that run the oscilloscope's tracing function continuously or in response to the configured trigger.
- monitoring the oscilloscope as it traces the selected drive signal.

The Oscilloscope window has these parameters and commands associated with it.

Parameter	Description
Channel A and B	
Input Signal	Click the down arrow to the right of the Channel Setup dialog to select a Channel (A or B). Note: The resolution of this signal may be confusing if Velocity Feedback is selected. See the topic Velocity Motor Feedback Resolution for information on how resolution is derived for various motor and feedback combinations.
Scale Type	Scale Types are: • Auto • Manual • Same As ChA (available for Channel B only)
Scale	The amplitude of the selected channel input signal that can be displayed between gridlines of the oscilloscope, in the units of the drive signal. It is dependent on the signal selected. If the Scale is left at its default value of 0, The data is auto scaled to fit the graph. Note: Visible only if Scale Type is Manual.
Offset	The trace offset for the selected Channel Input. Its range depends on the signal selected. A value of zero places the zero value of the signal at the middle grid line. A nonzero offset shifts the trace up or down so that the offset value is positioned at the middle grid line. Note: Visible only if Scale Type is Manual.
I/O Monitoring Type	The signal that want to be displayed between I/O signals Note: Visible only if Input Signal is Digital IO.
Sweep Parameters	
Sample Period	The time, in milliseconds, between samples that constitute a trace. The horizontal resolution of the oscilloscope is 128 samples. (For example, selecting a sample period of 1.0 ms will result in 128 ms of data being displayed.) Note: The Sample Period range is 0.2…20 ms with a resolution of 0.2 ms.
Samples per Division	Number of samples per division. For example, 32 samples per division will result in 4 horizontal divisions.
Trigger Source	The drive signal that will set off the trigger and begin tracing the selected channel signal, upon the occurrence of the Trigger Mode at the Trigger Threshold. Click the down arrow to the right of the Channel Setup dialog box to set the channel.
Trigger Mode	The event that triggers oscilloscope tracing: • Immediate: begins tracing immediately after the trigger is armed. • Rising Edge: begins tracing when the selected Trigger Source value increases above the Trigger Threshold value. • Falling Edge: begins tracing when the selected Trigger Source value decreases below the Trigger Threshold value.
Trigger Threshold	The value of the Trigger Source drive signal that begins tracing. Trigger Threshold selections are: • Rising Edge • Falling Edge
Trigger Status	The current status of the oscilloscope trigger: • Idle • Awaiting Trigger • Collecting Data

Parameter	Description
Tuning Properties	The Velocity, Position, and Current Regulator Tuning parameters are included in the Oscilloscope window to monitor drive performance while adjusting gains.
Oscilloscope Display	
Y-axis Labels	The labels to display on the y-axis: • Default: One reference point for each channel is displayed. • Channel A • Channel B
Legend	Displays the color of the trace for each input signal or channel. Click the color rectangles displayed in the legend to modify a color.

The following commands can be executed for the Oscilloscope window of an online drive.

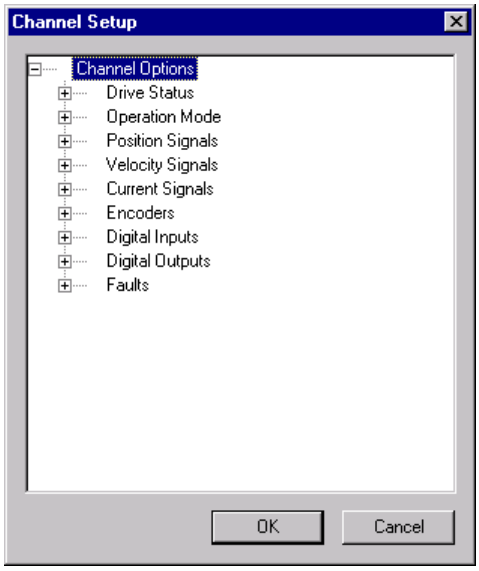
Command	Description
Arm Trigger	Turns the oscilloscope trigger ON.
Run Continuous	Runs the oscilloscope continuously, circumventing the trigger.
Stop Triggering	Turns the oscilloscope trigger OFF.
Snap Shot	Show a set of data in the Snap Shot dialog.

Customize the Oscilloscope window for your Kinetix 3 drive by selecting one or more of these commands:

- Click Show Properties to display or hide the Properties pane.
- Click Show Commands to display or hide the Commands pane.
- Click Save to save the oscilloscope data to a tab delimited file.
  This file can be read by spreadsheet or presentation software. Information saved includes the Oscilloscope data points from one or more channels.
- Click Revert to return parameter settings to the values they held when you opened this window.

Channel Setup Window

The collapsed Properties window for the Channel Setup looks like this.



Use this window to:

- assign a specific Input Signal to the selected Channel in the Oscilloscope window for a Kinetix 3 drive.
- assign no Input Signal to the selected channel in the Oscilloscope window for a Kinetix 3 drive.

Much like the Monitor window, this window lets you customize the display for the selected online Kinetix 3 drive. The window displays a tree diagram with all the status settings that can be monitored for the selected drive.

Refer to Understanding Kinetix 3 Status Displays on page 282 for a detailed list of drive status selections.

To assign a specific input signal or status to the specified channel, perform these steps.

1. Click one or more + (plus) signs to open the tree control to the desired branch.
2. Place a check mark in the box next to the desired input signal or status.
3. Click OK.

   The selected input signal appears in the selected Channel in the Oscilloscope window.

To assign no input signal or a status to the selected channel, perform these steps.

1. Be sure no check marks appear next to any input signal, or status.

2. Click OK.

   The word Unassigned appears in the selected Channel in the Oscilloscope window.

Understanding Kinetix 3 Status Displays

Status for the Kinetix 3 drive are displayed in the Monitor window. Signals from oscilloscope channels may be used as data sources for the status table.

Status	Description	Oscilloscope Input Trigger	Oscilloscope Output Trigger	Monitor	Analog Output Signal	Fault Detail Channel
Drive Status						
Analog Command - Velocity	Refer to Understanding the Analog Window on page 237	X	X	X	X	X
Analog Command - Current	Refer to Understanding the Analog Window on page 237	X	X	X	X	X
Bus Voltage	The current measure of DC Bus voltage.			X	X	X
Commutation Angle - Degrees	Reports the position within the motor electrical cycle in degrees from -180 to 180 degrees.	X	X	X	X	X
Enabled	ON indicates the power stage of the drive is enabled. As a precondition, either software or hardware enable must be active, and the drive cannot have any faults.			X		
Fault Warning	Refer to Understanding the Kinetix 3 Drive Branch on page 225.			X		
Firmware Version	Refer to Understanding the Service Information Window on page 297			X		
Motor Temperature	Reports the percentage of the Motor Temperature Trip value, that is based on the motors continuous current rating, thermal characteristics, and time. The Motor Temperature is an indication of the level of utilization of the motor's current capability. When the Motor Temperature reaches 100% a Motor Filter fault occurs.			X	X	X
Current Operating Mode	Refer to Understanding the Kinetix 3 Drive Branch on page 225			X		

Status	Description	Oscilloscope Input Trigger	Oscilloscope Output Trigger	Monitor	Analog Output Signal	Fault Detail Channel
Drive Utilization	Reports the percentage of the Drives Temperature Trip value, that is based on the drives continuous current rating, thermal characteristics, and time. It is an indication of the level of utilization of the drive's current capability. If the Drive Utilization reaches 100%, a Drive Overload fault occurs.	X	X	X	X	X
Position Signals						
Motor Feedback	Actual motor position	X	X	X	X	X
Master Position	Refer to Understanding the Tuning Window on page 253	X	X	X	X	X
Follower Position	Refer to Understanding the Tuning Window on page 253	X	X	X	X	X
Error	Refer to Understanding the Tuning Window on page 253	X	X	X	X	X
Position Command Count Frequency	The frequency of the position command input, in thousand counts per second.	X	X	X	X	X
Negative Overtravel	ON indicates that the Negative Software Limit as defined in Understanding the Kinetix 3 Drive Branch on page 230 is being exceeded.	X	X	X		
Positive Overtravel	ON indicates that the Positive Software Limit as defined in Understanding the Kinetix 3 Drive Branch on page 230 is being exceeded.	X	X	X		
Velocity Signals						
Command Velocity	Refer to Understanding the Tuning Window on page 253	X	X	X	X	X
Feedback Velocity	Refer to Understanding the Tuning Window on page 253 Note: The resolution of this signal may be confusing when using the Oscilloscope. See the topic Velocity Motor Feedback Resolution for information on how resolution is derived for various motor and feedback combinations.	X	X	X	X	X
Error	Refer to Understanding the Tuning Window on page 253	X	X	X	X	X
In Speed Window	Refer to Understanding the Kinetix 3 Drive Branch on page 225			X		
Up To Speed	Refer to Understanding the Kinetix 3 Drive Branch on page 225			X		

