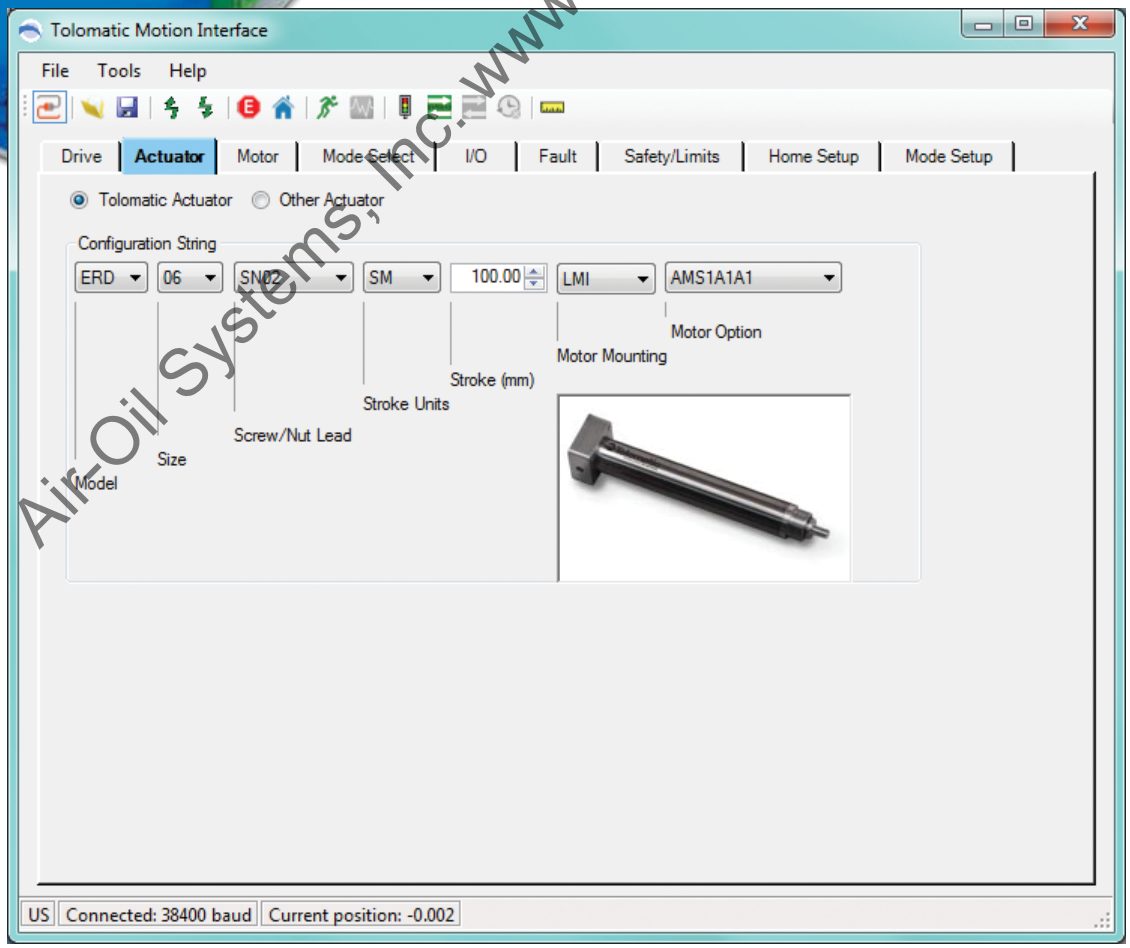
Tolomatic
EXCELLENCE *IN MOTION*®

USER GUIDE

Tolomatic Motion Interface (TMI)

Actuator Control Solutions for:

- ACS Stepper Drive/Controller
- Tolomatic Electric Linear Actuators



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1.1 Host Computer and Software System Requirements

The Tolomatic Motion Interface (TMI) is designed to work with a host PC with Windows® operating systems. Before installing the TMI software, be sure the host PC has the minimal host requirements indicated below.

1.1.1 Hardware Requirements

HARDWARE	MINIMUM REQUIREMENT
Processor	1 GHz
RAM	512 MB
Disk Space 32-Bit	600 MB
Disk Space 64-Bit	1.5 GB
USB	1 USB Connection
USB to Serial Converter	1 USB to Serial Converter

Table 1-1: Hardware Requirements

1.1.2 Operating Systems Supported

The Tolomatic Motion Interface (TMI) is compatible with the following operating systems: Windows® 7 and Windows® XP.

For all platforms, it is recommended that you upgrade to the latest Windows Service Pack and critical updates from the Windows Update Web Site at http://go.microsoft.com/fwlink/?LinkId=168461 to ensure the best compatibility and security.

The TMI software is not supported on IA-64-based (Itanium) systems.

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2 Installing the TMI Software

2.1 Installation Instructions

2.1.1 Installing from the Tolomatic CD

1. Insert the software CD supplied by Tolomatic into the CD-ROM drive in your PC.
2. Double-click the "setup.exe" file to run the installer.
3. Follow the prompts to install the software.

The software will install a program launch icon on the desktop and in the Windows® Start menu at:
Start > All Programs > Tolomatic > TolomaticMotionInterface

In the Start menu the program will start with single click. On the desktop the program will start with double click.

2.1.2 Downloading and Installing from the Tolomatic Web Site at www.tolomatic.com

The Tolomatic Motion Interface can be downloaded from the Tolomatic web site at www.tolomatic.com

1. To download, select the Electric Linear Motion Product Line and choose “Software” from the drop down listing.
2. Select the TMI software from the listing and save the file when prompted to the programs folder on your hard drive.
3. Double-click the "setup.exe" file to run the installer.
4. Follow the prompts to install the software.

The software will install a program launch icon on the desktop and in the Windows® Start menu at:
Start > All Programs > Tolomatic > TolomaticMotionInterface

In the Start menu the program will start with single click. On the desktop the program will start with double click.

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3.1 Launching the TMI Software

1. Double-click the program icon on the desktop or in the Windows® Start menu at: Start > All Programs > Tolomatic > TolomaticMotionInterface to launch the software.
2. When the TMI is launched for the first time, the software will automatically display the User Units dialog box (shown below, Figure 3-1) which defines the units displayed in the software. The user has two selections for linear actuator units: inches (US Linear) or mm (SI Linear).

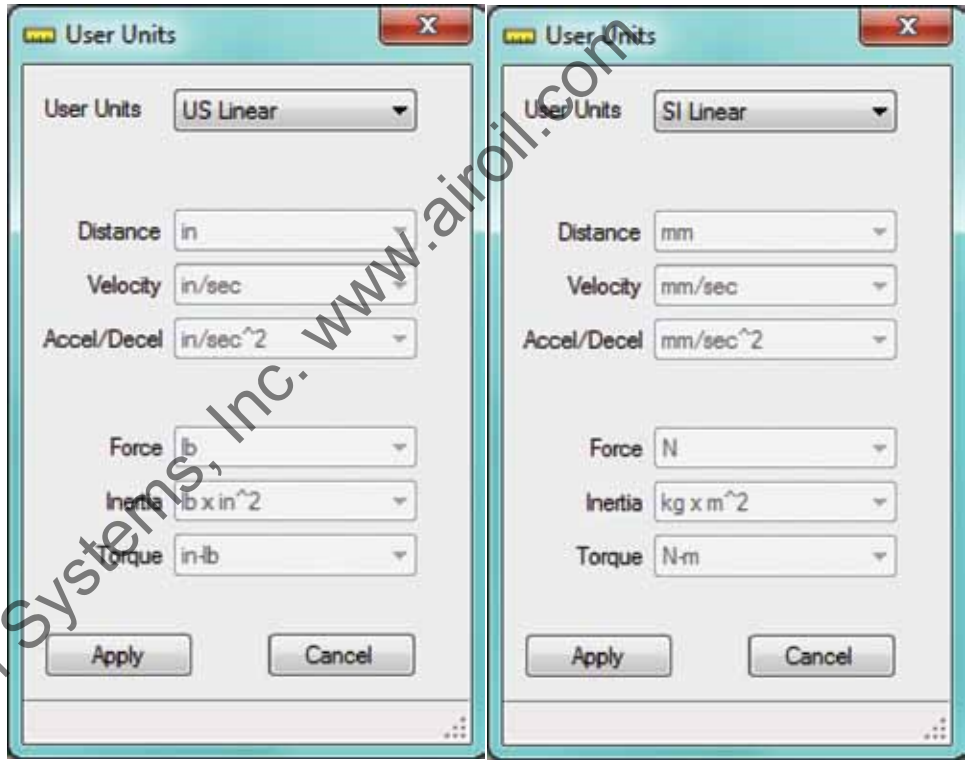

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Figure 3-1: User Unit Dialog Box

3. The user must select the desired units and click Apply. Once the apply button is clicked TMI will no longer automatically display the User Units dialog box on application launch. To access the User Units dialog box click on the ruler icon in the tool bar at top. The units can be changed at any time and all displayed parameters in the software will be adjusted accordingly.

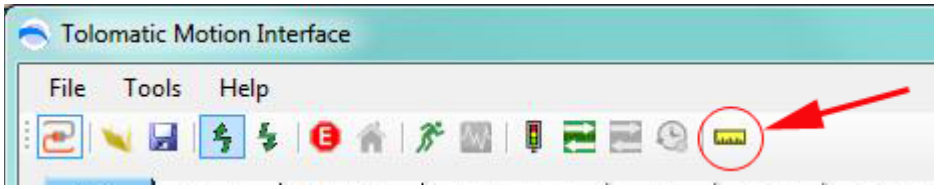

Figure 3-2: User Unit Tool Icon in menu

4 Establishing Communication

4.1 Establishing Communication with the Tolomatic Drive

RS-232 is the current communication protocol used to configure the Tolomatic drive. Ethernet TCP/IP will be available at a later date.

1. After the User Units have been selected on initial startup, and from then on once the TMI is launched, the software will automatically default to the Drive tab shown in Figure 4-1 below.

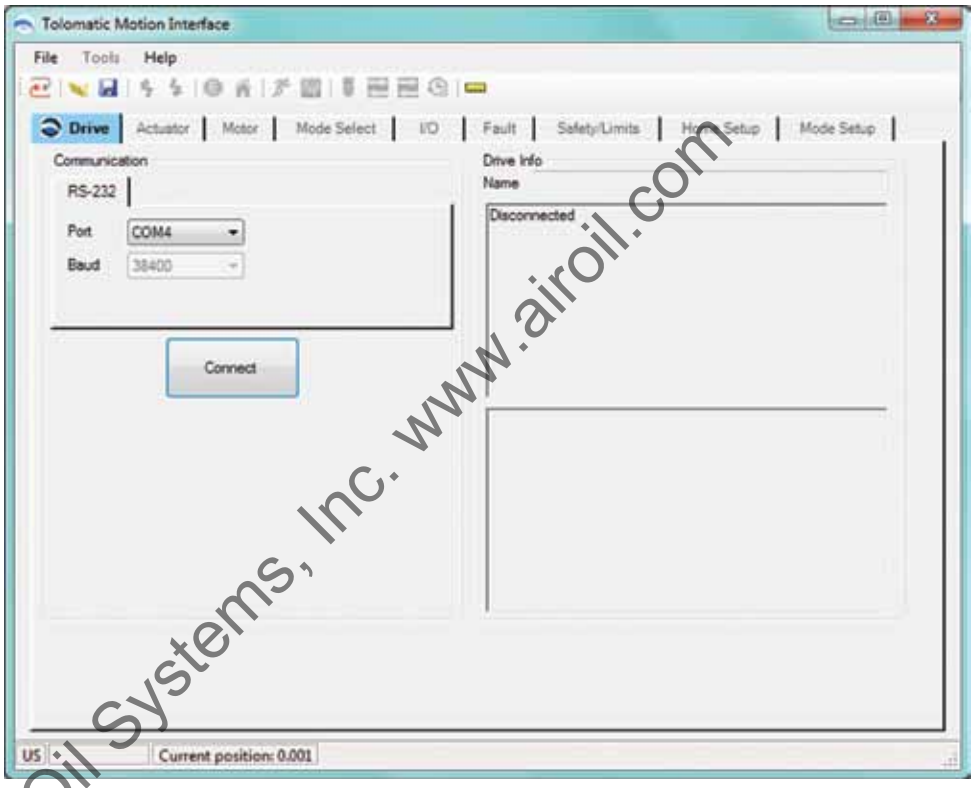

Figure 4-1: Drive Tab Showing Drive Disconnected

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2. The Baud rate is automatically set to 38400 and is not changeable. Verify that the COM port connected to the Tolomatic drive is selected in the Port drop down menu and then click the Connect button.
3. Upon establishing communication with the Drive, the TMI software automatically reads all the current settings in the drive and updates the software interface accordingly. As shown in Figure 4-2, the Drive information is displayed in several fields: Name of drive given by user; Drive information including Model and Firmware Version; and a Photo of the Tolomatic Drive product being configured (ACS Stepper Drive/Controller is pictured).

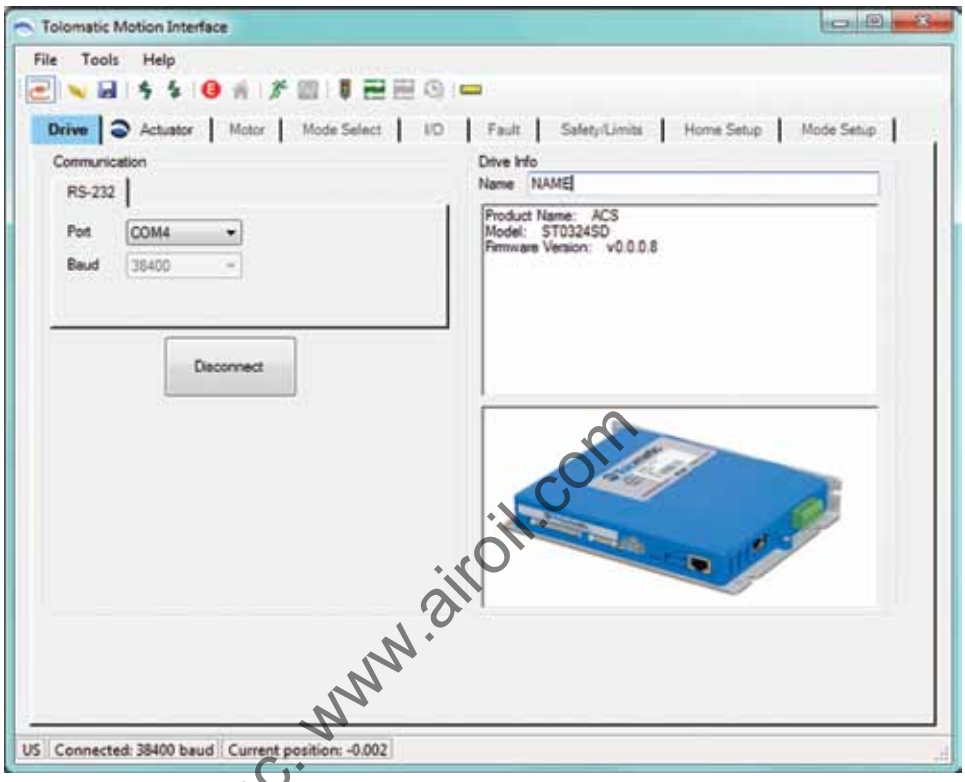

Figure 4-2: Drive Tab Showing Drive Connected

4. The TMI software also opens a Software Stop window shown in Figure 4-3. This Software Stop window is intended to be a software emergency stop. If the user clicks on the stop button, the actuator will immediately stop. The Tolomatic drive will be disabled along with the output to the motor. For safety reasons this window is intended to always be on top of other windows.

