Acutrol3000® Operator Interface User Guide

Technical Manual

TM-9388

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Introduction

This manual provides an introduction to the Acutrol3000® Digital Motion Controller. This manual describes the chassis configuration, basic operation, and then a detailed description of the operation of the Graphical User Interface. All descriptions included in this manual refer to GUI Version 65.06, some differences will occur to earlier GUI revisions.

The descriptions in this manual are general in nature; specific instructions for certain features of the Acutrol3000 are available in the following manuals:

TM-8004, Acutronic Command Language (ACL), Programming Manual

TM-9374, Acutrol3000 Real Time Data Communications, Technical Manual

TM-9375, Acutrol3000 Inner Loop Module, Technical Manual

TM-9377, Acutrol3000 Position Transducer Integration Procedure

TM-9384, Using the Acutrol3000 TCP/IP Interface, Technical Manual

TM-9385, Safety Interlocks and Discrete Control Integration Procedure for the Acutrol3000 Motion Control System, Technical Manual

TM-9392, Measuring Frequency Responses on the Acutrol3000, Technical Manual

TM-9411, Acutrol3000 RS232 Interface, Technical Manual

1 Acutrol3000 Digital Motion Controller

1.1 Overview

The Acutrol3000 consists of a 19" rack mount chassis, which houses two computers, the Real Time (RT) Computer and the Operator Interface (GUI) Computer. The RT Computer is used to control the motion system while the GUI Computer controls all interaction with the user. Through the GUI computer, the user can determine system status, read out the internal variables of the Acutrol3000, control the Axis and change settings and configuration when necessary. The two computers communicate to each other over an Ethernet connection. Optionally, with some external hardware, this Ethernet connection can also be used as a remote communication interface.

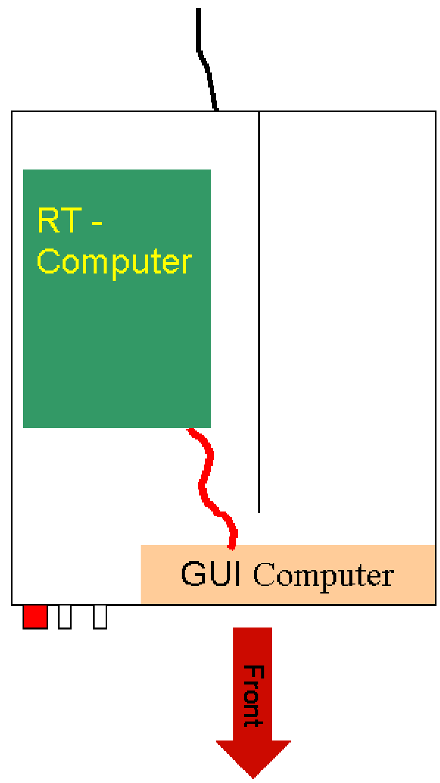


Figure 1-1 Acutrol3000 Dual Computer Architecture

The GUI is the normally the main interface to the RT-Computer for the user. For remote control, other interfaces such as Ethernet, GPIB, Reflective Memory (SCRAMNet+ or VMIC) or a Parallel Interface can be used to communicate with and control the RT Computer.

1.2 Front Panel

Figure 1-2 Acutrol3000 Operator Interface

Figure 1-2 shows the front panel of the Acutrol3000. The front panel has five main components:

- A Graphical User Interface (GUI) is the primary interface for data entry and display. The GUI is equipped with a touch screen surface for control, or optionally a mouse and/or keyboard can also be used.

- The ON/OFF button allows the Acutrol3000 to be turned ON and OFF. When energized, the ON/OFF button glows green to indicate that the controller is operating. See Section 2.

- The Disable Button serves two purposes.

    - The Disable Button shows the operating status of the servo controller. When an axis is operating under servo control, the Disable Button will glow red. When an axis is operating under servo control and a fault has occurred, the Disable button will blink to alert the user to the fault. When the Disable Button is not illuminated, all axis interlocks are opened and no faults have occurred.

  - When depressed by the user, the Disable Button will cause a hard abort and disable servo control on all axes.[1]

- The Disable Button has a safety lock feature that holds the button in the active position once pressed. To release the button, rotate the button in the counter clockwise direction and it will automatically be released.

- The BNC connectors can be configured by the User for input and/or output of Analog and Digital signals to/from the Acutrol3000. See Section 4.4.4.1 and 4.4.4.2.4,

- The USB connector can be used connect various devices to the Acutrol3000 such as USB Memory devices, Mice or Keyboards.

---

1 Note that when the Acutrol3000 is a part of a motion control system, the main Emergency Stop Button for that motion system should be used to disable the system in a critical situation.

2 Turning the Acutrol3000 ON/OFF

2.1 Turning the Acutrol3000 ON

Once it has been connected correctly, pushing the green ON/OFF button will turn on the Acutrol3000. Power will be applied to both the RT and the GUI Computers, and the Acutrol3000 application software will start automatically. Once the GUI Computer initializes and reads the system variable list from the RT Computer and no error is indicated, the Acutrol3000 is ready for use.

2.2 Turning the Acutrol3000 OFF

There are two methods to turn the Acutrol3000 off.

1. Press the green Power ON/OFF Button. See Figure 1-2.
2. In the Display Selection Toolbar,

- Press 

- Press 

- See Section 4.3.2.4 for additional instructions.

3 Quick Start Guide

To	See
Understand the GUI Layout	Section 4.1
Select an Axis to command	Section 4.5
Use the Numeric Keypad	Section 4.6
Enable the Servo Control for an axis	Section 4.4.2.1.1
Select the Axis Command Mode	Section 4.4.1.2
Enter Motion Data for an Axis	Section 4.4.1.1
Use the Axis Position Slider	Section 4.4.1.1.1
Enable an Analog Input for Motion Demands	Section 4.4.2.5
Use MACROS	Section 4.4.5
See System Status	Section 4.4.3
Configure an Analog Output	Section 4.4.4.1
Change the direction of rotation of an axis	Section 4.4.4.2.1
Set the motion limits for an axis	Section 4.4.4.2.7.2
Datalog variables	Section 4.4.6
Save and Restore System Configuration	Section 4.4.4.7.3
Backup System Configuration	Section 4.4.4.7.3.1
Adjust the zero position of an axis	Section 4.4.4.4.3.3
Set the GPIB Address	Section 4.4.4.6.2

4 Acutrol3000 Graphical User Interface

The Acutrol3000 GUI is a WindowsXP™ Embedded application written in National Instruments LabVIEW™ graphical programming software. Because the primary interface to the GUI is through the touch screen, all controls have been sized and organized to accommodate the range of users expected. All controls and indicators have been color coordinated to guide the user through the operation of the GUI functions.

4.1 Layout of the Acutrol3000 GUI

For those users upgrading from the Acutrol2000, one can see that the layout of the Acutrol3000 User Interface is quite similar and the transition should not be that difficult.

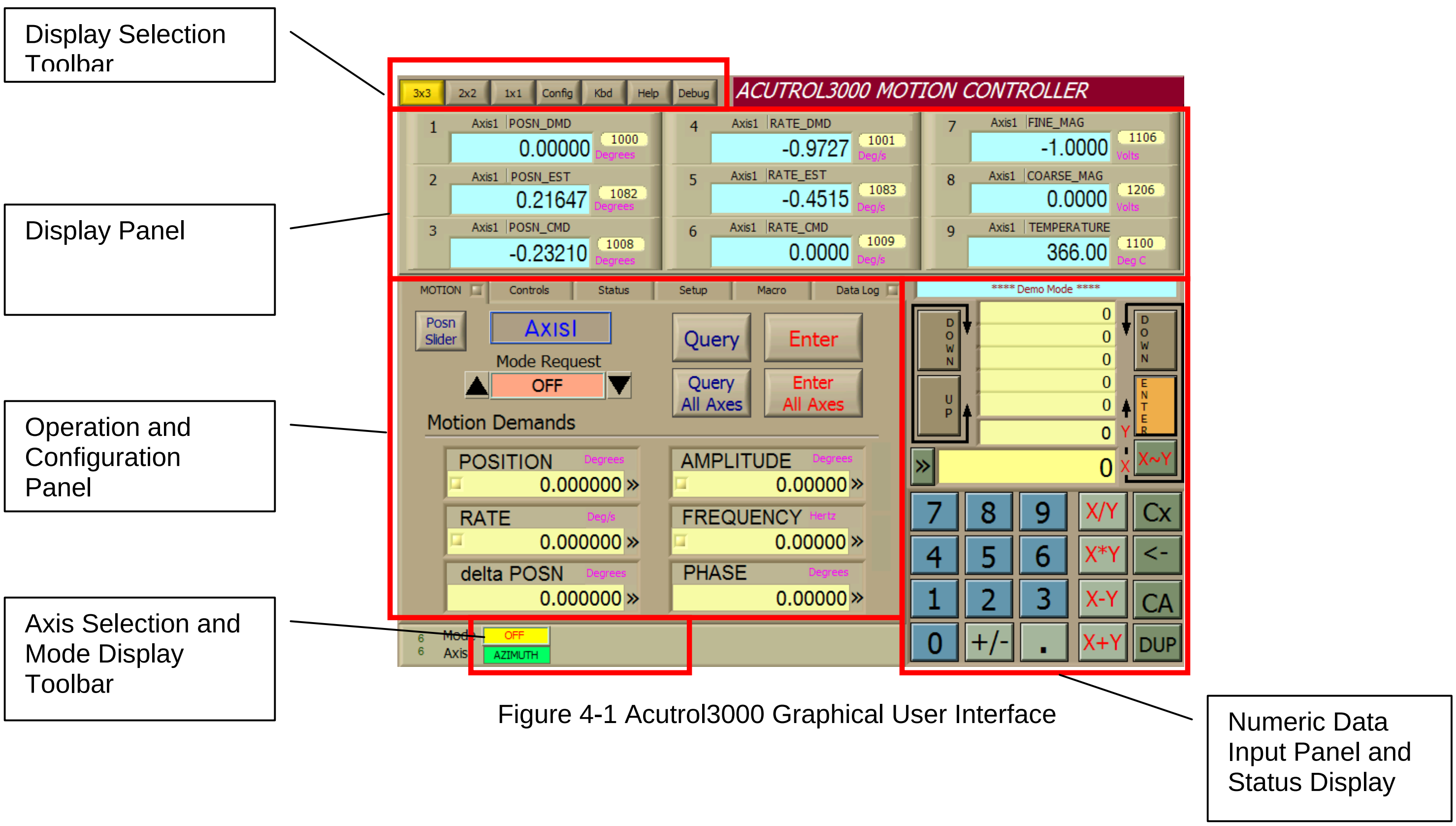


Figure 4-1 Acutrol3000 Graphical User Interface

The GUI has five main zones:

- The Display Selection Toolbar (Section 4.3)
- The Display Panel (Section 4.3)
- The Operation and Configuration Panel (Section 4.4)

- The Axis Selection/Mode Display Toolbar (Section 4.5)
- The Numeric Data Input Panel and Status Display (Section 4.6)

4.2 GUI Philosophy

4.2.1 Number transfer

It is often necessary to transfer numbers from one field to another. For example, it is often useful to grab a capture a number from a Variable Readout into the Numeric Key Panel. Fields are not universally transferable; therefore a color scheme has been introduced to indicate between which number fields can data be transferred.   The following table indicates the methods for data transfer.

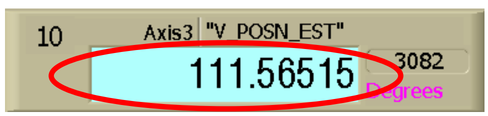
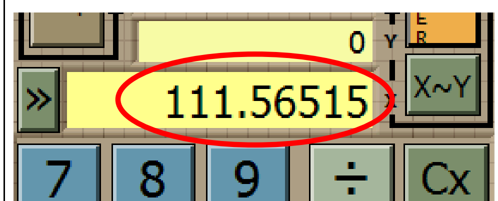
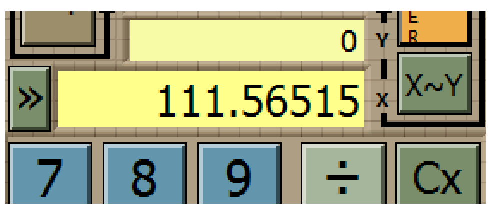
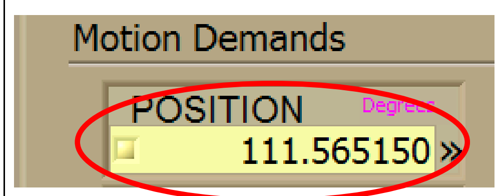
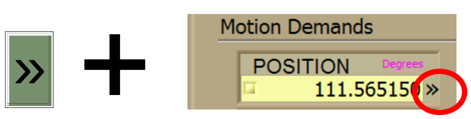
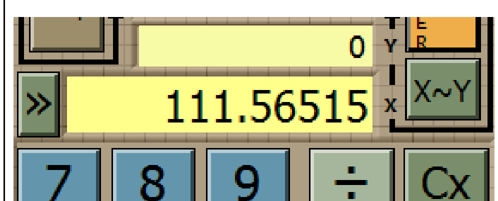
Action	Touch field		Transfer to
Touching a field with a blue background will automatically transfer the number to the Numeric Key Panel.		→	
Touching fields with a beige background will transfer the Number from the Numeric Key Panel		→	
Fields which have a “>>” can be transferred to the Numeric Key Panel through touching the “>>” button on the Numeric Key Pane before touching the selected field.		→	

Figure 4-2 GUI Data Transfer Methods

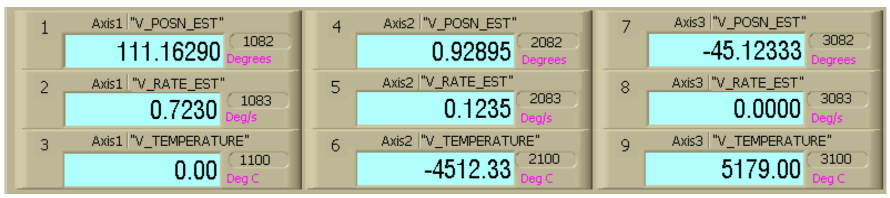
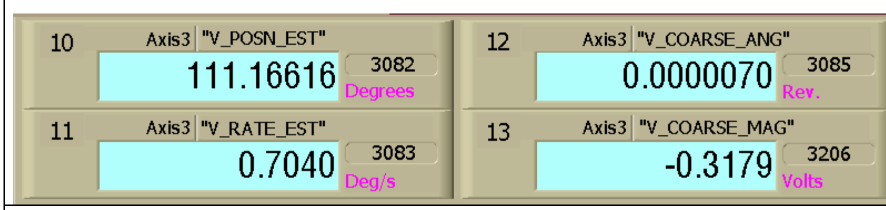
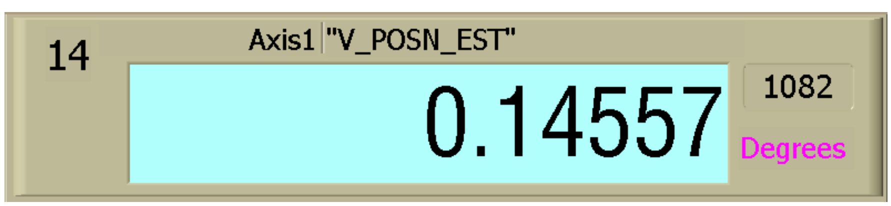
4.2.2 Color Coordination

The color of the controls and indicators in the GUI display have been selected to define uniform operation.

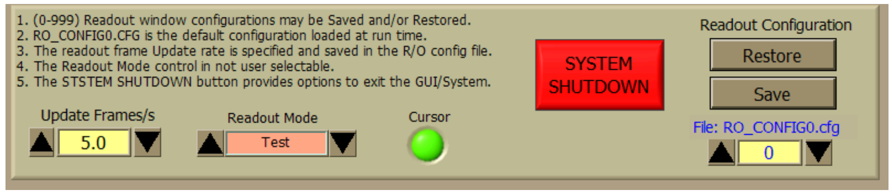
- CYAN indicates a numeric indicator (data display)
- YELLOW indicates a numeric control (data entry)
- LIGHT GREEN indicates a text control (text entry)
- GREEN indicates a text indicator (text display)

4.3 The Display Selection Toolbar and the Display Panel

The “Display Selection Toolbar” allows one to change the “Display Panel”. The following Panels may be selected:

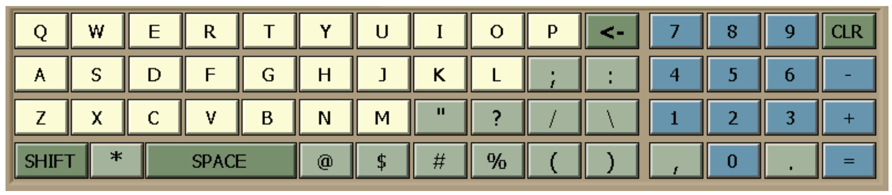
<table>
<tr><td rowspan="2">9 Readouts
3x3</td><td>
</td></tr>
<tr><td>In the 3x3 mode, nine Variable Readouts can be displayed simultaneously. See Section 4.3.1.</td></tr>
<tr><td rowspan="2">4 Readouts
2x2</td><td>
</td></tr>
<tr><td>In the 2x2 mode, only four Variable Readouts can be displayed simultaneously, but they are much larger than the 3x3 configuration. See Section 4.3.1.</td></tr>
<tr><td rowspan="2">1 Readout
1x1</td><td>
</td></tr>
<tr><td>In the 1x1 mode, only one Variable Readout can be displayed. However, the text is sufficiently large to allow viewing from across a room. See Section 4.3.1.</td></tr>
</table>

Configuration



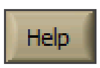
The **CONFIG** panel allows the user to adjust the variable window update rate, control the Readout Mode, enable/disable the cursor, save and restore readout configurations, and execute a shutdown sequence. See Section 4.3.2.

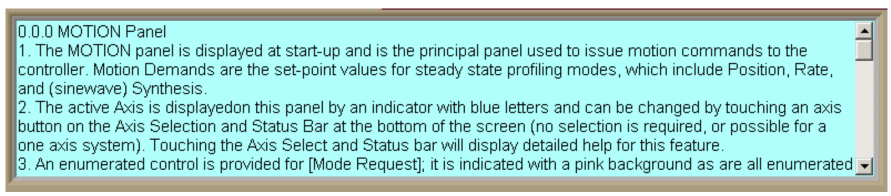
Keyboard



The Keyboard is used to enter Alphanumeric data.

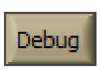
Help

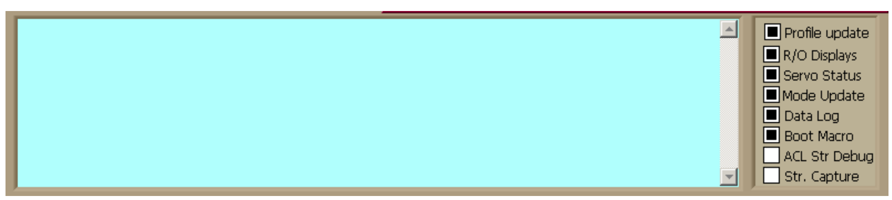




Pressing the **HELP** button displays context sensitive help information for the various Operation and Configuration Panels.

Debug





The **DEBUG** panel allows the user to control which items on the GUI are updated as well as display the communications between the GUI Computer and the RT Computer. See Section 4.3.5.

Figure 4-3 Display Panel Options

4.3.1 Variable Readout Windows

There are fourteen total readout windows: nine one the **3x3** panel, four on the **2x2** panel, and one on the **1x1** panel. Each can be individually configured to display an internal variable of the Acurol3000. Variables can be axis specific such as position or rate estimate, or they can be system specific such as communication interface parameters or system timing parameters.

4.3.1.1 Elements of a Readout Window

Each readout window has six components as shown in Figure 4-4.

- The **Window Number** is the numerical reference to the specific Readout Window.
- The **Variable Type** defines the type of variable to be displayed. Touching the **Variable Type** field will bring up a list box that displays the four valid types: System, Axis 1, Axis 2, and Axis 3.
- The **Variable Name** is the name of the variable that will be displayed. Touching the **Variable Name** field will bring up a list box that displays all the valid variables for the specific **Variable Type** selected.

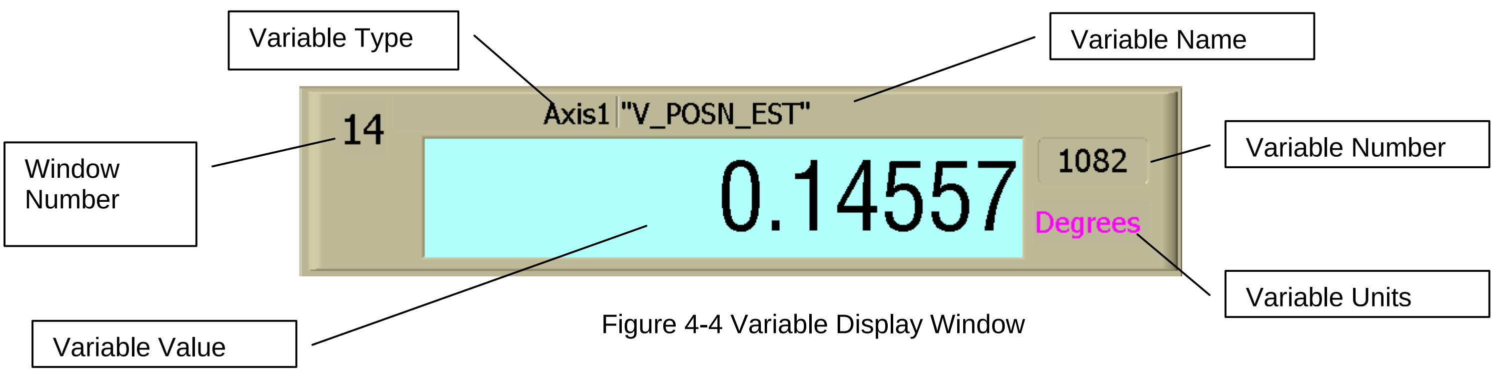


Figure 4-4 Variable Display Window

- The **Variable Number** is the numerical reference for a specific variable. The first digit corresponds to the **Variable Type**. For example, 1XXX would refer to Variable XXX on Axis 1.
- The **Variable Units** is the display unit for the variable.
- The **Variable Value** is the numerical value of the selected variable.

The **Variable Name**, **Variable Units**, and display format can be changed by the user. See Section 4.4.4.2.7.

4.3.1.2 Selecting a Variable to Display

There are two methods to select a variable to be displayed:

- Enter the variable number on the numeric keypad and touch the **Variable Number** field. For instructions on using the keypad, see Section 4.6.