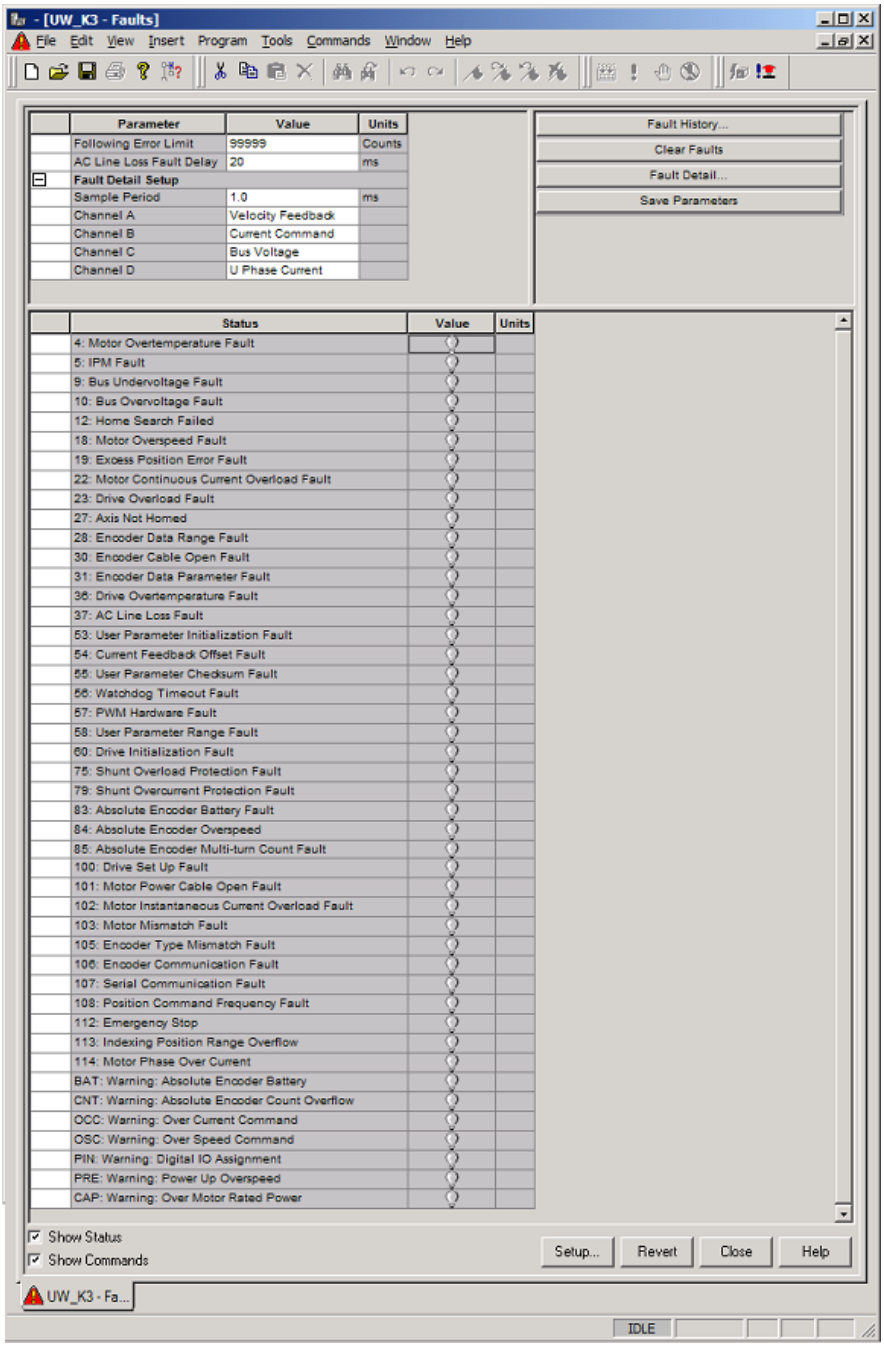
Status	Description	Oscilloscope Input Trigger	Oscilloscope Output Trigger	Monitor	Analog Output Signal	Fault Detail Channel
Drive Utilization	Reports the percentage of the Drives Temperature Trip value, that is based on the drives continuous current rating, thermal characteristics, and time. It is an indication of the level of utilization of the drive's current capability. If the Drive Utilization reaches 100%, a Drive Overload fault occurs.	X	X	X	X	X
Position Signals						
Motor Feedback	Actual motor position	X	X	X	X	X
Master Position	Refer to Understanding the Tuning Window on page 253	X	X	X	X	X
Follower Position	Refer to Understanding the Tuning Window on page 253	X	X	X	X	X
Error	Refer to Understanding the Tuning Window on page 253	X	X	X	X	X
Position Command Count Frequency	The frequency of the position command input, in thousand counts per second.	X	X	X	X	X
Negative Overtravel	ON indicates that the Negative Software Limit as defined in Understanding the Kinetix 3 Drive Branch on page 230 is being exceeded.	X	X	X		
Positive Overtravel	ON indicates that the Positive Software Limit as defined in Understanding the Kinetix 3 Drive Branch on page 230 is being exceeded.	X	X	X		
Velocity Signals						
Command Velocity	Refer to Understanding the Tuning Window on page 253	X	X	X	X	X
Feedback Velocity	Refer to Understanding the Tuning Window on page 253 Note: The resolution of this signal may be confusing when using the Oscilloscope. See the topic Velocity Motor Feedback Resolution for information on how resolution is derived for various motor and feedback combinations.	X	X	X	X	X
Error	Refer to Understanding the Tuning Window on page 253	X	X	X	X	X
In Speed Window	Refer to Understanding the Kinetix 3 Drive Branch on page 225			X		
Up To Speed	Refer to Understanding the Kinetix 3 Drive Branch on page 225			X		

Status	Description	Oscilloscope Input Trigger	Oscilloscope Output Trigger	Monitor	Analog Output Signal	Fault Detail Channel
Current Signals						
Current - Command	Refer to Understanding the Tuning Window on page 253	X	X	X	X	X
Current - Feedback	Refer to Understanding the Tuning Window on page 253	X	X		X	
U Phase Current	The current through the U phase of the motor				X	X
V Phase Current	The current through the V phase of the motor				X	X
W Phase Current	The current through the W phase of the motor				X	X
Encoder Signals						
S1	Hall input S1 of the motor encoder			X		
S2	Hall input S2 of the motor encoder			X		
S3	Hall input S3 of the motor encoder			X		
Digital Inputs						
Input 1…7 State	Refer to Understanding the Digital Inputs Window on page 267	X	X	X		X
Digital Outputs						
Output 1…3 State	Refer to Understanding the Digital Outputs Window on page 271	X	X	X		X
Power Status						
Shunt Power Limit Ratio	Reports the percent of the shunts rated capacity currently being used.	X	X	X	X	X
Instantaneous Shunt Power	Power dissipated in the internal shunt resistor.	X	X	X	X	X
Output Power Limit Ratio	Reports the accumulated usage of the drive's capability to operate above its rated output power. The drive may safely produce slightly more than the rated output power for a period of time. If this value reaches 100%, the drive produces fault 104, Continuous Power Overload Fault. This value decreases to zero when the drive is operating at less than rated output power.	X	X	X	X	X

Status	Description	Oscilloscope Input Trigger	Oscilloscope Output Trigger	Monitor	Analog Output Signal	Fault Detail Channel
Instantaneous Output Power	Power output of the drive.	X	X	X	X	X
Faults						
Faults	Refer to topic: Faults (Kinetix 3), for a complete list of the displayed fault statuses		X	X		

Understanding the Faults Window

The Properties window for the Faults display looks like this.



The Faults window contains the configuration settings for the Kinetix 3 drive's fault handling and the current status of all faults that the drive reports. Use the Fault History window to display the eight most recent faults that have occurred. The Fault History is accessible from the Faults window.

The Faults branch is a child of a Kinetix 3 drive, and can be in the Workspace window's On-Line Drives branch or in an Ultraware software file.

A Faults branch has associated parameters and these direct commands:

- Fault History
- Clear Faults
- Fault Detail

Use the Faults window to:

- set fault limits.
- monitor fault status.
- execute the Clear Faults command.
- open a window where you can review the drive's fault history.
- enable or disable user faults.
- open a window where you can view a scope trace of selected drive signals for a period of time immediately prior to a fault.

The Faults window has these parameters, status, and commands associated with it.

Parameter	Description
Following Error Limit	Position error overflow fault occurs when the difference between position command and actual position is greater than the value set by this parameter. The range is 0…2,147,483,647 motor encoder counts. The default is 99,999 counts.
AC Line Loss Fault Delay	AC line loss fault delay is the time the main AC voltage can be absent without generating an AC line loss fault. The range is 20…000 ms. The default is 20 ms.

Command	Description
Fault Detail Setup	This command lets the drive to capture four channels of drive variables when a drive fault occurs. This can be helpful when diagnosing system faults.
Sample Period	The time, in milliseconds, between samples that constitute a trace. The horizontal resolution of the fault detail data is 50 samples. For example, selecting a sample period of 1.0 ms will result in 50 ms of data being displayed. The range is 0.2…19.8 ms with a resolution of 0.2 ms.
Channel A-D	Click the down arrow to the right of the Channel Setup dialog to assign a Channel (A, B, C, or D).

The following Warnings and Errors are displayed on the Status display of the drive, and in the Value column of the Faults window.

Three segments of the Status display show an abbreviated title, bAt for example, for any warning or overtravel condition.

Status (1)	Description	Possible Cause	Suggested Action
bAt	Absolute Encoder Battery	3.2V or less output from encoder battery or external power supply.	Replace battery or verify external power supply.
oCC	Overcurrent Command	Improper setting of analog current scale	Verify scaling parameter corresponds to analog signal range.
		System cannot meet motion profile	Verify velocity loop tuning.
			Verify system sizing.
		Incorrect current limit settings	Verify current limits do not restrict current to less than system capabilities.
oSC	Overspeed Command	Improper setting of analog velocity scale	Verify scaling parameter corresponds to analog signal range.
		System cannot meet motion profile	Verify position loop tuning.
			Verify system sizing.
Pin	Digital I/O Assignment	Inappropriate assignment of digital inputs or outputs	If operated in preset mode, verify presets are assigned.
			If operated in a normal/override mode, verify the override function is assigned.
PrE	Power Up Overspeed	Control power is applied to the drive while the motor is in motion.	Inappropriate assignment of digital inputs or outputs.
CAP	Over Motor Capacity	It occurs when motor power is set higher than the drive rated output.	Use a motor suitable to the drive or set the torque limit below the drive capacity.
Overtravel conditions that may display include:			
not	Indicates a Negative Overtravel condition.		
Pot	Indicates a Positive Overtravel condition.		

(1) The value of status that are ON = 1, OFF = 0.

Errors are displayed on the drive's Status display with an E. prefix. The remaining segments alternate between a three-digit error code and a five-digit text message.

Status	Description	Possible Cause	Suggested Action
Note: The value of status that are 'ON' = 1. The value of status that are OFF = 0.			
E.004 E.Ntrot	Motor Overtemperature	Motor thermal switch trips due to: • High motor ambient temperature, • Excessive current, or • Both high temperature and excessive current	• Operate within (not above) the continuous torque rating for the ambient temperature. • Lower ambient temperature, or increase motor cooling.
		Motor wiring error	Check motor wiring.
		Incorrect motor selection	Verify the proper motor has been selected.
E.005 E.PNFt	IPM Error	Motor cables shorted	Verify the continuity of motor power cable and connector.
		Motor winding shorted internally	Disconnect the motor power cables from the motor. If the motor is difficult to turn by hand, it may need to be replaced.
		Drive temperature too high,	• Check for clogged vents or a defective fan. • Ensure cooling is not restricted by insufficient space around the drive.
		Drive has a bad IPM output, short circuit, or overcurrent	• Verify ambient temperature is not too high. • Operate within the continuous power rating. • Reduce acceleration rates. • Remove all power and motors connections, then perform a continuity check from the DC bus to the U, V, and W motor terminals. If continuity exists, check for wire fibers between terminals, or send drive in for repair.

Status	Description	Possible Cause	Suggested Action
E.009 E.UdutG	Bus Undervoltage	Low AC line/AC power input	• Verify voltage level of the incoming AC power. • Check AC power sources for glitches or line drop. • Install uninterruptible power supply (UPS) on the AC input.
		Attempted to enable drive without main power active.	Verify input is within specification.
E.010 E.ouutG	Bus Overvoltage	Excessive regeneration of power (When the motor is driven by an external mechanical force, it may regenerate too much peak energy through the drive's power supply and the drive faults to save itself from an overload.)	• Verify shunt circuit. • Adjust motion profile to stay within the range of the regenerative resistor. • Replace regenerative transistor. • Replace drive.
		Excessive AC input voltage	Verify input is within specification.
E.012 E.HFAIL	Home Search Failed	Homing is not complete until the time defined in Homing time limit (IN-01.11) is elapsed.	• Increase the time defined in Homing time limit (in-01.11). • Set a value other than '0' in Homing Velocity (In-01.02) and Creep Velocity (IN-01.03). • Check if there is any obstacle that disturbs Homing. • Check mechanical parts and parameter settings for Homing.
E.018 E.ouSPd	Motor Overspeed	Motor speed exceeds maximum	• Confirm encoder wiring. • Retune the drive system. • Verify the input gain of external speed or torque commands.
E.019 E.PoSEr	Excess Position Error	Position error exceeds permitted value.	• Increase following error limit. • Check position loop tuning.