Figure 4-3: Software Emergency Stop

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5 Navigating through the TMI Software

5.1 Navigating through the Tolomatic Motion Interface (TMI)

5.1.1 Setup Wizard Tabs

The TMI software for configuring the drive is designed as a setup wizard. It uses tabs, navigating from left to right through all the steps needed to configure the drive and create motion. As shown below, there are multiple tabs which are used in the setup process.

TMI Setup Wizard Navigation Tabs

Drive	Establish communication and verify drive identification information such as model and firmware version.
Actuator	Configure a Tolomatic actuator or create a custom actuator in the "Other Actuator Catalog."
Motor	Configure or view parameters of a Tolomatic motor or create a 3rd party motor file in the "Other Motor Catalog."
Motor Select	Select the desired operating mode. Tolomatic drive products were designed to have dedicated operating modes to simplify the configuration and operation of the drive. Currently, there are three operating modes: 4, 8 & 16 move commands
I/O	Configure the functionality of the digital inputs and digital outputs of the drive. The TMI will automatically configure a suggested I/O map based on the selected operating mode.
Fault	Enable/disable faults, and configure the action taken for the displayed faults.
Safety/ Limits	Configure safety parameters and motion limits such as: in position, position error, maximum velocity/accel/decel, current limit, software limits and zone bounds
Home Setup	Configure the homing routine parameters such as type, direction, velocity, force, and home on power-up.
Mode Setup	Setup the operating Mode selected in the Mode Setup tab. For example, in 4 Move Command mode, the user configures move type, position, velocity, acceleration, deceleration and force for all 4 moves.

Table 5-1: TMI Setup Wizard Navigation Tabs

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5.1.2 Tolomatic Logo

The TMI software uses the Tolomatic Logo (shown above) to guide the user through the software in order to correctly configure all necessary parameters. Notice in figure 4-2 & 5-1 showing that the drive is connected, the Tolomatic logo has moved to the Actuator tab which is the next required step–configuring the actuator. The Drive tab remains highlighted in Blue which gives the user visual indication of the currently selected tab.

5.1.3 Tool Bar

Figure 5-1: Tolomatic Motion Interface (TMI) Tool Bar

The Tool Bar includes the following:

Drive Connect: Connect or disconnect communication to the drive.

Open: Open a previously saved drive configuration file to setup all the parameters of the drive.

Save: Save all parameters to a drive configuration file for later use.

Restore Current Settings from Drive Flash: Read all parameters from drive flash memory into the TMI software.

Write Current Settings to Drive Flash: Write all parameters from the TMI software into the drive flash memory.

Software Stop: Disables drive and output to the motor

Home: Initiates a home routine

Motion Manager tool: Tool used to create simple moves such as absolute, incremental and jog. All motion profile parameters are adjustable through this tool.

Tuning Filter tool: Tool not implemented at time of this release

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Drive Status tool: Tool used to notify user of critical drive information such as Enable status, Home status, In Position status and Faults (see Section 16: Drive Status Tool).

Digital I/O tool: Tool used to view the status of the Digital Inputs and Digital Outputs (see Section 15: Digital I/O Tool).

Analog I/O tool: Tool not implemented at time of this release

Fault History tool: Tool not implemented at time of this release

User Units tool: Tool to select application user units. At time of this release, units are selected in inches or millimeters.

5.1.4 Tool Tips

As the user moves the mouse over Tool Bar items, drive parameters or action buttons, the TMI will display a tool tip providing useful information about that item.

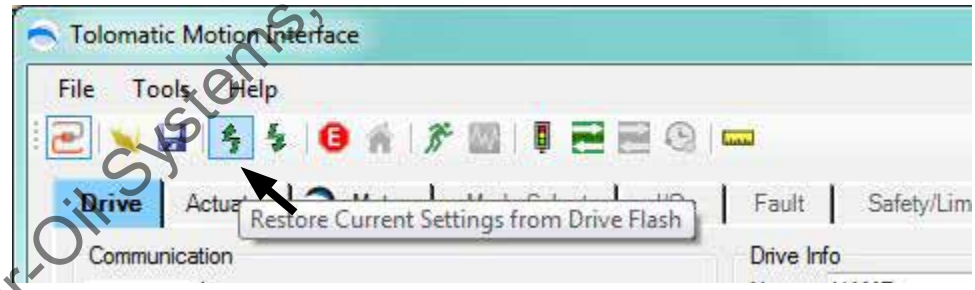

Figure 5-2: Tool Tips Display

Tool Tip Displays: Moving the mouse over a parameter field will activate the Tool Tips display and it will show the allowable range for that parameter. If a user attempts to enter a lower number than is allowed, the TMI software will automatically default to the minimum allowable value. If a user attempts to enter a higher number than is allowed, the TMI will automatically default to the maximum allowable value.

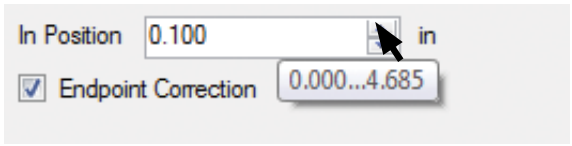

Figure 5-3: Parameter Range in Tool Tip Display

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5.1.5 Parameter Entry

Red Parameter Field: The TMI will automatically shade any parameter field a red color if that parameter has not been configured (see Figure 5-4). This is a notice to the user that this parameter must be configured before continuing or creating motion.

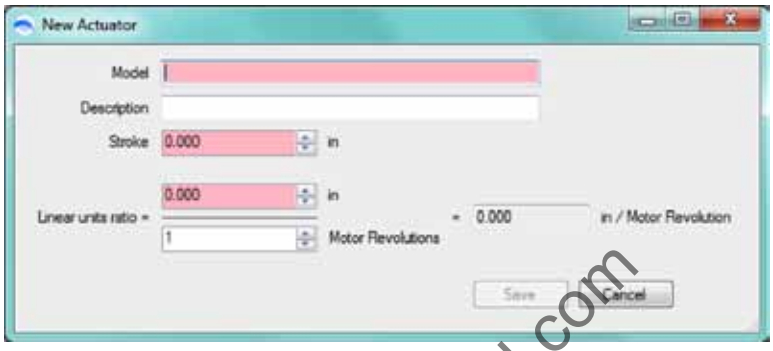

Figure 5-4: Red Parameter Fields

5.1.6 File Menu

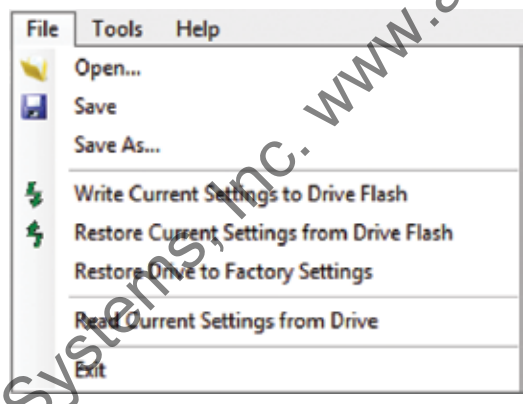

Figure 5-5: File Menu Options

File Menu Drop Down Descriptions	
Open	Open a drive configuration file to setup all the parameters of the drive.
Save	Saves all parameters to a drive configuration file. If user hasn't given a name to the file yet, a File Save window will be opened.
Save As	Opens a File Save window to allow user to select location and name of drive configuration file.
Write Current Settings to Drive Flash	Write all parameters from the TMI software into the drive flash memory.
Read Current Settings to Drive Flash	Read all parameters from drive flash memory into the TMI software.
Restore Drive to Factory Settings	Restores all parameters in the drive flash and RAM memory to factory defaults.
Read Current Settings from Drive	Reads all parameters in drive RAM into the TMI software (Performed automatically when communication is established)

Table 5-2: File Menu Drop Down Descriptions

NOTE: Executing any Open, Restore or Read operation will result in the TMI software automatically moving to the Drive Tab. This updates all parameters to current drive settings into the TMI software.

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5.1.7 Tools Menu

Figure 5-6: Tools Menu

Tools Menu Drop Down Descriptions	
Motion Manager	Used to create simple moves such as absolute, incremental and jog. All motion profile parameters are adjustable through the Motion Manager tool.
Tuning Filter	Tool not implemented at time of this release.
Drive Status	Used to notify user of critical drive information such as Enable status, Home status, In Position status and Faults
Digital I/O	Used to view the status of the Digital Inputs and Digital Outputs.
Analog I/O	Tool not implemented at time of this release
Fault History	Tool not implemented at time of this release
User Units	Used to select application user units. At time of this release, units are selected in inches or millimeters.
Software Stop	Used to disable drive and output to the motor. This tool is automatically launched when the TMI software connects to the drive.

Table 5-3: Tools Menu Drop Down Descriptions

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5.1.8 Help Menu

Figure 5-7: Help Menu Drop Down Options

ACS Hardware & Installation Guide: Launches a PDF of the manual with drive specifications, wiring diagrams, connector and cable information.

Tolomatic Motion Interface (TMI) Software Guide: Launches a PDF of this manual.

About: Indicates the current software version of the Tolomatic Motion Interface and the build date.

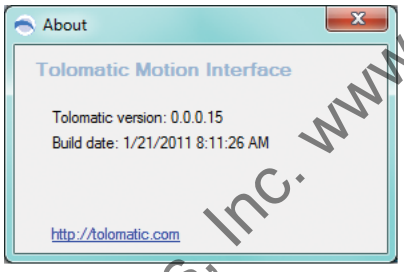

Figure 5-8: About Window

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6 The Actuator Tab

6.1 Using the Actuator Tab

The Actuator tab is used to configure a Tolomatic actuator or create a different actuator in the Other Actuator Catalog. The default selection of the radio button is Tolomatic Actuator.

6.1.1 Tolomatic Actuator Selection

1. Identify the actuator configuration string on the actuator. Enter Model, Size, Screw/Nut Lead, Stroke Units (either SM for mm, or SK for inches), length of Stroke in units specified, Motor Mount, and Motor option.

Figure 6-1: Configuration string on ERD actuator

2. When Model is configured, a photo of the actuator will be shown.

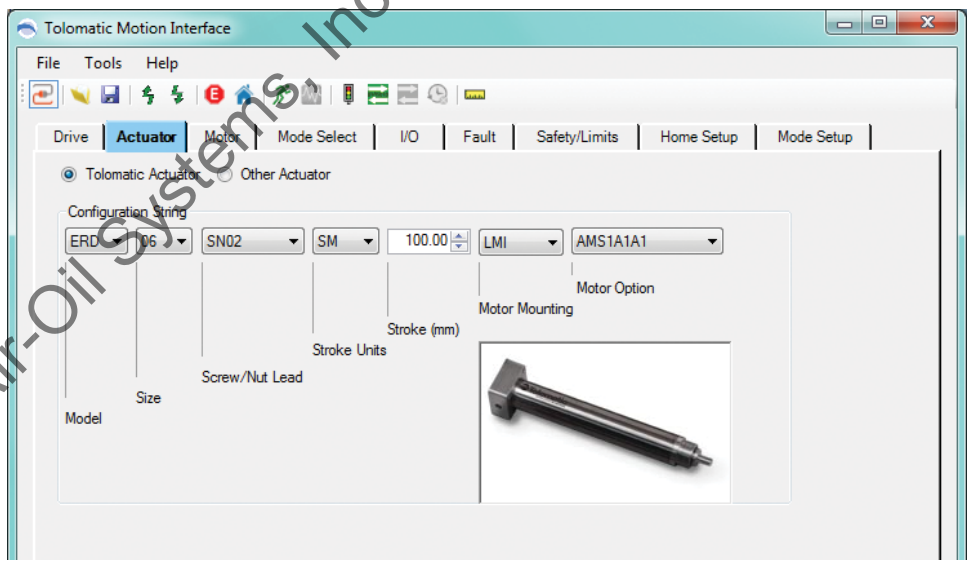

Figure 6-2: Configuring the Tolomatic Actuator Selection

NOTE: When you have completed filling in the configuration string the Tolomatic logo will move to the next tab requiring attention.

6.1.2 Other Actuator Selection

The Other Actuator Catalog allows a user to keep any number of Other Actuator models in the file for convenience and later reference.

1. If no Other Actuators have been created there will be no selections under the

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Models drop down. In this case, the user must click the New button at the bottom of the screen (see Figure 6-3).