- Select the variable directly using the **Variable Type** and **Variable Name** fields.

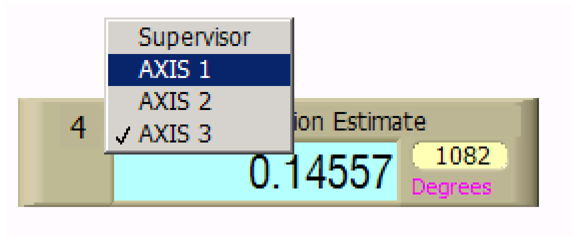


Figure 4-5 Readout Window Variable Types

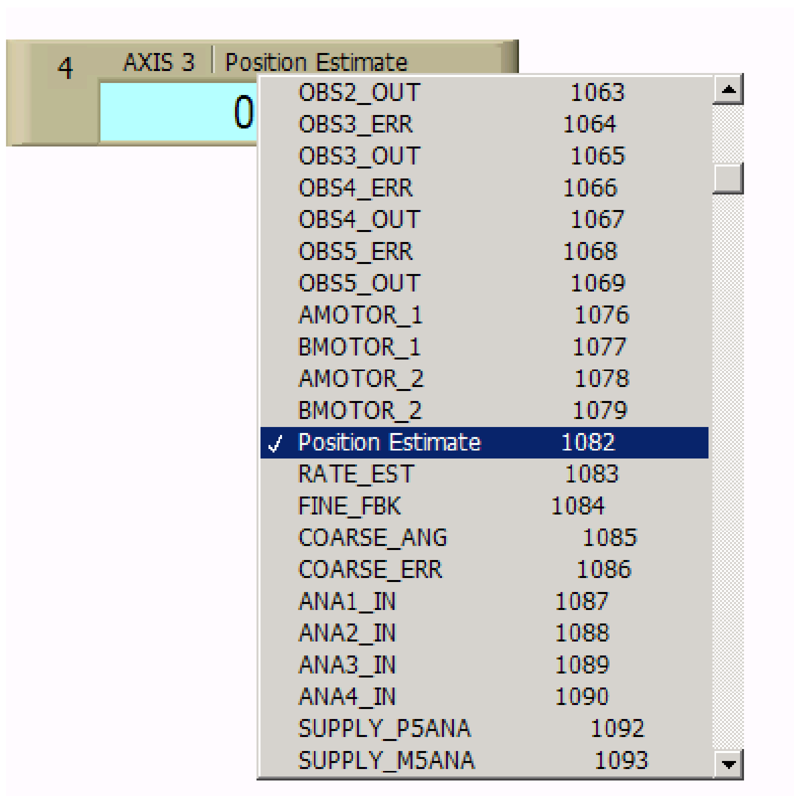


Figure 4-6 Readout Window Variable Names

4.3.2 CONFIG Display Panel

The **CONFIG** display panel allows the user to adjust the variable window update rate, control the Readout Mode, enable/disable the cursor, save and restore readout configurations, and execute a shutdown sequence.

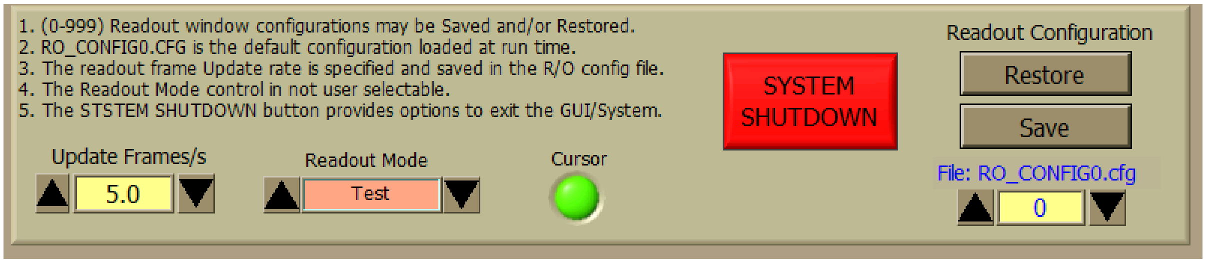


Figure 4-7 The CONFIG Display Panel

4.3.2.1 Adjusting the Variable Window Update Rate

To change how quickly the GUI will update the readout windows, enter a numerical value on the keypad and touch the **Update Frame/s** field. Valid frame rates are any value greater than equal to zero. The default value is 5 frame/second. Practically, 50 frame/second are a reasonable upper limit. Excessive frame rates can have an adverse effect on the performance of the real time computer.

4.3.2.2 Changing the Readout Mode

The readout windows have three update modes controlled by the **Readout Mode** list box: **Test**, **Long String**, and **Multi-String**. The default mode is **Long String**, which means that all variable windows are updated with a single request to the Real Time computer. **Multi-String** sends a single request to the Real Time Computer for each GUI element, and is used when monitoring communication between the GUI Computer and the RT Computer. **Test** is used to simulate readout behavior when the GUI is operating in DEMO mode.

4.3.2.3 Cursor Control

Normally a cursor is not necessary for a touch screen. Some users may prefer a cursor, or may prefer to use a mouse instead of a touch screen. For these situations, you can enable the cursor by touching the Cursor Control Button. When pressed, the control will change color to bright green, and the cursor will be activated.

4.3.2.4 System Shutdown

Pressing the 

button will open the Shutdown Dialog Box.

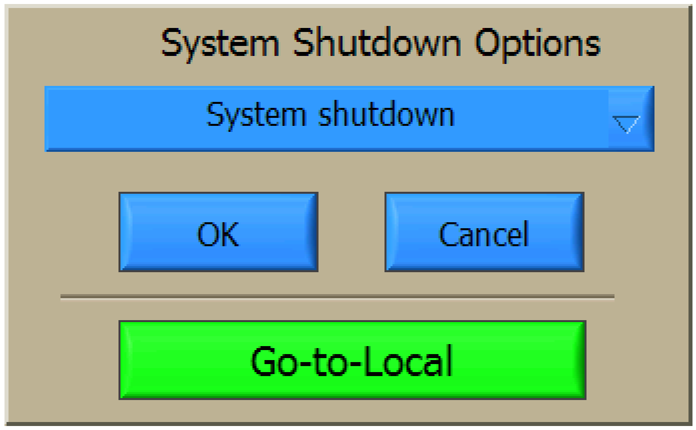
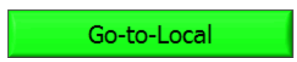


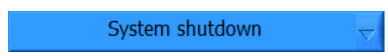
Figure 4-8 Shutdown Dialog Box

When the Shut Down Dialog box appears, the user has several options:

- Pressing  will close the Shutdown Dialog Box.

- Pressing  will start the system shutdown sequence. First the RT Computer, then the GUI computer will be turned off.

- Pressing  will change the Acutrol3000 from REMOTE to LOCAL control over the remote interfaces.

- Pressing the  ring control will give the user a choice of actions. See Figure 4-9.

    - **System Reboot** will cause a warm start of both the GUI and the RT Computers.

    - **System Shutdown** will start the system shutdown sequence

    - **Lynx Only Reboot And Exit User Interface** will reboot the RT Computer, terminate the GUI application and place the GUI Computer in a limited WindowsXP environment.

    - **Exit User Interface** will terminate the GUI application and return the GUI Computer to a limited WindowsXP environment.

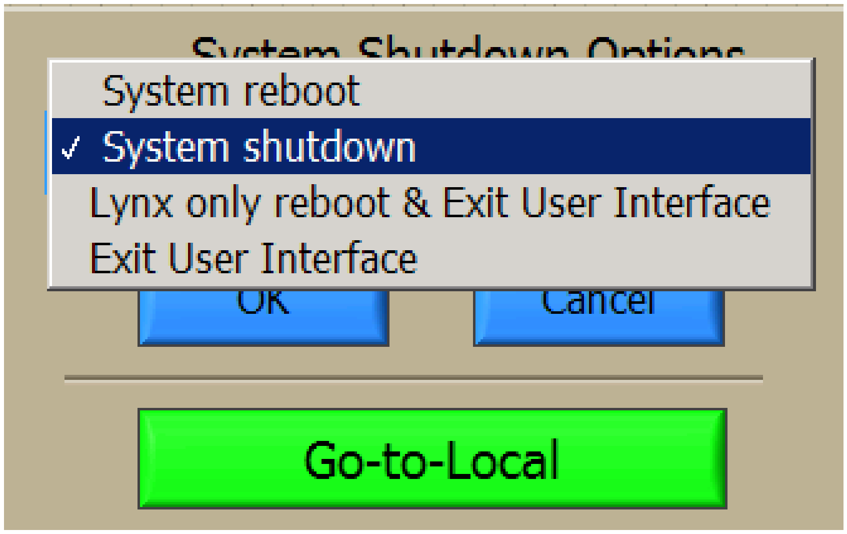


Figure 4-9 Shutdown Options

4.3.2.5 Saving Readout Variable Selections

The list of fourteen variables that are currently displayed on the **3x3**, the **2x2**, and the **1x1** panels is called a Readout Configuration. Multiple Readout Configurations can be **SAVED** and **RESTORED** with the controls on the **CONFIG** Display Panel. See Figure 4-7.

To Save the currently Readout Configuration:

- Select the Configuration File Number by either first entering the number on the keypad and pressing the **Config Number Control**, or by pressing the Up and Down Arrows on the **Config Number Control** until the proper value is reached.
- Press Save.

Similarly, to recall a previously saved configuration, select the Configuration File Number and press Restore.

NOTE: During the Acutrol3000 initialization sequence, Readout Configuration 0 will always be loaded.

IMPORTANT: As the Readout Configuration is being saved on the GUI Computer only, the user must set the Update GUI Flash control make the configuration permanent. See Section 4.4.4.7.3.

4.3.3 Keyboard Display Panel

An alphanumeric **Keyboard Display Panel** is included because the Acutrol3000 typically does not have an attached keyboard. The **Keyboard Display Panel** allows the user to enter text for several of the controls on the GUI such as Variable Names, ACL Macros etc. Alternatively, a PS/2 or USB keyboard can be attached to the Acutrol3000 and implement the same feature.

4.3.4 Help Display Panel

The **Help Display Panel** displays context sensitive help information for the various Operation and Configuration Panels. The text for the screens is stored in the *C:\Program Files\A3K GUI\Help.cfg* file on the GUI computer and can be tailored as necessary for each system.

4.3.5 DEBUG Display Panel

The **DEBUG** panel allows the user to control which items on the GUI are updated as well as display the communications between the GUI Computer and the RT Computer. These settings should only be changed by an experienced user as abnormal behavior of the GUI can result.

4.4 The Operation and Configuration Panel

The Operation and Configuration Panel contains the GUI elements that are used to control the system and to configure the behavior of the system. There are six main functions of the Operation and Configuration Panel:

- Motion
- Controls
- Status
- Setup
- Macro
- Datalog

Each of these functions is described in the following sections.

4.4.1 MOTION Panel

The Motion Panel has three main functions:

- Motion Demand Entry and Query
- Mode Control
- Status

4.4.1.1 MOTION Demand Entry and Query

To enter a Motion Demand:

- Use the Numeric Key Pad to specify the desired data value.
- Transfer the data to the Motion panel by touching the correct Motion Demand window. The window will start to flash red to indicate that a change has been made but that it has not yet been entered.
- To enter data for the axis currently selected, press 

.
- To enter the motion data that is pending for all axes, press 

.

Note: You may switch between axes to change Motion Demands and the pending changes will be preserved. If a different Main panel is selected, then all Motion Demand changes will be lost.

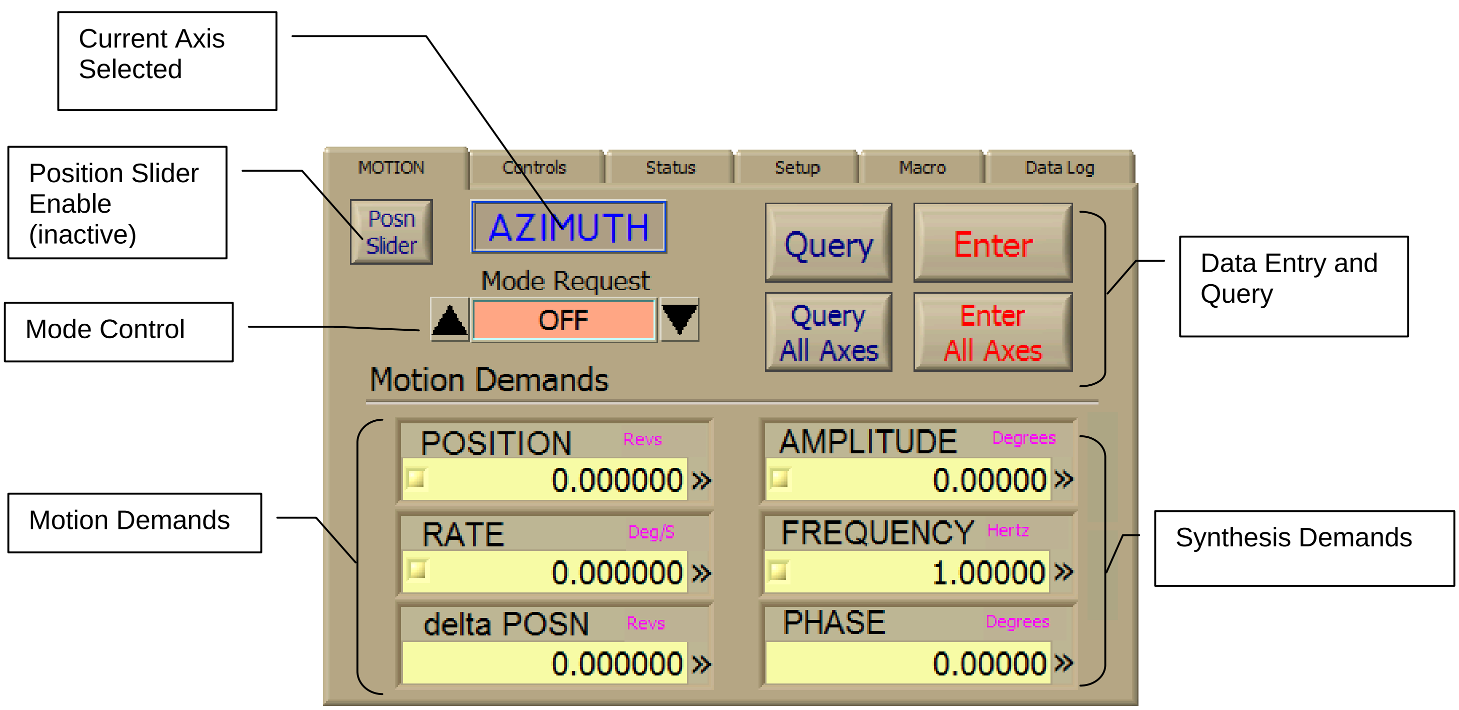
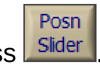


Figure 4-10 Motion Sub-Panel

4.4.1.1.1 MOTION Demand Entry Using the Position Slider

The Position Slider allows the user to control the position of an axis with a slider. To use the Position Slider, press 

. The Slider Control will appear as shown Figure 4-11. The slider control is especially useful to make fine adjustments when aligning or leveling the motion system.

When the upper slider is moved, the position of the selected axis changes according to the value of the slider.

The lower Slider defines the sensitivity of the upper Slider. Adjusting the Slider Sensitivity will automatically update the slider minimum and maximum values.

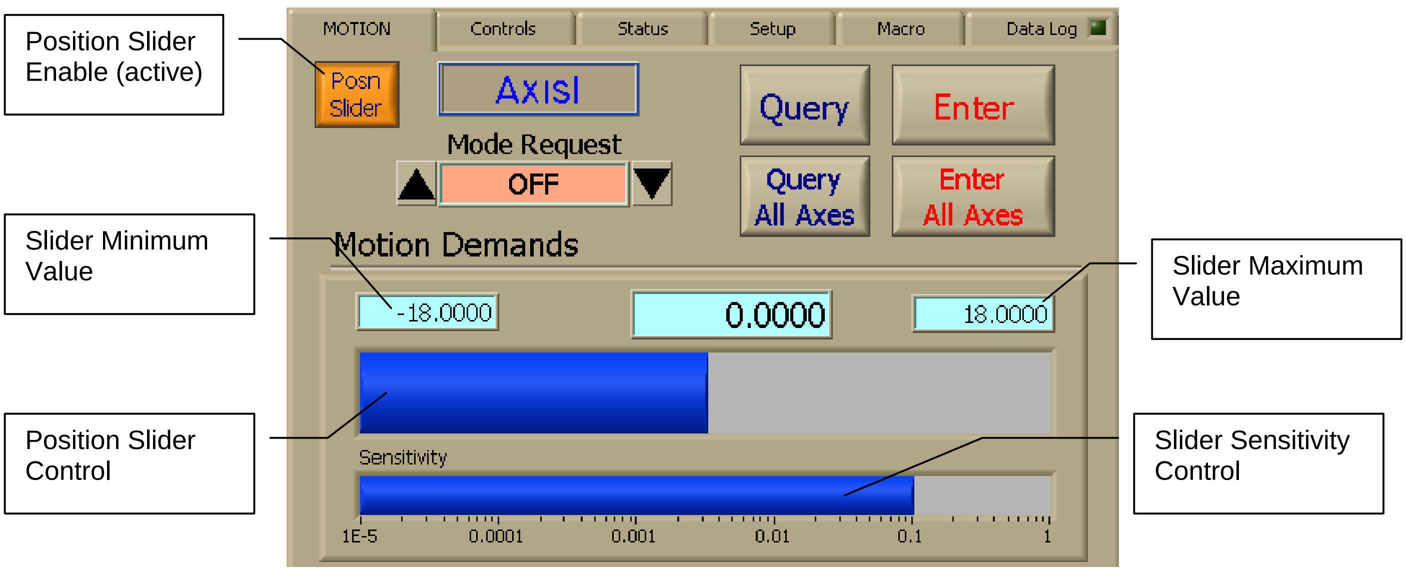


Figure 4-11 Position Slider Control

4.4.1.2 Mode Control

Each axis can be controlled in seven different modes. A mode refers to the method of command generation for the servo loops and does not imply any changes to the servo structure.

To set the mode for the axis:

- Select the desired mode with the list box as shown in Figure 4-12.
- Press 

4.4.1.2.1 OFF Mode

OFF mode is the default mode the controller to which the controller will initialize. It is also the mode to which an axis will always go upon a command to close the Axis Interlock (enable the servo). In **OFF** mode the command generator will produce zero acceleration command, zero rate command, and will use the current position for the position command. The transition to **OFF** mode from any other mode is subject to the **OFF** mode rate and acceleration limits. See Section 4.4.4.2.7.2.

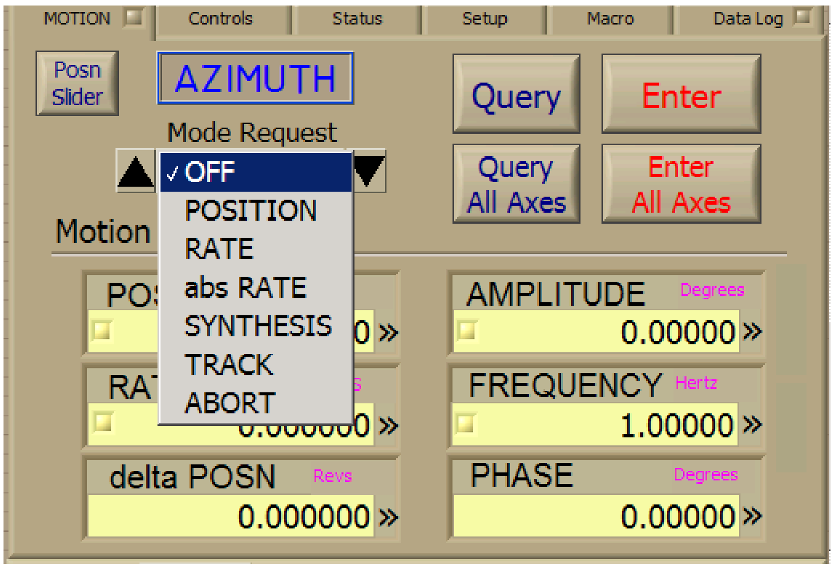


Figure 4-12 MODE Control

4.4.1.2.2 POSITION Mode

In **POSITION** mode, the command generator will produce a time optimal profile to move the axis from the current position to the demanded position, subject to the **POSITION** mode velocity and acceleration limits and the axis position limits. See Section 4.4.4.2.7.2.

POSITION mode has a terminal position profile; this means the command generator will produce a profile that arrives at the demanded position with zero rate. Thus, while optimal for point-to-point moves, it is not suitable for trajectory following as occurs with HWIL simulations.

4.4.1.2.3 RATE Mode

In **RATE** mode, the command generator will produce a time optimal profile to change the axis from the current rate to the demanded rate, subject to the **RATE** mode velocity and acceleration limits and the axis position limits. See Section 4.4.4.2.7.2.

RATE mode does not have a terminal position profile as **POSITION** mode, so it can be used for simulation purposes. However, because it only uses rate commands the user must close a position loop in their simulation code to prevent long-term drift.

4.4.1.2.4 abs RATE Mode

abs RATE mode is similar to **RATE** mode but has one significant difference: when a new rate demand is entered, the command generator produces an acceleration limited rate profile as with **RATE** mode, but generates position commands using the newly demanded rate. This allows the axis to maintain an absolute position lock, the side effect is the axis will need to "over rate" to catch up with the position profile. Note that this is a legacy mode and is not widely used.

As with **RATE** mode, **abs RATE** mode is also subject to position, velocity, and acceleration limits. See Section 4.4.4.2.7.2.

4.4.1.2.5 SYNTHESIS Mode

SYNTHESIS mode is used to produce sinusoidal motion on an axis or group of axes. It can also be used to generate "chirp" patterns, i.e., swept sinusoids over a defined frequency range.

When a new **Amplitude** entered, the command generator will ramp to the demanded amplitude at the rate defined by the **Amplitude Slew** parameter. See Section 4.4.4.2.2.

When either a new **Frequency** or **Phase** is entered, the command generator will ramp to demanded frequency or phase at the rate defined by the **Frequency Slew** parameter. The sweep can be either Linear or Log as determined by the **Frequency Sweep Mode** control. See Section 4.4.4.2.2.

SYNTHESIS mode is also subject to position, velocity, and acceleration limits. See Section 4.4.4.2.7.2.

4.4.1.2.6 TRACK Mode

TRACK mode is used for real time simulation. It differs from all other modes in that it expects real time demands to be continuously sent over one of the real time communication interfaces at a consistent frame rate. It is not for general usage from the operator interface.