Status	Description	Possible Cause	Suggested Action
E.022 E.ConoL	Motor Continuous Current Overload	The internal filter protecting the motor from overheating has tripped.	• Reduce acceleration rates. • Reduce duty cycle (ON/OFF) of commanded motion. • Increase time permitted for motion. • Use larger drive and motor. • Checking tuning.
E.023 E.druoL	Drive Overload	The motion application requires average drive current in excess of rated capability.	• Reduce acceleration rates. • Reduce duty cycle (ON/OFF) of commanded motion. • Increase time permitted for motion. • Use larger drive and motor. • Check tuning.
E.027 E.notHN	Axis Not Homed	Absolute positioning attempted without homing.	Verify homing position.
E.028 E.EnCdE	Encoder Data Range Error	Encoder not programmed correctly	Replace motor
		Encoder memory corrupted	
E.030 E.EnCoP	Encoder Cable Open	Communication is not established with an intelligent encoder.	• Verify the motor configuration is for an intelligent encoder. • Verify the motor has an intelligent encoder. • Verify continuity of the DATA+ and DATA- signal wires. • Verify encoder power is present. • Replace the motor.
E.031 E.EnCPE	Encoder Data Parameter Error	Encoder not programmed correctly	Replace motor.
		Encoder memory corrupted	

Status	Description	Possible Cause	Suggested Action
E.036 E.druot	Drive Overtemperature	Excessive heat exists in the drive	• Verify cooling fan operation (only 2071-A10, 2071-A15) • Check tuning. • Reduce acceleration rate. • Reduce duty cycle (ON/OFF) of commanded motion. • Increase time permitted for motion. • Use larger drive and motor.
E.037 E.ACoFF	AC Line Loss	Poor quality power	Increase Ride Through time.
		Attempted to enable drive without main power active.	Apply main power before enabling drive.
		Phase connection missing	Remove power and verify all physical connections.
		Fault Delay parameter is set too short	Increase the Fault Delay parameter setting.
E.053 E.ACoFF	User Parameter Initialization Error	Error in parameter memory storage	• Re initialize parameter.
			• Reset drive to factory defaults.
E.054 E.oFSEt	Current Feedback Offset	Defective hardware	Replace drive.
E.055 E.CHSUN	User Parameter Checksum Error	Checksum error	• Confirm and reset parameter. • Reset drive to factory defaults.
E.056 E.CPUFt	Watchdog Time-out	Excessive system noise	• Verify wiring and installation methods. • Defective hardware • Replace drive.
E.057 E.HWArE	PWM Hardware Error	Defective hardware	Contact A-B.
E.058 E.rAnGE	User Parameter Range Error	Range of parameter is invalid	• Enter parameter with value(s) within range. • Reset drive to factory defaults.
E.060 E.dInIt	Drive Initialization Error	Hardware error	Replace drive.
E.075 E.SHtoL	Shunt Overload Protection	Power at regenerative resistor exceeds the permitted value	• Adjust motion profile to stay within the range of the regenerative resistor. • Shunt resistor is disconnected or damaged • Verify resistance of shunt resistor.

Status	Description	Possible Cause	Suggested Action
E.079 E.SHtoC	Shunt Overcurrent Protection	Shunt current exceeded the instantaneous value	• Verify shunt is not shorted or damaged.
			• Verify load energy is not excessive during deceleration.
E.083 E.AbSbE	Absolute Encoder Battery Error	Encoder Backup Battery parameter is set to installed, but a battery is not installed.	Set Encoder Backup Battery parameter to Not Installed.
		Battery voltage is sensed below 2.7V DC.	• Confirm battery voltage and connection. • Replace battery.
E.084 E.ABSoS	Absolute Encoder Overspeed	Battery powered encoder is mechanically rotated at high speed while drive is powered down.	• Mechanically disengage motor from system.
			• Cycle power to drive and reset alarm.
E.085 E.AbSCt	Absolute Encoder Multi-turn Count Error	Noise in the encoder	• Cycle power to drive and reset alarm.
			• Defective encoder
			• Replace motor.
E.100 E.SEtUP	Drive Set Up	The drive operating mode and motor selection are incompatible.	Change the operating mode, the motor selection, or both, and then reset the drive.
E.101 E.CAbLE	Motor Power Cable Open	Motor cable open	Verify power connection between motor and drive.
E.102 E.InSOL	Motor Instantaneous Current Overload	Motion profile requires a peak current for an excessive time interval	Verify motor wiring.
		Adjust accel/decel time.	Confirm motor selection.
		Defective current feedback sensing	Verify phase currents.
E.103 E.NAtCH	Motor Mismatch	Dynamic braking current of the selected motor exceeds twice the drive peak current rating	Install a different motor.
E.106 E.CEnCCE	Encoder Type Mismatch	Motor encoder signals do not match drive configuration	Verify motor selection.
		Defective encoder	Replace motor.
E.107 E.oSErCE	Special Communication Error	communication error between host and drive (noise)	• Verify serial cable.
			• Check for noise on serial interface.

Status	Description	Possible Cause	Suggested Action
E.108 E.CdFrE	Position Command Frequency Error	Input frequency limit exceeded	• Verify hardware type selected in the drive matches the physical hardware.
			• Change from open collector to line drive.
			• Reduce the speed command.
			• Apply gearing.
E.112 E.EStoP	Emergency Stop	Emergency stop (E-STOP) signal detected	• Remove Emergency stop conditions.
			• Clear E-STOP.
E.11e E.IrAnG	Indexing Position Range Overflow	The value of a Position Parameter for indexing is out of the range.	Use a value within the range of -2,147,483,647 …2,147,483,647
E.114 E.ouCUr	Motor Phase Over Current	Problem with control or main power circuitry if this error occurs when power is turned on.	Check wiring and power.
		Excessive current to the motor if this error occurs during operation (current more than 300% of the rated current to the motor more than 10 ms).	Check power, and set or adjust the acceleration and deceleration times.

The Faults window has these commands.

Command	Description
Fault History	Opens the Fault History window, where you can view a list of the last 20 fault events that occurred since the drive was powered-up.
Clear Faults	Clears all drive faults.
Fault Detail	Opens the Fault Detail window.
Save Parameters	Saves the current working values as power-up values in memory for the selected online drive and all of its children.

Customize the Faults window for your Kinetix 3 drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Show Commands to display or hide the Commands pane.
- Click Setup to open the window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Understanding the Fault Detail Window

Use the Fault Detail window to view traces of selected drive signals for a period of time immediately prior to the occurrence of a fault. This feature is helpful when because a fault event is always at the right of the screen.

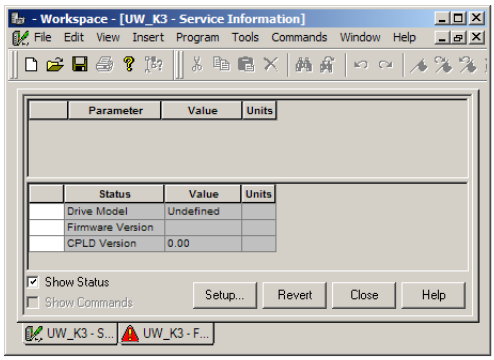
The Faults window has these parameters, and commands associated with it.

Parameter	Description
Samples per division	Number of samples per division. For example, 32 samples per division will result in 4 horizontal divisions.
Channel A and B	The input signal selected for each channel in the Faults window is displayed directly below the Channel heading. Input signals include: • Visible: Lets you selectively hide or show each channel in the scope. **Yes** includes the channel. • Selected Signal: Assigns Digital Inputs and Digital Outputs to a Channel. When this signal is selected, data is collected for all of the digital inputs and outputs. Note; One input or output is required for the scope to display. • Scale Type: Scale Types are: Auto Manual Same As Ch A (available for Channel B only) Same As Ch B (available for Channel A only) • Scale: The amplitude of the selected channel input signal that can be displayed between gridlines of the oscilloscope, in the units of the drive signal. It is dependent on the signal selected. If the Scale is left at its default value of 0, The data is automatically scaled to fit the graph. Note: Scale is visible only when the Scale Type is Manual. • Offset: The trace offset for the selected Channel Input. Its range depends on the signal selected. A value of zero places the zero value of the signal at the middle grid line. A nonzero offset shifts the trace up or down so that the offset value is positioned at the middle grid line. Note: Offset is visible only when the Scale Type is Manual.
Oscilloscope Display	Defines how the y-axis and trace are displayed. • Y-axis Labels: The labels to display on the y-axis: Default displays one reference point for Channel A and one reference point for Channel B. Channel A displays only the Channel A reference points. Channel B displays only the Channel B reference points. • Legend: Displays the color of the trace for each input signal or channel. Click the color rectangles displayed in the legend to modify a color.
Command	**Description**
Refresh Data	Acquires the fault information from the drive. Use this button if a new fault occurs while this window is open, and you want to see the data for the new fault.

The Fault Detail window has no associated statuses.

Understanding the Service Information Window

The Service Information window looks like this.



Use the Service Information window to:

- display and monitor service information about the drive.
- display the firmware revision of the drive.

The following parameters and status apply to the Service Information window.

Status	Description
Drive Model	The model number of the drive. This is the number you selected from the Select New Drive dialog box after executing the **Insert** Kinetix 3 command.
Firmware Version	The revision of the selected On-Line drive's firmware in the format XX.YY, where: • XX = major revision • YY = minor revision
CPLD Version	The revision of the CPLD device in the drive

Customize the Service Information window for your Kinetix 3 Drive by selecting one or more of these commands:

- Click Show Status to display or hide the Status pane.
- Click Setup to open the Monitor Setup window, where you can customize the status display for this window.
- Click Revert to return parameter settings to the values they held when you opened this window.

Notes:

Creating and Running Programs

Introduction

This chapter describes how to create and run programs, called executable program files. An executable program file is identified by its .exe extension.

Using a Project Branch

The Project branch functions as both a container for its child source files, header files and executable program files, and the platform from which you can:

- Open a window where you can edit project parameters.
- Create new source and header files.
- Execute the Build command to create new executable program files.

You can move an entire Project - along with its child source and header files - to an Ultra5000 drive's Archives branch for storage.

Creating a New Project

To create a new Project do one of these:

- Click Project in the Insert menu.
- Click the offline Ultraware file, and then right-click Insert Project from the pop-up menu.

A new project appears beneath the open Ultraware file in the Workspace window. The default name of the new project is Project or (if Project already exists) Project*n*, where *n* is the lowest integer that creates a unique project name within the selected path.

When you create a project, Ultraware software automatically populates the project with the project information contained in the New Project.uxf file in the Ultraware installation directory. The default New Project.uxf file is a project containing a source file with the outline of a typical motion program. You may customize this default project template by exporting one of your own projects to replace the file “New Project.uxf”.

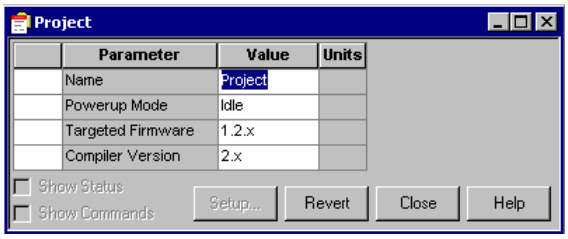
Once a project is created, you can:

- edit the parameters of the new project,
- add a new header file, or
- add a new source file.

Configuring a Project

To configure a project, follow these steps.

1. Select the project in the Workspace window.
2. Use one of these commands to open the Project window:
   - Click Properties in the File menu.
   - Right-click Properties from the pop-up menu.
   - Double-click the project branch.



3. Use the Project window to edit these parameter values for the project selected in the Workspace window.

Parameter	Description
Name	Edit the project's name. The name of the project must: • be at least one, but not more than eight, characters in length, • be unique within its branch of the tree, and • not contain a space or backslash (\), forward slash (/), colon (:), asterisk (*), question mark (?), double quote (“), greater than symbol (>), less than symbol (<) or pipe (|).
Powerup Mode	The action you want an online drive (a drive in the On-Line Drives branch of the Workspace window) to take with respect to the selected project's child executable program (.exe) file: • Run, to automatically run the program when power is first applied to the online drive, or • Idle, to not run the program on powerup. Idle is the default setting.
Targeted Firmware	The firmware revision that the program built from this project will run under. Understanding the Service Information Window on page 217 describes how a drive's firmware revision can be verified in the Status display. Note: If the user attempts to run a program under an earlier revision of firmware than it was built for, an error message is displayed and the program will not run.
Compiler Version	The compiler version to use when building a program. Note: The new revision of the compiler (version 2.x) significantly reduces the size of most program files. However, the original compiler (version 1.x) is still provided because it is possible that a program developed under the 1.x compiler may have build errors under the 2.x compiler, or may have slight differences in how it runs.