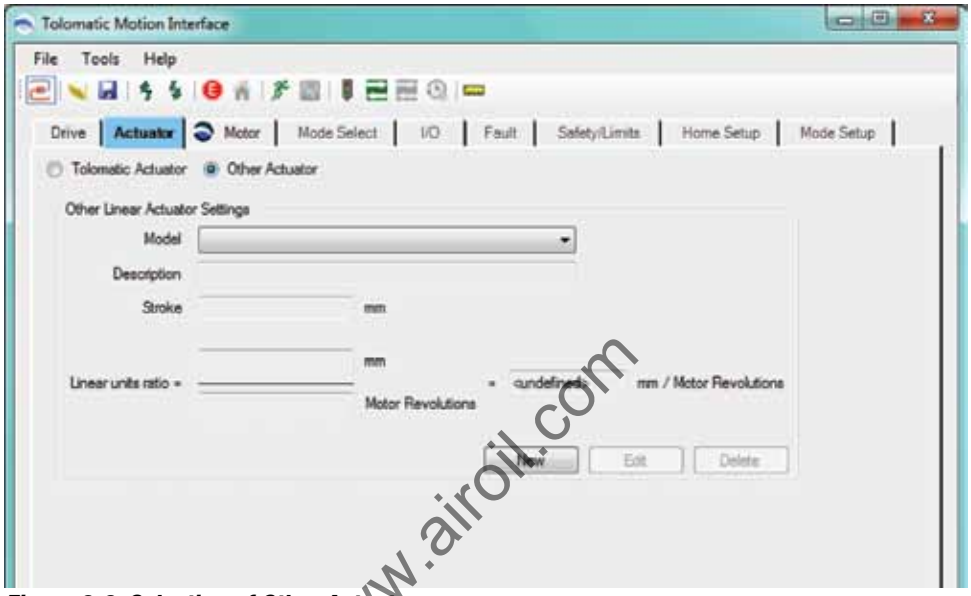

Figure 6-3: Selection of Other Actuators

2. Clicking the New button, will bring up a New Actuator dialog in which the user must enter critical information about the actuator (see figure 6-4)

3. Model field: Enter the name selected for the Other Actuator. It will remain red until the user enters a unique name that has not already been saved into the Other Actuator Catalog.

2. Description field: Enter a unique description of the Other Actuator, up to a 28 alpha-numeric character entry that is all uppercase. This field is optional.

3. Stroke field: Enter the stroke in the selected user units. There is no stroke limit for Other Actuators.

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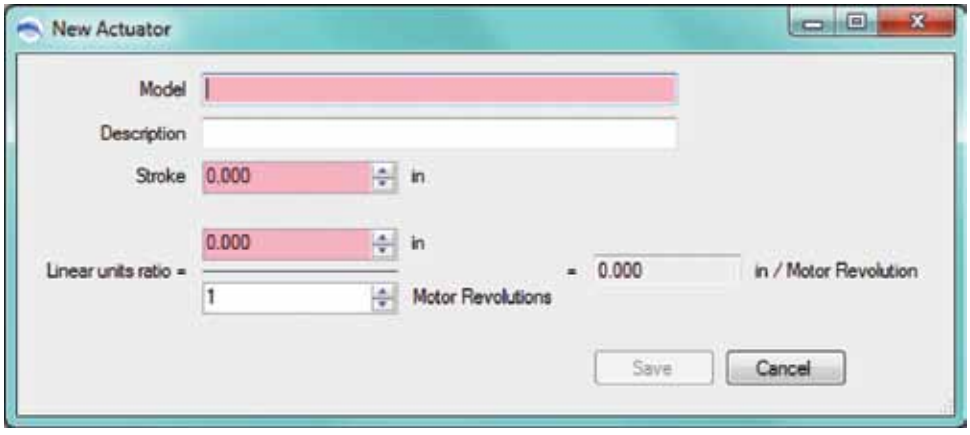

Figure 6-4: New Actuator Window

4. Linear Units Ratio field: These numerator and denominator entries are used to setup the ratio of rotary motor revolutions to linear distance in selected user units per motor revolution. If there is a gearbox inline with the motor, this ratio must be taken into account and entered accordingly.

   For example, if there is an Other Actuator with a 2 turns/inch screw, then the Linear Units Ratio would look as in Figure 6-5 below. All the required fields have been entered properly and the parameters have been validated. This activates the Save button.

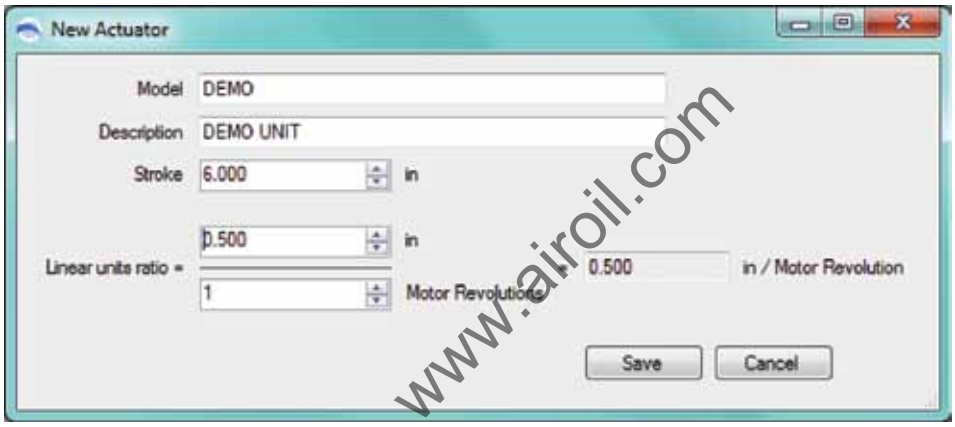

Figure 6-5: New Actuator Window Data Entry Complete

5. Clicking the save button adds the New Actuator information to the Other Actuator catalog. The name of the new actuator is automatically added to the Model drop down for later reference.

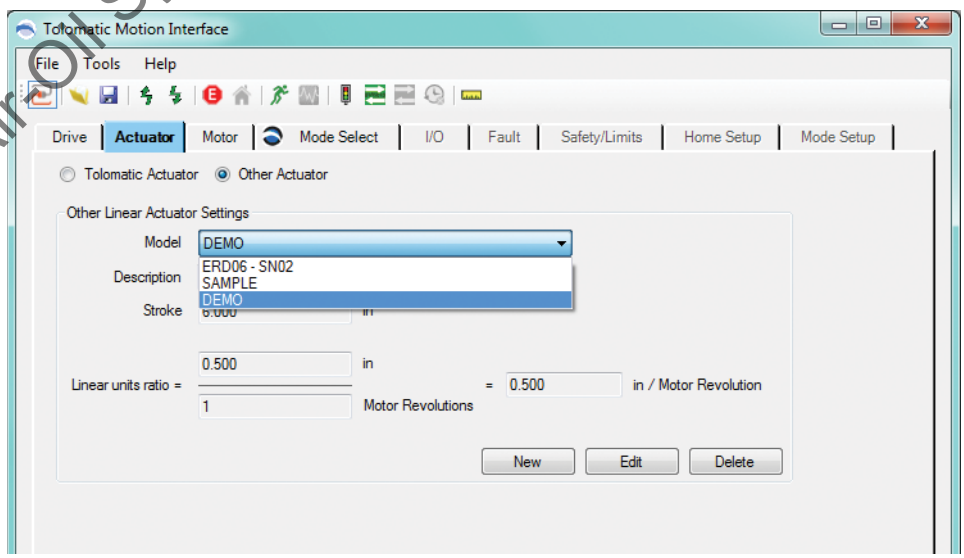

Figure 6-6: Other Actuator Window with Multiple Model Drop Down Display

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7.1 Using the Motor Tab

The Motor tab is used to configure a Tolomatic motor or create a different motor in the Other Motor Catalog. The default selection of the radio button is Tolomatic Motor.

7.1.1 Tolomatic Motor Selection

1. Verify the correct Motor selection and settings are displayed.
2. All parameters except the Reverse Direction check box are automatically populated with those of the selected motor and are disabled from entry.

   If the user wishes to select a different motor Model that is acceptable for the actuator chosen, then simply select a new motor from the Model drop down.
3. Depending on the actuator configuration or the actuator installation in the machine, the user may wish to reverse the direction of the motor's positive direction. Default positive motion direction is CW (clockwise). To change it to CCW (counter-clockwise), the Reverse Direction check box must be checked.

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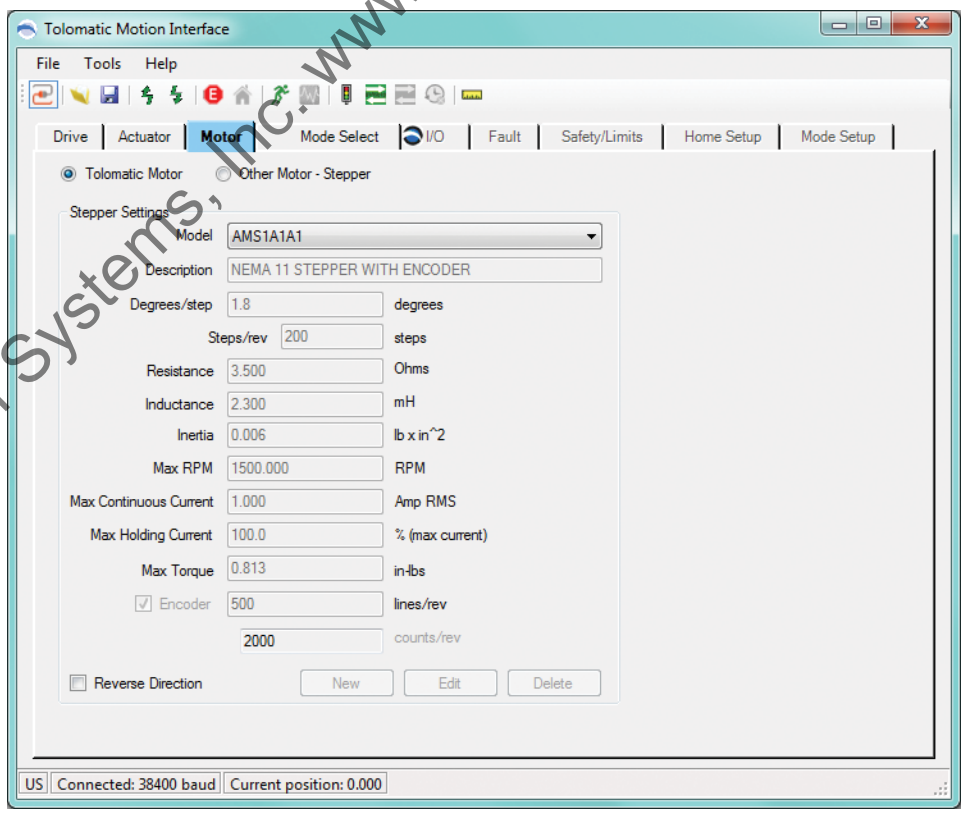

Figure 7-1: Motor Tab with Tolomatic Motor Selected

7.1.2 Other Motor Selection

The Other Motor catalog allows a user to keep any number of motor models compatible with the drive in the file for convenience and later use. At the time of

this release, stepper motors are the only available option. Selection of a motor other than one supplied by Tolomatic is done in a similar procedure as selecting an Other Actuator.

1. If no Other Motors have been created there will be no selections under the Models drop down (see Figure 7-2). In this case, the user must click the New button at the bottom of the screen.

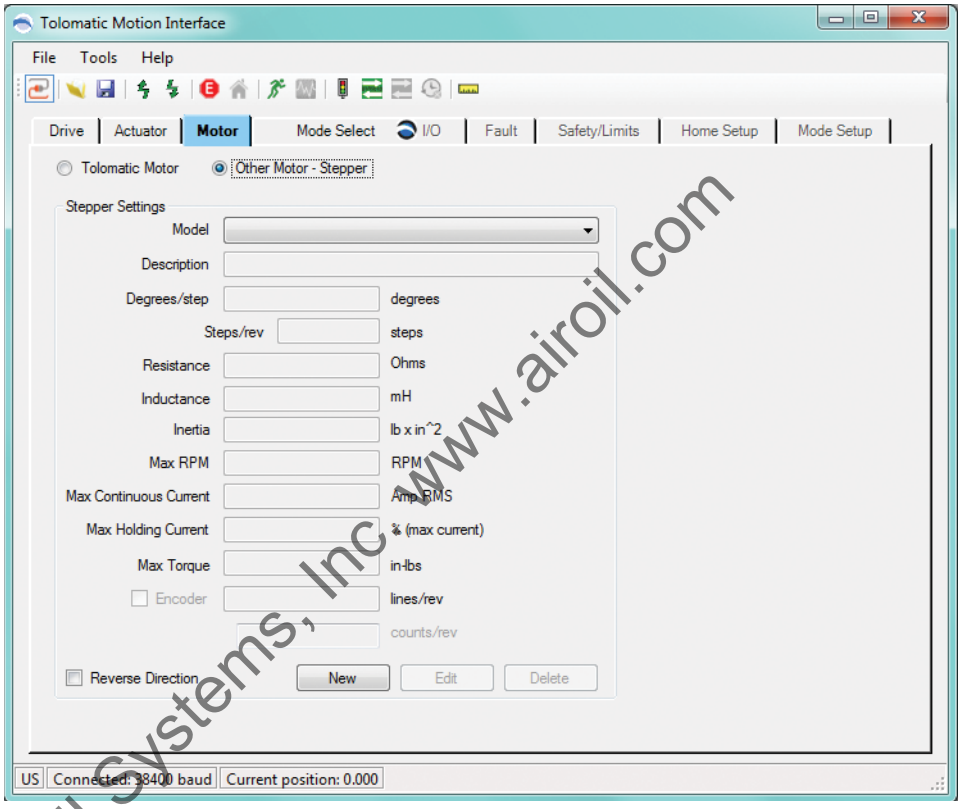

Figure 7-2: Other Motor with no Model Choices Available

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2. Clicking the New button, will bring up a New Stepper Motor dialog box in which the user must enter the motor name, description (28 alpha-numeric characters in uppercase), and specifications. Once the information entered has been validated, the light red fields will disappear and the save button will become active.
3. Clicking the save button adds the New Motor information to the Other Motor catalog. The name of the new motor is automatically added to the Model drop down for later reference.
4. Depending on the actuator configuration or the actuator installation in the machine, the user may wish to reverse the direction of the motor's positive direction. Default positive motion direction is CW (clockwise). To change it to CCW (counter-clockwise), the Reverse Direction check box must be checked.