In **TRACK** mode, the command generator will produce a time optimal profile to change the axis command state from the current position and rate to the demanded position and rate, subject to the **TRACK** mode velocity and acceleration limits and the axis position limits. See 4.4.4.2.7.2.

For further information on **TRACK** mode and the real time communication interfaces, see manual *TM-9374 Acutrol3000 Real Time Data Communications*.

4.4.1.2.7 ABORT Mode

ABORT mode is a special profiling mode that is automatically engaged when the axis encounters a soft abort, or when the axis is commanded to open the interlocks. In **ABORT** mode, a time optimal profile is produced by the command generator to bring the axis to zero rate, subject to the **ABORT** mode rate and acceleration limits. See Section 4.4.4.2.7.2.

4.4.1.3 Status

The Motion Demand Window also provides feedback to the user about the status of a trajectory. While transitioning between motion demands, the **In Motion** Indicator will illuminate. Once the motion demand has been achieved, the **In Motion** Indicator will extinguish.

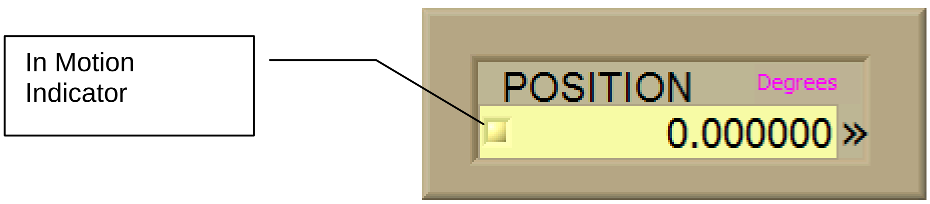


Figure 4-13 Motion Demand Window

4.4.2 CONTROLS Panel

The Controls Panel has five main functions:

- Enabling and Disabling of Servo Control
- Enabling and Disabling of Remote Interfaces
- Control of Discrete Outputs
- Configuration of Interlocks
- Configuration of Demand Summers

Each function has an associated sub-panel in the Controls Panel, and are discussed below.

4.4.2.1 ACTIVATE SERVO Sub-Panel

The **ACTIVATE SERVO** Sub-Panel (see Figure 4-14) has three main functions:

1. Controlling the Servo Interlock
2. Displaying/Clearing Servo Faults
3. Startup/Shutdown Macro Control

Each function is described below.

4.4.2.1.1 Controlling the Servo Interlock

The phrase “Closing the Servo Interlock” is synonymous with enabling the servo control for an axis. Similarly, “Opening the Servo Interlock” implies disabling the servo control for an axis. The phrases date back in time to when manual interlocks had to be closed to enable the servo control.

The Servo Interlock can be controlled from the **ACTIVATE SERVO** Sub-Panel.

In order to close the Interlock of one axis,

- Push the Close button of the chosen axis
- Press Execute

In order to open the Interlock of one axis,

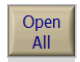
- Push the Open button of the chosen axis
- Press Execute

NOTE: More then one Close button can be pressed before the Execute button is pressed. This allows the user to close the servo interlocks on more than one axis at the same time. Similarly for opening the servo interlocks.

In order to close the Interlock on all axes,

- Push Close All
- Press Execute

In order to open the Interlock on all axes,

- Push 

- Press 

In case of a wrong selection, press 

to clear all pending operations.

NOTE: If an interlock fault has occurred prior to closing the interlocks, you will not be able to close the interlock until this fault is cleared. See section 4.4.2.1.2.

The status of the servo interlock can be seen either from the Servo Interlock status Indicator (see Figure 4-14), or in the **Axis Selection and Mode Display Toolbar** (see Section 4.5).

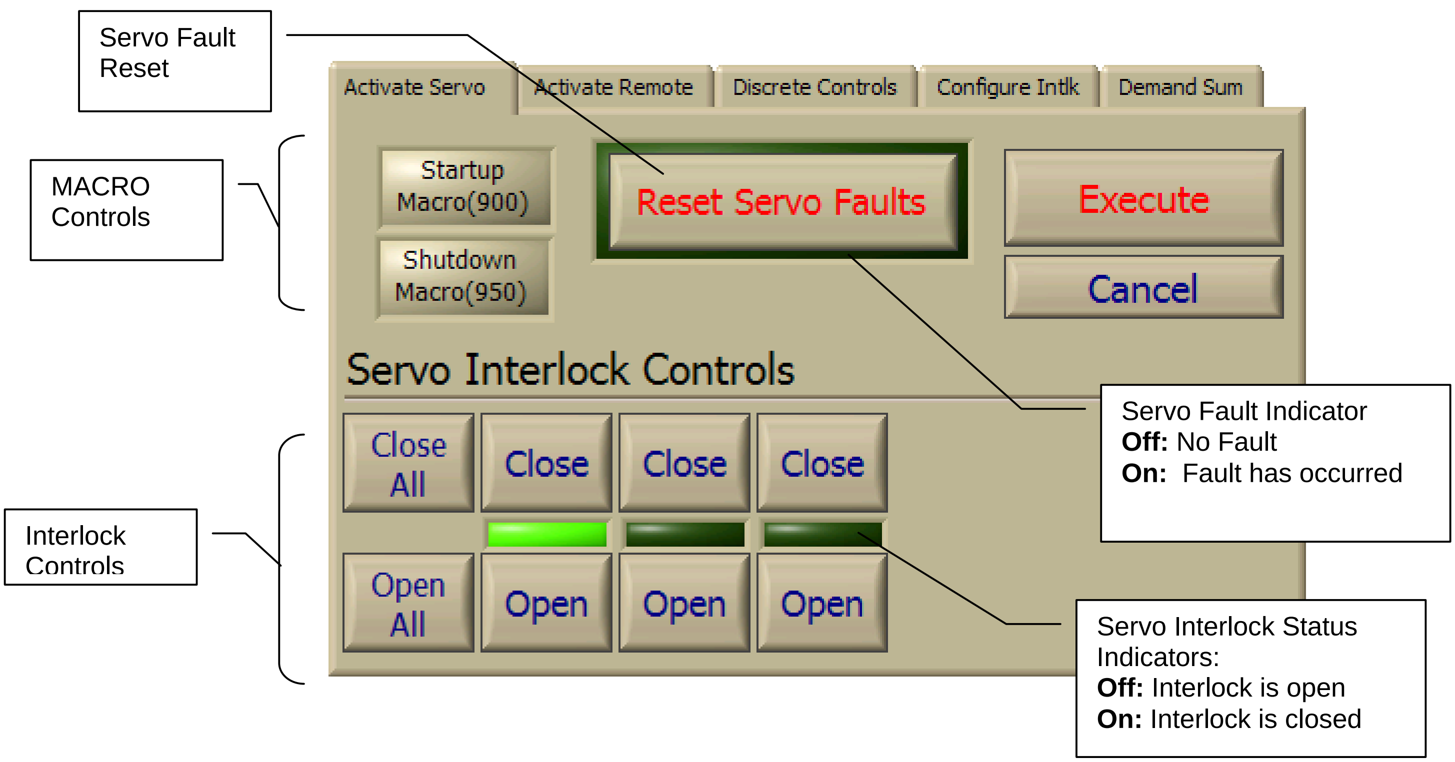


Figure 4-14 ACTIVATE SERVO Sub-Panel

4.4.2.1.2 Servo Faults

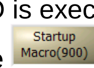
If a fault has occurred, the Servo Fault indicator will illuminate 

. This fault must be cleared prior to closing the servo interlock by pressing the 

button.

4.4.2.1.3 Startup/Shutdown MACRO Control

MACROS are sequences of commands that can be automatically executed. These are defined in general in Section 4.4.5. Two special MACROS are used with the servo interlocks:

- The Startup MACRO is executed every time the system begins to operate, or when the 

button is pressed. The sequence of commands that are executed are defined in MACRO file 900.

- The Shutdown MACRO is executed after the system shutdown command is received, or when the 

button is pressed. The sequence of commands that are executed are defined in MACRO file 950.

4.4.2.2 ACTIVATE REMOTE Sub-Panel

The **ACTIVATE REMOTE** Sub-Panel (see Figure 4-15) is used to enable (or disable) both the real time (RT) and non-real time (NRT) interfaces. GPIB and TCP/IP are examples of NRT interfaces; SCRAMNet+ and VMIC are examples of RT Interfaces.

The **ACTIVATE REMOTE** Sub-Panel has two controls

- **Remote Computer Enable**. This control is used to enable or disable (lockout) the NRT interface.

- **Real-Time Interface Control**. This control is used to enable (online) or disable (offline) the RT interfaces.

and four indicators

- **No (NRT) Interface Detected**. This indicator will illuminate when there are no NRT interfaces detected in the system, e.g., neither the GPIB or TCP/IP interface is installed or operational.

- **No (RT) Interface Detected.** This indicator will illuminate when there are no RT interfaces detected in the system, e.g., neither the VMIC, the SCRAMNet+, or the Parallel16 interface is installed or operational.

- **NRT Fault.** This indicator will illuminate when a problem is detected on any NRT interface.

- **RT Fault.** This indicator will illuminate when a problem is detected on any RT interface.

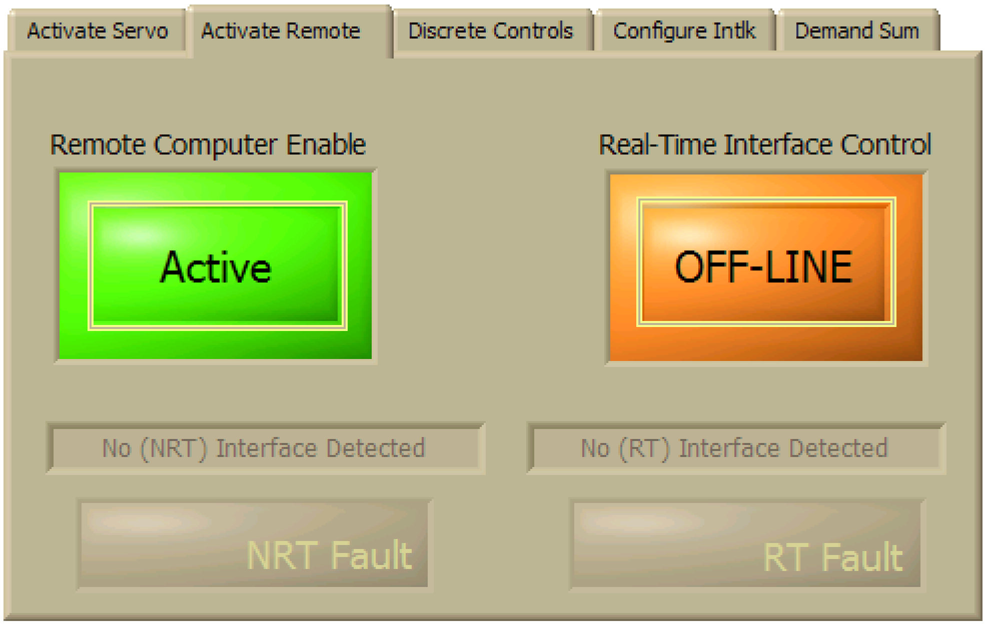
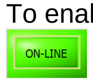


Figure 4-15 ACTIVATE REMOTE Sub-Panel

Figure 4-15 shows the default configuration for the NRT and RT interface, i.e. the NRT interface is enabled (active) and the RT interface is disabled (offline).

- To disable the NRT interface, press . The control will change to  to indicate the NRT interface is disabled.

- To enable the RT interface, press . The control will change to  to indicate the RT interface is enabled.

NOTE: The default condition for both the NRT and the RT interface can be changed by saving a new default configuration. See section 4.4.4.7.3.

4.4.2.3 DISCRETE CONTROLS Sub-Panel

The **DISCRETE Controls** Sub-Panel (see Figure 4-16) allows the user to manually toggle the discrete outputs assigned to the six soft-keys. These soft keys are tied to physical devices in the system, e.g., a Power Amp Remote Enable or a brake on a Tilt Axis.

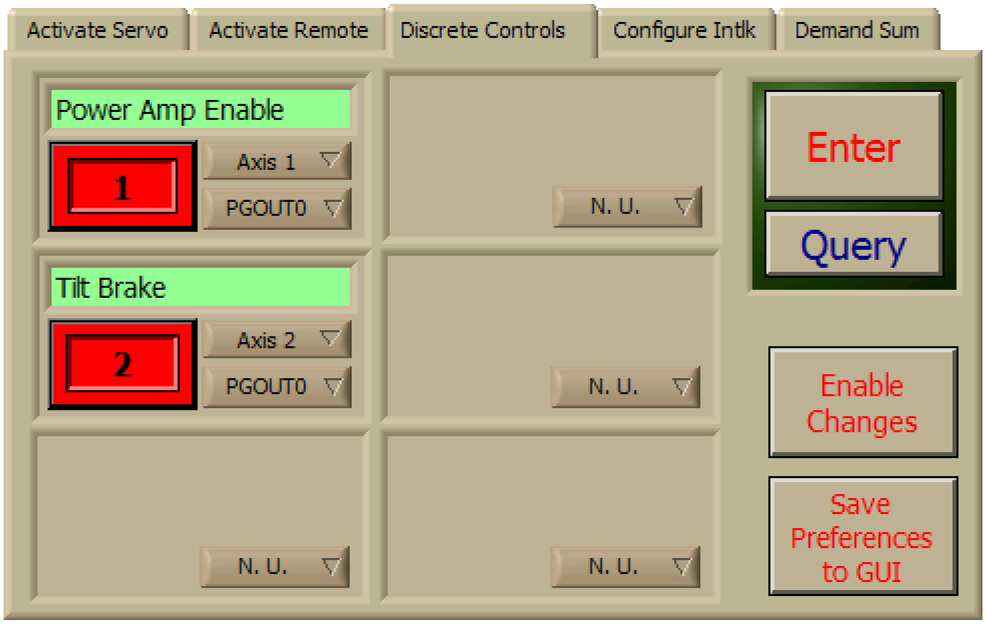


Figure 4-16 DISCRETE CONTROLS Sub-Panel

See Section 4.2 of *TM-9385 Safety Interlocks and Discrete Control Integration Procedure for the Acutrol3000 Motion Control System* for a detailed description and configuration procedures.

4.4.2.4 CONFIGURE INTLK Sub-Panel

The **CONFIGURE INTLK** Sub-Panel (see Figure 4-17) gives access to the system interlock inputs and their configuration. Sixteen Interlocks can be configured such that only if they are satisfied, servo control for an axis can be enabled.

NOTE: By changing the interlock configuration, it can be possible that the system is rendered inoperable. Please use caution when changing any interlock settings. Refer to Section 3.2.1 of *TM-9385 Safety Interlocks and Discrete Control Integration Procedure for the Acutrol3000 Motion Control System* for more detailed on configuring interlocks.

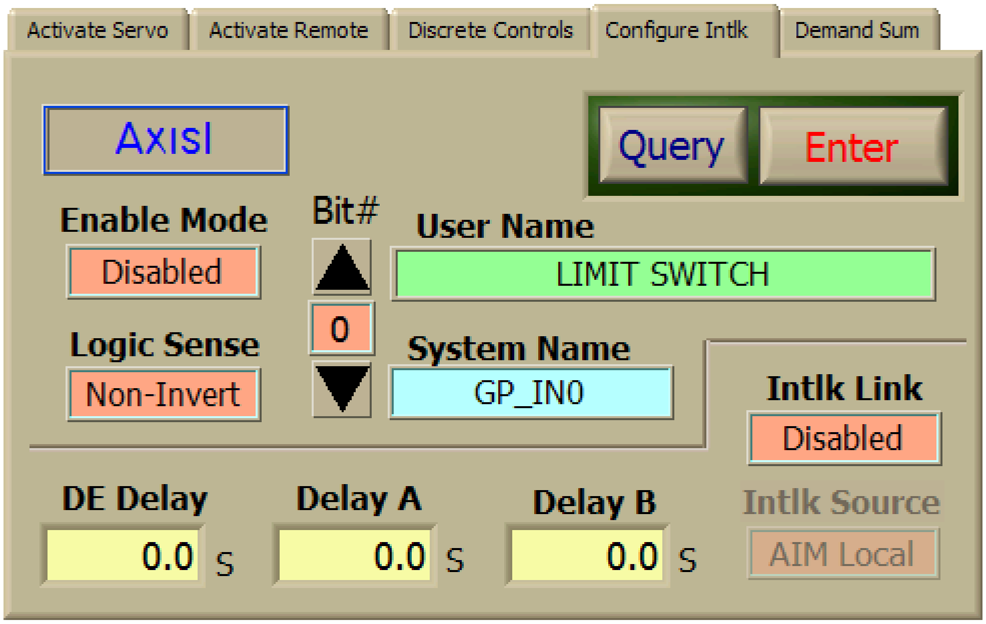


Figure 4-17 CONFIGURE INTLK Sub-Panel

4.4.2.5 DEMAND SUM Sub-Panel

The Demand Summer takes the motion demands from all the possible sources (user demands, real time demands, etc.) and produces a demand vector that is the input to the state limiter.

One of the inputs to the Demand Summer is a Variable Block. The **Demand Sum** Sub-Panel allows the user to choose any variable to be added to demanded Position, Rate or Acceleration. (Jerk profiling is not yet implemented). For example, this feature can be used to add a constant rate to the Synthesis movement to get a rotating Synthesis profile.

Four parameters are required to define a variable for the demand summer.

- **Motion State** allows the user to enable or disable the demand summation of the variable into the Position, Rate, or Acceleration state.
- **Variable** is the numerical index of the variable to be summed into the demand summer.
- **Gain** is the scale factor to apply to the raw variable reading. This is typically used to convert engineering units (e.g., Volts to deg).
- **Offset** is the value to be added to the variable after scaling and before summation into the demand summer.

Figure 4-18 shows all four parameters.

In operation, the value of the **Variable** is multiplied by a **Gain** factor and an **Offset** is added to arrive at the value to be summed into the demand summer.

To configure an input to the Demand Summer:

- Use the Numeric Key Pad to specify the desired **Variable**
- Transfer the data by touching the **Variable** of the motion state to be configured
- Use the Numeric Key Pad to specify the desired **Gain**
- Transfer the data by touching the **Gain** of the motion state to be configured
- Use the Numeric Key Pad to specify the desired **Offset**
- Transfer the data by touching the **Offset** of the motion state to be configured
- Press 

to complete the configuration

To enable the variable demand summer,

- Press the button defining the **Motion State** to be enabled
- Press 

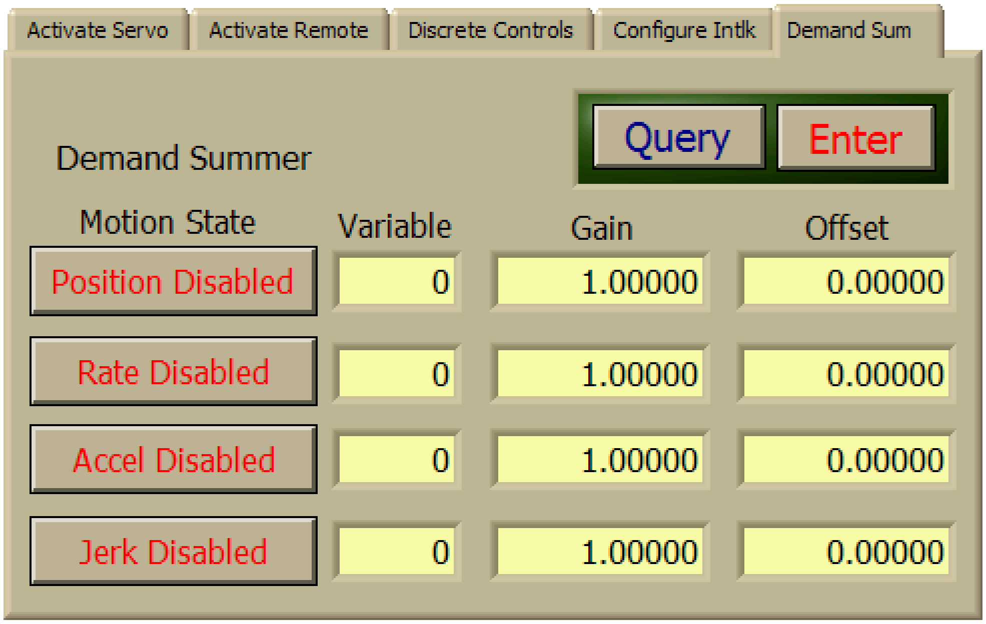


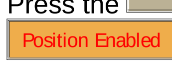
Figure 4-18 DEMAND SUM Sub-Panel

This function can also be used to scale and enable the analog inputs into the demand summer, allow control of the motion system via the analog inputs. These analog inputs can represent a Position, Rate, or Acceleration Demand.

The Front Panel Analog Inputs are available as variables x089 (Input 1) and x090 (Input 2). The variables have the same scaling as the analog input, i.e., +/-10 VDC.

For example, to configure Axis 1 Analog Input #1 on the front panel to be a position demand scaled at 10 VDC = 45 deg,

- Enter 1089 on the numeric keypad
- Touch the **Variable** field in the first row
- Enter 4.5 on the numeric keypad (4.5 deg/Volt)
- Touch the **Gain** field in the first row
- Press the 

 button. The button will change to 

.
- Press 

Analog Input #1 is configured to supply position demands. To disable the demand summing,

- Press the Position Enabled button. The button will change to Position Disabled.
- Press Enter

4.4.3 STATUS Panel

The **STATUS** Panel (see Figure 4-19) gives access to various system states that can be used for troubleshooting and get information on the system's condition.

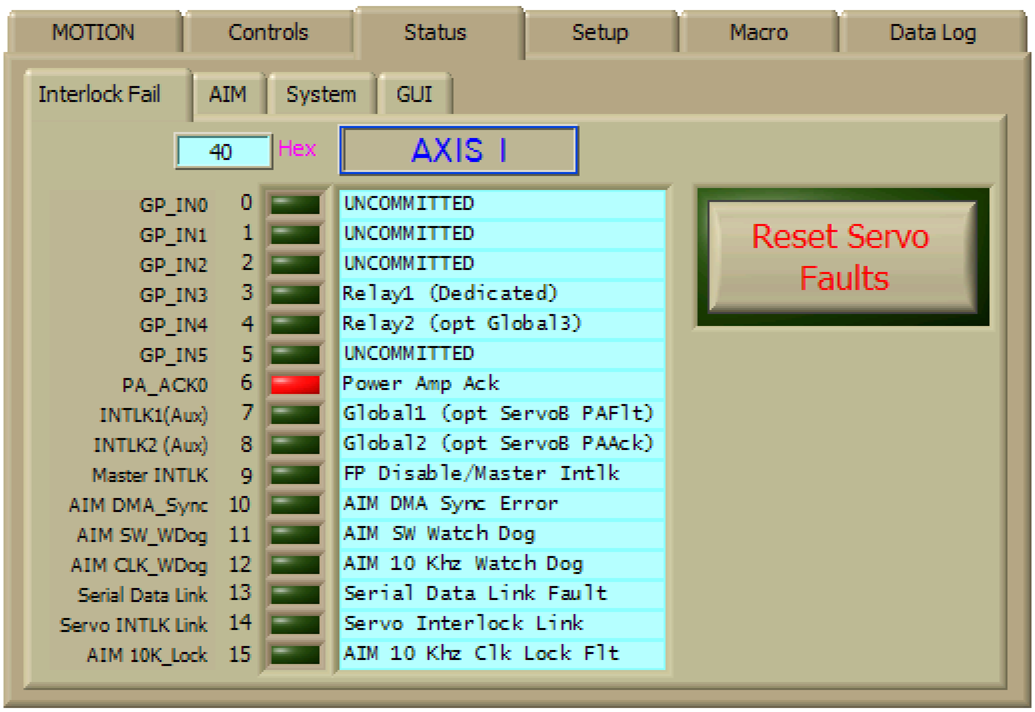


Figure 4-19 Status Panel

There are four status sub-panels that can be used for troubleshooting the Acutrol3000 in case of problems or unknown behavior:

- Interlock Status
- AIM Status
- System Status
- GUI Status

Each sub-panel is described below.