4. Click Revert to undo any changes.

Executing Project Commands

In addition to the Cut, Copy, Paste and Delete commands, you can execute other commands for a Project.

To execute Project commands, perform these steps.

1. Click Project in the Workspace window.
2. Right-click the title bar to access a pop-up menu.
3. Click one of these commands from the pop-up menu.

Command	Description
Insert Source File	Adds a new Source File to a Project in the offline Ultraware file.
Insert Header File	Adds a new Header File to a Project in the offline Ultraware file.
Import	Opens the Import From dialog box, where you can retrieve previously exported Workspace window Header or Source Files, in the form of an User data eXchange File (with a .uxf extension), and add them to the Project.
Export	Opens the Export To dialog box, where you can copy the Project File, including any child Header and Source Files, and save them as an User data eXchange File (with a .uxf extension).
Build	Creates an executable program file (with an .exe extension), by compiling all project Header and Source Files.

Using Source Files

A source file is a text file that contains C programming language code, which Ultraware software uses to create an executable program file for an Ultra5000 drive when you execute the Program menu's Build command. A source file is identified by its .c extension. Each source file contains:

- # include statements, (which refer to external header files - identified by their .h extensions)
- the C code that is the body of the source file.

You can move a source file to an Ultra5000 drive's Archives branch for storage.

Creating a New Source File

To create a new source file do one of these actions:

- Click Source File in the Insert menu.
- Click project in the Workspace window, and then right-click Insert Source File.

A new source file appears in the Workspace window. The name of the new source file is Source.c or Source*n*.c if Source.c already exists. Where *n* is the lowest integer that creates a unique source file name within the selected project.

After a source file is created, you can configure its parameters (change its name) and edit its contents.

Renaming a Source File

To rename a source file, perform these steps.

1. Choose the source file in the Workspace window.
2. Choose one of these commands:
   - Click Properties in the File menu.
   - Right-click Properties from the pop-up menu.
   - Double-click the selected source file.

   The Source File window appears in the Client Area:

3. Type the name of the source file. If you do not include the .c extension to the source file name, the Ultraware software adds it for you. The name of the source file must:
   - be at least one, but not more than eight, characters in length (exclusive of the .c extension).
   - be unique within its branch of the tree.
   - not contain a space or backslash (\), forward slash (/), colon (:), asterisk (*), question mark (?), double quote (“), greater than symbol (>), less than symbol (<) or pipe (|).
4. Click OK to save or Cancel to exit without saving.

Using Header Files

A header file is a text file that contains C programming language code, which Ultraware software uses to create an executable program file for an Ultra5000 drive. A header file is identified by its .h extension and contains external declarations of variables and functions that the source file can use. Each header file may contain:

- # include statements, (which refer to other header files - identified by their .h extensions), and
- the C code declarations.

You can move a header file to an Ultra5000 drive's Archives branch for storage.

Creating a New Header File

To create a new header file, perform this step.

1. Use one of these commands:
   - Click Header File in the Insert menu.
   - Click the project in the Workspace window, and then right-click Insert Header File.

A new header file appears in the selected place in the Workspace window. The name of the new header file is Header.h or (if Header.h already exists) Header*n*.h, where *n* is the lowest integer that creates a unique header file name within the selected project.

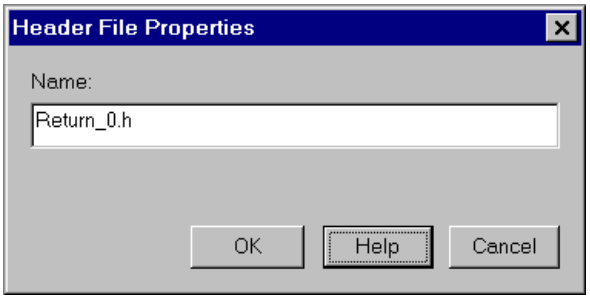
Once a header file is created, you can configure its parameters (for example, change its name), and edit its contents.

Renaming a Header File

To rename a header file, perform these steps.

1. Click the header file in the Workspace window.
2. Use one of these commands:
   - Click Properties in the File menu.
   - Right-click Properties from the pop-up menu.
   - Double-click the selected source file.

The Header File window appears:



3. Type the name of the header file. If you do not include the .h extension to the header file name, Ultraware software adds it for you. The name of the header file must:
   - be at least one, but not more than eight, characters in length (exclusive of the .h extension).
   - be unique within its branch of the tree.
   - not contain a space or backslash (\), forward slash (/), colon (:), asterisk (*), question mark (?), double quote (“), greater than symbol (>), less than symbol (<) or pipe (|).
4. Click OK or Cancel.

Executing Source or Header File Commands

In addition to the Cut, Copy and Delete commands, you can execute other commands for a source or header file.

To execute source or header file commands, perform these steps.

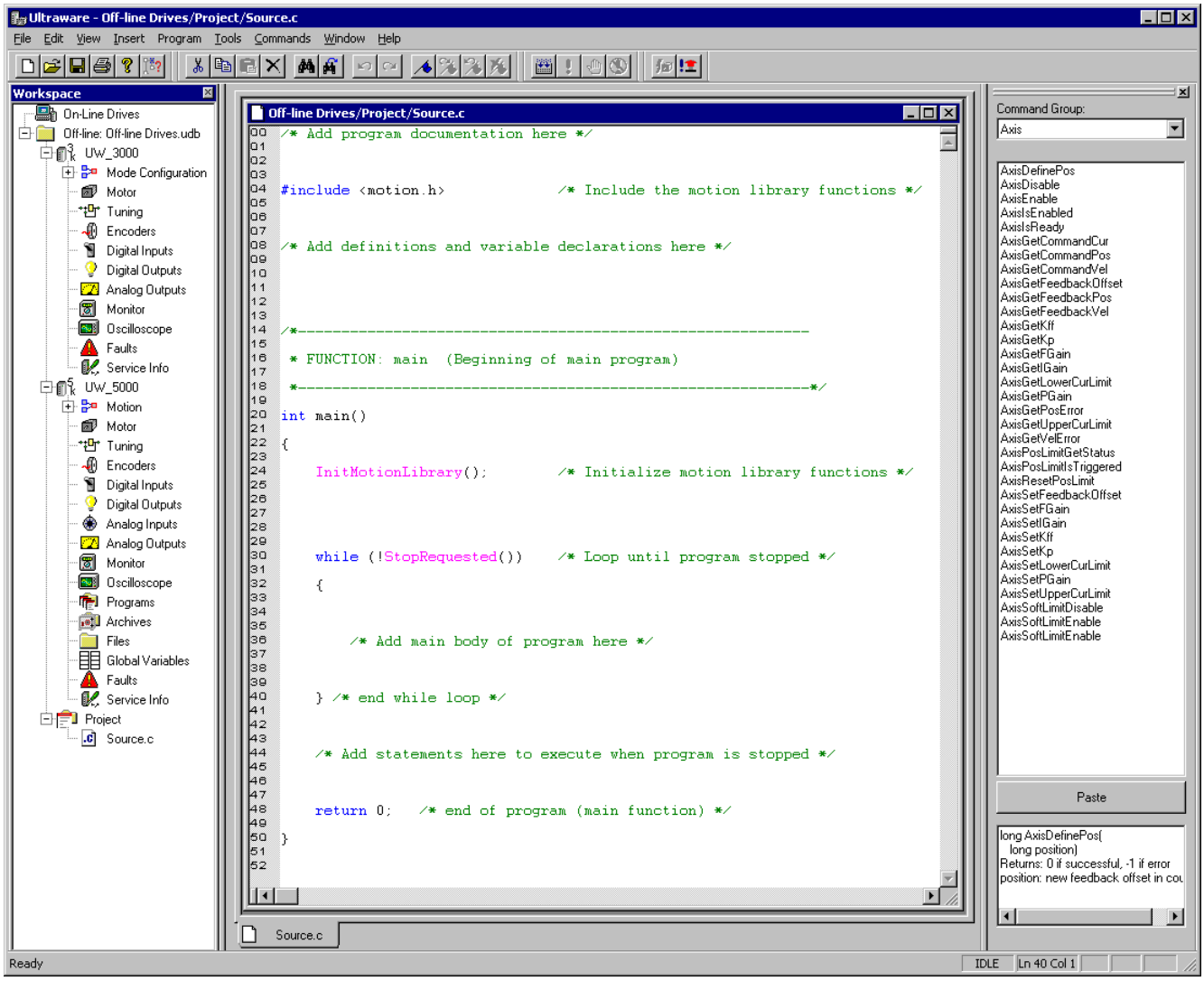
1. Click click the source or header file in the Workspace window.
2. Right-click in the Workspace window for a pop-up menu.
3. Click one of these commands from the pop-up menu.

Command	Description
Edit	Opens the text editor in the Client Area, where you can edit the file’s C programming language code.
Export	Opens the Export To dialog box, where you can export the file and save it as an User data eXchange File (with a .uxf extension).
Build	Creates an executable program file (with an .exe extension), by compiling all project Header and Source files.

No status settings are associated with the Source File item.

Using the Motion Library Dialog

The Motion Library dialog lets you quickly find and insert specific motion library commands and C statements in a motion program.



The Motion Library is displayed when a source or header file is open; and is hidden when source and header files are closed or not the top view windows. The Motion Library dialog is docked to the right side of the main window by default.

To find and copy a specific command, perform these steps.

1. Click a command group to display all commands belonging to that group.
2. Click a command from the list.

   A Help window will list the arguments for the command and a brief description of what each does.
3. To paste the selected command to your file, perform one of these actions:
   - Position the cursor at the place where the command should be pasted.

- Click the text that you want to be replaced.

4. Click Paste or double-click the command.

To display a hidden Motion Library dialog bar, click Motion Library in the View menu. A check mark is displayed next to the Motion Library menu when the dialog is enabled. The dialog also may be disabled by the user. Ultraware software remembers the user setting for future use.

You can resize and move the Motion Library dialog bar in several ways:

- With the Motion Library dialog bar in its default state (attached to the Ultraware interface), you double-click the Motion Library header bar to detach it from the Ultraware interface.
- Once detached, the Motion Library dialog bar possesses all the parameters of any window. It can be resized or moved entirely outside the Ultraware interface.
- To return the Motion Library dialog bar to its default position, you double-click the header bar or drag it to the left or right side of the main window.

Using the Text Editor

Ultraware software contains text editing tools that help you write, edit and test the C code in your source (.c) and header (.h) files.

Find

Use this command to open the Find dialog box, which you can use to search for text in the source (.c) or header (.h) file. The Find command is enabled only if a source or header file is currently selected in the Client Area.

To execute the Find command, perform these steps.

1. Click the source (.c) or header (.h) file to search in the Client Area.
2. Do one of these actions:
   - Click Find from the Edit menu.
   - Simultaneously press the Ctrl + F keys.
   - Click the Find icon in the Edit toolbar.

   The Find dialog box appears.

3. Use the Find dialog box, as follows.

Control	Description
Find What	Type, click in the drop-down list, or describe (using an expression) the text that is the subject of the search. If Regular expression (below) is selected, you can search using expressions constructed with the Wildcard Search Characters on page 316.
Match Case	The characters in the text to be found must match the case (upper or lower) of the characters in the Find What field.
Regular expression	Permits searching of expressions made with Wildcard Search Characters on page 316.
Wrap around search	Continues the search beyond the end (Direction Down) or beginning (Direction Up) of the file back to the cursor.