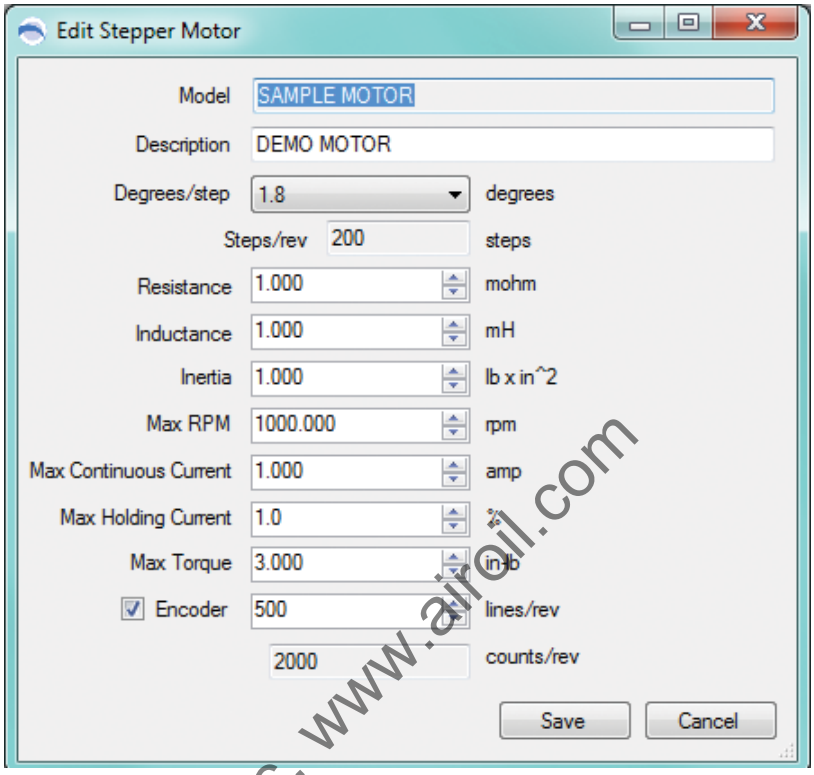

Figure 7-3: Edit Stepper Motor Window with Data Complete

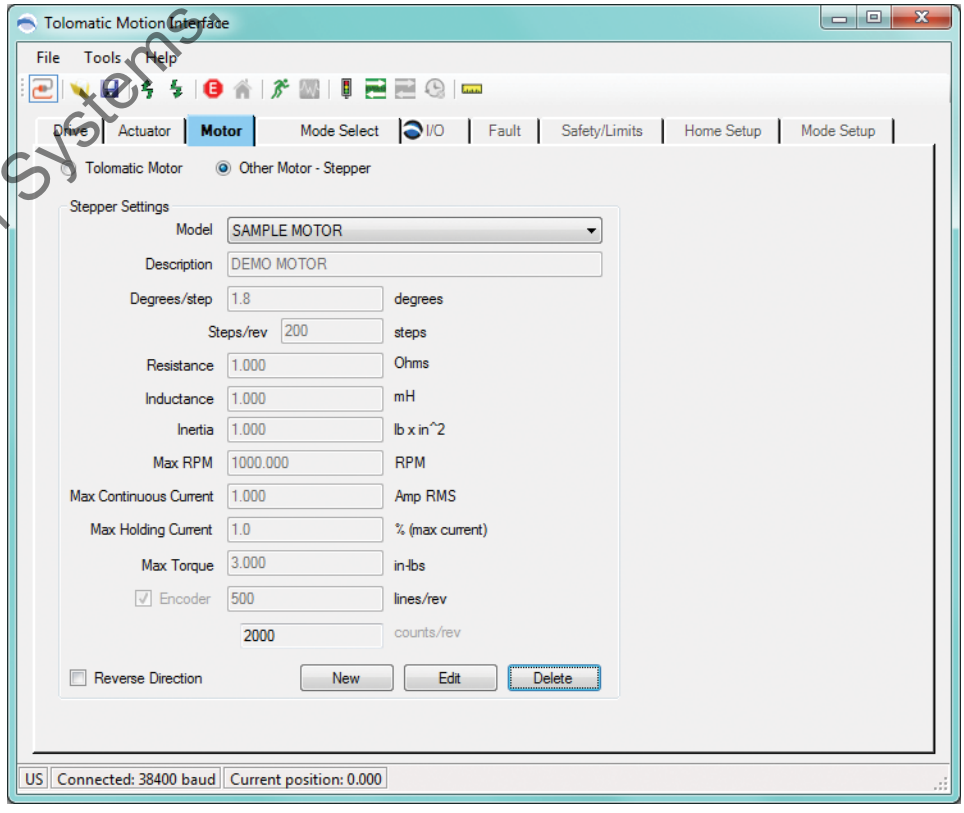

Figure 7-4: Other Motor Window with Model Added to Drop Down Display

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8 The Mode Select Tab

8.1 Using the Mode Select Tab

At time of this release, the software accommodates three different Operating Modes: 4, 8, & 16 Move Commands. These Move Commands can be configured to be Absolute, Incremental or Jog moves for virtually infinite positioning capabilities.

The motion profile can be independently set for each move. The motion profile includes velocity, acceleration, deceleration and force which is setup in the Mode Setup tab (see Section 13: Mode Setup Tab). The Move Commands are selected via the Move Select digital inputs which are configured on the I/O tab (see section 9, Figure 9-1).

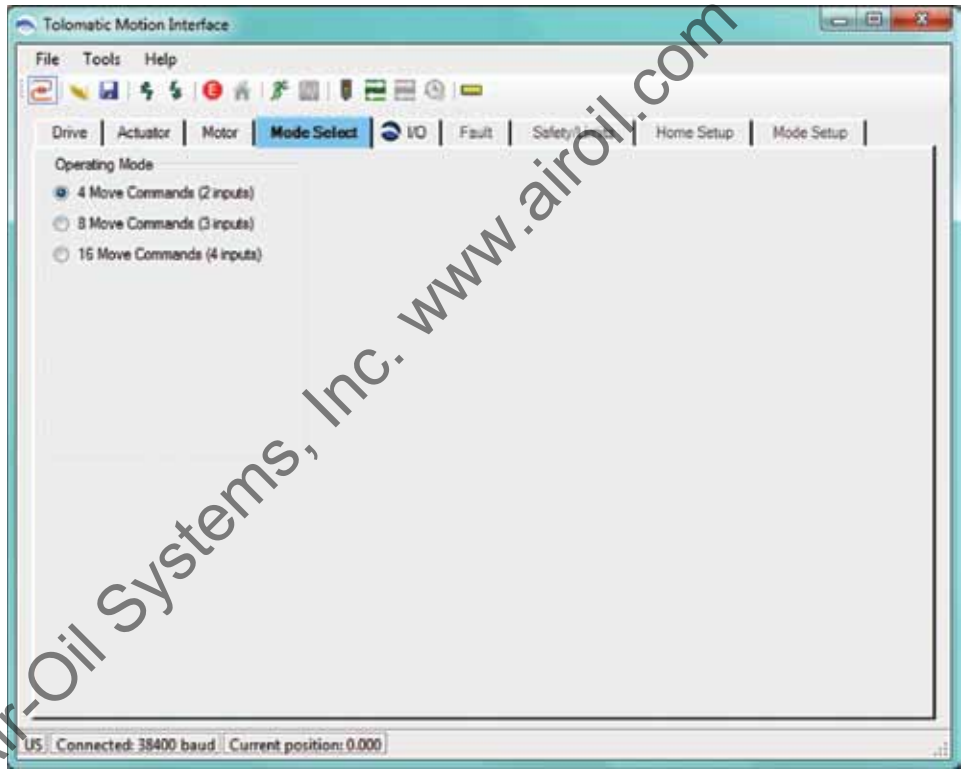

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Figure 8-1: Mode Select Tab Window

9.1 Using the I/O Tab

The digital input and digital output functionality are configured using the I/O tab. At the time of this release, default configurations are set up for 4, 8, & 16 Move commands and are shown after the Digital Input and Output Command Tables in Figures 9-1 through 9-3.

9.1.1 Digital Inputs

Digital Input Functionality	
Enable	Enables or Disables the drive and power to the motor. NOTE: Faults configured to Disable Motor (see Section 10: Fault Tab) will require PLC or logic device to cycle level of Enable input to re-enable the drive. Cycling this input when there is no feedback device will clear the Home output.
Start Motion	Initiates the selected move command from the Move Select inputs.
Home	Initiates the homing routine setup in the Home Setup tab (see Section 12: Home Setup Tab).
E-stop	Executes a software stop which either stops motion or disables drive depending on the fault configuration in the Fault tab (see Section 10: Fault Tab).
Move Select 1-4 Inputs	Selects a Move from 1 to 4 (4 Move Commands, 2 inputs), 1 to 8 (8 Move Commands, 3 inputs) or 1 to 16 (16 Move Commands, 4 inputs) depending on the Mode Select (see Section 8: Mode Select Tab). (see Appendix 2 for Move Select Logic)
Positive Limit Switch	Stops motion or disables the drive depending on the fault configuration in the Fault tab (see Section 10: Fault Tab).
Negative Limit Switch	Stops motion or disables the drive depending on the fault configuration in the Fault tab (see Section 10: Fault Tab).

Table 9-1: Descriptions of Digital Input Functionality

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Refer to Appendix 1: I/O Timing Diagrams for Input Requirement, System Startup Timing, Jog Move Timing, Absolute and Incremental Moves, Timing and Move Timing Rules.

9.1.2 Digital Outputs

Digital Output Functionality	
Motion Complete	Signal to PLC or logic device indicating whether motion is in progress (off) or motion is complete (on).
Home Complete	Signal to PLC or logic device indicating whether drive/motor combination is homed (on) or not homed (off). NOTE: When homing is in progress, the Home Complete output will be off.

Digital Output Functionality	
Fault	Signal to PLC or logic device indicating that a fault has occurred. The steps to reset the fault are different depending on the fault category (see section 10: Fault Tab) for a complete description of faults and recovery.
Zone (Optional)	Signal to PLC or logic device indicating that the position of the actuator is within the Zone Positive Bound and Zone Negative Bound setup in the Safety/Limits tab (see Section 11: Safety/ Limits Tab).

Table 9-2: Descriptions of Digital Output Commands

Refer to Appendix 1: I/O Timing Diagrams for Input Requirement, System Startup Timing, Jog Move Timing, Absolute and Incremental Moves, Timing and Move Timing Rules.

9.1.3 Default Configurations for Move Commands

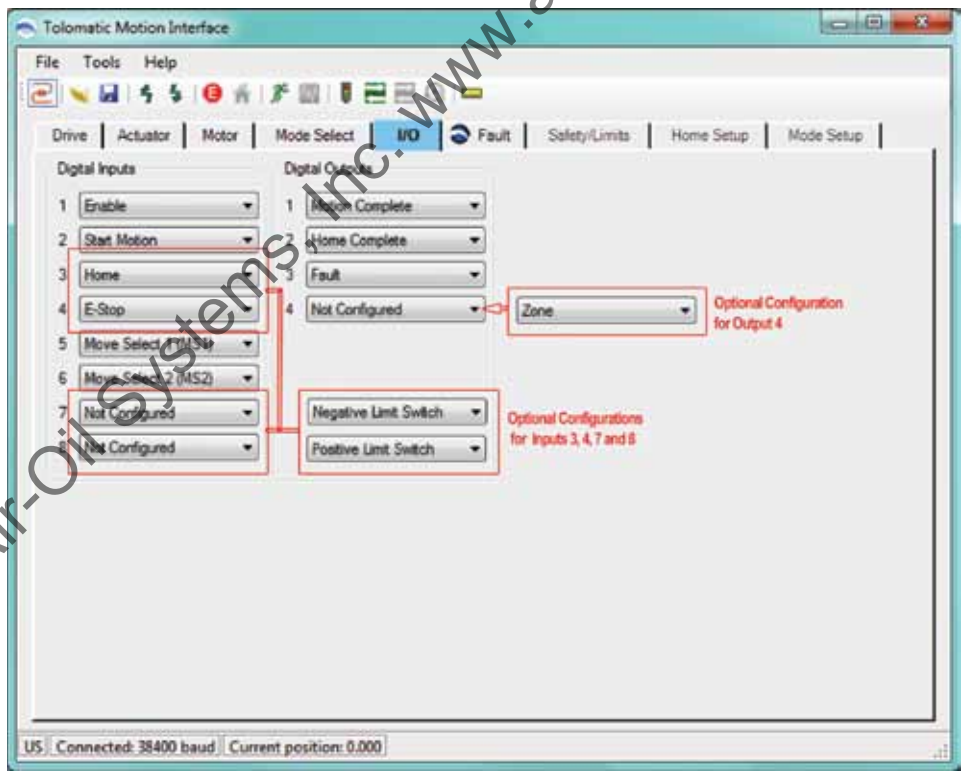

Figure 9-1: Default Configuration and Options for 4 Move Command

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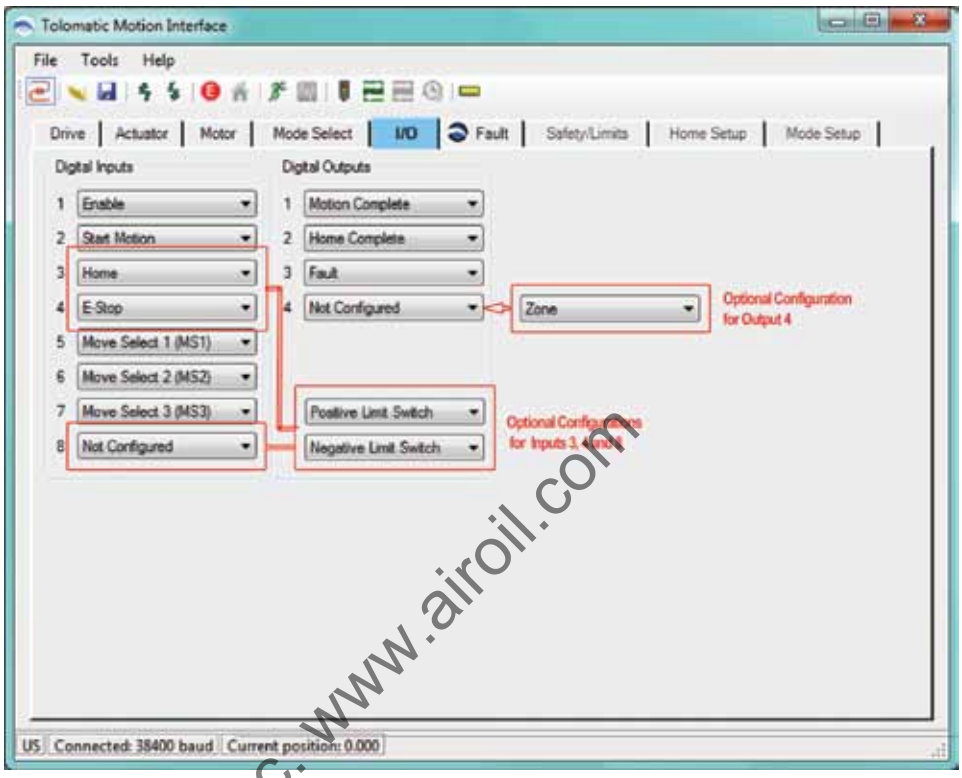