For additional information on Interlock Status, see *TM-9385 Safety Interlocks and Discrete Control Integration Procedure for the Acutrol3000 Motion Control System*.

4.4.3.1 INTERLOCK FAIL Sub-Panel

The **Interlock Fail** Sub-Panel shows the status of the interlocks of the Acutrol3000. Once an interlock fault occurs during the operation of an axis, the status is latched with the first fault that occurred. To reset the status, press 

.

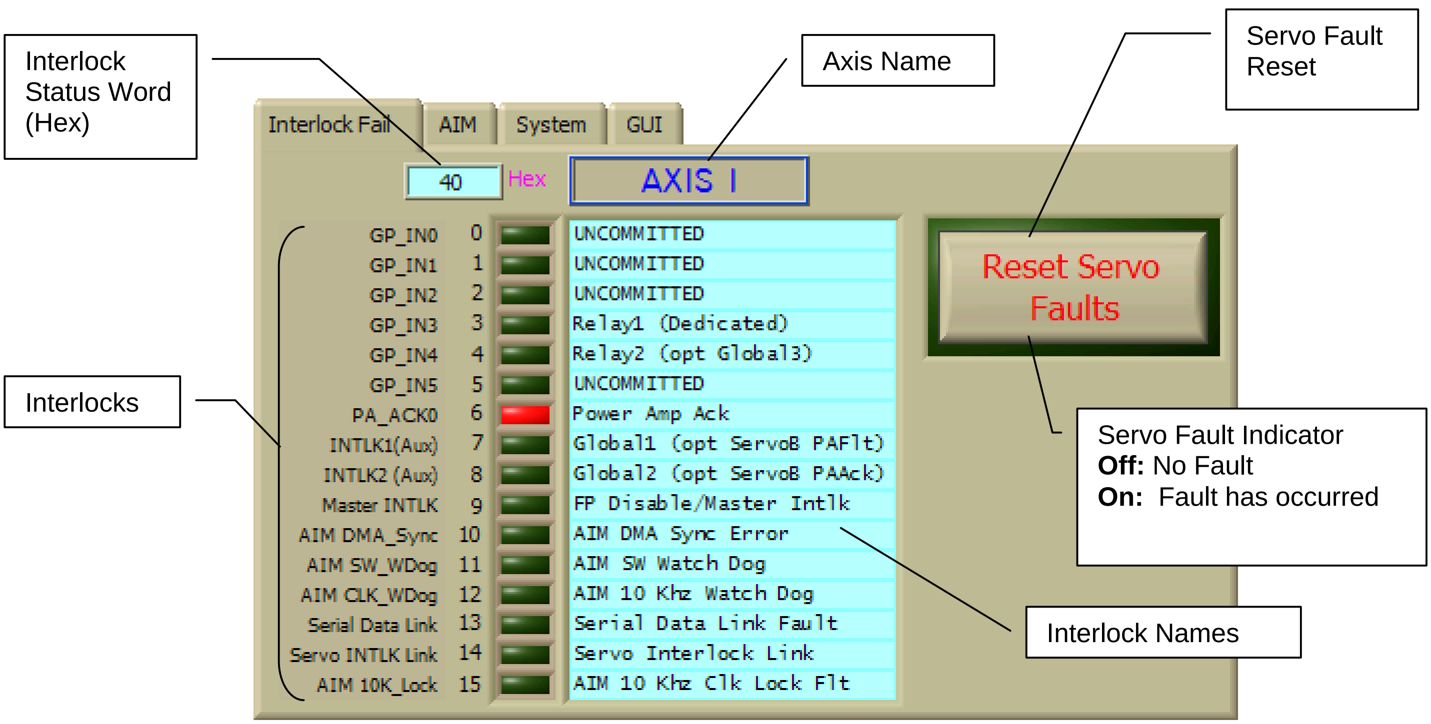


Figure 4-20 INTERLOCK FAIL Sub-Panel

4.4.3.2 AIM Sub-Panel

The **AIM** Sub-Panel (see Figure 4-21) is used for advanced debugging only. It should only be used in communication with Acutronic personnel. With the **AIM** Sub-Panel you can directly read the registers from the **A**xis **I**nterface **M**odules within the Acutrol3000 chassis.

The **STATUS** pickbox can be used to select the various registers of the AIM. See Figure 4-22.

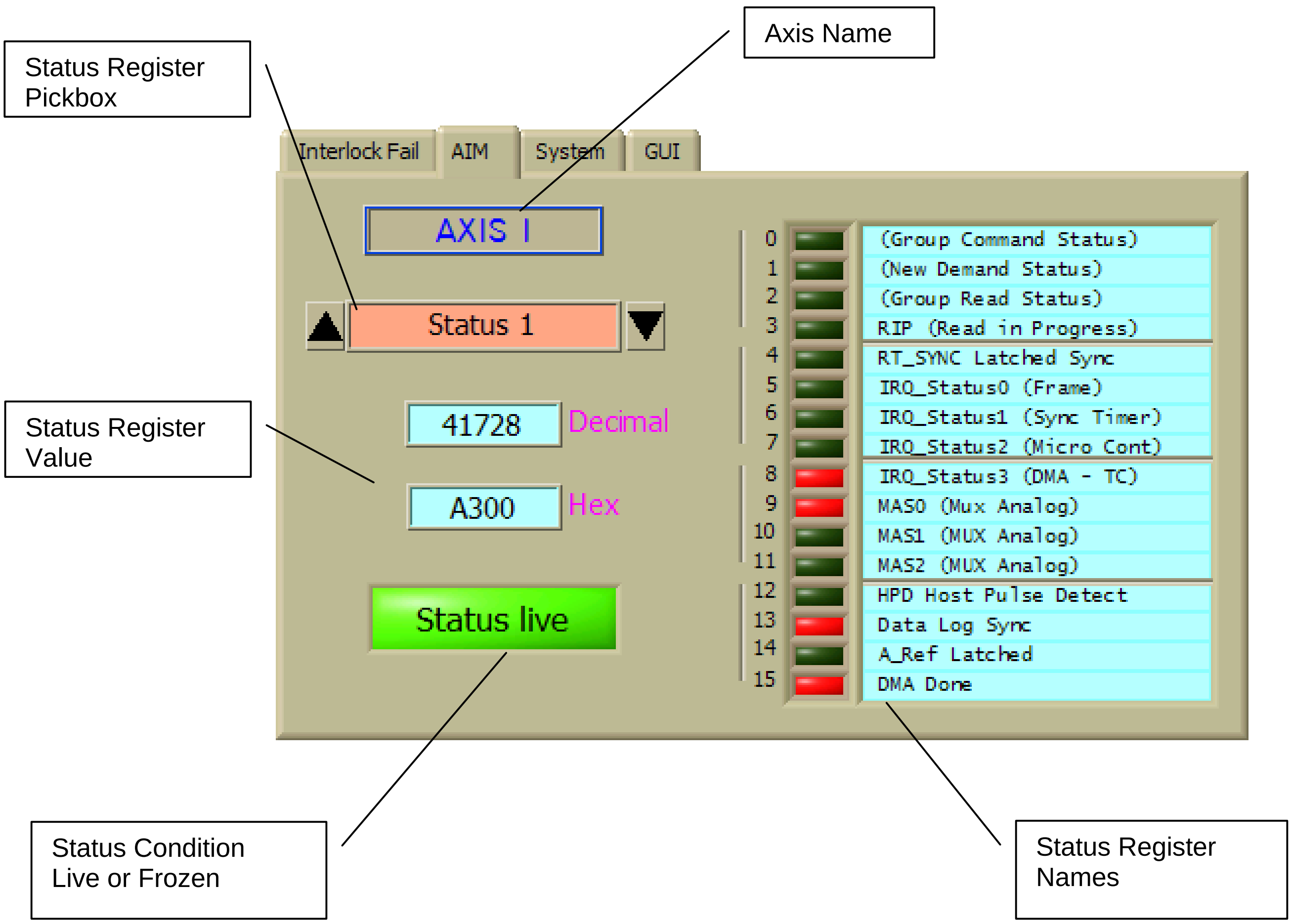


Figure 4-21 AIM Status Sub-Panel

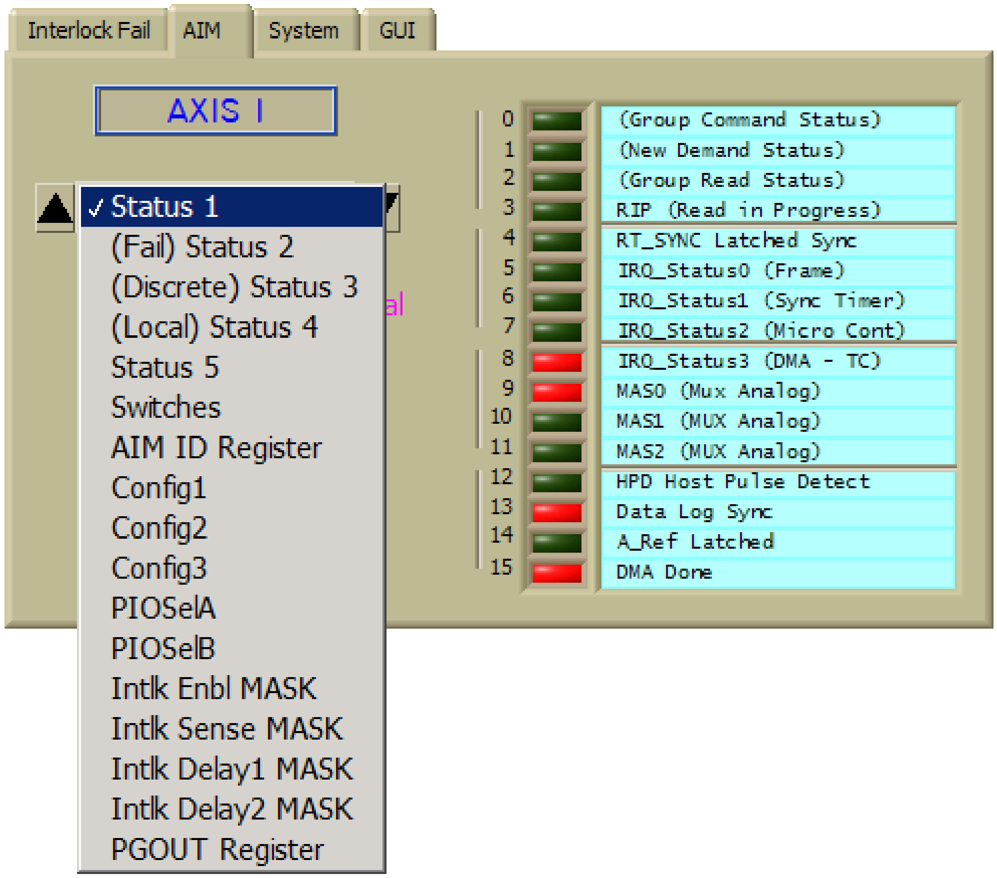


Figure 4-22 AIM Status Registers

4.4.3.3 SYSTEM Sub-Panel

The **SYSTEM** Sub-Panel shows the Status of the Acutrol3000 at the system level. It is the main tool for system troubleshooting.

The System Status is structured as a byte tree structure where the STB (Status Byte) is the top-level status byte. It displays the states or value of the

- System Interlock Summary Byte (SI)
- ACP Processes Summary Byte (ACP)
- Supervisor Processes Summary Byte (SUP)
- Remote Interface Summary Byte (RI)

These again display the value of the lower level bytes (see Figure 4-24).

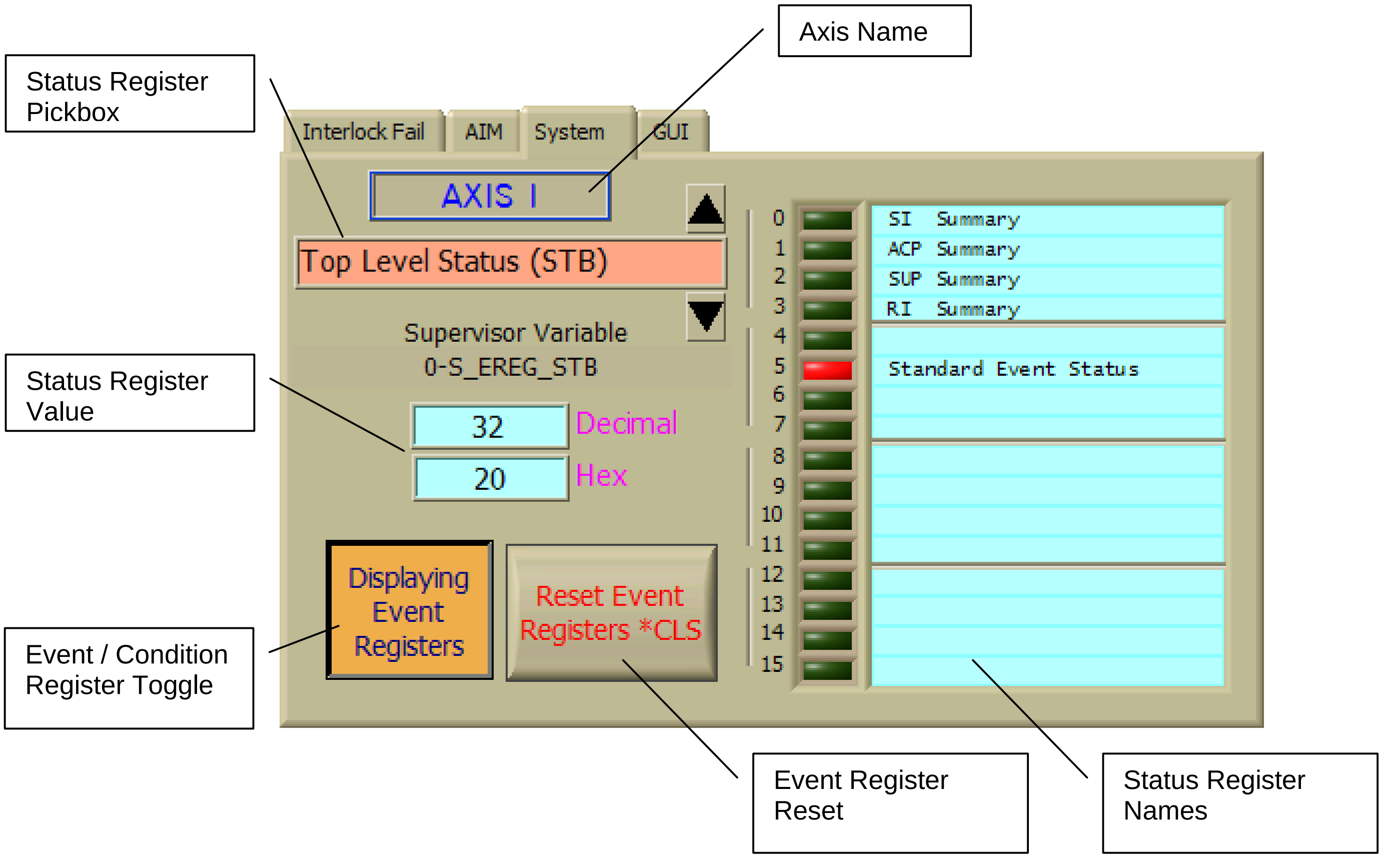


Figure 4-23 SYSTEM Status Sub-Panel

The procedure to isolate a fault is as follows:

1. Select the top-level status byte (STB) using the Status Register Pickbox. See Figure 4-25.
2. Determine which bit of the STB shows a fault (e.g. RI)
3. Select the RI Byte from the Status Register Pickbox and check for the fault (e.g. TCP/IP).
4. Select the TCP/IP Byte and check for the fault indicator
5. Keep progressing down the status tree until the fault is isolated

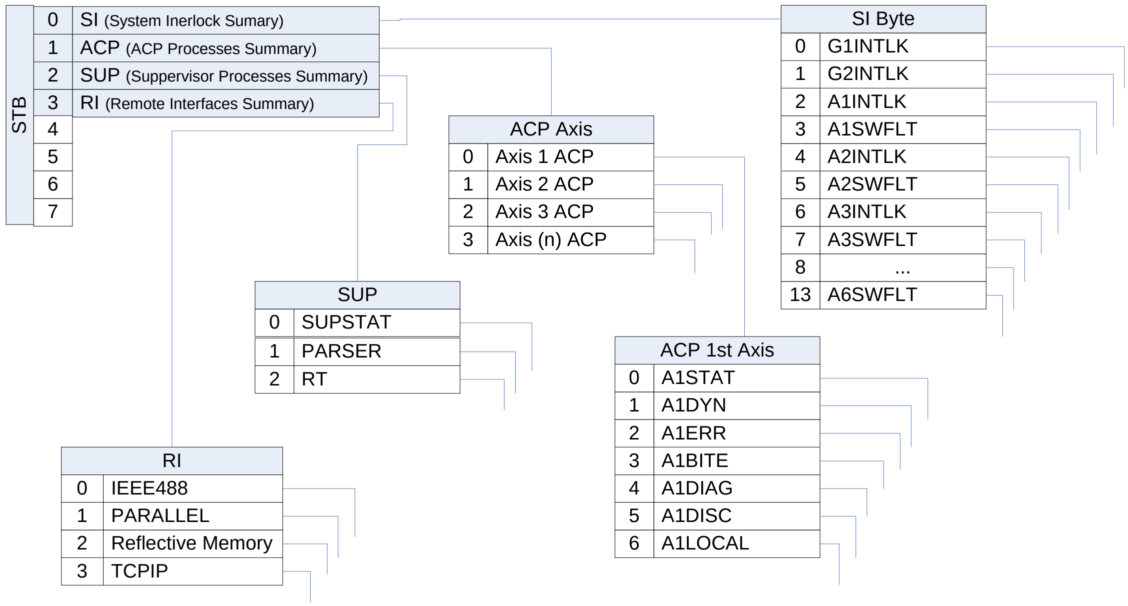


Figure 4-24 System Status Tree

Example:

The Status tree selection of “STB-ACP-AxDYN-Bit4”
Results in an Error Message of “(+) Rate Limit”

Each status sub-panel has a Condition Register which shows the current and live status of the Acutrol3000. Additionally an Event Register exists which shows the latched status at the time a error or fault occurred. Use the Event / Condition Register Toggle to switch between live and latched statuses.

- 

indicates live status

- 

indicates latched status

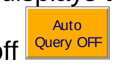
4.4.3.4 GUI Sub-Panel

The **GUI** Status sub-panel (see Figure 4-26) displays the status of the User Interface and the various error messages that can be reported from the RT-Computer.

When a GUI error occurs, the **GUI** sub-panel will automatically be displayed. To reset an error press the 

button which appears at the bottom of the **GUI** sub-panel.

The 

function is used to automatically query new values every time a different sub-panel is selected. This ensures that the GUI always displays the correct and current data and status. In case auto query is turned off 

the data and status displayed will not be current, and the user must query manually with a Query button after entering a sub-panel.