Control (Continued)	Description
Direction	The search direction beginning at the cursor. Select: • Up to search backward, toward the top of the file. • Down to search forward, toward the bottom of the file.
Find Next	Finds the next occurrence of the selected text, in the specified Direction. Displays a message box if the selected text is not found.
Mark All	Places a Bookmark (a blue circle) to the left of every line containing the search text.

Find Next

Finds the next occurrence of header file text - sought by the previous Wildcard Search Characters command - by searching in the specified direction.

Replace

Use this command to open the Replace dialog box, which you can use to search for and highlight text in a selected header (.h) file, and replace highlighted text with standard text.

The Replace command is enabled only if a header file is currently selected in the Client Area.

To use the Replace dialog box, make entries in these fields: Field, Description, Find What, Type. Use the drop-down list, or describe in an expression the text that is the subject of your search.

TIP If Regular Expression is checked, you can search using expressions constructed with these search conditions

Control	Description
Replace With	Type or select from the drop-down list the text you want to replace the text described in the "Find What" field.
Match Case	The characters in the text to be found must match the case (upper or lower) of the characters in the "Find What" field.
Regular expression	Permits searches using expressions made with Wildcard Search Characters on page 316.
Wrap around search	Continues the search beyond the end (Direction Down) or beginning (Direction Up) of the file back to the cursor.

Control (Continued)	Description
Direction	The search direction beginning at the cursor. Select: Up to search backward, toward the top of the file. Down to search forward, toward the bottom of the file. Find Next Finds the next occurrence of the selected text, in the specified Direction. Displays a message box if the selected text is not found.
Replace	Replaces the highlighted text in the header file with the text in the "Replace With" field, then finds and highlights the next text string that equals the text in the "Find What" field.
Replace All	Replaces each occurrence of the text in the "Replace With" field with the text in the "Find What" field.

Select All

Use this command to select all the text in a header (.h) file. The Select All command is enabled only if a header file is selected in the Client Area. To execute the Select All command.

Select a header file in the Client Area, and then:

- click Select All in the Edit menu, or
- simultaneously press the Ctrl + A keys.

Go To Corresponding { } ( )

Use this command to find a corresponding brace or parenthesis. You can use this command in the header (.h) file. The Corresponding {} () command is enabled only if a header file is currently selected in the Client Area.

To execute the Corresponding {} () command: Click the header (.h) file to search in the Client Area. Place the cursor before or after (or highlight) the curly brace or parenthesis. Then do one of these actions:

- Click Go in the Edit menu and then click Corresponding {} () from the Go To Popup menu.
- Simultaneously press the Alt +] keys.
- Right-click to display the pop-up menu, click Go To, and then click Corresponding {} ().

Go To Line Number

Use this command to find a specific line. You can use this command in the header (.h) file. The Line Number command is enabled only if a header file is currently selected in the Client Area.

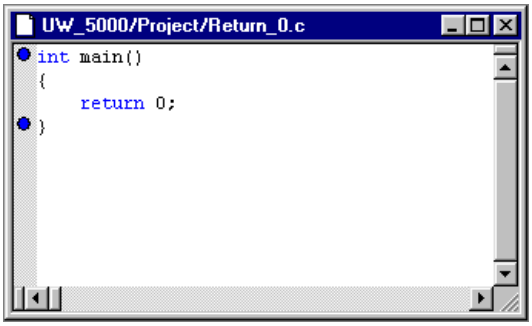
To execute the Line Number command, perform these steps.

1. Select the header (.h) file to search in the Client Area.
2. Use one of these commands:

- Click Go To from the Edit menu, and then click Line Number from the Go To pop-up menu.
- Simultaneously press the Alt + L keys.
- Right-click to display the pop-up menu, click Go To, and then click Line Number.

Bookmarks

The use of bookmarks is supported. A bookmark is a blue marker you can place to the left of a line of code in a source or header file. It brings visual attention to that line of code. Using a bookmark makes it easier to find a particular place in your code, when you are working in a header or source file. Bookmarks are blue, or dark, dots in the left margin of the window, and look like this.



Bookmarks can be inserted either one at a time, using the Toggle Bookmark command, or all at once using the Mark All command in the Find dialog box. Bookmarks are not persistent and cannot be saved. Closing a header or source file clears all bookmarks in that file.

Toggle Bookmark

Use this command to set or remove a bookmark in a selected line of code for a source or header file. This command is available while a source or header file is open in the Client Area.

To set a bookmark:

1. In a source or header file, place the cursor in a line of code that does not already have a bookmark (a blue dot).
2. Do one of these actions:
   - Click the Toggle Bookmark icon in the Edit toolbar.
   - Right-click Toggle Bookmark from the pop-up menu.
   - Click Bookmarks in the Edit menu, and then click Toggle Bookmark.

   A blue bookmark appears to the left of the selected line of code in the Text Editor.

To remove a bookmark:

1. In a source or header file, place the cursor in a line of code that has a bookmark (a blue dot).
2. Do one of these:
   - Click the Toggle Bookmark icon in the Edit toolbar.
   - Right-click Toggle Bookmark from the pop-up menu.
   - Click Bookmarks in the Edit menu, and then click Toggle Bookmark.

   The bookmark disappears.

To remove all bookmarks:

1. Click a source or header file with multiple bookmarks (blue dots).
2. Click Clear All Bookmarks icon in the Edit toolbar.

   All bookmarks in the disappear.

Next Bookmark

Use this command to locate the bookmark (a blue dot) that next appears in the selected source or header file. Ultraware software searches in a forward (downward) direction for the next bookmark. If no bookmark is found, the search wraps around to the beginning of the file and find the first bookmark in the file.

This command is available while a source or header file, with at least one bookmark, is open in the Client Area.

To execute the Next Bookmark command, perform these steps.

1. Place the cursor in a line of code in a source or header file in the Client Area.
2. Do one of these action:
   - Click Next Bookmark icon in the Edit toolbar.
   - Click Bookmarks in the Edit menu, and then click Next Bookmark.

   The cursor moves down to the next bookmark. If there are no more bookmarks in the source or header file, the cursor goes to the top of the file and moves to the first bookmark.

Previous Bookmark

Use this command to locate the bookmark (a blue dot) that appears above the cursor in the selected source or header file. Ultraware software searches in a backward (upward) direction for the previous bookmark. If no bookmark is found, the search wraps around to the end of the file and finds the last bookmark in the file.

This command is available while a source or header file, with at least one bookmark, is open in the Client Area.

To execute the Previous Bookmark command, perform these steps.

1. Place the cursor in a line of code in a source or header file in the Client Area.
2. Do one of these:
   - Click the Previous Bookmark icon in the Edit toolbar.
   - Click Bookmarks in the Edit toolbar, and then click Previous Bookmark.

   The cursor moves up to the previous bookmark. If there is no previous bookmark in the source or header file, the cursor goes at the bottom of the file and moves to the last bookmark.

Clear All Bookmarks

Use this command to remove all bookmarks (blue dots) that have been set in the selected source or header file.

This command is available while a source or header file, with at least one bookmark, is open in the Client Area.

To execute the Clear All Bookmarks command:

1. Place the cursor in a line of code in a source or header file in the Client Area.
2. Do one of these:
   - Click the Clear All Bookmarks icon in the Edit toolbar.
   - Click Bookmarks in the Edit menu, then click Clear All Bookmarks.

   All bookmarks (blue dots) in the selected text file are removed.

Show Line Numbers

Use this command to display line numbers to the edit window and printouts. You can use this command in the header (.h) file.

To execute the Show Line Numbers command:

Select the header (.h) file in the Client Area.

Do one of these:

- Click Show Line Numbers in the Edit menu, or
- Right-click to display the popup menu, and then click Show Line Numbers.

TIP The Show Line Numbers command is enabled only if a source or header file is currently selected in the Client Area.

Wildcard Search Characters

Both the Find dialog box and the Replace dialog box permit you to search for text in a header (.h) or source (.c) file using expressions. You create an expression using ordinary text combined with these wildcard characters.

Expression Name	Syntax	Description
Beginning of Line	^	Starts the match at the beginning of a line. Significant only at the beginning of an expression.
Or	|	Matches the expression before or after the | symbol. Used mostly within a group. For example, ((sponge)|(mud)) bath matches both sponge bath and mud bath.
End of Line	$	Anchors the match to the end of a line. Significant only at the end of an expression.
Character Not in Set	[^]	Matches any character not in the set of characters following the ^ symbol.
Grouping	()	Groups a subexpression.
Any Character	.	Matches any character.
One or More	+	Matches at least one occurrence of the preceding expression, matching as many characters as possible.
Escape	\	Matches the literal character following the backslash. This lets you search for characters which otherwise would be treated as a wildcard search character, such as ^ or +.
Set of Characters	[ ]	Matches any one of the characters within the []. To specify a range of characters, list the starting and ending character separated by a dash, as in [a-z].
Zero or More	*	Matches zero or more occurrences of the preceding expression.

Replace

Use this command to open the Replace dialog box, which you can use to:

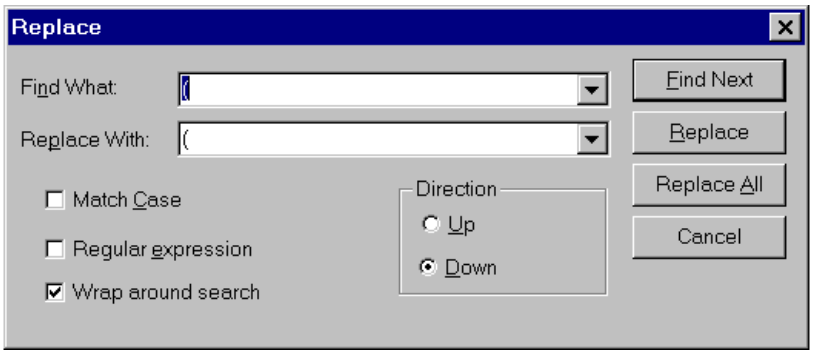
- search for and highlight text in a selected source (.c) or header (.h) file, and
- replace the highlighted text with other text.

The Replace command is enabled only if a source file (.c) or header file (.h) is currently selected in the Client Area.

To execute the Replace command:

1. Select the source (.c) or header (.h) file to search in the Client Area.
2. Use one of these commands:
   - Click Replace in the Edit menu.
   - Simultaneously press the Ctrl + H keys.

The Replace dialog opens:



Use the Replace dialog to make replacements with these control commands.

Control	Description
Find What	Type, select from the drop-down list, or describe (using an expression) the text that is the subject of the search. If Regular expression (below) is selected, you can search using expressions constructed with Wildcard Search Characters on page 316.
Replace With	Type or select from the drop-down list the text you want to replace the text described in the Find What field.
Match Case	The characters in the text to be found must match the case (upper or lower) of the characters in the Find What field.
Regular expression	Permits searches using expressions made with Wildcard Search Characters on page 316.
Wrap around search	Continues the search beyond the end (Direction Down) or beginning (Direction Up) of the file back to the cursor.
Direction	The search direction beginning at the cursor. Select: • Up to search backward, toward the top of the file. • Down to search forward, toward the bottom of the file.
Find Next	Finds the next occurrence of the selected text, in the specified Direction. Displays a message box if the selected text is not found.
Replace	Replaces the highlighted text in the source or header file with the text in the Replace With field, then finds and highlights the next text string that equals the text in the Find What field.
Replace All	Replaces each occurrence of the text in the Replace With field with the text in the Find What field.

Select All

Use this command to select all the text in the selected source (.c) or header (.h) file. The Select All command is enabled only if a source or header file is selected in the Client Area.

To execute the Select All command, perform these steps.

1. Select either a source or header file in the Client Area.
2. Either:
   - Select All from the Edit menu.
   - Simultaneously press the Ctrl + A keys.

   All text in the text editor is highlighted. You can now execute the Edit menu's Cut, Copy and Delete commands.