Figure 9-2: Default Configuration and Options for 8 Move Command

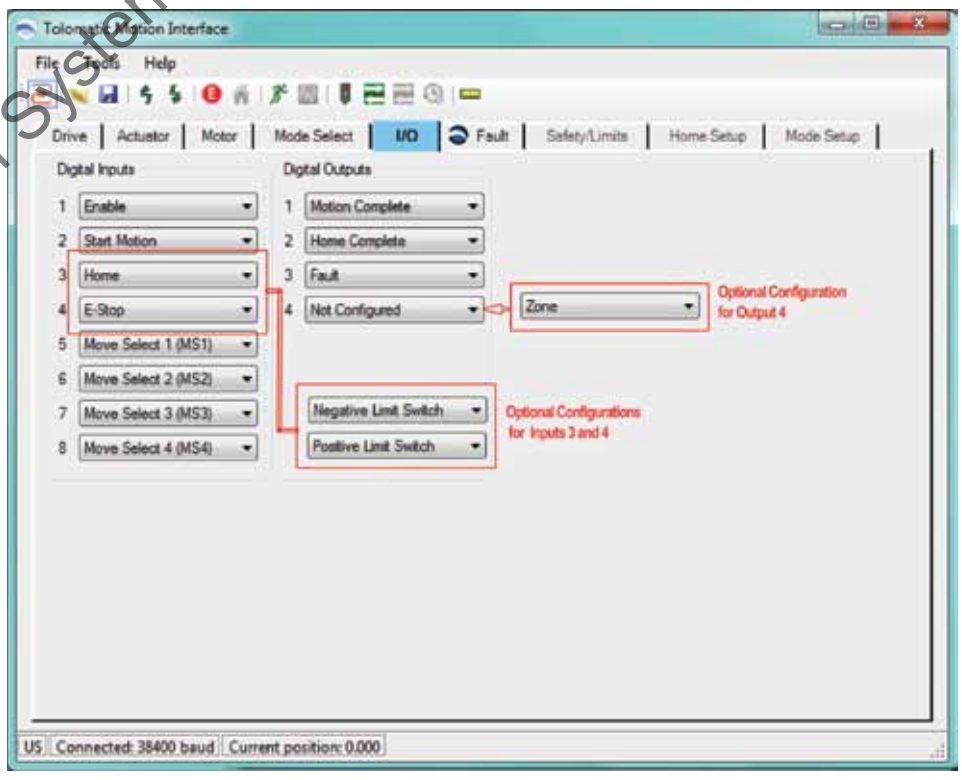

Figure 9-3: Default configuration and Options for 16 Move Command

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10 The Fault Tab

10.1 Using the Fault Tab

The Fault tab allows the user to configure the response of the Safety Faults. The Critical Faults are always enabled and the configured response is to disable the motor. Critical Faults are listed for information only.

The default configuration for the faults is with the Positive/Negative Limit Switch disabled and Position Error / E-Stop enabled. The default response for any Safety Fault is to Stop Motion, although an alternative response can be configured through the drop down to Disable Motor. To enable the Positive/Negative Limit Switch faults go to the I/O tab (see Section 9: I/O Tab).

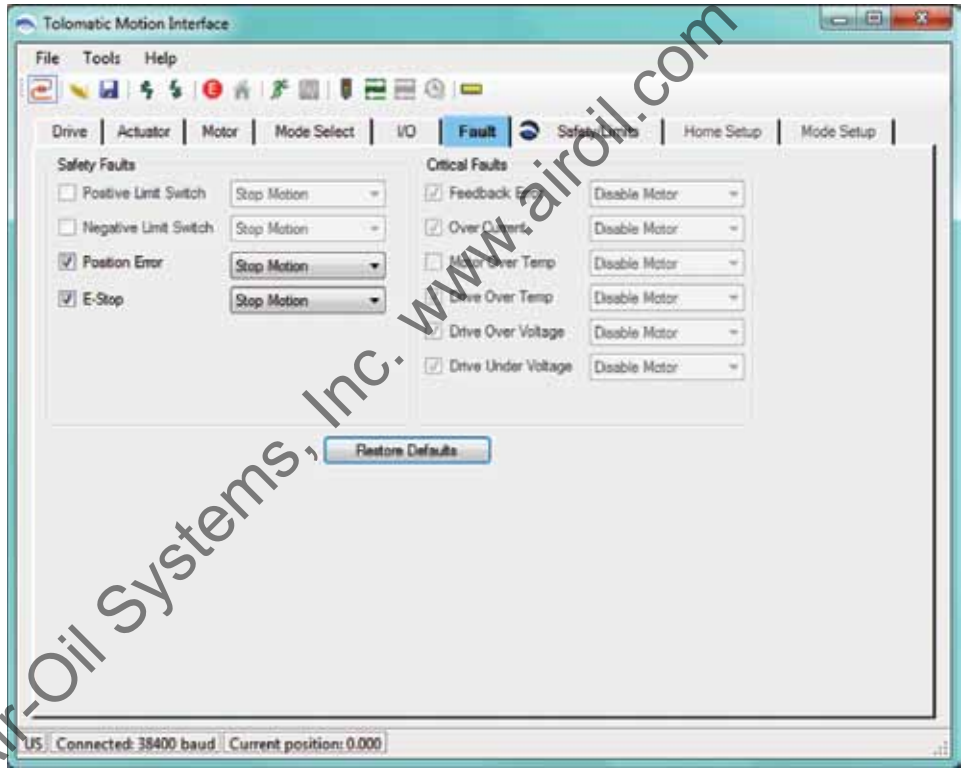

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Figure 10-1: Fault Tab Default Configuration

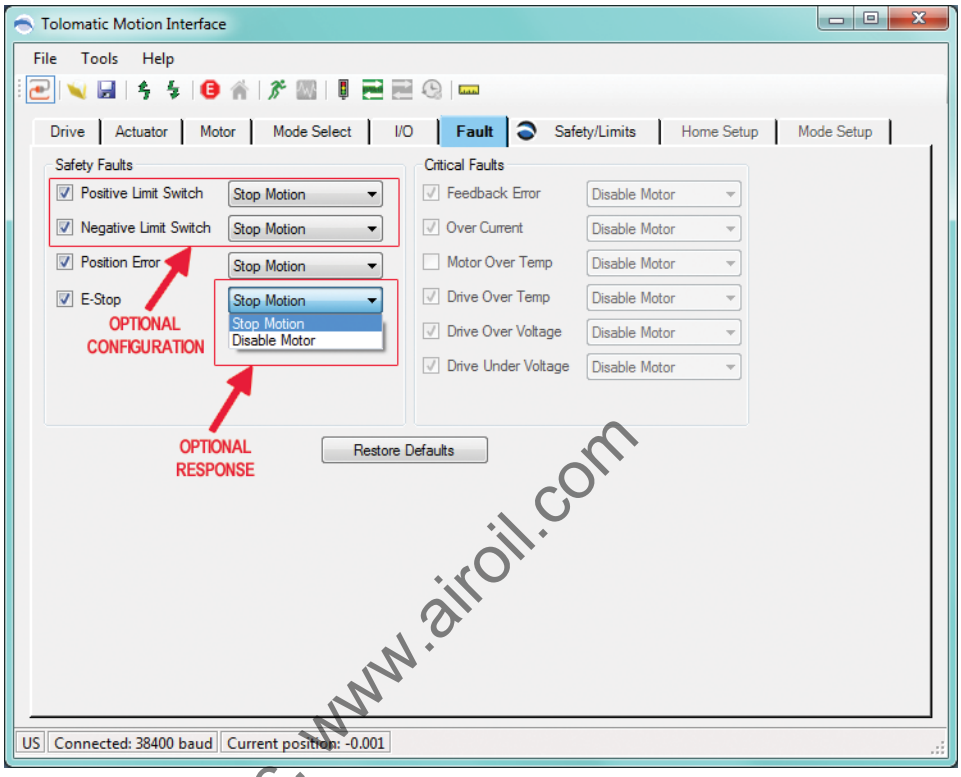

Figure 10-2: Fault Tab with Positive & Negative Limit Switches Enabled

10.2 Fault Descriptions and Recovery

Faults are broken up into Safety Faults and Critical Faults.

Safety Faults are configurable. If the fault is configured as a stop motion, the fault will be cleared automatically once the fault condition is no longer present. If a safety fault is enabled and configured for disable motor, the fault will be latched until it is cleared in the same manner as the critical faults described next.

All Critical Faults will disable the motor when they occur. To clear these faults, the fault condition cannot be present.

Safety Faults Table	
Positive Limit Switch	Positive limit switch has been reached. If configured as a stop motion, motion will be allowed in the reverse direction. The fault will be cleared once the positive limit switch input is no longer active and there is motion in the negative direction.
Negative Limit Switch	The negative limit switch has been reached. If configured as stop motion, motion will be allowed in the positive direction. The fault will be cleared once the negative limit switch input is no longer active and there is motion in the positive direction.

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Safety Faults Table	
Position Error	If an encoder is present, the position error fault can be enabled. If encoder position and commanded position differ by a larger magnitude than the defined position error, the position error fault will be activated. If fault is configured as a stop motion, fault will be cleared on next move command. NOTE: If force is less than 100%, a position error fault will not be triggered. It will stop and hold position (push mode).
E-Stop	If an input is configured as an E-stop and fault is enabled, this fault will be activated when the signal level on the pin is high. This fault is configured as a stop motion, it will be cleared once the E-stop input is lowered. Motion will not be allowed until E-stop has been cleared.

Table 10-1: Safety Faults Descriptions

Critical Faults Table	
Feedback Error	Feedback device is malfunctioning.
Over Current	If a short circuit occurs from output to ground, this fault will be triggered.
Motor Over Temp	Not implemented in this release.
Drive Over Temp	Drive temperature is greater than the maximum allowed temperature (75˚C).
Drive Over Voltage	Main power voltage exceeds the maximum voltage.
Drive Under Voltage	Main power voltage below the minimum voltage.

Table 10-2: Critical Faults Descriptions

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11.1 Using the Safety/Limits Tab

The Safety/Limits tab is used to configure Safety parameters, Motion Limits and setup such features as Endpoint Correction or Zone Output.

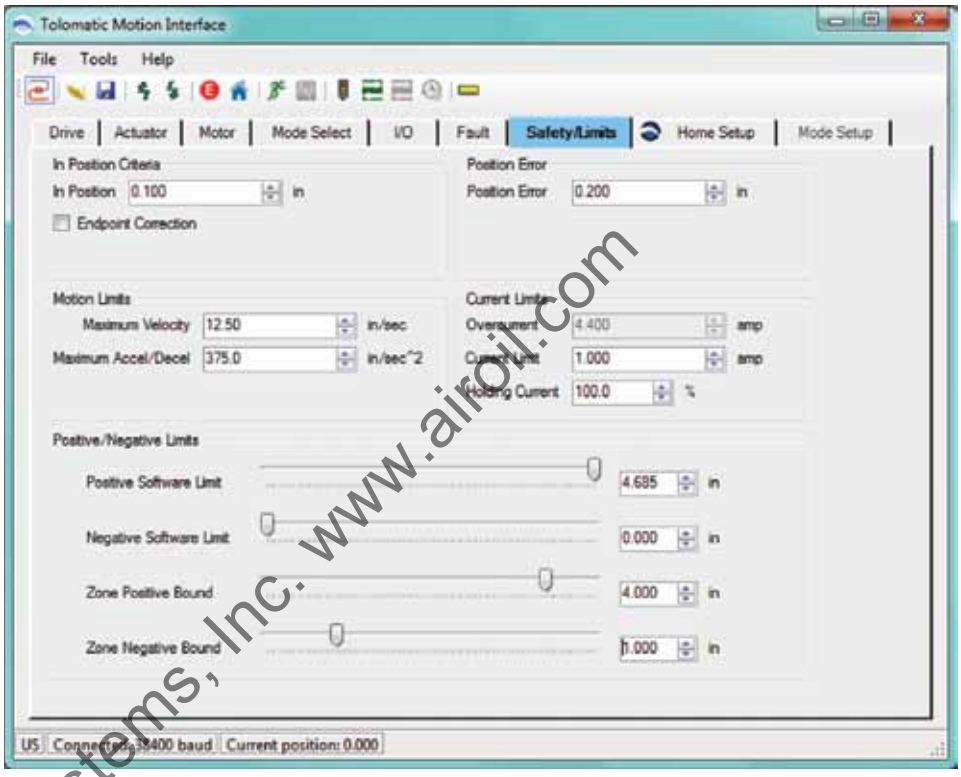

Figure 11-1: Safety/Limits Tab

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11.1.1 In Position Criteria

In Position: This value defines the +/- window around the desired target position that is considered within position.

Endpoint Correction: When enabled, Endpoint Correction initiates one correcting move at the end of the initial move to correct any position error that is greater than the In Position value. At the end of the initial move, the distance of the corrected move will be the difference between Target Position & Actual Position. This correcting move will use the same motion profile parameters (velocity, accel, decel, force) as the initial move. Endpoint Correction is only available with stepper motors with encoders.

11.1.2 Position Error

This value defines the +/- window around the commanded position that the actual position must be within or a Position Error fault will occur.

Position Error = Commanded Position – Actual Position.

The Position Error is calculated throughout the entire move. Position Error is only available with motors with encoders. A Position Error can only be generated if the Force % setting equals 100%. When the Force % is set to less than 100%, the actuator will be in "push" mode where a following error will stop and hold current position with no Position Error being generated. The Position Error setting must always be larger than the setting for the In Position parameter. If the Position Error setting is smaller than the In Position setting, the In Position parameter will turn red, indicating an invalid setting.

11.1.3 Motion Limits

Maximum Velocity: This value defines the maximum velocity that is allowed to be configured by the software and commanded by the drive. The TMI software will automatically cap any entered velocity value to the max setting. When the actuator & motor information is entered, the TMI software will automatically calculate the Maximum Velocity setting using the actuator max speed and motor max RPM. The drive ensures that no moves can be commanded with a velocity value higher than the max setting.