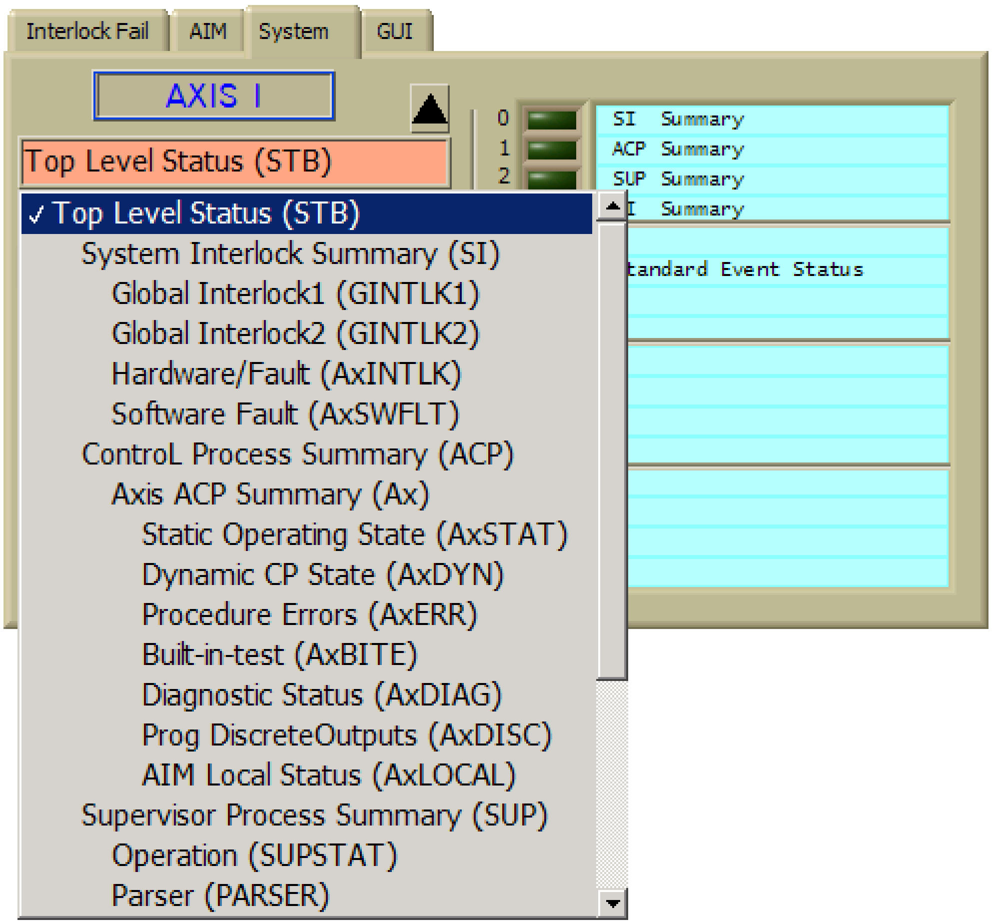


Figure 4-25 System Status Registers

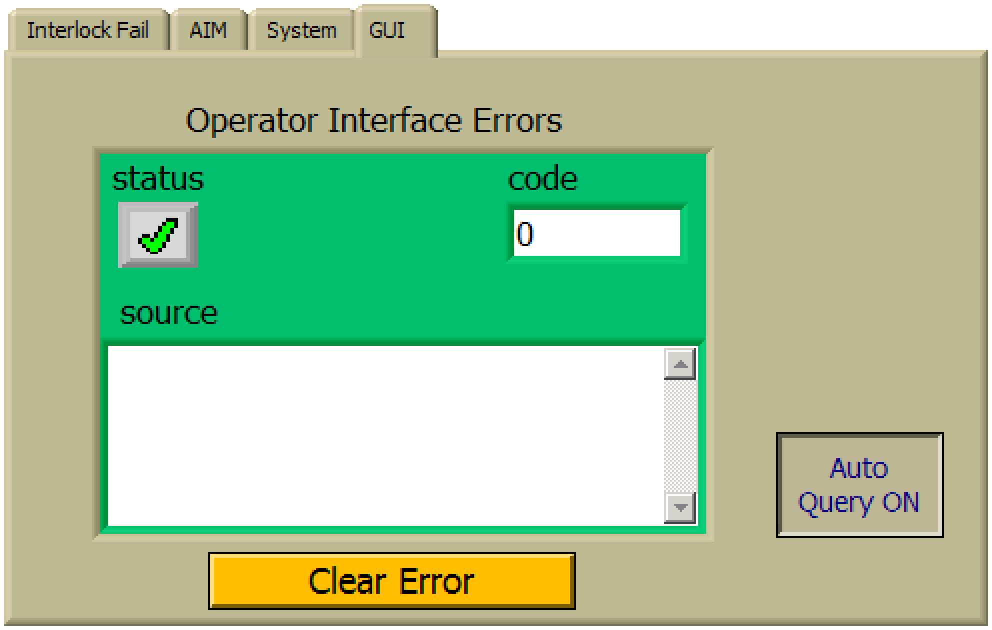


Figure 4-26 GUI Status Sub-Panel

4.4.4 SETUP Panel

The **SETUP** Panel (see Figure 4-27) contains the majority of the configuration controls for the Acutrol3000. The **SETUP** Panel has seven main functions:

- Analog Output Configuration
- Command Processor Limits Configuration
- Encoding Configuration
- Servo Configuration
- Communication Interface Configuration
- System Configuration
- Miscellaneous Configuration

Each function has an associated sub-panel in the **SETUP** Panel, and are discussed below.

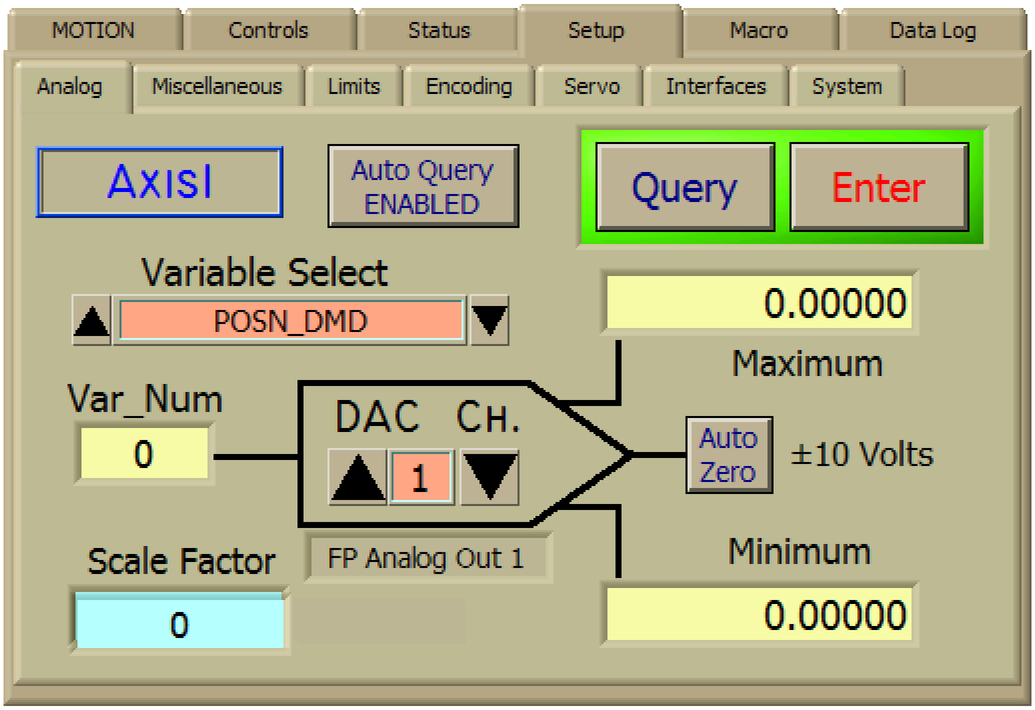


Figure 4-27 SETUP Panel

4.4.4.1 ANALOG Sub-Panel

There are two analog output BNC connectors for each axis on the front panel of the Acutrol3000. The analog outputs can be configured to output any variable. The analog signal has a range of ±10 Volts.

To Configure an Analog Output:

- Using the Analog Output Ring Control , select the desired analog output channel. (1 or 2)
- Using the Variable Pickbox , select the variable to connect to the analog output. Alternatively, enter the variable number on the numeric keypad and touch the **Variable Number** field.
- On the numeric keypad, enter the value of the variable that corresponds to +10 VDC. Touch the **Maximum** field.
- On the numeric keypad, enter the value of the variable that corresponds to –10 VDC. Touch the **Minimum** field.
- Press 

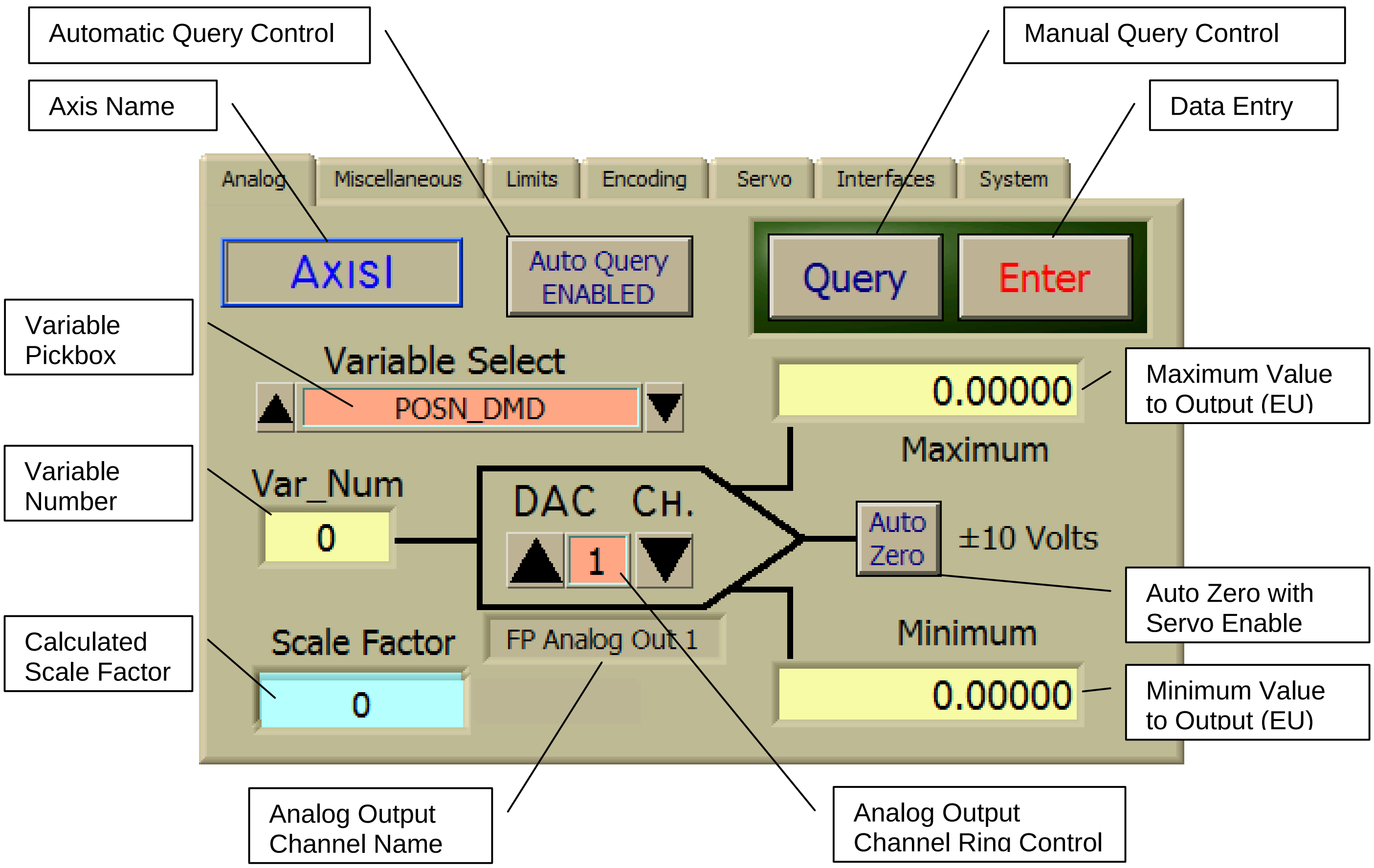


Figure 4-28 ANALOG Setup Sub-Panel

4.4.4.2 MISCELLANEOUS Sub-Panel

The MISCELLANEOUS Sub-Panel contains various configuration functions for the Acutrol3000. These functions are described below.

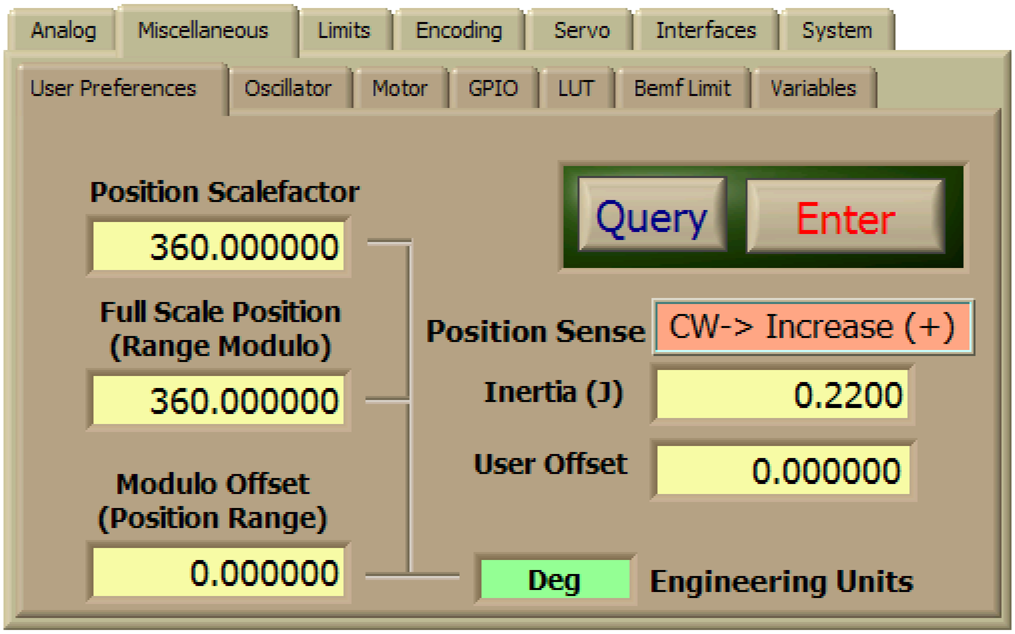


Figure 4-29 MISCELLANEOUS Configuration Sub-Panel

4.4.4.2.1 USER PREFERENCES

In the **USER PREFRENCES** Sub-Panel, the user can adjust some of the commonly used parameters such as the Position Sense, Inertia or Position Offset. These settings are axis dependent and can be set differently for each axis.

The **Engineering Units** field is use to define the units of measure for the axis. For rotational axes, this is typically degrees. To define the **Engineering Units**, use the Kbd display panel to enter the text description, and press Enter. See Section 4.3.3.

The **Position Scale Factor** is used to define the relationship between the **Engineering Units** selected and one revolution of the axis. Typically, this is 360 deg/rev. To define the **Position Scale Factor**, use the numeric keypad to enter the value and press Enter. See *TM-9377, Acutrol3000 Position Transducer Integration Procedure*, Section 2.1 for further information.

The **Position Full Scale Range** is used to define the full-scale command range of the position variable. Typically, the command range is defined to be one revolution and the **Position Full Scale Range** is 360 deg. If the axis command range were to be two revolutions, the **Position Full Scale Range** would be 720 deg. See *TM-9377, Acutrol3000 Position Transducer Integration Procedure*, Section 2.2 for further information.

NOTE: Setting the **Position Full Scale Range** to 720 degrees does not imply absolute positioning; this requires that the coarse transducer be absolute over that range. To define the **Position Full Scale Range**, use the numeric keypad to enter the value and press Enter.

The **Modulo Offset** is used to set the center point of the **Position Full Scale Range**. Nominally this is set to zero; this implies a bipolar axis range (e.g., +/- 180 deg). If the **Modulo Offset** is set to ½ of the **Position Full Scale Range**, then the axis will operate in a unipolar range (e.g., 0 – 360 deg). To define the **Modulo Offset**, use the numeric keypad to enter the value and press Enter. See *TM-9377, Acutrol3000 Position Transducer Integration Procedure*, Section 2.3 for further information.

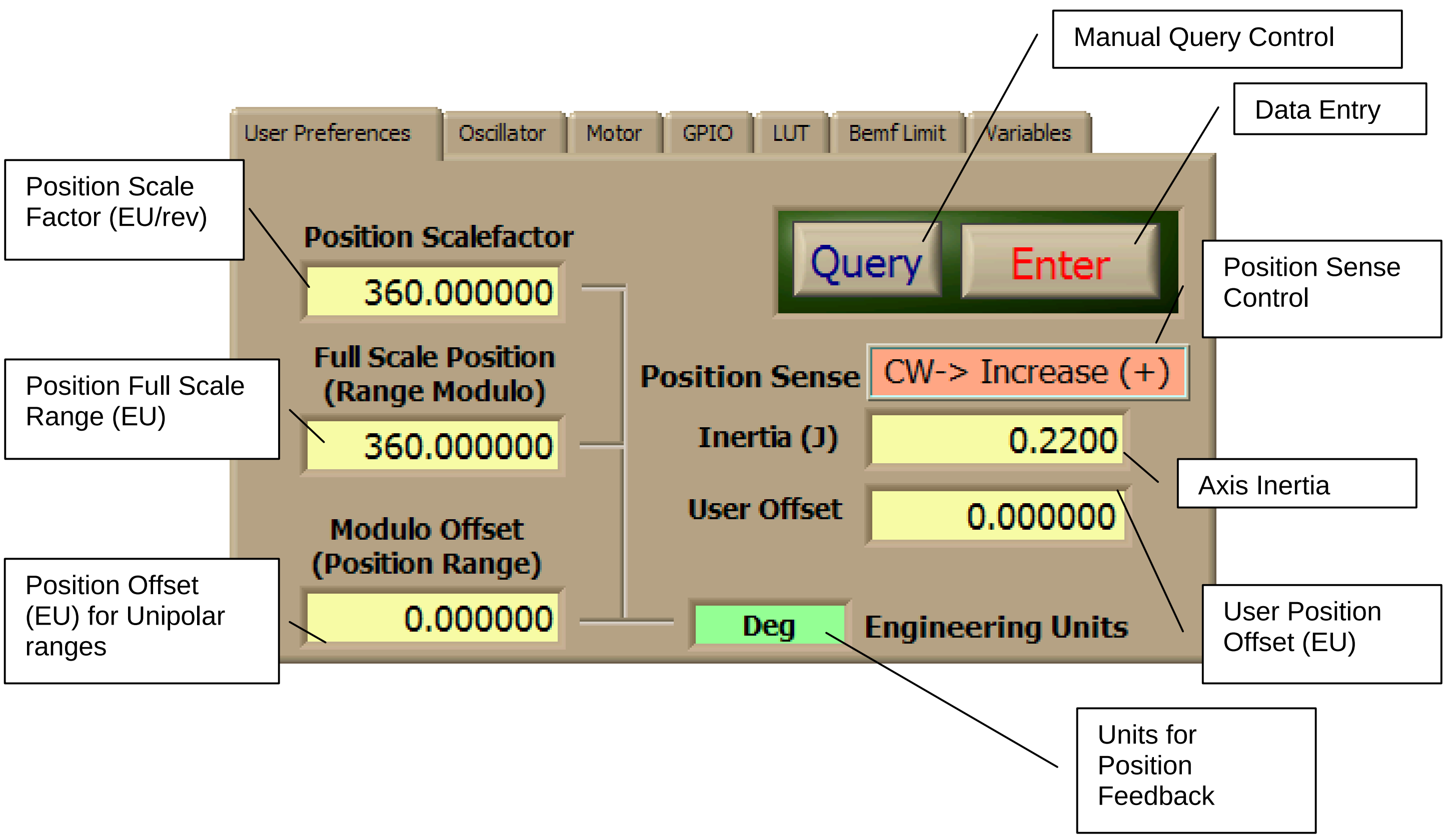


Figure 4-30 USER PREFERENCES Configuration Sub-Panel

The **Position Sense** defines the positive direction of rotation of the axis. Two choices exist, CW-> Increase (+) and CCW -> Decrease (-. To define the **Position Sense**, use the pickbox to select the sense and press Enter.

The **Inertia** parameter defines the moment of inertia of the axis. Units need to be consistent with the other Plant Normalization parameters. To define the **Inertia**, use the numeric keypad to enter the value and press Enter. See also Section 4.4.4.5.5.

The **User Offset** is a zero offset that can be used to align the axis to an external reference such as gravity or true north. To define the **User Offset**, use the numeric keypad to enter the value and press Enter.

4.4.4.2.2 OSCILLATOR

The **OSCILLATOR** Sub-Panel is used to define the behavior of the sine wave generator used by the Synthesis profiler mode. Parameters controlling the operation of the sine wave generator can be configured independently for each axis.

Upon entering **SYNTHESIS** mode, both the amplitude and frequency will slew from DC to the requested **SYNTHESIS** demand at the rates defined in this panel. When a demand is changed while in **SYTHESIS** mode, the amplitude and frequency will slew from the current value of amplitude and frequency to the requested **SYNTHESIS** demands, again at the rates defined in this panel.

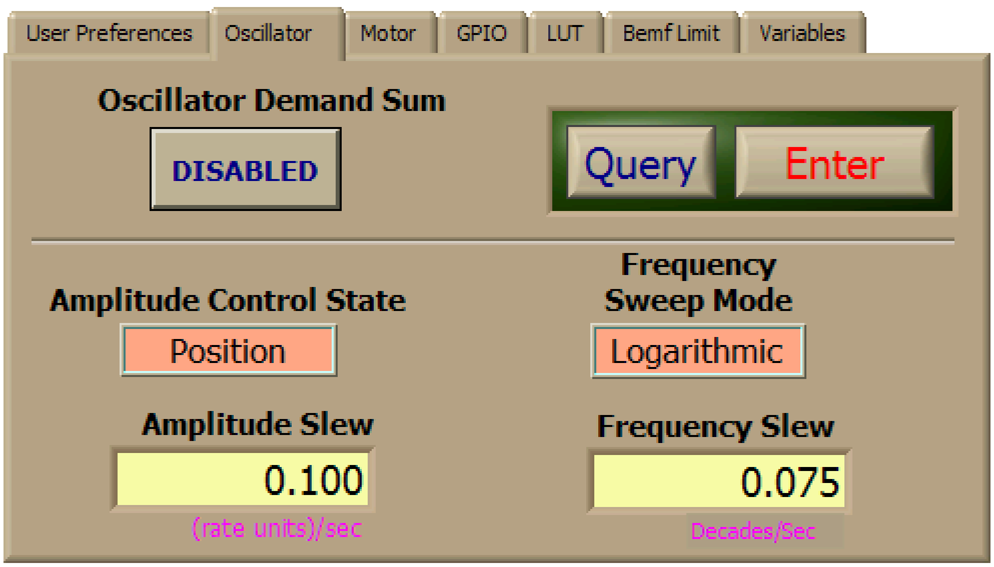


Figure 4-31 OSCILLATOR Configuration Sub-Panel

Amplitude Control State is used to specify which motion state (Position, Rate, or Acceleration) is maintained at a constant peak amplitude as frequency is changed. For example, since acceleration is directly proportional to motor torque and current, specifying Acceleration mode means that the power amp demand (torque) will remain constant independent of frequency, preventing torque saturation. To define the **Amplitude Control State**, use the pickbox to select the motion state and press Enter.

Amplitude Slew defines at what rate the amplitude will change from one set point to another. The units are scaled consistently with the Amplitude units for Synthesis profiling. To define the **Amplitude Slew**, use the numeric keypad to enter the value and press Enter.

Frequency Sweep Mode defines how the frequency moves from one set point to the next. Valid values are Linear or Logarithmic. To define the **Frequency Sweep Mode**, use the pickbox to select the mode and press Enter.

Frequency Slew is used to specify the rate that the frequency changes from one set point to another. If the sweep mode is Linear, then the slew is scaled in Hz/sec. If the sweep mode is Logarithmic, then the slew is scaled in decades/sec. To define the **Frequency Slew**, use the numeric keypad to enter the value and press Enter.

Oscillator Demand Sum control is normally DISABLED. When ENABLED, the sine wave motion state vector is summed with the motion demand vector in Position, Absolute Rate, or Track profiling modes. The effect of this feature is to produce multi-mode composite motion. An example is rotating an axis at a base rate and modulating this motion with a sinusoid.

To cancel any pending operations, or to recall the current settings, press Query.

4.4.4.2.3 MOTOR

The MOTOR Sub-Panel (see Figure 4-32) is used to configure the sinusoidal commutation algorithm for a brushless-DC motor connected to the Acutrol3000. The Acutrol can independently commutate two brushless-DC motors per axis. The motor to be configured is selected with the **Motor** pickbox ▲ 1 ▼. Valid values are 1 or 2. **NOTE:** To cancel any pending operations, or to recall the current settings, press Query.