Undo

Use this command to reverse the last command or delete the last entry you typed in a header (.h) or source (.c) file in the Client Area. Ultraware software keeps up to 2048 previous actions in memory.

This command is enabled only for selected source or header files with at least one command or typing entry in memory.

To execute the Undo command, perform these steps.

1. Select a source or header file, for which Ultraware software has stored at least one command or typing entry in its clipboard.
2. Do one of these:
   - Click Undo in the Edit menu.
   - Right-click the source or header file, and then click Undo from the pop-up menu
   - Click the Undo button,  , in the Edit toolbar.
   - Simultaneously press either the Ctrl + Z keys or the Alt + Backspace keys

The previous text command is reversed: cut or deleted text reappears; typed text disappears.

Redo

Use this command to reverse the action taken by the previous Undo command, for the selected header (.h) or source (.c) file in the Client Area. Ultraware software keeps up to 2048 previous actions in memory.

This command is enabled only for selected source or header files where an Undo command is the last action - or actions - taken. The Redo command is no longer available for a source or header file when you type new text in that file.

To execute the Redo command, perform these steps.

1. Select a source or header file, where an Undo command is the last action - or actions - taken for that file.
2. Do one of these:
   - Click Redo from the Edit menu
   - Right-click, and then click Redo from the pop-up menu.
   - Click the Redo icon,  , in source or header file.
   - Simultaneously press the Ctrl + Shift + Z keys

The previous Undo command is reversed.

Using Executable Program Files

An executable program file is a child of a Project branch. It is generated by compiling all Source Files (identified by a .c extension) and Header Files (identified by a .h extension) in a selected Project, using the Program menu's Build command.

Creating a Program

After creating - or importing - all necessary source header files to a Project branch, you can create a new Program (or re-compile a pre-existing program) by executing the Build command.

To create a new executable program file, perform these steps.

1. In an offline Ultraware file, select a project.
2. Do one of these:
   - Click Build from the Program menu.
   - Click the right mouse button, then click Build from the pop-up menu.
   - click the Build icon in the Program toolbar.

If the build fails, any pre-existing program (.exe) file bearing the project name is lost. The Output window displays messages and errors relating to the compile. Double-clicking on an Output window error or warning message with these format:

<Filename>:<Line number>:<error or warning message>

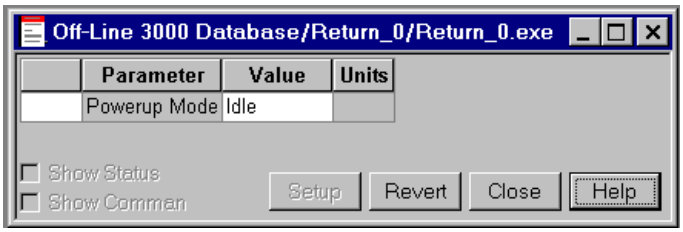
IMPORTANT You must move or copy the program (.exe) file from the Ultraware file to the Programs branch of an online drive before you can run it. You can do this using the Copy and Paste commands, or the Drag and Drop function.

Configuring a Program

To configure an executable program file, follow these steps.

1. Click the executable program file in the Workspace window.
2. Do one of these:
   - Click Properties in the File menu.
   - Right-click Properties from the pop-up menu.
   - Double-click the selected header file.

The executable program file window opens:



3. Use this window to edit these parameter value for the executable program file selected in the Workspace window. Click Revert to undo any changes.

Parameter	Description
Powerup Mode	The action you want an online drive (a drive in the On-Line Drives branch of the Workspace window) to take with respect to the selected project's child executable program (.exe) file: • Run, to automatically run the program when power is first applied to the online drive, or • Idle, to not run the program on powerup. Idle is the default setting. (Note: The executable program file inherits this parameter setting from its parent Project when you execute the Build command. You may independently edit this value.)

Executable Program File Commands

In addition to Cut, Copy, Paste and Delete, you can execute other commands for an executable program file.

To execute executable program file commands:

1. Click the executable program file in the Workspace window.
2. Right-click in the Workspace window to display a pop-up menu.
3. Use one of these commands from the pop-up menu.

Command	Description
Run	This command tells an online drive to start or resume execution of the selected executable program (.exe) file. While the program is running, the Workspace window icon for the selected program is animated.
Stop	This command tells an online drive to stop executing a selected executable program (.exe) file. This command provides a controlled stop to program execution (unlike the Kill command). When the Stop command executes, animation for the selected program's icon stops.
Kill	This command tells an online drive to immediately stop executing the selected executable program (.exe) file. Unlike the Stop command, this command does not provide a controlled stop to program execution. When the Kill command executes, animation for the selected program's icon stops.

Refer to Executing Your Program on page 325 for more information regarding these commands.

You can move an executable program file from a Project in an offline Ultraware file to the Programs branch of an online Ultra5000 drive (for execution) or an offline Ultra5000 drive (for storage).

Importing and Exporting Files

Instead of creating a new project and configuring its settings, or creating new source or header files and editing their content, you can import existing projects, header files and source files using the File menu's Import command.

Only items that have been previously exported, using the File menu's Export command, can be imported. Exporting a file saves it as an User data eXchange File with a .uxf extension.

Exporting Projects, Header Files and Source Files

You can export Projects, Header Files and Source Files. Although you cannot export an executable program file, you can export and save the Project, Source file and Header file that are used to create an executable program file.

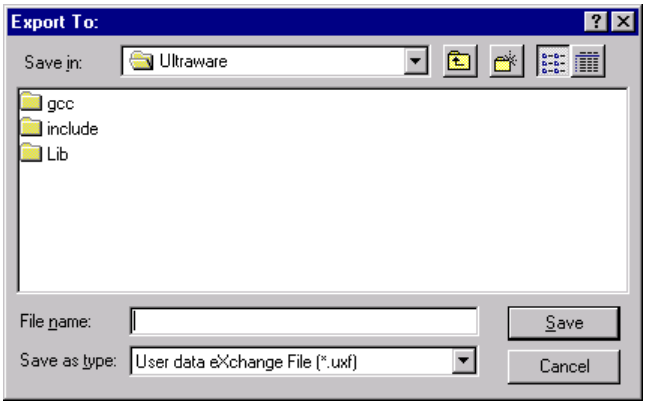
To Export a Project, Header File or Source File.

1. Select the item to be exported, perform these steps.

   TIP If you select a Project, all of its child source files and header files also are exported.
   If you select a Source File or a Header File, only the selected Source File or Header File is exported.

2. Do one of these:
   - Click Export in the File menu, or
   - Place the cursor over the drive branch, right-click the mouse button and click Export from the pop-up menu.

   The Export To dialog box opens.



3. In the Export To dialog box, enter the name for the exported file.
4. Navigate to a location to where the file should be exported.
5. Click Save.

   The exported file is saved as an User data eXchange File (with a .uxf extension).

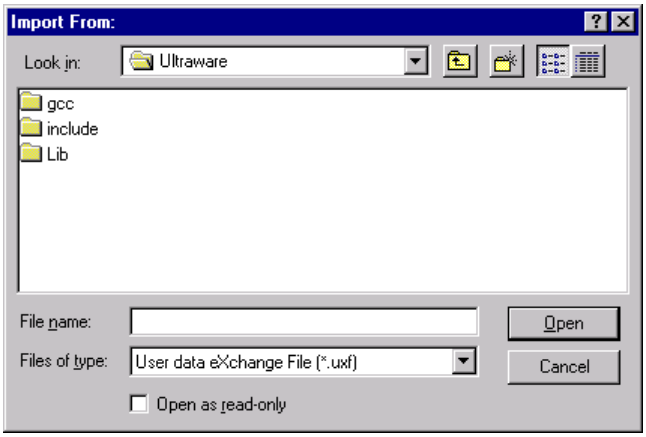
Importing Projects, Header Files, and Source Files

You can import Projects, Header Files and Source Files. Although you cannot independently import an executable program file, if you previously exported a Project with a child executable program file, importing that Project also imports the executable program file.

To Import a previously exported Project, Header File, or Source File, perform these steps.

1. Do one of these steps:
   - To import a previously saved Project, select the offline Ultraware file in the Workspace window
   - To import a previously saved Source File or Header File, select the Project to which the Source File or Header File is to be imported.
2. Then do one of these steps:
   - Click Import in the File menu.
   - Place the cursor over the branch selected in the Workspace window, right-click in the window, and then click Import in the pop-up menu.

   The Import From dialog box opens.



3. In the Import From: dialog box, navigate to and select the User data eXchange File (.uxf) that contains the desired file settings.
4. Click Open.

   The imported file in the Workspace window is displayed.

Executing Your Program

Use the Program menu to insert Run, Stop and Kill commands into a program.

To execute these commands in your program, perform these steps.

1. Create an executable program file (Refer to Using Executable Program Files on page 6-320).
2. Move the executable program file to the Programs branch of an online Ultra5000 drive, as follows:
   a. Click an executable program file in a Project branch in the Workspace window.
   b. Click Copy from the Edit menu.
   c. Click in the Workspace window of the Programs branch for an online Ultra5000 drive.
   d. Click Paste in the Edit menu.
3. Click the executable program file you want to run in the Programs branch of an online drive.
4. click the Program menu.
5. Click the desired command: Run, Stop or Kill.

   These commands are described in the paragraphs below.

Run (Program)

This command tells an online drive to start or resume execution of the selected executable program (.exe) file. While the program is running, the Workspace window icon for the selected program is animated.

An executable program file can be run, even though the drive is disabled. If the drive is enabled while the program is running, Ultraware software prevents sudden large motion by calculating an offset between the motor's actual position and the drive's command position, then adding this offset to the drive's command position.

When you run the program with the drive enabled, the motor may immediately begin to move as the program issues commands.

Stop (Program)

Use this command to tell an online drive to stop executing a selected executable program (.exe) file. This command provides a controlled stop to program execution, unlike the Kill command. When the Stop command executes, animation for the selected program's icon stops.

When you execute this command, Ultraware software sends the SYSTEMSIGNAL_STOP signal to the executing program selected in the Workspace window. In order to stop program execution, your program must include code that receives and implements this command.

Ultraware software sends the SYSTEMSIGNAL_STOP signal each time the Stop (Program) command is issued. In order to stop program execution, the program must be written to recognize when a stop has been requested. The Ultra5000 Motion library contains a function, Stop_Requested, which is set to zero until a stop is requested. To respond to the stop request, write your program like this.

```
int main(void){
 /* Initialization code
   ...
 */
    while (!Stop_Requested()){
     /* repeating program code */
    }
 /* Code to stop smoothly
   ...
 */
}
```

Kill (Program)

Use this command to tell an online drive to immediately stop executing the selected executable program (.exe) file. Unlike the Stop command, this command does not provide a controlled stop to program execution.

When the Kill command executes, animation for the selected program's icon stops.

Using Direct Commands

A direct command is a command executed through the Ultraware interface (rather than through a compiled, loaded and executed program) for a drive in the On-Line Drives branch of the Workspace window.

Motion caused by a direct command (for example, Jog, Move or Gear) is produced in addition to - and not in lieu of - motion caused by the currently executing program. Thus, commanded motion at any one time is the sum of all currently executing program motion commands plus direct commands.

To execute a direct command, perform these steps.

1. Select an item for a drive in the On-Line Drives branch.
2. Do one of these:
   - Right-click Commands, then select a direct command from the pop-up menu.
   - Click a direct command from the Commands menu.

Many, but not all, of an online drive's branches or windows are associated with direct commands, as shown in the tables and chapters below.

- Refer to Configuring the Ultra3000 Drive on page 37.
- Refer to Configuring the Ultra5000 Drive on page 138.