Maximum Accel/Decel: This value defines the maximum accelerations and decelerations that are allowed to be configured by the software and commanded by the drive. The TMI software will automatically cap any entered value to the maximum Accel/Decel setting. When the actuator and motor information are entered, the TMI software will automatically set the Maximum Accel/Decel parameter to 30 times the maximum allowable velocity setting. The maximum allowable Accel/Decel is 40 times the maximum allowable velocity. The drive ensures that no moves can be commanded with an acceleration or deceleration value higher than the value of the Maximum Accel/Decel parameter.

> ***Note:*** If Ø velocity or accel/decel is entered, these parameters will turn red and the Tolomatic logo will appear on the Safety/Limits tab.

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11.1.4 Current Limits

Over current: At the time of this release, this value is hard coded to 4.4 Amps for the ACS drive due to its internal circuit design. If a short circuit occurs, this will trigger an Over Current Fault.

Current Limit: This value defines the current applied to the stepper motor for all moves unless a Force % is set to less than 100% for any Move Command in the Mode Setup tab. The current limit value is automatically set by the motor selection from the Motor Tab. The value cannot be set higher than the motor value but its value can be reduced.

Holding Current: This value defines the current level (in percentage) to which the drive sets the output current to the motor when any move is complete. The drive maintains this current level to the motor until the next Move Command is executed. The default value for this parameter is 100%. This parameter can be used to conserve energy while the motor is at rest.

11.1.5 Positive/Negative Limits

Software Limits: There are two software limits, a *positive* and a *negative.* These software limits create a virtual position boundary for the motor/actuator system which the drive can not be commanded to exceed. The exception to this rule is for homing. A home command will ignore both software limits and will ignore limit switches if move to hard stop is selected. The TMI software will automatically cap any move to the positive software limit if the entered value is larger, or to the negative software limit if the entered value is smaller. The default values of the software limits are dependent upon the following homing sequences:

1. *Home to Hardstop*

   Negative home direction: Positive Software Limit = Stroke – Home Offset; Negative Software Limit = - Home Offset

   Positive home direction: Positive Software Limit = + Home Offset; Negative Software Limit = - Stroke + Home Offset

2. *Home to Limit Switch*

   Negative Software Limit = - Stroke; Positive Software Limit = + Stroke

   Note: The software limits must be changed to restrict motion bounds.

Zone Bounds: This feature is only visible if the Zone output is enabled on the I/O tab (see Section 9: I/O Tab). There are two zone bounds, a *positive* and a *negative*. These zone bounds define a virtual position window that is monitored at all times by the drive. When the actual position is greater than or equal to the Negative Bound Zone and less than the Positive Bound Zone, the Zone Output will be on. The TMI software has rules regarding these zones. The Zone Positive Bound is always smaller than the Positive Software Limit but larger than the Negative Software Limit. The Zone Negative Bound is always larger than the Negative Software Limit but smaller than the Positive Software Limit. The Zone Output feature does not interfere with motion. This feature can be used in a variety of applications to prevent a collision with another axis of motion or to initiate a process during a specific position range.

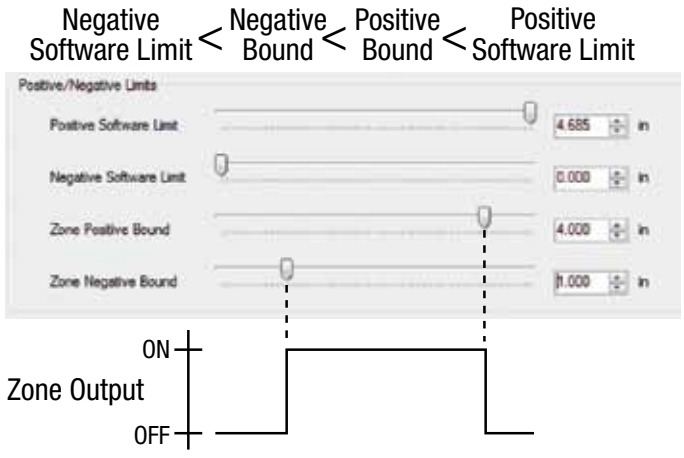

Figure 11-2: Zone Bounds Diagram

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12 The Home Setup Tab

12.1 Using the Home Setup Tab

The Home Setup tab is used to configure the homing routine. Every home routine has a configurable motion profile (velocity, accel/decel, force), a choice of direction, and an option to home on power-up.

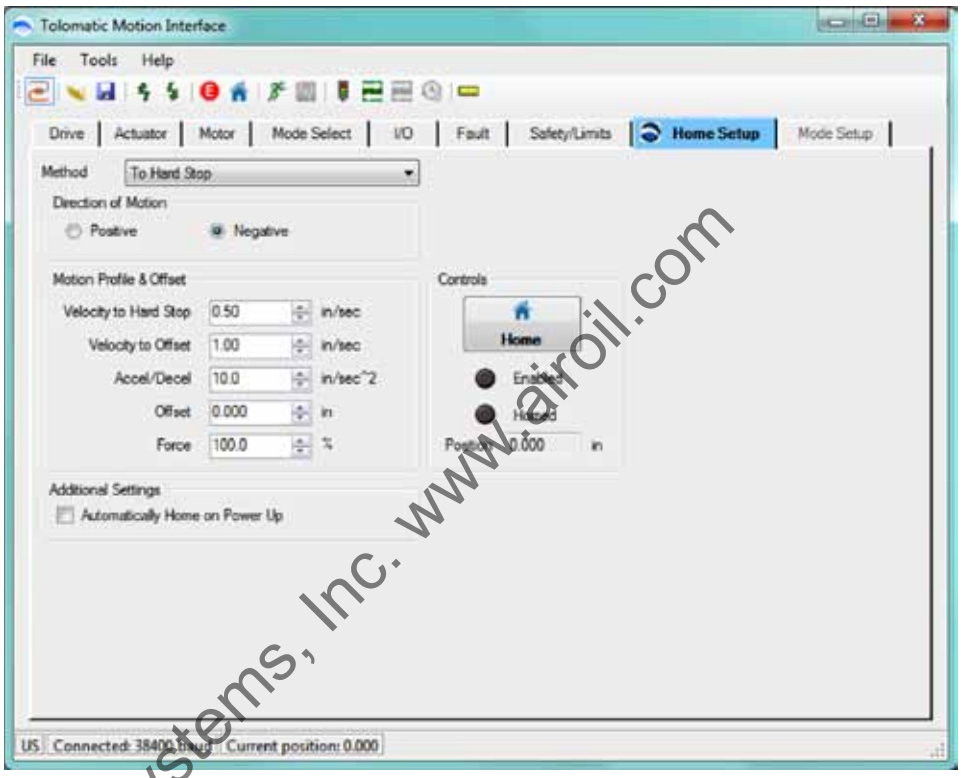

Figure 12-1: Home Setup Tab

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12.1.1 Method of Homing

There are two different types of homing routines:

Homing To Hard Stop

1. ***With encoder:*** This home routine uses the encoder to detect position error to find the hard stop during home.
2. ***Without encoder:*** This home routine initiates an incremental move the size of one stroke length. This ensures that the actuator will find the hard stop since there is no encoder to help detect it. Warning: Depending on where the actuator is positioned when homing begins, this routine may cause the motor/actuator to push against the hard stop for several seconds. This is not ideal for the mechanical system and may cause audible noise.

NOTE: To ensure repeatability it is best to home with relatively slow velocity (<=1"/sec or 25 mm/sec) and relatively high accel/decel (>40"/sec^2 or 1000mm/sec^2).

Homing to Limit Switch

The To Limit Switch homing routine is only available if the Positive or Negative Limit Switch is configured in the I/O tab (see Section 9: I/O Tab). This home routine uses either the positive or negative limit switch to find home position. The drive initiates an incremental move the size of one stroke length and stops motion when the limit switch input is activated.

NOTE: To ensure repeatability it is best to home with relatively slow velocity (<=1"/sec or 25 mm/sec) and relatively high accel/decel (>40"/sec^2 or 1000mm/sec^2).

12.1.2 Direction of Motion

Positive or Negative: Depending on the setup of the motor in the Motor tab (see Section 7: Motor Tab), this selection will define the direction the motor/actuator system homes.

12.1.3 Motion Profile & Offset

Velocity to Hard Stop / Limit Switch: Velocity used in the initial move towards the hard stop or limit switch.

Velocity to Offset: Velocity used when reversing direction to the Offset.

Accel / Decel: Acceleration and Deceleration setting for all moves in the homing routine.

Offset: Distance to move away from either hard stop or limit switch in the opposite direction selected by Direction of Motion.

Force: Force % setting for all moves in the homing routine.

12.1.4 Controls

Home: Initiates the Home sequence.

Enabled and Homed: Status LEDs.

Position: Indicates current position in user units.

12.1.5 Additional Settings

Automatically Home on Power Up: This feature homes the system automatically when the drive unit is powered up.

NOTE: The Enable input must be activated for the home routine to start.

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13 The Mode Setup Tab

13.1 Using the Mode Setup Tab

The Mode Setup tab is used for configuring the selected mode in the Mode Select tab (see Section 8: Mode Select Tab).

13.1.1 4, 8 & 16 Move Command Modes

At the time of this release, there are three different operating modes: 4, 8 & 16 Move Command modes. If the drive has not been previously configured or it has been restored to factory defaults, the Move Commands will be configured with zero velocity, accel & decel to prevent any motion. The velocity, accel and decel fields will be highlighted in light red indicating they are invalid settings (see table below).

The setup table used for the 4, 8 & 16 Move Commands mode has the following columns: Label, Move Type, Position, Velocity, Accel, Decel and Force. Each individual Move Command (rows) can have different, independent settings for each column.

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Setup Table Move Definitions	
Label	Descriptive alpha-numeric "name" for each Move Command. Limited to 28 characters, all uppercase.
Move Type	Drop down selection for the type of move for each Move Command. Valid selections are Absolute (default), IncrPos, IncrNeg, JogPos, & JogNeg. If an encoder is present, all moves are validated with the encoder feedback. If no encoder is present, the move is operated in open loop with no feedback. **Absolute:** Initiates an absolute move upon the Start Motion Input. **IncrPos:** Initiates an incremental move in the positive direction upon the Start Motion Input. **IncrNeg:** Initiates an incremental move in the negative direction upon the Start Motion Input. **JogPos:** Initiates a jog move in the positive direction when the Start Motion Input is active. When the Start Motion Input is not-active motion is stopped. **JogNeg:** Initiates a jog move in the negative direction when the Start Motion input is active. When the Start Motion input is not-active motion is stopped. **NOTE:** See Start Motion Input (see Appendix 1: Timing Diagrams)
Position	Move position value for either absolute or incremental moves. This field is not used in JogPos or JogNeg move types.
Velocity	Velocity value for all move types
Accel/Decel	Acceleration and Deceleration value for all move types
Force %	Force % value from 10 to 100% for all move types.

Table 13-1: Descriptions of Setup Table Move Definitions for 4, 8, and 16 Move Commands