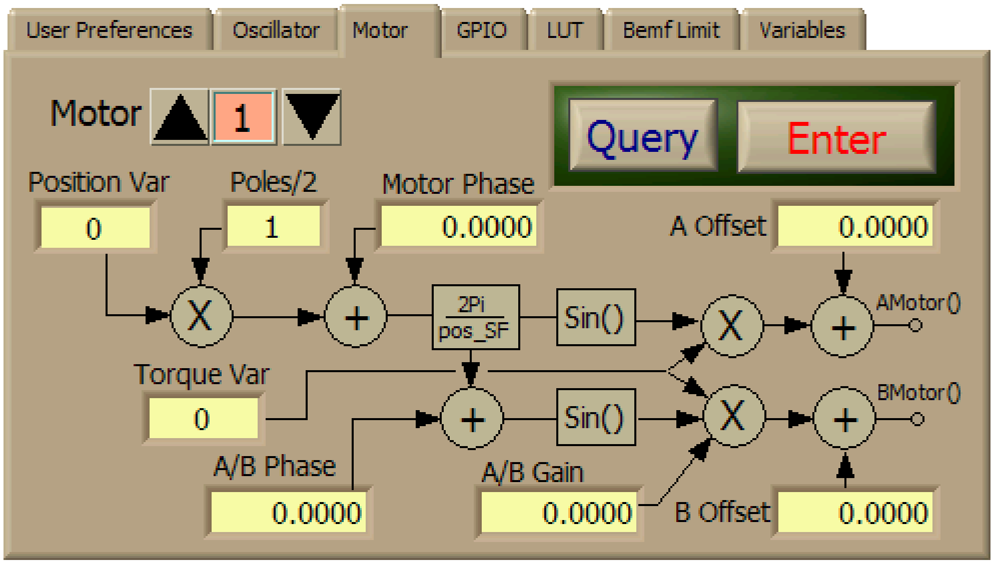


Figure 4-32 MOTOR Configuration Sub-Panel

The parameters are on the **MOTOR** Sub-panel are grouped into two areas: Configuration and Calibration.

4.4.4.2.3.1 Brushless-DC Motor Configuration

Five parameters are necessary for configuration of the commutation for the Brushless-DC motor:

- **Position Var.** This parameter defines the position feedback variable to be used for the commutation reference. Typically this variable is x107, the factory position, as this position reference is unaffected by user offsets. To define the **Position Var**, use the numeric keypad to enter the variable and press Enter.

- **Torque Var.** This parameter defines the torque variable to be used for the commutation reference. Typically this variable is x164, Servo Error, as this torque variable is unaffected by user sense. To define the **Torque Var**, use the numeric keypad to enter the variable and press Enter.

- **Poles/2.** This parameter defines the number of sinewaves/revolution to be produced by the commutation algorithm. To specify the **Poles/2**, use the numeric keypad to enter the value and press Enter.

- **Motor Phase.** This parameter defines the phase between the Acutrol3000 position reference (**Position Var**) and the electrical angle of the motor. This value is not calculable and must be measured during system integration. To specify the **Motor Phase**, use the numeric keypad to enter the value and press Enter.

- **A/B Phase.** This parameter defines the phase between the two sinewave current commands produced. Typically this value is either +120 or –120 degrees, although sometimes it is slightly varied to minimize the ripple torque. To specify the **A/B Phase**, use the numeric keypad to enter the value and press Enter.

The sinewave current commands produced are:

	Motor 1	Motor 2
Phase A	x076	x077
Phase B	x078	x079

4.4.4.2.3.2 Brushless-DC Motor Calibration

Three parameters are necessary for configuration of the commutation for the Brushless-DC motor:

- **A/B Gain.** This parameter defines the relative gain the two sinewave current commands produced. Typically this value is 1, although sometimes it is slightly varied to minimize the ripple torque. To define the **A/B Gain**, use the numeric keypad to enter the variable and press Enter.

- **A Offset.** This parameter defines zero torque value for the A Phase current command. Typically this value is 0.000, although it is slightly varied to minimize the ripple torque. To define the **A Offset**, use the numeric keypad to enter the variable and press Enter.

- **B Offset.** This parameter defines zero torque value for the B Phase current command. Typically this value is 0.000, although it is slightly varied to minimize the ripple torque. To define the **B Offset**, use the numeric keypad to enter the variable and press Enter.

4.4.4.2.4 GPIO

Each GPIO-Bitx selector has a 16-bit multiplexer that can be configured to select various discrete signals in the AIM hardware. If configured as an output, the selected signal is generally used to drive a GPIO pin and the associated relays (if a Transition Module is used).

Digital I/O 1 and **Digital I/O 2** are the digital outputs available on the front panel BNC connectors. They can be set to any of the 16 signals available in the selector by tabbing on the selector and selecting the desired Signal.

GPIO-Bit0-5 are used to setup the system during system integration and should not be changed without consulting Acutronic. Refer to Section 4.1 of *TM-9385 Safety Interlocks and Discrete Control Integration Procedure for the Acutrol3000 Motion Control System* for more detailed on configuring the GPIO.

To cancel any pending operations, or to recall the current settings, press 

.

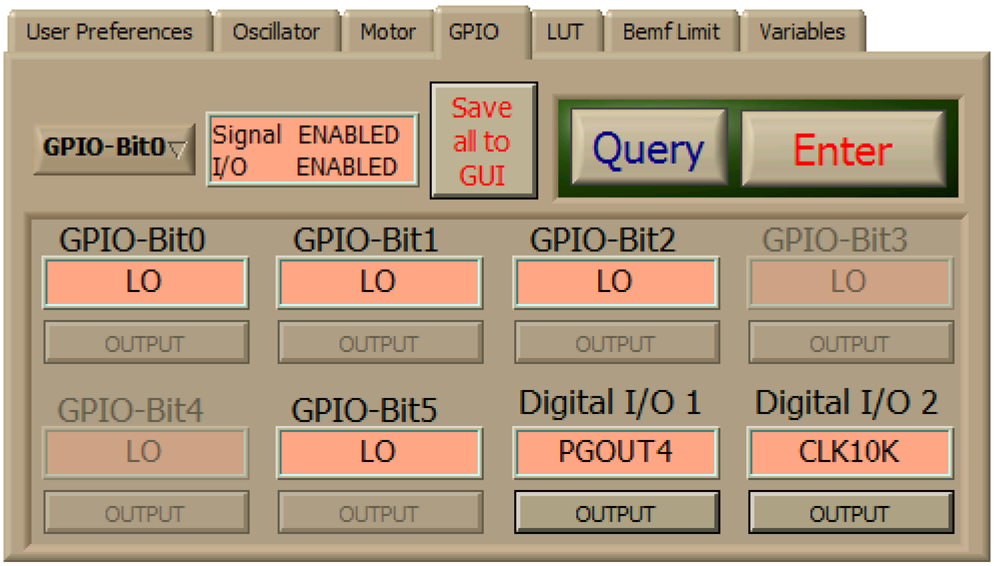


Figure 4-33 GPIO Configuration Sub-Panel

4.4.4.2.5 LUT

The LUT Sub-Panel (see Figure 4-34) is used to configure Look Up Tables (LUTs) that are used with the Acutrol3000 for deterministic error correction. The error correction can be applied to sensors or to actuation. The purpose of the error correction is to improve the motion of the axis.

As shown in Figure 4-35, five types of LUT error correction are available.

- **Coarse Position** uses a LUT to correct the coarse position sensor, typically a resolver.
- **Factory Position** uses a LUT to correct the correlated position word, typically a resolver correlated with an Inductosyn.
- **User Position** uses a LUT to allow the user to add a correction for errors in the fixtures that hold the UUT.
- **Cogging Torque** uses a LUT to provide a torque command to cancel out the cogging torque present in motors.

- **Three-Phase Motor** uses a LUT to provide a mechanism for varying the commutation waveform to cancel out disturbances in the torque actuation system. *Note this is an advanced feature and is not yet implemented.*

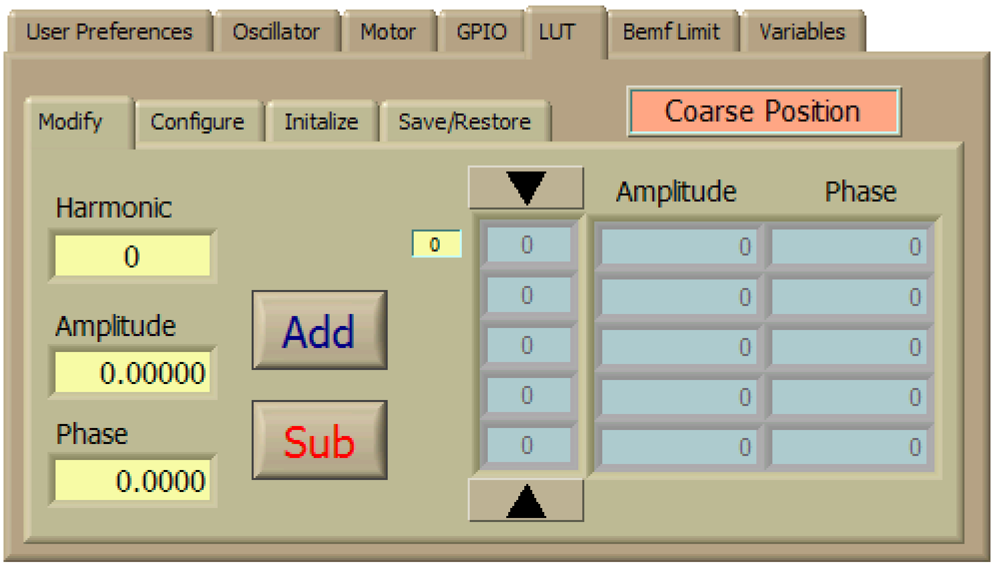


Figure 4-34 LUT Configuration Sub-Panel

The process to use a LUT is as follows:

1. Initialize the LUT (see Section 4.4.4.2.5.3)
2. Configure the LUT (see Section 4.4.4.2.5.2)
3. Wire the LUT into the encoding channel. See *TM-9377, Acutrol3000 Position Transducer Integration Procedure* Section 4.5 and Encoding System Block Diagram.
4. Enable the LUT (see Section 4.4.4.2.5.2)
5. Add the harmonic coefficients to reduce the deterministic error (see Section 4.4.4.2.5.1)
6. Save the LUT (see Section 4.4.4.2.5.4) and the system and axis configuration (see Section 4.4.4.7.3)

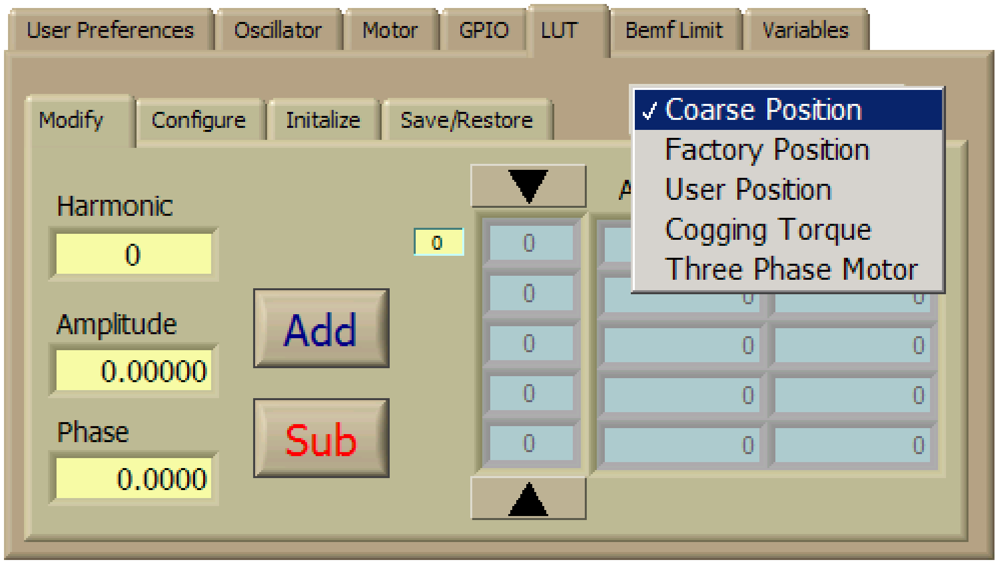


Figure 4-35 LUT Selection

4.4.4.2.5.1 MODIFY

The **MODIFY** Sub-Panel (see Figure 4-36) is used to change the values stored in the LUT. Changes are made by the addition of harmonic correction terms to the LUT. Three parameters are required to specify a harmonic correction: the **Harmonic** spatial frequency (number of cycles per LUT **Ref_Var**), the **Amplitude** (in same units as the **In_Var**), and the spatial **Phase** (in degrees) of the **Harmonic**.

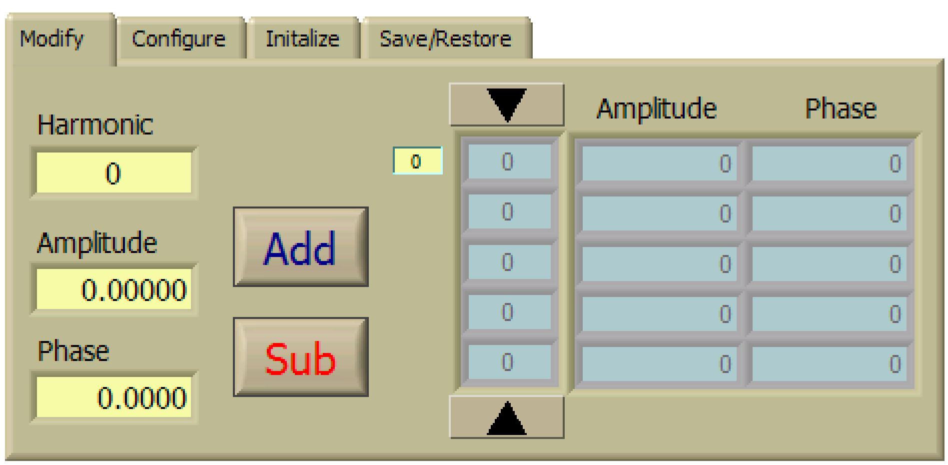


Figure 4-36 LUT MODIFY Sub-Panel

There are three steps to add a harmonic correction term to the LUT:

- Use the numeric keypad to specify the **Harmonic** spatial frequency

- Use the numeric keypad to specify the **Amplitude**
- Use the numeric keypad to specify the **Phase**
- Press Add to sum the harmonic into the LUT, or press Sub to remove the harmonic from the LUT.

4.4.4.2.5.2 CONFIGURE

LUT configuration is controlled in the **CONFIGURE** Sub-Panel (see Figure 4-37). Three parameters are required to configure a LUT: the input variable (**In_Var**), reference variable (**Ref_Var**) and the **Reference Range**. Note that these values are different for each of the five types of LUT. See Table 4-1.

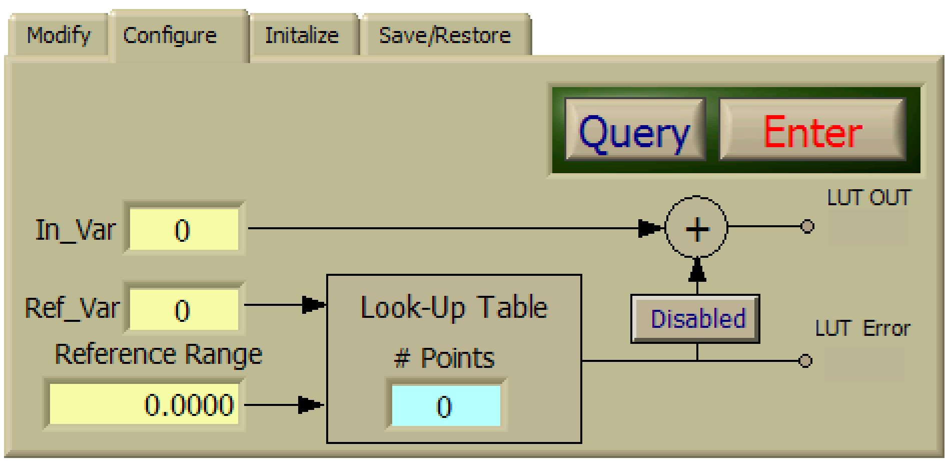


Figure 4-37 LUT CONFIGURE Sub-Panel

LUT	In_Var	Ref_Var	Reference Range	LUT Out Variable	LUT Error Variable
Coarse Position	x085	x085	1.00	x240	x241
Factory Position	x084	x084	1.00	x242	x243
User Position	x107	x107	**Position Full Scale Range**	x248	x249
Cogging Torque	x164	x107	20.00	x244	x245
Three-Phase Motor	TBD	TBD	2*pi	x246	x247

Table 4-1 LUT Configuration Parameters

- To enable the LUT correction, press Disabled. The control will then change to Enabled to indicate the LUT has been enabled.

- To disable the LUT correction, press Enabled. The control will then change to Disabled to indicate the LUT has been disabled.

- To cancel any pending operations, or to recall the current settings, press Query.

4.4.4.2.5.3 INITIALIZE

LUT initialization is controlled in the **INITIALIZE** Sub-Panel (see Figure 4-38). Two parameters are required to initialize a LUT: the **Number of Points** and the **Preset Value**.

- The **Number of Points** is somewhat arbitrary, but a rule of thumb is 20 times the highest spatial harmonic you wish to model. For example, if you have a position error that repeats 720 times per revolution, then as a minimum you should have 14,400 points in your LUT table for good resolution. To define the **Number of Points**, use the numeric keypad to enter the value and press Enter.

- The **Preset Value** is the default value that will populate the LUT when initialized. In most cases 0.000 is always a safe value to use. To define the **Preset Value**, use the numeric keypad to enter the value and press Enter.

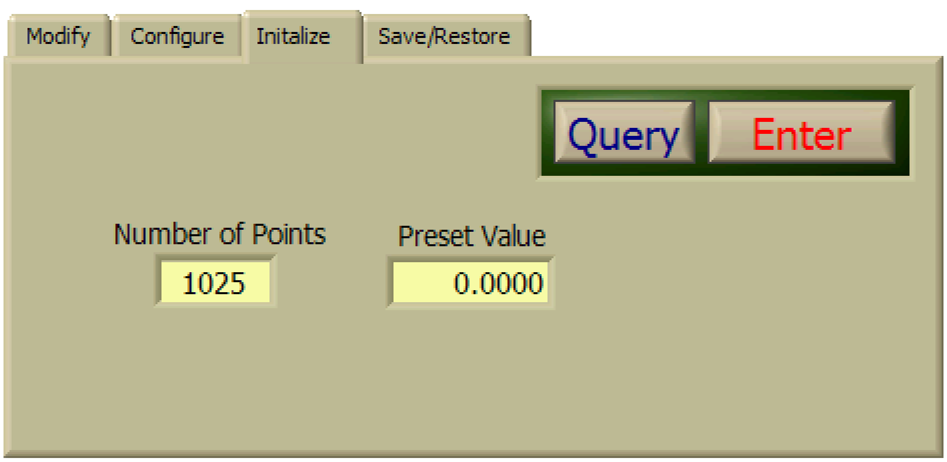


Figure 4-38 LUT INITIALIZE Sub-Panel

To cancel any pending operations, or to recall the current settings, press Query.

4.4.4.2.5.4 SAVE/RESTORE

Once a LUT has been initialized, configured, and the harmonic correction specified, the LUT data files must be saved to make them permanent. This is accomplished in the **Save/Restore** Sub-Panel (see Figure 4-39).

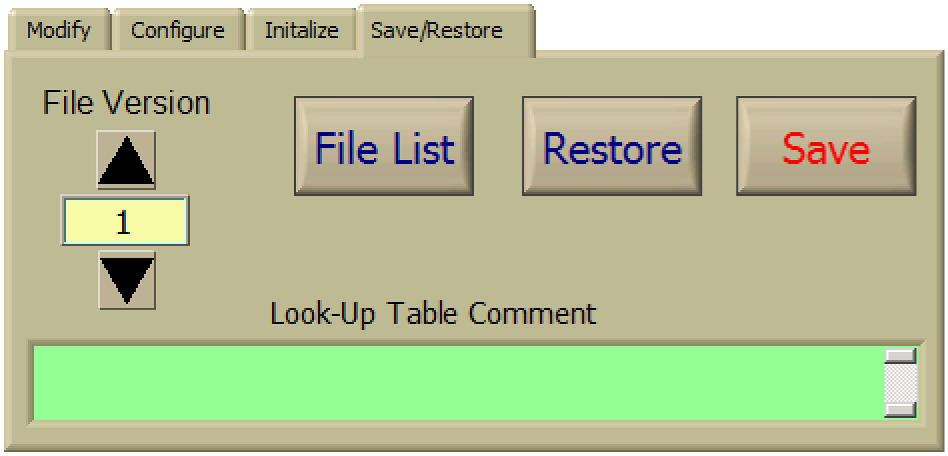
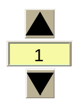
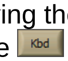


Figure 4-39 LUT SAVE/RESTORE Sub-Panel

Four controls are provided for LUT file control:

-  The file version control is used to select the LUT file to access. By default, LUT version 1 is loaded at startup.
-  Pressing this button will display a list of all LUT files and their associated comments in the text display at the bottom of the panel.
-  Pressing this button will restore the LUT file specified in the file version control.
-  Pressing this button will save the current LUT file in memory as specified by the file version control. Prior to saving the LUT file you can first add a comment to the LUT file by using the  display panel to enter the text description and pressing .

NOTE: These controls only save the LUT file. You must also save the system and axis configuration (see Section 4.4.4.7.3)

4.4.4.2.6 BEMF LIMIT

Nominally all axes would have a square torque vs. speed curve. However, because of the highly non-linear torque vs. speed curves that occur with most amplifier/motor combinations, saturation of the servo control loops during large transients would be inevitable without some form of trajectory control that incorporated knowledge of the torque vs. speed curve. The trajectory generator built into the Acutrol3000 has a feature that allows for a non-square torque speed curve. This feature is called Back-EMF limiting, or BEMF limiting for short. The BEMF Limit feature is controlled through the **BEMF LIMIT** Sub-Panel (see Figure 4-40 - Figure 4-42).