The following tables contain information about Ultra3000 and Ultra5000 executable commands, and what each command can do.

Ultra3000 Direct Commands

Ultra3000 Drive Branch	Direct Commands
Drive	Clear Faults Reset Drive Reset EEPROM to Factory Settings
	Velocity Control Panel, containing: Set to Zero Enable Drive Disable Drive Clear Faults Velocity Command Acceleration
	Current Control Panel, containing: Set to Zero Enable Drive Disable Drive Clear Faults Current Command
	Indexing Control Panel, containing: Start Index Start Homing Stop Homing Enable Drive Disable Drive Clear Faults Define Home Index Number
Analog	Remove Velocity Input Offset Remove Current Input Offset Remove Position Input Offset Analog Command In
Motor	Commutation Diagnostics Motor Feedback Diagnostics Motor Marker Diagnostics Refresh Data all containing: Start Test Stop Test
Tuning	Autotuning Manual Velocity Tuning Manual Position Tuning all containing: Start Autotune/Tuning Stop Autotune/Tuning Clear Faults
Encoders	Commutation Diagnostics Motor Feedback Diagnostics Motor Marker Diagnostics Auxiliary Feedback Diagnostics Auxiliary Motor Marker Diagnostics

Ultra3000 Drive Branch	**Direct Commands**
Digital Outputs	Override Outputs containing: Toggle Output 1 Toggle Output 2 Toggle Output 3 Toggle Output 4 Toggle Relay Turn All On Turn All Off
Analog Outputs	Override Output
Monitor	Format Reset Peaks Setup
Oscilloscope	Arm Trigger Run Continuous Stop Triggering
Faults	Fault History Clear Faults

Ultra5000 Direct Commands

Ultra5000 Drive Branch	**Direct Commands**
Drive	Save Power Up Values Clear Faults Reset Drive Reset Factory Settings Enable Position Limits Disable Position Limits Reset Position Limits
Jog	Jog Forward Jog Reverse Stop (Jog) Abort (Jog)
Move	Start (Move) Stop (Move) Abort (Move)
Cam	Unload Table Enable Cam Disable Cam
Gear	Enable Gear Disable Gear
Motor	Refresh Data
Tuning	Start Velocity Tuning Stop Velocity Tuning Start Position Tuning Stop Position Tuning Autotuning
Digital Outputs	Toggle Digital Output 1 – 8 Turn All On Turn All Off

Ultra5000 Drive Branch	**Direct Commands**
Monitor	Format Setup
Oscilloscope	Arm Trigger Run Continuous Stop Triggering
Faults	Fault History Clear Faults

Creating Custom Motors

Introduction

Each motor controlled by a drive requires a unique parameter set. The parameter set provides the drive with information about the motor needed for proper commutation and precise control. The parameter settings also provide a level of protection for the motor and drive combination.

When you assign a motor for your drive, Ultraware software selects a motor parameter set from the Ultraware motor database (motors.mdb). The motor database is populated with information for standard Allen-Bradley motors. If necessary, you can create a parameter set for a custom motor by using the motor configuration utility in Ultraware software.

Accessing the Motor Database

To access the motor database (.mdb), perform these steps.

1. Click Windows Start, and then sequentially click Programs, Ultraware, and Motor Configuration to display the Open Motor Database window.
2. Click Motors.mdb in the Ultraware directory to display the Motor Database window.

Two types of motors are displayed in the motor database window and may be loaded to drives.

- Standard motors, marked with an asterik, are read-only in the motor database.
- Custom motors may be added to the motor database.

The motor configuration utility creates or duplicates a motor's parameter set, save it, and then modify or delete it.

Creating Custom Motor Parameter Sets

Use the Motor Database command buttons to access Rotary or Linear motor parameter windows. These windows configures, and then saves or deletes the custom motor parameter set.

The requirements of a motor for use by an Ultra-Series drive include:

- Motor must have a TTL level, incremental, quadrature encoder with commutation signal, or
- A sine/cosine encoder with commutation signals.

  TIP If no commutation signals are available, the Start Up Type parameter must be set for Self-Sensing (resolvers are not supported).

- Motor inductance must be greater than 1 milliHenry.
- Motor electrical time constant (phase-to-phase inductance divided by the phase-to-phase resistance) must be greater than 1 ms.

From the main Motor Database window:

1. Use one of these commands:
   - Click a command button
   - New Rotary to create a custom rotary motor with default values.
   - New Linear to create a custom linear motor with default values.
   - Click a motor model from the list that approximates your custom motor (Type, Speed, Current and Mass/Inertia parameters) and then click the Duplicate toolbar, or double-click the motor.
2. Modify the Rotary or Linear motor parameters as required. See
   - Using the Linear Motor Window, or
   - Using the Rotary Motor Window

   for information on motor parameters that can be set.

   TIP Set all Flux Saturation levels at 1.000 for any custom motor.

3. Click the Close button to exit the New Rotary motor or New Linear motor window.

The custom motor appears in the Motor Database window with the abbreviated parameter set as created, modified or unaltered.

Motor Database

Each motor controlled by an Ultra Series drive requires a unique parameter set. The parameter set provides the drive with the information about the motor to achieve proper commutation, precise control and protection.

When Ultraware software is used to assign a motor with a drive, the motor parameter set is obtained from a motor database (motors.mdb). The motor database is populated with standard motors available from Allen-Bradley during installation of Ultraware software. Ultraware software also provides a motor configuration utility for defining custom motors.

To access the motor database (.mdb), perform these steps.

1. Click Windows Start, and then sequentially click Programs, the Ultraware software program, and Motor Configuration to display the Open Motor Database window.
2. Click Motors.mdb from the Ultraware directory to display the Motor Database window.
3. Two types of motors are displayed in the motor database window and may be loaded to drives.
   - Standard motors are read-only in the motor database.
   - Custom motors may be added to the motor database.

The motor configuration utility creates or duplicates a motor's parameter set, save it, and then modify or delete it.

The Motor Database window has:

- a Main menubar with File, Edit, and Help menus providing these drop-down menu selections:
- the File menu contains New, Open, Import, Export, and Exit functions.
- the Edit menu contains Duplicate, Delete, and Properties functions.
- the Help menu contains an About function.
- a Toolbar with Open, Duplicate and Delete buttons.
- a scrolling Motor window, which provides a display of the basic motor parameters for all standard and custom motors currently stored in the Ultraware motor database.

The window displays and sorts the motor files into these categories:

- Std - standard motor files provided by Rockwell Automation as part of the Ultraware software package are denoted by an asterik.
- Model - lists motor files by Series Designator, Frame Size, Winding Ke, and Encoder Line Count.
- Type - designates whether the file is for a Rotary or Linear motor.
- Speed - lists the maximum speed in rpms for rotary motors, or meter per second (mps) for linear motors.
- Rated Current - lists the Continuous Current rating in Amps
- Mass/Inertia - lists linear motor Mass in Kg or rotary motor Inertia in $Kg\text{-}cm^2$.

Command buttons for creating and modifying motor files include:

- New Rotary creates a custom rotary motor.
- New Linear creates a custom linear motor.

Edit displays the complete set of parameters for the highlighted motor. The display shows:

- a standard (supplied) motor file to be viewed, or
- a user-created motor examined, modified, and saved.

A Status bar displaying:

- Date
- Time

Using the Linear Motor Window

The Linear Motor window configures a custom motor by entering motor parameters, or to edit an existing motor's parameter set.

Standard motors are opened in a read-only mode. If a motor is duplicated, it becomes a custom motor with a default model name consisting of the duplicated motor's model with _copy n appended (for example, Std-Linear_copy 1).

The following parameters can be entered and edited in the Linear Motor window,

Parameter	Description
General:	
Model:	Model number or name up to 32 digits in length
Standard Motor:	Checked if standard Rockwell Automation motor.
Force Constant:	0.625 to 4095.9375 N/A
Coil Mass:	0.00001 to 32767.999 Kg
Electrical Cycle Length:	0.01 to 1.0 meters
Electrical:	
Resistance:	0.0039 to 255.996 Ohms
Inductance:	0.0039 to 255.996 mH
Rated Voltage:	100 to 1000 Volts
Flux Saturation	
1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 7/8, and Peak Current	0.000 to 1.000 Set all flux saturation levels for custom motors to 1.000.
Ratings:	
Maximum Speed:	0.125 to 127.99 mps
Intermittent Current:	0.008 to 255.99 Amps
Continuous Current	0.008 to 255.99 Amps
Note: All units relative to current (Amps) are based upon 0 to Peak of the sine wave (not RMS units). Winding data values are phase-to-phase.	
Feedback:	
Encoder Type:	The type of encoder provides motor feedback: • Incremental • Sine/Cosine
Commutation Type:	The type of commutation for the motor: • Brush • Trapezoidal • Sinusoidal
Startup Type:	The start-up commutation algorithm for the motor: • Self-Sensing • Hall Inputs
Hall Input Offset:	0 to 359 Degrees
Lines Per Meter:	4000 to10,000,000 lines
Integral Limits:	Check when feedback has integral limit switches. For example, if the motor has built-in overtravel limits which are interfaced to the Ultra drive's Encoder (CN2) connector.

Parameter	Description
Thermal:	
Integral Thermostat:	Check when motor has a built-in thermostat.
Software Protection:	Check when thermal protection through software is desired.
Thermal Properties	
Rth(w-e)	0.00001 to 32767.999 C/W winding-to-encoder thermal resistance
Cth(w-e)	0.0039 to 8388607 W-s/C winding-to-encoder thermal capacitance
Rth(w-a)	0.00001 to 32767.999 C/W winding-to-ambient thermal resistance
Cth(w-a)	0.0039 to 8388607 W-s/C winding-to-ambient thermal capacitance

The following command applies to the Linear Motor window.

Command	Description
Close	Closes the Linear Motor window with the parameters as entered.

Using the Rotary Motor Window

The Rotary Motor window configures a custom motor by entering motor parameters, or to edit an existing motor's parameter set.

Standard motors are opened in a read-only mode. If a motor is duplicated, it becomes a custom motor with a default model name consisting of the duplicated motor's model with _copy n appended (for example, Std-Rotary_copy 1).

The following parameters can be entered and edited in the Rotary Motor window.

Parameter	Description
General	
Model:	Model number or name up to 32 digits in length
Standard Motor:	Checked if standard Rockwell Automation motor.
Torque Constant:	0.00024…15.9998 N-m/A
Inertia:	0.00001…65535.999 Kg-cm^2
Poles per Revolution:	even numbers from 2…100
Electrical	
Resistance:	0.0039…255.996 Ohms
Inductance:	0.0039…255.996 mH
Rated Voltage:	100…1000 Volts
Flux Saturation	
1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 7/8, and Peak Current	0.000…1.000 Set all flux saturation levels for custom motors to 1.000.
Ratings	
Maximum Speed:	300…32767 rpm
Intermittent Current:	0.008…255.99 Amps
Continuous Current	0.008…255.99 Amps
Note: All units relative to current (Amps) are based upon 0 to Peak of the sine wave (not RMS units). Winding data values are phase-to-phase.	
Feedback	
Encoder Type:	The type of encoder provides motor feedback: • Incremental • Sine/Cosine
Commutation Type:	The type of commutation for the motor: • Brush • Trapezoidal • Sinusoidal
Startup Type:	The start-up commutation algorithm for the motor: • Self-Sensing • Hall Inputs
Hall Input Offset:	0…359º
Lines Per Revolution:	100…64,000 lines
Integral Limits:	Check when feedback has integral limit switches. For example, if the motor has built-in overtravel limits which are interfaced to the Ultra drive's Encoder (CN2) connector.