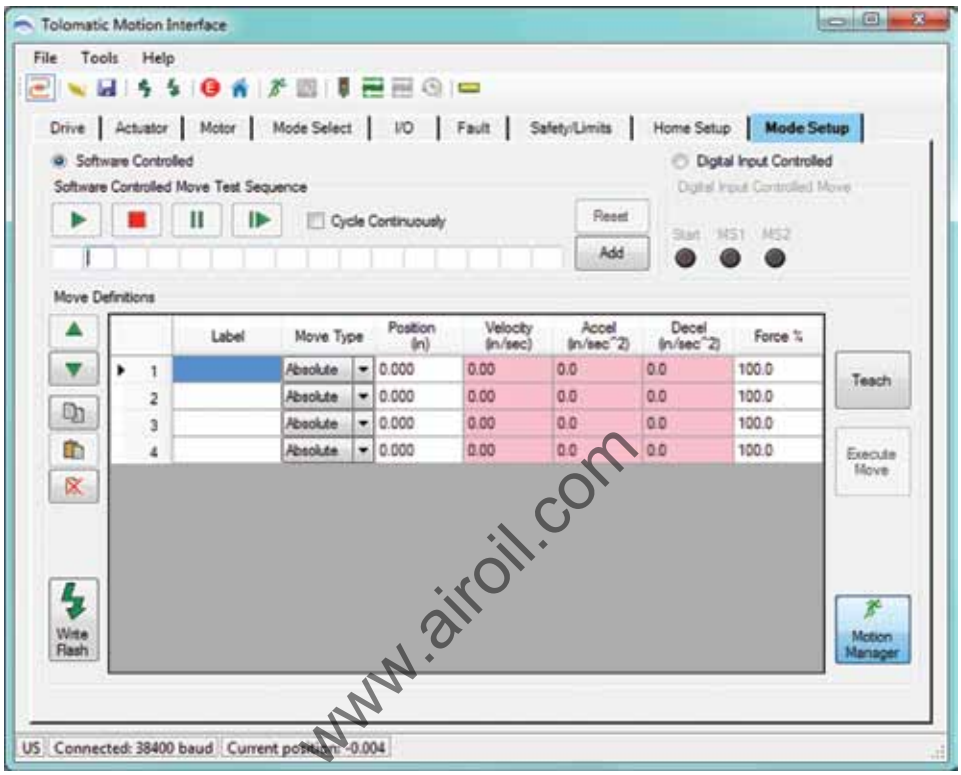

Figure 13-1: Mode Setup– 4 Move Commands, Not Configured

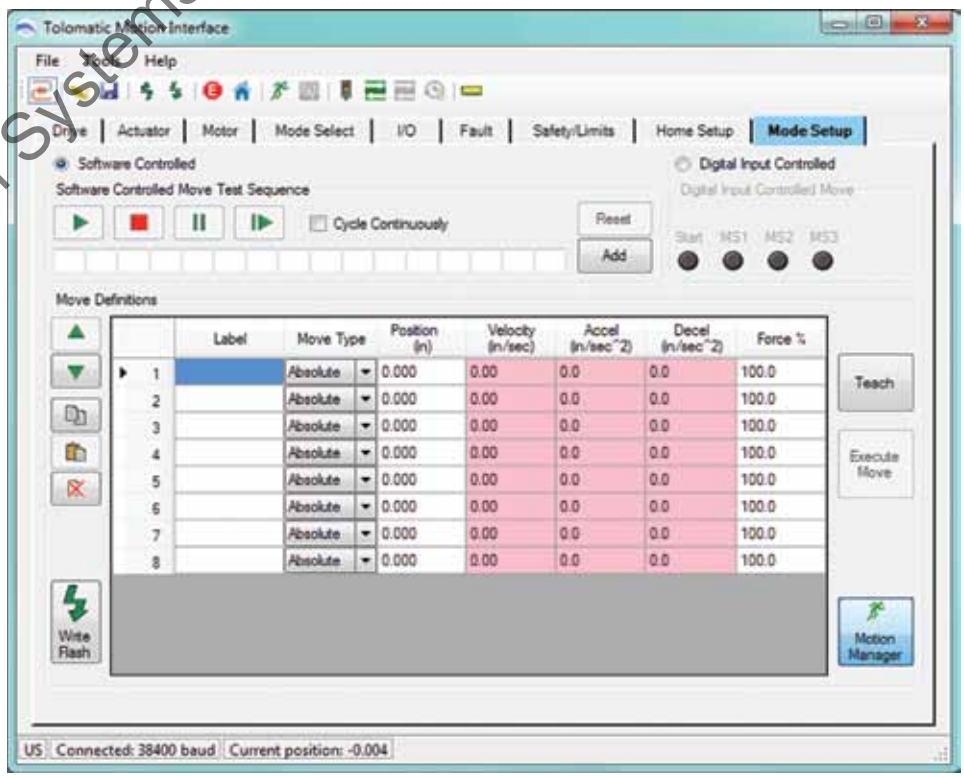

Figure 13-2: Mode Setup– 8 Move Commands, Not Configured

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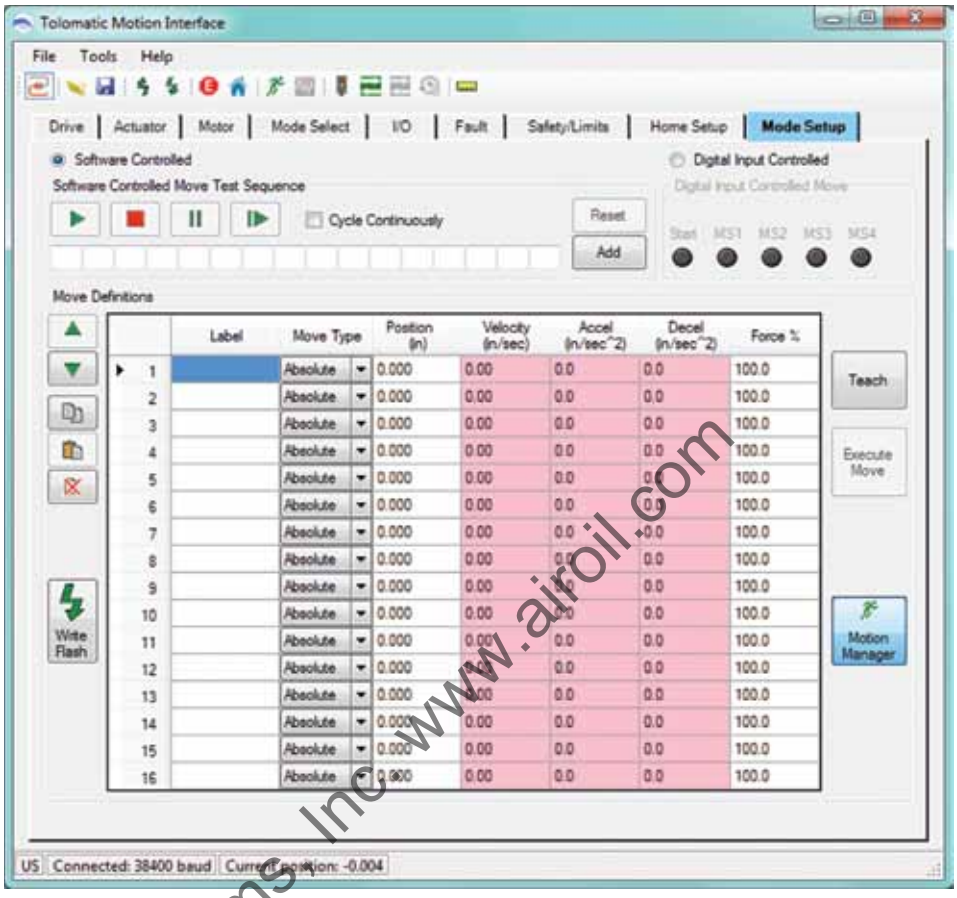

Figure 13-3: Mode Setup– 16 Move Commands, Not Configured

NOTE: Default Move Command velocities, acceleration, and deceleration are 0. If user does not configure a valid value for all motion parameters the TMI software and the drive will not allow that move to be executed.

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13.1.2 Editing, Arranging and Testing Move Commands

Once all the Move Commands have been configured, there are several features in the Mode Setup screen for editing, arranging, or testing the configured Move Commands.

Move Row Up / Down: Move the Move Commands up and down one row at a time in the table.

Copy / Paste / Cut Row: Copy, Paste & Cut functionality for each row. Select the row and click button for desired functionality.

Write Flash: Write Current Settings to Drive Flash: Write all parameters from the TMI software into the drive flash memory.

Teach: Teach all motion profile parameters (position, velocity, accel/decel, force) from the Motion Manager (see Section 14: Motion Manager Tool) into the selected row in the table. If the selected row already has valid data, the TMI will prompt the user whether they want to overwrite it or not.

Execute Move: Clicking this button will execute or start the selected move in the table. The selected move is denoted by the move highlighted in blue with the black arrow on the left hand side. For Jog moves, the move is initiated while the Execute Move button is pressed and will stop when the Execute Move button is released.

Motion Manager: Opens and closes the Motion Manager tool (see Section 14: Motion Manager Tool)

Software Controlled: When the TMI is in Software Control, all motion commands (Start Motion and Home inputs) from the I/O interface (PLC or logic controller) are ignored. In order to test the I/O logic with the PLC or logic controller, the user must select Digital Input Controlled.

While in Software Control, the user can test the moves by using the Software Controlled Move Test Sequence. This feature allows up to 16 Move Commands to be tested in any order. When in Software Controlled mode, the Move Select (MS#) LEDs in the Digital Input Controlled group box will echo the logic of the selected Move Command in the table. The Software Controlled mode feature has the following controls:

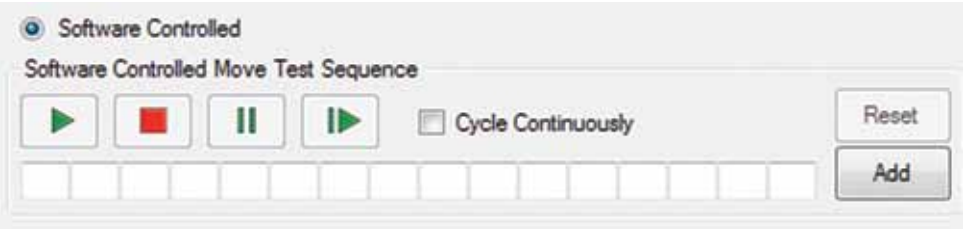
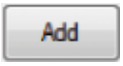


Figure 13-4: Software Controlled User Options



Add: Click Add to add a Move Command to the next available position.

Reset: Removes all Move Commands from the test sequence

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Play: Initiates the test sequence. All Move Commands in sequence will be executed once.

Stop: Stops the test sequence.

Pause: Pauses the test sequence on the highlighted move.

Step: Steps through the test sequence one Move Command at a time.

Cycle Continuously: When this feature is checked, the test sequence cycles continuously in an endless loop until the Stop or Pause button is clicked, the user switches to the Digital Input Controller, navigates to another tab, or communication is disconnected.

When the test sequence is in progress:

1. All other move controls in Mode Setup and Motion Manager will be disabled.
2. The currently executed move will be highlighted in blue in the table.

Digital Input Controlled:

In order to test the I/O logic with the PLC or logic controller, the user must select Digital Input Controlled. When in this mode, all move buttons in the software are disabled and motion can only be initiated from the logic controller (PLC). The selected move from the Move Select inputs (see Section 9: I/O Tab) will be highlighted in blue in the table below. The Move Select (MS#) LEDs in the Digital Input Controlled group box will echo the logic of the Move Select inputs from the physical I/O interface. In this mode, the PLC or logic controller can select the desired move using the Move Select inputs and initiate motion using the Start Motion input (see Appendix 1: Timing Diagrams).

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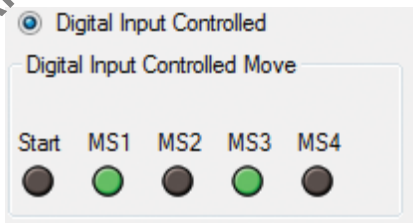

Figure 13-5: Digital Input Controlled

NOTE: When Software Controlled is selected the MS1 to MS4 “LEDs” will track the selected line in the Move Definitions table.

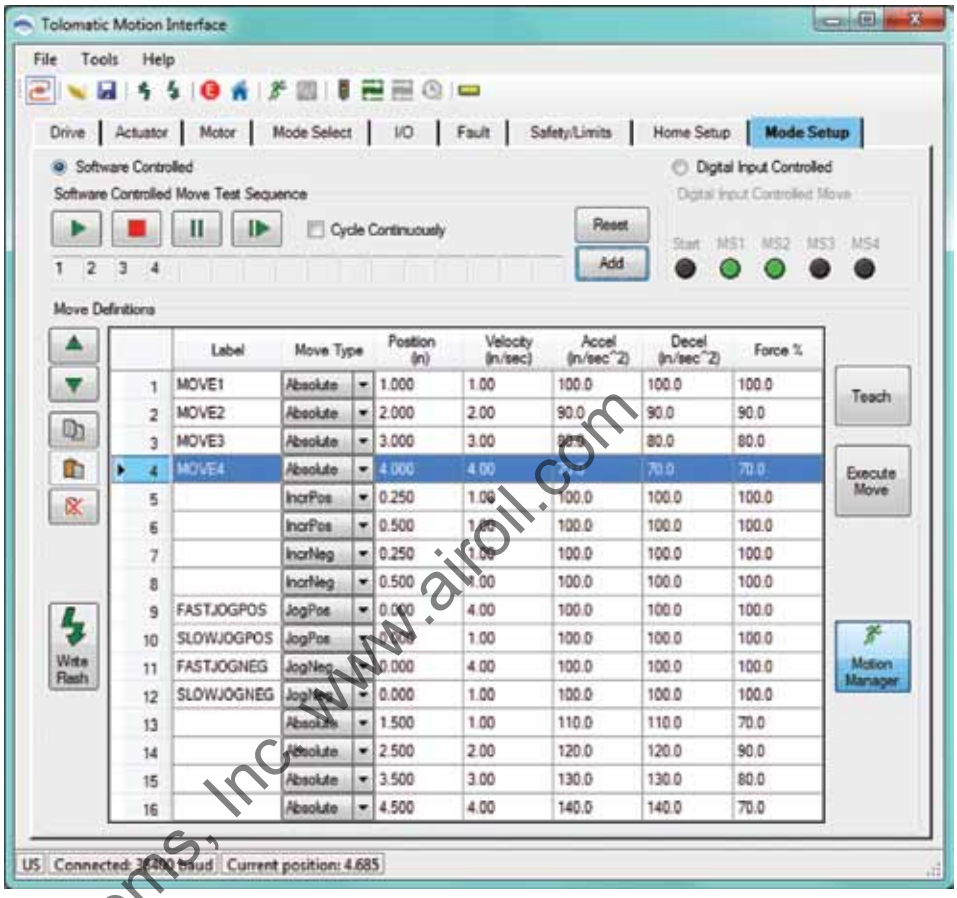

Figure 13-6: Configured Mode Setup, 16 Move Command Mode

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14 Motion Manager

14.1 Using the Motion Manager

The Motion Manager allows the user to enable/disable the motor, home, and create simple motion commands (Absolute, Incremental, Jog). The Motion Manager is a good tool to use for positioning in order to teach Moves into the Mode Setup table (see Section 13: Mode Setup Tab).

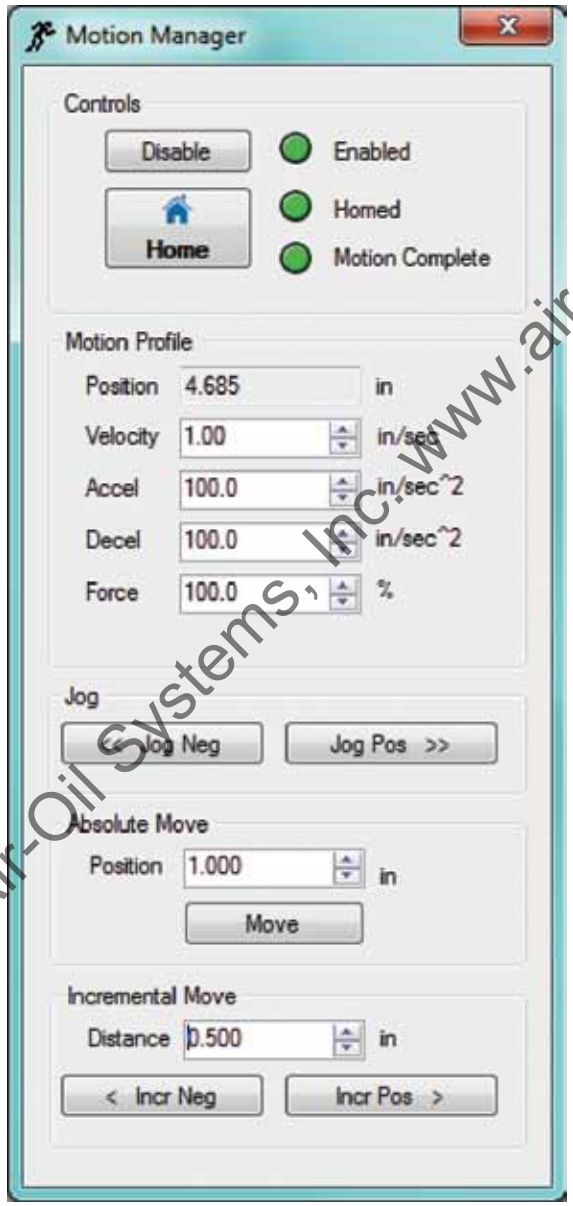

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Figure 14-1: Motion Manager Panel

14.1.1 Controls

Enable/Disable: Enables or Disables drive and output to motor.

Home: Initiates Home sequence configured in Home Setup Tab.

Enabled, Homed, Motion Complete LEDs: Status LEDs.

14.1.2 Motion Profile

Position: Displays actual position from encoder or commanded position without encoder. Motion profile (velocity, Accel, Decel, Force) per Jog, Absolute and Incremental moves in Motion Manager.