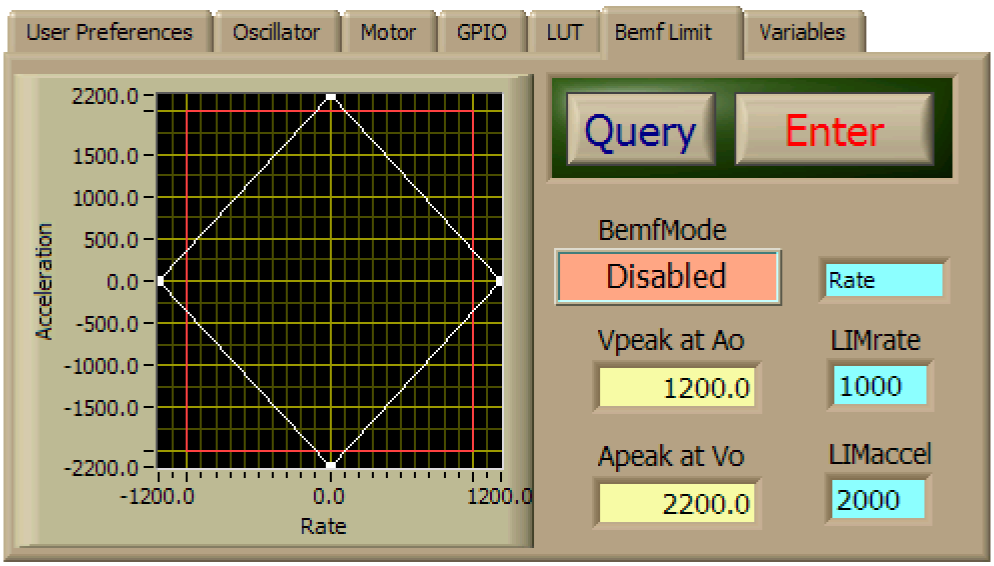


Figure 4-40 BEMF Configuration Sub-Panel, BEMF Disabled

There are three parameters that control the operation of the BEMF Limit algorithm:

- **$V_{A=0}$.** This parameter defines the x-intercept of the BEMF Limit curve, the velocity at which the acceleration is zero. This value must be a minimum of 5% higher than the axis rate limit. To define the **$V_{A=0}$**, use the numeric keypad to enter the value and press 

.

- **$A_{V=0}$.** This parameter defines the y-intercept of the BEMF Limit curve, the acceleration available at zero speed. This value must be a minimum of 5% higher than the axis acceleration limit. To define the **$A_{V=0}$**, use the numeric keypad to enter the value and press 

.

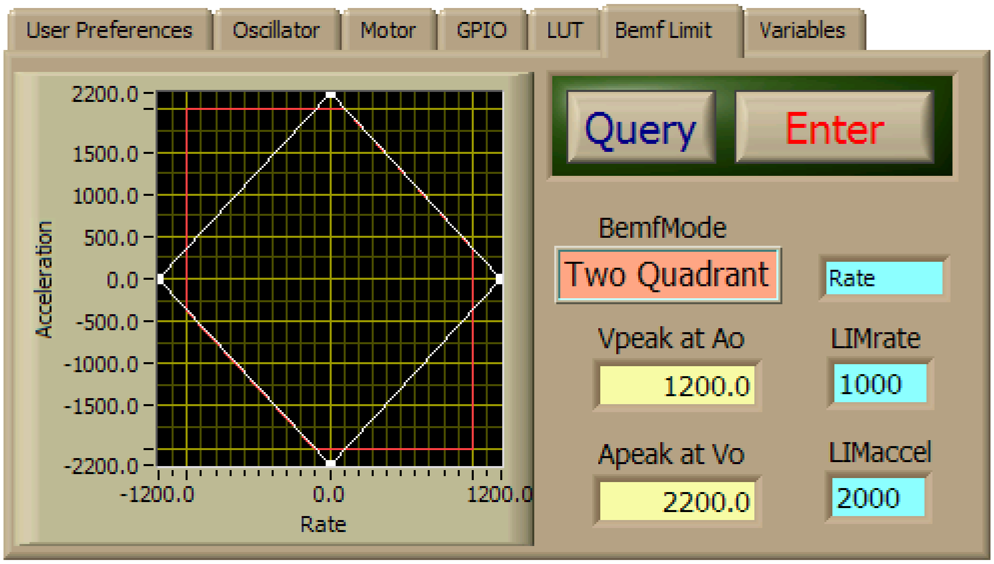


Figure 4-41 BEMF Configuration Sub-Panel, Two Quadrant BEMF Enabled

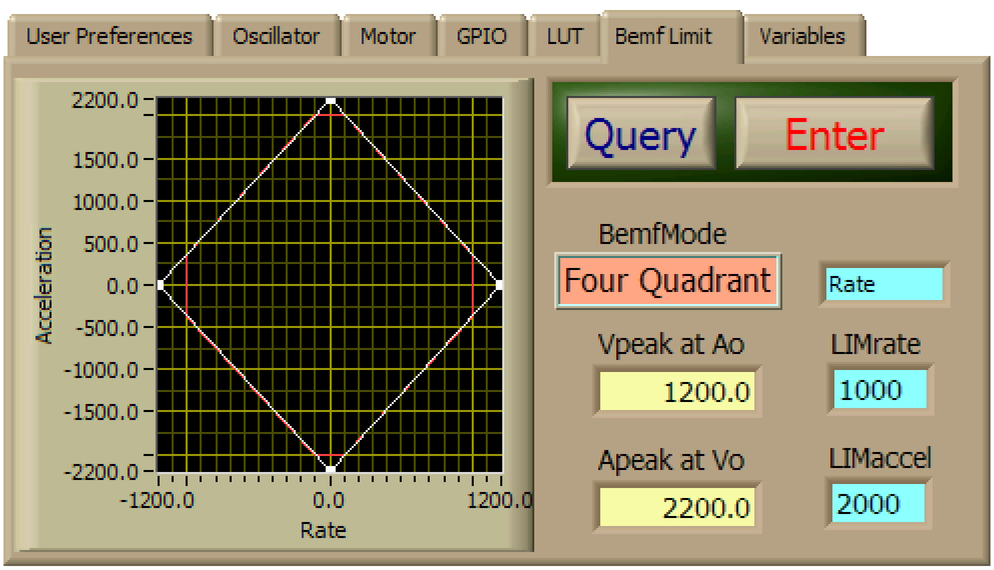


Figure 4-42 BEMF Configuration Sub-Panel, Four Quadrant BEMF Enabled

- **BemfMode.** This controls how the BEMF Limit algorithm will operate. To define the **BemfMode**, use the pickbox to select the algorithm and press Enter. The possible options are:
    - o Disabled. In this mode the BEMF Limit algorithm is disabled and will not affect the axis acceleration limit. See Figure 4-40.
    - o Two Quadrant. In this mode the BEMF Limit algorithm will reduce the axis acceleration limit during acceleration (quadrants 1 and 3), and will not affect the acceleration limit during braking (quadrants 2 and 4). See Figure 4-41.
    - o Four Quadrant. In this mode the BEMF Limit algorithm will operate symmetrically and reduce the axis acceleration limit during acceleration (quadrants 1 and 3) and braking (quadrants 2 and 4). See Figure 4-42.

To cancel any pending operations, or to recall the current settings, press Query.

4.4.4.2.7 VARIABLES

The format and units of all variables in the system can be modified to meet user requirements. The formats are defined in the Variables Sub-Panel (see Figure 4-43). Note that the variables are stored in two locations, the RT Computer and the GUI Computer. The format information stored on the RT computer defines how a variable is reported back over the communication interfaces. The format information stored in the GUI computer defines how a variable is displayed on the GUI.

4.4.4.2.7.1 GUI Variable Format

Four parameters define the format of the GUI variables:

- **GUI Units** define the display unit for the variable. Examples are Volts, deg, deg/sec^2, etc. To define the **GUI Units**, use the Kbd display panel to enter the text description, and press Enter.
- **Size** defines the number of digits to be displayed. To define the **Size**, use the numeric keypad to enter the value and press Enter.
- **Precision** defines the number of digits to be displayed after the decimal point. To define the **Precision**, use the numeric keypad to enter the value and press Enter.
- **Type** defines the data format of the variable. To define the variable **Type**, use the pickbox to select the type and press Enter. Valid data types are shown in Table 4-2.

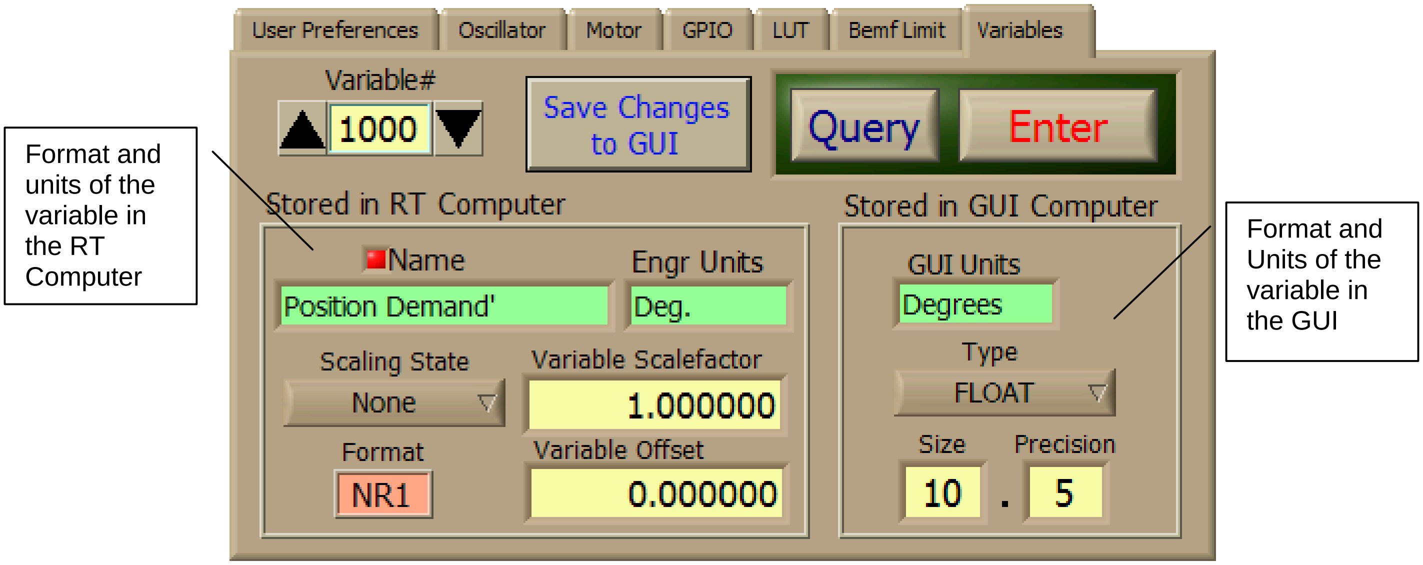


Figure 4-43 VARIABLES Configuration Sub-Panel

To cancel any pending operations, or to recall the current settings, press Query.

The changes will be made permanent by pressing the Save Changes to GUI button followed by a normal System shutdown.

Type	**Description**	**Example**
Float	32 Bit Floating Value	4.23646
16 Bit Int	16 Bit Integer	-155 or +456
32 Bit Int	32 Bit Integer	-3445 or +234
32 Bit Uint	32 Bit Unsigned Integer	2234
Hex	Hex Format	F05C
Exp	Exponential Format	12.674034E+5
Engr		1.267E+1 (exponent is always a multiple of three)

Table 4-2 GUI Data Types

4.4.4.2.7.2 RT Variable Format

Six parameters define the format of the RT variables:

- **Name** defines the name of the variable. To define the **Name**, use the Kbd display panel to enter the text description, and press Enter.

- **Engr Units** defines the engineering unit for the variable. Examples are Volts, deg, deg/sec^2, etc. To define the **Engr Units**, use the Kbd display panel to enter the text description, and press Enter.

- **Scaling State** defines how the value of the variable is to be interpreted. Valid values are None, Position, Rate, Acceleration, Jerk, and Volts. To define the variable **Scaling State**, use the pickbox to select the type and press Enter.

- **Format** defines the format of the variable when it is transmitted over a communication interface. Valid values are NR1, NR2, NR3, H8, H16, H32, H64, B16, B32, and B64. To define the variable **Format**, use the pickbox to select the type and press Enter.

- **Variable Scalefactor** is the scale factor to apply to the variable value. This is typically used to convert engineering units (e.g., Volts to deg). To define the **Variable Scalefactor**, use the numeric keypad to enter the value and press Enter.

- **Variable Offset** is the value to be added to the variable after scaling. To define the **Variable Offset**, use the numeric keypad to enter the value and press Enter.

4.4.4.3 LIMITS Sub-Panel

In the **LIMITS** Sub-Panel (see Figure 4-44), the limits for the different profiling modes can be set. By selecting a Mode, the current stored values are queried. These can be changed and entered again.

Use the **MODE** pickbox to choose the mode to set the limits for. See Figure 4-45. To cancel any pending operations, or to recall the current settings, press Query.

There are two types of limits that can be set:

- **Mode Limits** are limits that apply to the current selected mode. Note that all modes must have limits less than or equal to the Factory Limits.

- **Rate** defines the maximum rate the profiler can obtain in the selected mode. To define the **Rate** limit, use the numeric keypad to enter the value and press Enter.

- **Acceleration** defines the maximum acceleration the profiler can obtain in the selected mode. To define the **Acceleration** limit, use the numeric keypad to enter the value and press Enter.

- **Jerk** defines the maximum jerk the profiler can obtain in the selected mode. To define the **Jerk** limit, use the numeric keypad to enter the value and press Enter. **NOTE:** Jerk limiting is not currently limited.

> **Important:** Factory Limits should not be changed under any circumstance as this can cause damage to the machine.

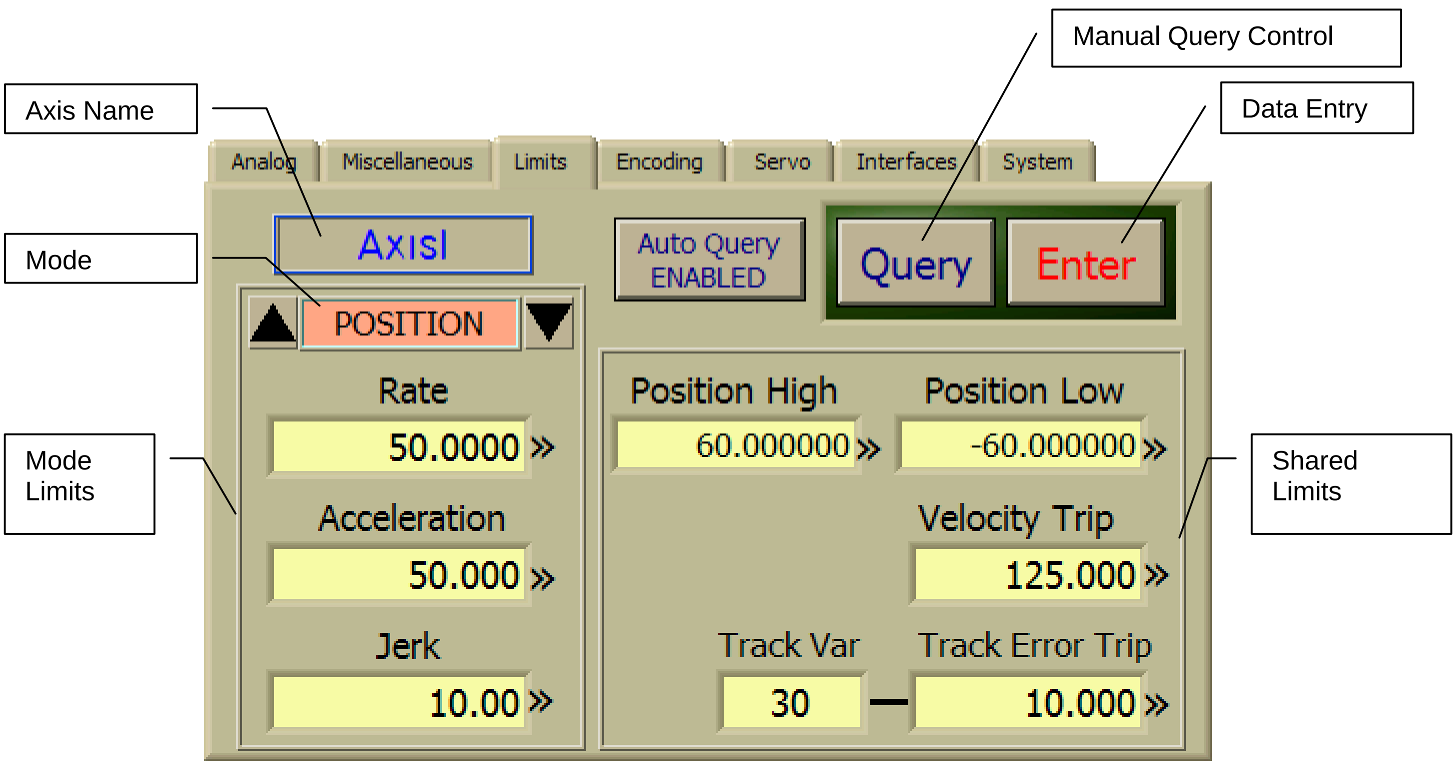


Figure 4-44 LIMITS Configuration Sub-Panel

- **Shared Limits** are limits that apply to all modes
  - **Position High** defines the maximum position the profiler can obtain in any mode. To define the **Position High** limit, use the numeric keypad to enter the value and press Enter.
  - **Position Low** defines the minimum position the profiler can obtain in any mode. To define the **Position Low** limit, use the numeric keypad to enter the value and press Enter.
  - **Velocity Trip** sets the threshold for detecting an over rate condition. To define the **Velocity Trip**, use the numeric keypad to enter the value and press Enter.
  - **Track Error Trip** is a safety feature that aborts axis movement when the axis cannot follow a command within the specified Track Error Trip level. Generally the position error variable (x030) is specified as the **Track Variable**, but other appropriate variables may be specified. To define the **Track Error Trip**, use the numeric keypad to enter the value and press Enter.

NOTE: If an axis is configured for continuous rotation the **Position High** and **Position Low** variables must be set at a large number (> 10 x **Pos Full Scale Range**) or erratic axis motion may result. For limited rotation systems the **Position High** and **Position Low** variables should be set no greater than the limit of the axis motion.

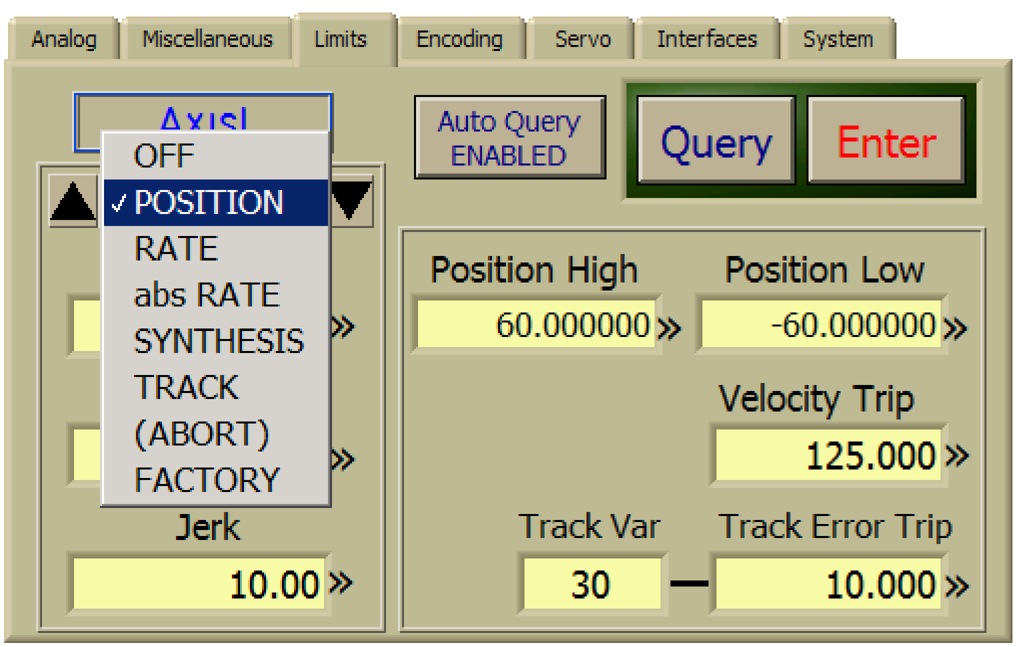


Figure 4-45 LIMITS Mode Selection

4.4.4.4 ENCODING Sub-Panel

The **ENCODING** Sub-Panel (see Figure 4-46) contains the controls for configuration of the encoding system. These should only be accessed by experienced users as erratic system behavior may result from improper settings. For a detailed description on encoding system configuration and calibration, see *TM-9377, Acutrol3000 Position Transducer Integration Procedure*.

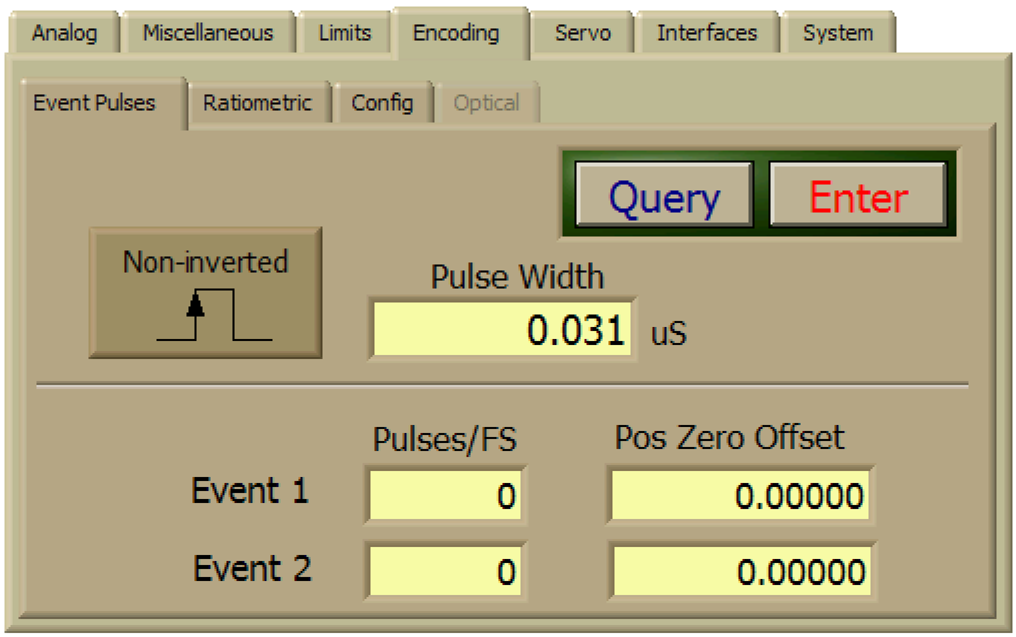


Figure 4-46 ENCODING Sub-Panel

4.4.4.4.1 EVENT PULSES

Event Pulses are high-resolution position synchronous pulses that are developed by the Acutrol3000. Two pulses are available per axis on the front panel of the Acutrol3000. Note that these pulses are asynchronous to the digital update rate, and that the maximum pulse rate can be no higher than the digital update rate.