Parameter	Description
Thermal	
Integral Thermostat:	Check when motor has a built-in thermostat.
Software Protection:	Check when thermal protection through software is desired.
Thermal Properties	
Rth(w-e)	0.00001…32767.999 C/W winding-to-encoder thermal resistance
Cth(w-e)	0.0039…8388607 W-s/C winding-to-encoder thermal capacitance
Rth(w-a)	0.00001…32767.999 C/W winding-to-ambient thermal resistance
Cth(w-a)	0.0039…8388607 W-s/C winding-to-ambient thermal capacitance
Gearing	
Integral Gearbox:	Check when motor has built-in gearbox.
Gear Ratio:	0…255

The following command applies to the Rotary Motor window.

Command	Description
Close	Closes the Rotary Motor window with the parameters as entered.

Importing Motors

The Import menu can be used to read two types of motor data:

- A motor exchange file (.mxf) previously written by the motor configuration tool using the Export function.
- An Ultra Master motor file (.mtr). This allows a custom motor file created for Ultra Master to be added to the Ultraware motor database.

Select the type of file you want to import from the Open Import dialog box by:

1. Selecting the file to import from the "Files of type:" drop down list, and
2. Click Open to add the motor to the database.

TIP The data contained in a .mtr file does not include all the properties for a motor stored in the motor database. You should examine the motor properties after importing an Ultra Master motor file to verify the information.

Exporting Motors

The Export Menu copies the selected motor to a motor exchange file (.mxf). The motor exchange file is a binary format that transfers between different personal computers, but Ultraware software must be installed on both personal computers.

Ultraware Software Updates

Introduction

This appendix lists the significant changes to each version of Ultraware software.

Version 1.80

Kinetix 3 Drive-related Enhancements

- Adds support for the Kinetix 3 drive.

General Enhancements

- Enlarges the selection of RS-232 serial communication port numbers to COM1...COM4.

Version 1.64

Ultra3000 Drive-related Enhancements

- Adds support for SKS/SKM encoders.

Version 1.63

Ultra3000 Drive-related Enhancements

- Adds support for firmware upgrades on series B drives.

Ultra5000 Drive-related Enhancements

- Includes fault numbers in fault history.
- Includes tuning parameters in scope window.

Version 1.60

Ultra1500 Drive-related Enhancements

- Adds support for Ultra1500 drive.

Ultra3000 Drive-related Enhancements

- Adds support for SERCOS Hardware Overtravel fault.
- Adds Define Home command when in Analog Position Mode.
- Adds Trigger Position parameter to Oscilloscope that lets you specify the percent of the data to collect before the trigger occurs.
- Resetting the drive to factory settings after an E55 is detected.
- Includes tuning parameters in scope window.

Ultra5000 Drive-related Enhancements

- Includes fault numbers in fault history.
- Includes tuning parameters in scope window.

General Enhancements

- Prompts to save.udb file when user shuts down/logs out of the OS.
- Adds feature to show all hidden messages.
- Adds additional messages to help customers understand how to save online drive data to a file.

Help File Enhancements

Ultra1500

- Adds support for Ultra1500 Drive.

Ultra3000

- Adds support for SERCOS Hardware Overtravel fault.
- Adds Define Home command when in Analog Position Mode.
- Adds Trigger Position parameter to Oscilloscope in which you can specify the percent of the data to collect before the trigger occurs.
- Reset to factory settings after an E55 is detected.
- Includes tuning parameters in scope window.

Ultra5000

- Includes fault numbers in fault history.
- Includes tuning parameters in scope window.

General

- A prompt reminds the user to save a .udb file when user shuts down/logs out of OS.
- Adds feature to show all hidden messages.
- Adds additional messages to help customers understand how to save online drive data to a file.

Version 1.50

Ultra3000 Drive-related Enhancements

- Changes two existing position comparators to permit the use of a position window (Within Window and Outside Window) in addition to a Greater Than and Less Than.
- A new parameter, Absolute Direction, permits the user to specify the direction of motion for each absolute index. Directions include: Forward Uni-Directional, Reverse Uni-Directional, or Bi-Directional when Position Rollover is Enabled.
- A new parameter, Single-Turn Absolute, permits the user to specify whether an SRS encoder should be considered an absolute feedback device or not.
- Extends the range of scaling for position signals when mapped to the analog output.
- Adds support for integrated Gear Motors.
- Adds support for controlling Acceleration Feedforward in the Tuning properties.
- Additional scope attributes are now saved on the drive (Scale Type and Samples Per Division).

Ultra5000 Drive-related Enhancements

- Adds capability for two adjacent linear cam segments.
- New motion library functions let the program define cam tables, queue cam tables, and adjust the phasing of the cam.
- Enhancements to link only code required for the current application instead of the entire library using new compiler (2.x), but maintained support of old compiler (1.x) when needed.
- Fixes the executable size being included in calculations that determine if there's enough space on the drive to copy a project to the archive branch.
- Permits negative position values in a .csv files imported as cam tables.
- Global Variables in monitor window can be displayed and edited in decimal, hexadecimal and binary format.
- Progress meter displays while transferring large variable arrays.
- Eliminates crash that occurs while creating an online global variable when there isn't enough space available.
- Scope properties are now stored on the drive.
- Adds these new faults:
  - Ground Short Circuit
  - Soft-Starting Fault
  - Power Module Over temperature
  - AC Input Phase Loss
  - Self-sensing Startup Error
  - Excessive CPU Load

General

- Adds capability of saving and loading monitors.
- Adds Cancel button to progress meter displayed during transfers.
- Refresh only 'visible' rows in a property windows to speed up refresh rate.
- Automatic transfer of custom motors to new motor database during installation.

Version 1.40

Ultra3000 Drive-related Enhancements

When Ultraware software connects to a SERCOS Ultra3000 drive, the workspace and property window contents are customized to only show the data that is appropriate for a SERCOS drive. Previously, SERCOS drives were shown as broken drives, only letting the user upgrade firmware, or disable the SERCOS interface.

Ultra5000 Drive-related Enhancements

- Support for standard size Ultra5000 drives.
- Autotune feature is now available. To perform autotuning, go to the Tuning window and click the Autotuning button. Click Start Autotuning to begin autotuning process.
- Encoder Pulse Generation is now supported.
- Adds ability to monitor the states of the feedback device lines.
- Go To Corresponding {} () and Go To Line Number commands are now accessible from the Edit menu and from the pop-up menu in the Source.c or Header.h. Hot keys are also available. More details are available in the online help.
- Monitor tree updates to make basic position, velocity and current signals easier to find.
- Support for properties controlling the behavior of self-sensing startup.
- Device Net support added.
- Line number display option added to Edit window and source/header printout.
- Cam Cycle Limit support
- New fault support for: Excessive Output Frequency, Self Sensing Startup Failure, and Excessive CPU Load
- Digital I/O Polarity configuration capability
- Encoder Fault Mode supported
- Description field for each element of the Global Variable Array provided.

General Enhancements

- Undo and Redo commands are now accessible from the Edit toolbar. To activate this feature, you must reset the Edit toolbar by opening the Customize dialog box with the Tools/Customize menu, select the Edit toolbar from the list, and then click Reset.
- The Save As function can be accessed by a right-click to open a .udb file in the workspace, and then click Save As from the pop-up menu.
- Support for intelligent encoders when offline. The motor database now supports an SRS/SRM encoder type and a startup type of Serial, both of which are for intelligent encoders. You can now select a motor with these attributes for an offline drive in Ultraware software. When you do, the Auto Motor Iden for the motor automatically enables, but uses the motor attributes from the motor database while offline.
- Motion Library dialog bar is available now to assist the programmer with instruction recollection and syntax accuracy.
- Progress meters display for all significant data transfer operations.
- Additional grid formatting options are available now to enhance the usability of the oscilloscope function.
- Ultraware motor files (.mtr files) can now be imported into the motor database.
- The monitor now lets integer data to be displayed in decimal, hexadecimal, or binary format.

Version 1.30

Ultra3000 Drive-related Enhancements

- Support for high voltage drives.
- Ability to deactivate and re-activate the SERCOS functions on a SERCOS drive. This lets a SERCOS drive be used as a non-SERCOS drive. Right-click a SERCOS drive in the Workspace to display the context menu for the drive to access this feature.
- Ability to set the current level used for self sensing startup. The self sensing current level may be accessed in the Motor property window, when it applies (Auto Motor Identification disabled and Startup type of Self Sensing).
- Digital inputs may now be configured to perform a Drive Reset.
- Can change the Drive Size of an Off-Line drive. Ultraware software permits the same size drive to be copied to an online drive. This permits a fully configured offline drive, that does not match the size of an online drive, to be modified and copied to the online drive.
- The Scale and Offset values of each oscilloscope channel are now saved on the drive. When opening the oscilloscope for an Ultra3000 drive, it should be restored to the same configuration as the last time it was used, even if Ultraware software has been restarted, or the drive has been reset.

Ultra5000 Drive-related Enhancements

- Template for new projects. When a new project is created it is automatically populated with a source file containing the skeleton of a basic Ultra5000 motion program. The template may be customized as well. The template is in the form of an Ultraware export file (.uxf) named New Project.uxf in the Ultraware installation directory. You can replace this uxf file with your own exported project to define your own project template.
- Ratchet Enable/Disable commands have been removed. Disabling the ratchet is unnecessary and can lead to confusion when using gearing.
- Reset Drive to Factory Settings. The main Ultra5000 drive window now contains a button which resets the drive to factory settings. The flash file system is cleaned, removing all user programs, drivers, cam files, and archives. All attributes are returned to their default values.
- The Service Info page now displays current and peak CPU utilization levels for all four frames of the sequencer.

General Enhancements

- The way Ultraware software manages a .udb files has been updated. All changes are made to a temporary file until you perform a File/Save or File/Save As. This also lets you open a file, make changes, and exit without saving your changes. Ultraware software keeps track of modifications to the temporary file, and prompts you with the option to save your changes when you close a file or exit the application. With this change, the File/New command no longer requires you to select a udb file name right away.
- The oscilloscope now contains a Save button, which lets the data displayed in the scope to be written to a tab delimited text file, which can then be read into other programs, such as Excel.
- The Ultraware help file has been expanded to provide instructions for using the Motor Configuration tool, and provide access to the release notes.

Installation Notes

- When installing Ultraware or on a machine that has a current version of the software already installed a dialog will ask to upgrade the current version. This is the same as removing the old version and installing the new version.
- If you have custom motors defined in your previously installed motor database, they will be transferred to the new motor database. If an error occurs during the transfer, you can manually transfer them to your new database using these technique. Your old motor database will have been copied to a database called MotorBackup1.mdb. Use the Export function in the motor configuration Utility to retrieve your custom motors from the back-up database and import them into your new motor database, motors.mdb. Make sure you transfer them before running the installation a second time, or your back-up copy will be overwritten.
- Computers running Windows NT 4 operating system with Service Pack 5 (SP5) might receive errors during install concerning registration of DLL and OCX files (for example, COMCAT.DLL). This is due to an incompatibility with the COMCAT.DLL version 5.0 with other system DLL files. The solution to this problem is to replace COMCAT.DLL version 5.0 with COMCAT.DLL version 4.71. This requires the un-registration and deletion of COMCAT.DLL version 5.0 and the copying and registration of COMCAT.dll version 4.71. The batch file Comfix.bat in the Util directory of the distribution CD completes this operation. Run the batch file from its location on the CD and then run the install program again.

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Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products.
At http://www.rockwellautomation.com/support/, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/support/.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/support/americas/phone_en.html, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication RA-DU002, available at http://www.rockwellautomation.com/literature/.

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Publication 2098-UM001G-EN-P - February 2011 PN-98806
Supersedes Publication 2098-UM001F-EN-P June 2002