14.1.3 Jog

Jog Neg: Initiates a Jog Move with motion profile settings in a negative direction.

Jog Pos: Initiates a Jog Move with motion profile settings in a positive direction.

NOTE: Jog move will be initiated while Jog Neg or Jog Pos button is held down by mouse click. The jog move will stop when the mouse click is released.

14.1.4 Absolute Move

Initiates an absolute move to entered position parameter with motion profile settings.

14.1.5 Incremental Move

Incr Neg: Initiates an incremental move the size of the entered distance parameter in a negative direction.

Incr Pos: Initiates an incremental move the size of the entered distance parameter in a positive direction.

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15 Digital I/O Tool

15.1 Using the Digital I/O Tool

The Digital I/O tool is launched from the Tools Menu in the TMI interface menu bar or the Tool Bar. This tool shows the current status of the physical I/O interface. The description of each input and output is dependent on the I/O configuration from the I/O Tab (see Section 9: I/O Tab)

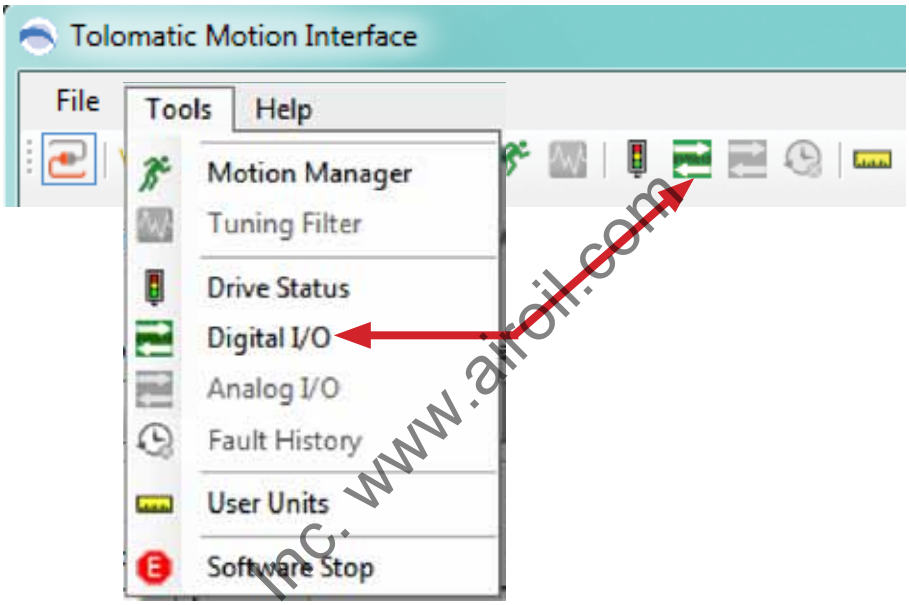

Figure 15-1: Launching the Digital I/O Tool

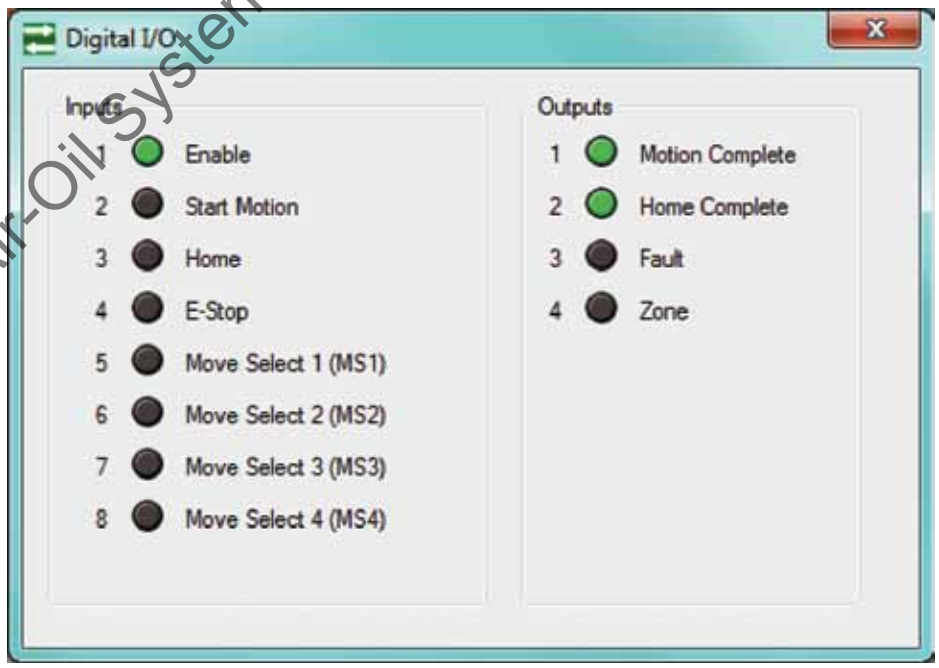

Figure 15-2: Digital I/O Tool

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16.1 Using the Drive Status Tool

The Drive Status Tool is launched from the Tools Menu in the TMI interface menu bar or the Tool Bar. This tool shows the current status of critical information about the drive.

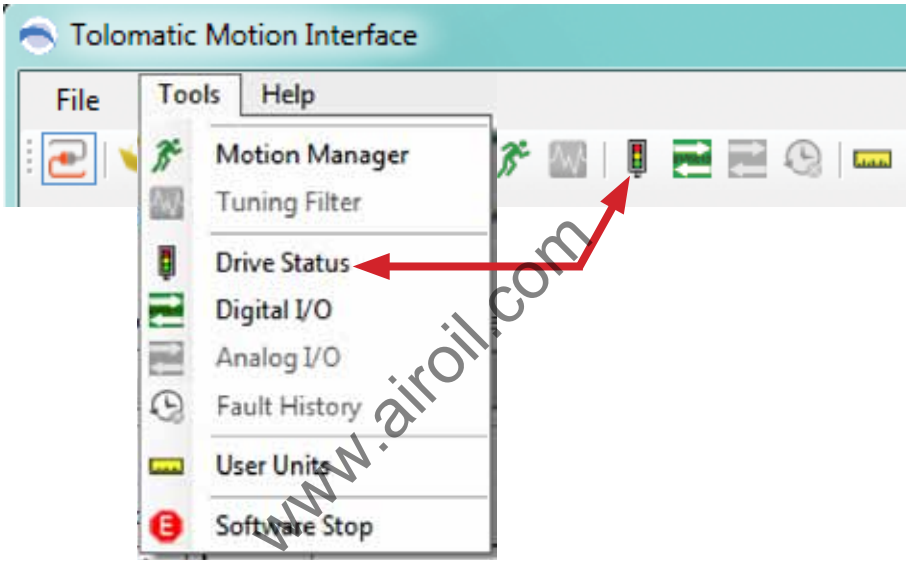

Figure 16-1: Launching the Drive Status Tool

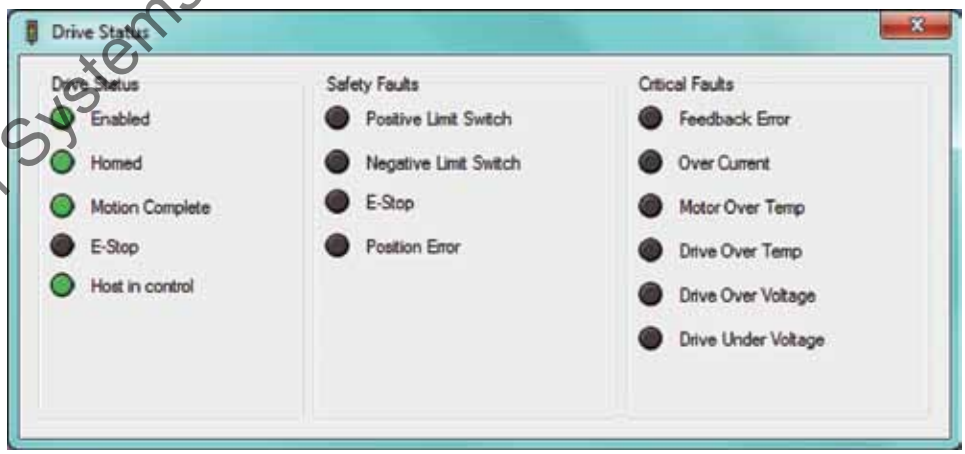

Figure 16-2: Drive Status Tool

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Appendix 1

Timing Diagrams

The opto-isolated digital inputs require a minimum of 2ms of time to guarantee that the input signal is registered by the drive. This is an important consideration to take into account, especially if limit switches are used. If limit switches are used, careful consideration should be used to prevent missed triggering due to high velocities. Output timing assumes 10 K Ohm load.

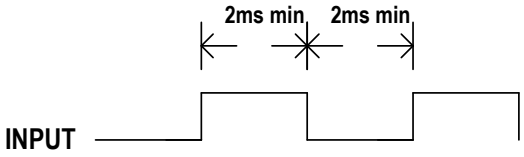

Figure A-1 Input Requirement

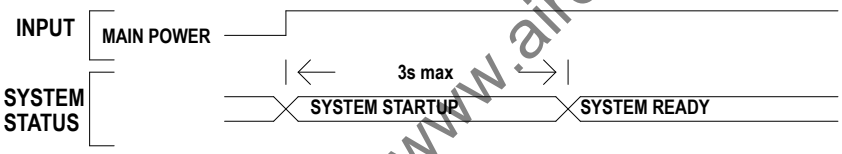

Figure A-2 System Startup Timing

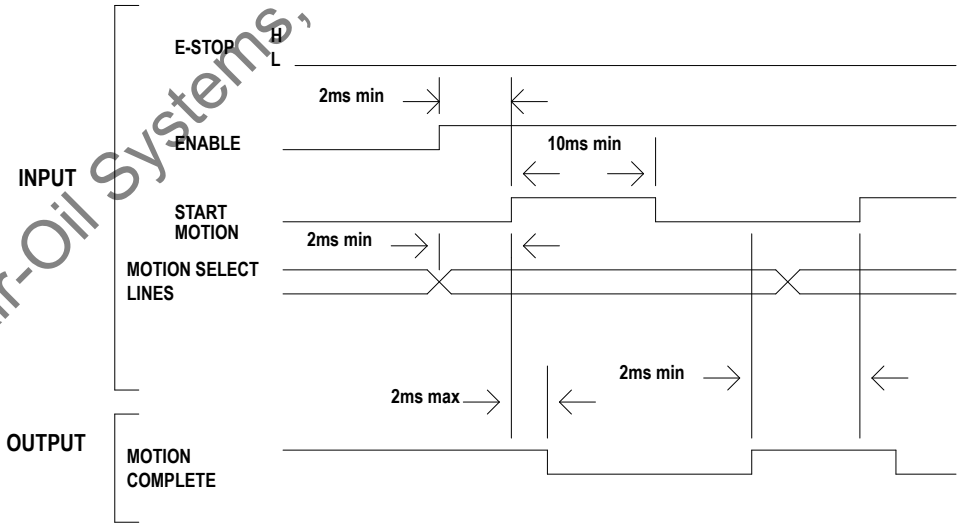

Figure A-3 Jog Move Timing

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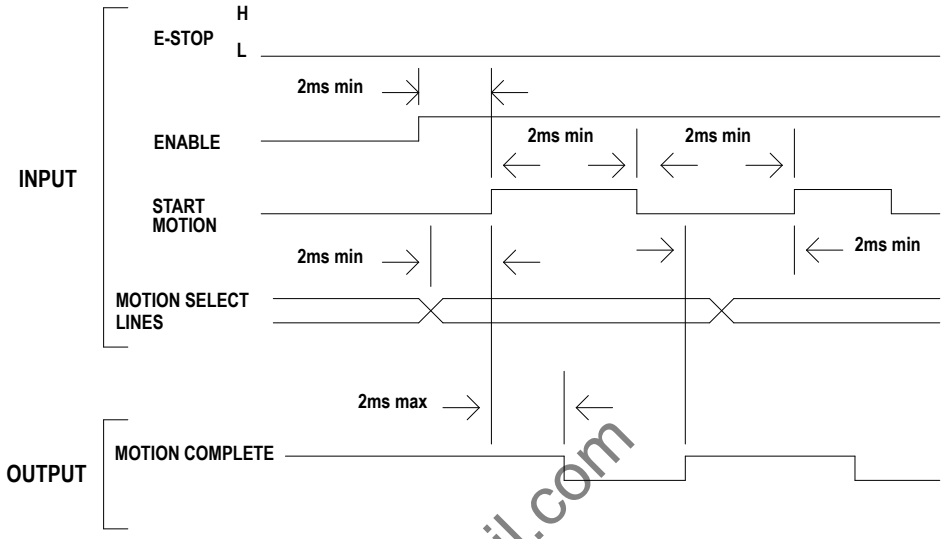

Figure A-4 Start Motion Timing

Timing Rules

1. While the Motion Complete signal is low, the drive will ignore Start Motion pulses and Motion Selection lines.
2. If the enable signal is low or E-stop signal is high, the drive will ignore start motion pulses.

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Move Select Logic Table

The three operating modes, 4/8/16 move commands, require digital inputs to select the desired move for execution. The digital inputs are called Move Select 1 through 4 (MS1-MS4) in the digital input map. To select the desired move command refer to the three logic tables below.

NOTE 1: MS# stands for Move Select #

NOTE 2: 1 = On; 0 = Off

4 Move Commands Mode Logic Table		
MOVE	MS1	MS2
1	0	0
2	1	0
3	0	1
4	1	1

Table A2-1: 4 Move Commands Mode Logic

8 Move Commands Mode Logic Table			
MOVE	MS1	MS2	MS3
1	0	0	0
2	1	0	0
3	0	1	0
4	1	1	0
5	0	0	1
6	1	0	1
7	0	1	1
8	1	1	1

Table A2-2: 8 Move Commands Mode Logic

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16 Move Commands Mode Logic Table				
MOVE	MS1	MS2	MS3	MS4
1	0	0	0	0
2	1	0	0	0
3	0	1	0	0
4	1	1	0	0
5	0	0	1	0
6	1	0	1	0
7	0	1	1	0
8	1	1	1	0
9	0	0	0	1
10	1	0	0	1
11	0	1	0	1
12	1	1	0	1
13	0	0	1	1
14	1	0	1	1
15	0	1	1	1
16	1	1	1	1

Table A2-3: 16 Move Commands Mode Logic

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