Four parameters define the characteristics of the Event Pulses:

- **Pulses/FS** defines the number of pulses that will occur over the **Full Scale Position Range**. To define the **Pulses/FS**, use the numeric keypad to enter the value and press .

- **Pos Zero Offset** defines the width (in EU) from the axis zero position where the first pulse will occur. To define the **Pos Zero Offset**, use the numeric keypad to enter the value and press .

- **Pulse Width** defines the offset (in usec) of the Event Pulse. To define the **Pulse Width**, use the numeric keypad to enter the value and press Enter.

- The **Polarity** button defines the sense of the event pulses. Valid values are Non-inverted and Inverted. After selecting the polarity, press Enter.

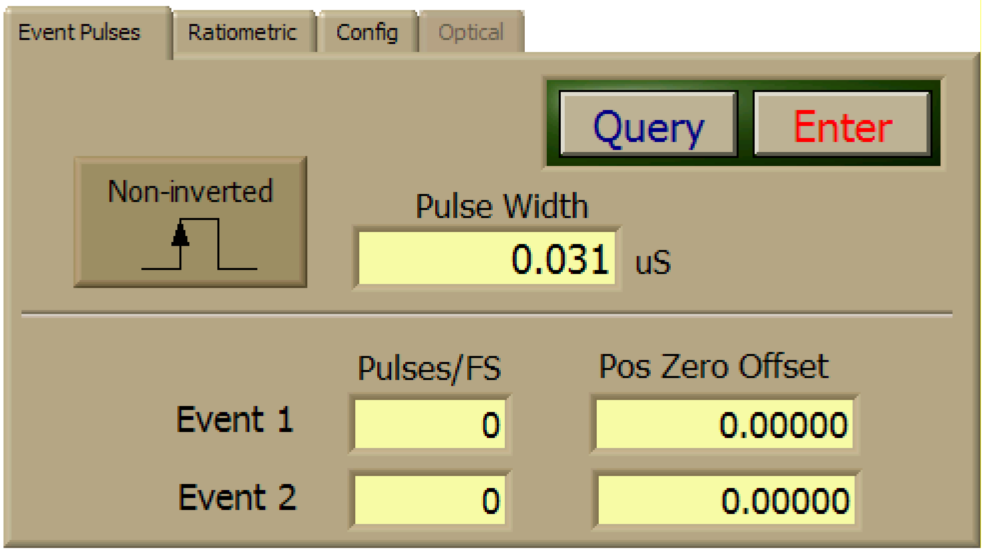


Figure 4-47 EVENT PULSES Configuration Sub-Panel

To cancel any pending operations, or to recall the current settings, press Query.

4.4.4.4.2 RATOMETRIC

The **RATIOMETRIC** Sub-Panel (see Figure 4-48) contains the controls for configuration and calibration of the coarse and fine encoding channels. These controls should only be accessed by experienced users as erratic system behavior may result from improper settings. For a detailed description see Section 4 of *TM-9377, Acutrol3000 Position Transducer Integration Procedure*.

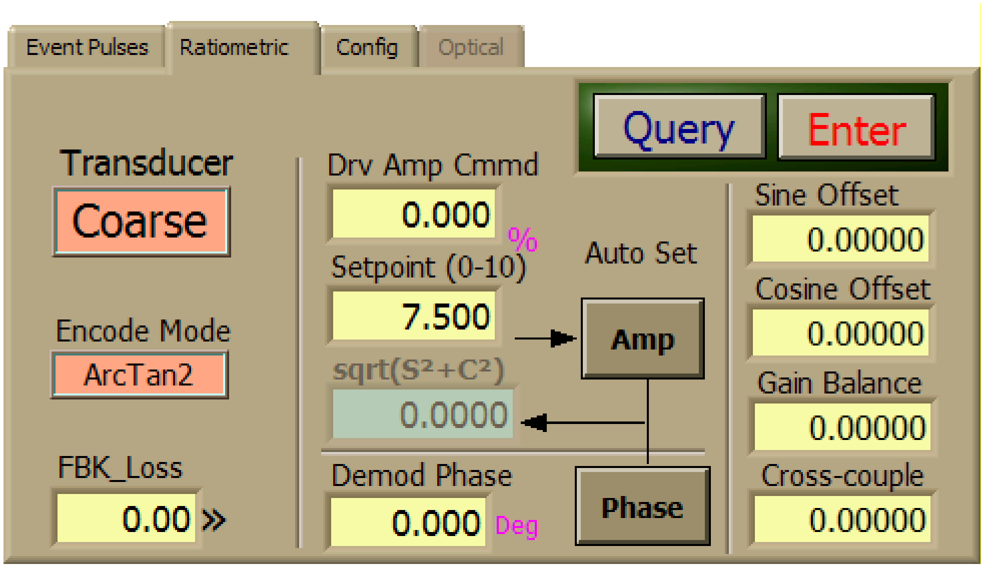


Figure 4-48 RATIOMETRIC Sub-Panel

4.4.4.4.3 CONFIG

The **CONFIG** Sub-Panel (see Figure 4-49) contains the controls for demodulation and calibration of the coarse and fine encoding channels, correlation of the coarse and fine encoding channels, and conditioning of the coarse and fine feedbacks. These controls should only be accessed by experienced users as erratic system behavior may result from improper settings. For a detailed description see Section 4 of *TM-9377, Acutrol3000 Position Transducer Integration Procedure*.

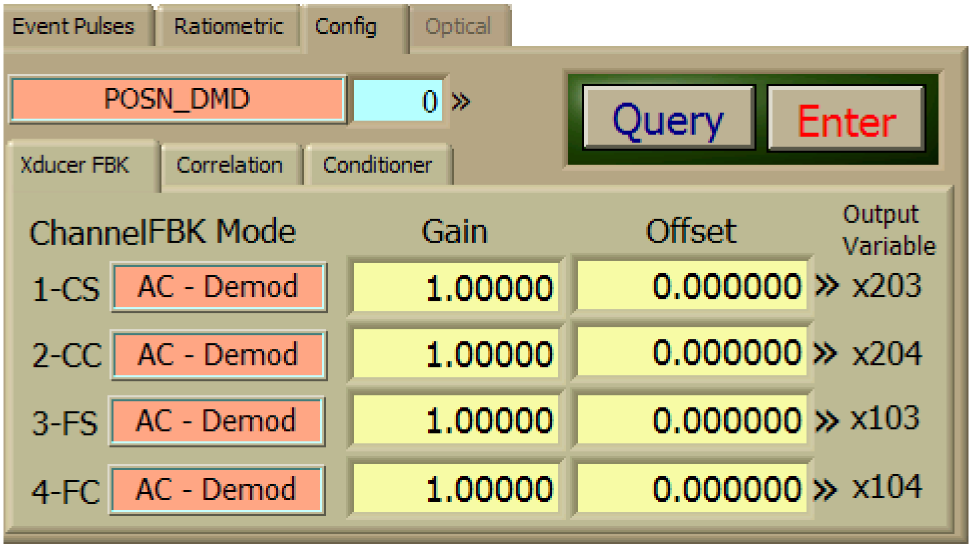


Figure 4-49 ENCODING Config Sub-Panel

4.4.4.4.3.1 XDUCER FBK

The **XDUCER FBK** Sub-Panel (see Figure 4-50) contains the controls for demodulation and calibration of the coarse and fine encoding channels. These controls should only be accessed by experienced users as erratic system behavior may result from improper settings. For a detailed description see Section 4 of *TM-9377, Acutrol3000 Position Transducer Integration Procedure*.

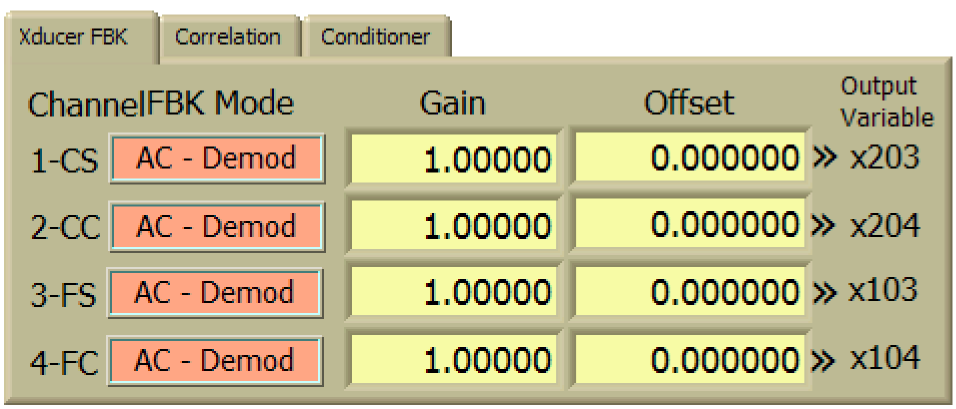


Figure 4-50 Xducer FBK Sub-Panel

4.4.4.4.3.2 CORRELATION

The **CORRELATION** Sub-Panel (see Figure 4-51) contains the controls for correlation of the coarse and fine encoding channels. These controls should only be accessed by experienced users as erratic system behavior may result from improper settings. For a detailed description see Section 4 of *TM-9377, Acutrol3000 Position Transducer Integration Procedure*.

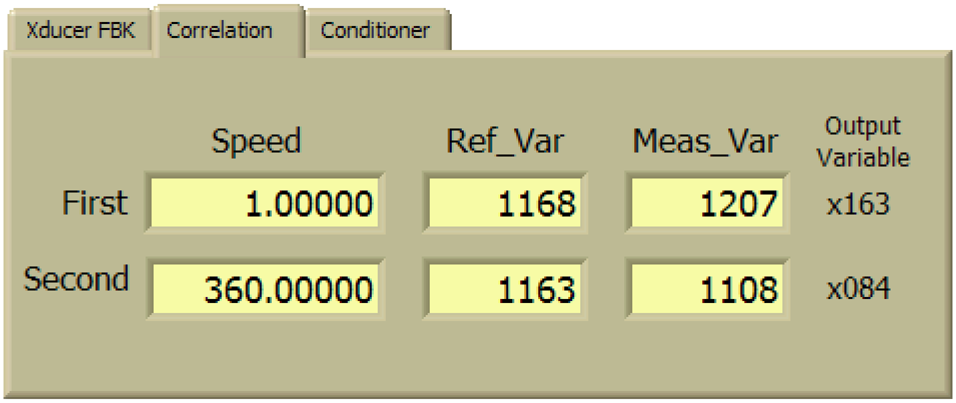


Figure 4-51 Correlation Sub-Panel

4.4.4.4.3.3 CONDITIONER

The **CONDITIONER** Sub-Panel (see Figure 4-52) contains the controls for conditioning of the coarse, factory, and user position feedbacks.

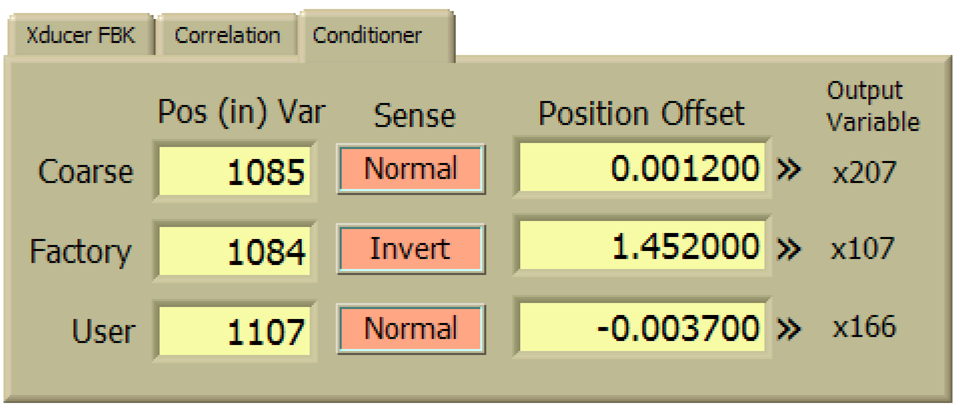


Figure 4-52 Conditioner Sub-Panel

The **Coarse** and **Factory** conditioners are set during integration and should not be changed or erratic system behavior can happen.

The **User** conditioner can be carefully modified by the experienced user. The **Sense** of the User Feedback can be changed by selecting either Normal or Invert. The **Position Offset** of the **User** conditioner can be modified to alter the zero point of an axis. Use the numeric keypad to enter the position offset and press Enter. For further instructions see Section 4 of *TM-9377, Acutrol3000 Position Transducer Integration Procedure*.

4.4.4.4.4 OPTICAL

The OPTICAL Sub-Panel (see Figure 4-53) is for use of the Acutrol3000 with optical encoders and is not active at this time.

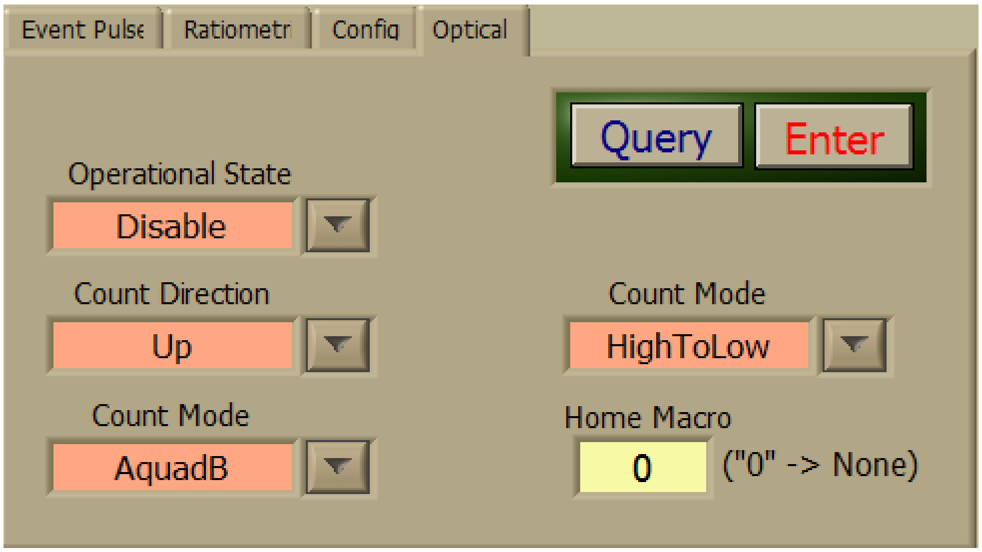


Figure 4-53 OPTICAL Encoder Configuration Sub-Panel

4.4.4.5 SERVO Sub-Panel

The **SERVO** Sub-Panel (see Figure 4-54) is used for configuration and optimization of the servo control. It is only for use in system integration and Acutronic should be consulted prior to making any changes.

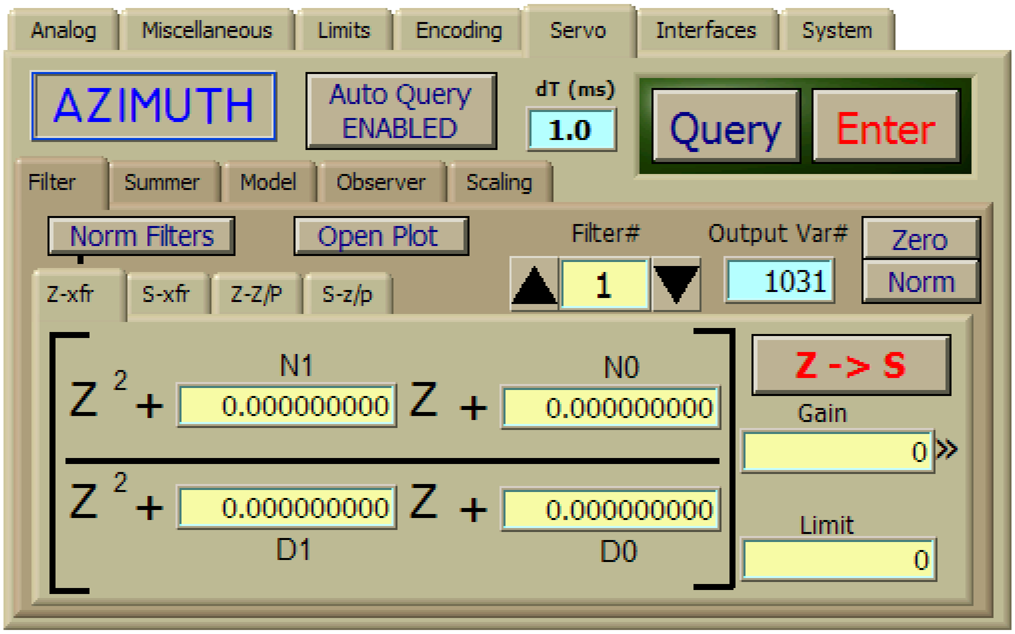
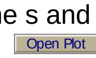


Figure 4-54 SERVO Sub-Panel

4.4.4.5.1 FILTER

The **FILTER** Sub-Panel (see Figure 4-55) is used for configuration of the digital filters. Coefficients can be entered directly as a z-domain or s-domain polynomial, and easily converted between the s and z domain. The response of the filter can be displayed by pressing the 

button.

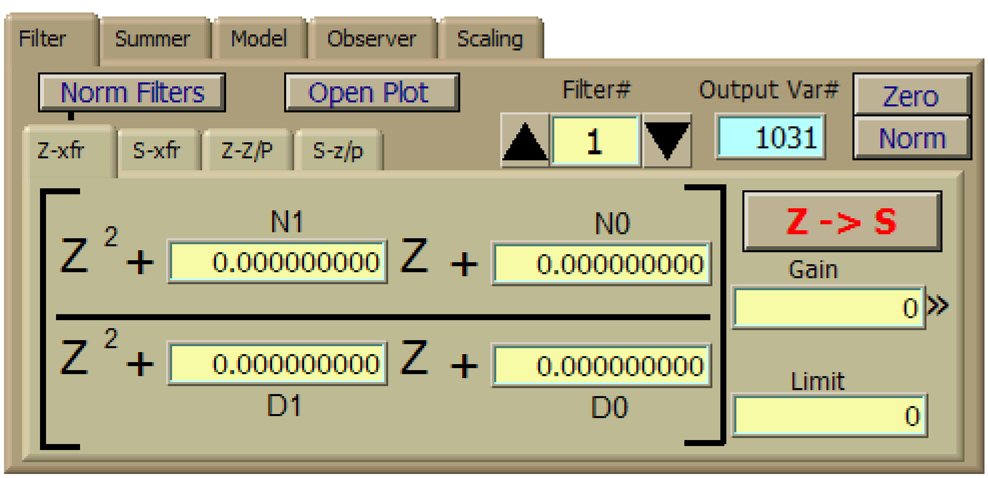


Figure 4-55 Filter Sub-Panel

4.4.4.5.2 SUMMER

The **SUMMER** Sub-Panel (see Figure 4-56) is used for configuration of the servo structure. The inputs to the summer define the connections of the digital filters. The **SUMMER** Sub-Panel is only for use in system integration and Acutronic should be consulted prior to making any changes.

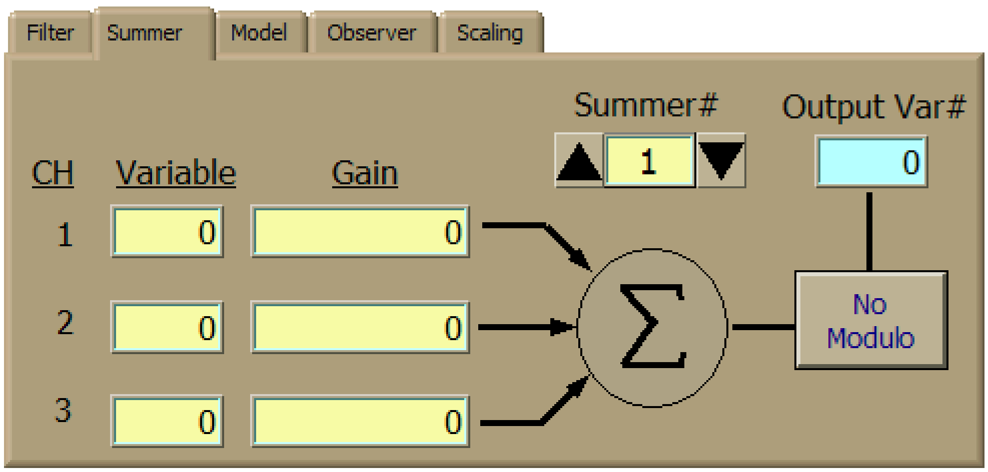


Figure 4-56 SUMMER Sub-Panel

4.4.4.5.3 MODEL

The **MODEL** Sub-Panel (see Figure 4-57) is used for configuration of the state observer. The inputs to the model define the configuration and initialization values of the observer. The **MODEL** Sub-Panel is only for use in system integration and Acutronic should be consulted prior to making any changes.

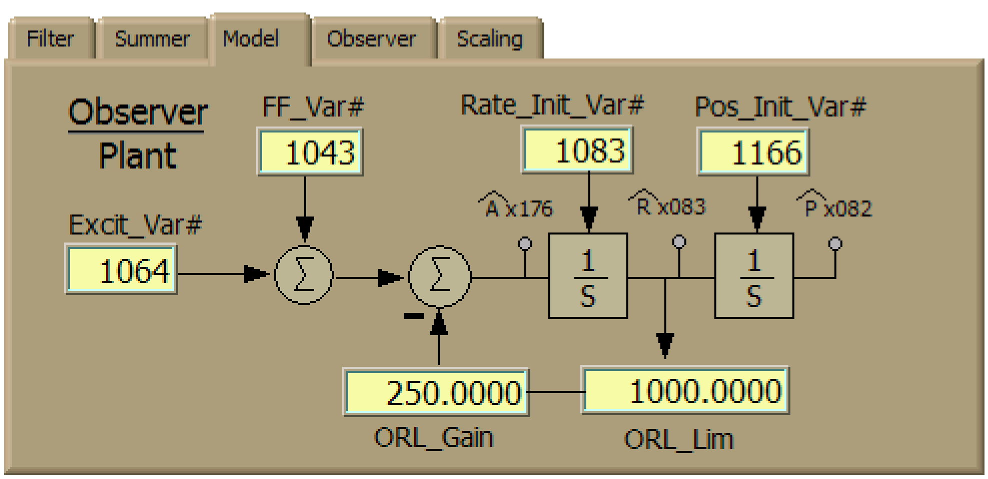


Figure 4-57 Plant MODEL Sub-Panel

4.4.4.5.4 OBSERVER

The **OBSERVER** Sub-Panel (see Figure 4-58) is used for configuration of the state observer controller. The **OBSERVER** Sub-Panel is only for use in system integration and Acutronic should be consulted prior to making any changes.

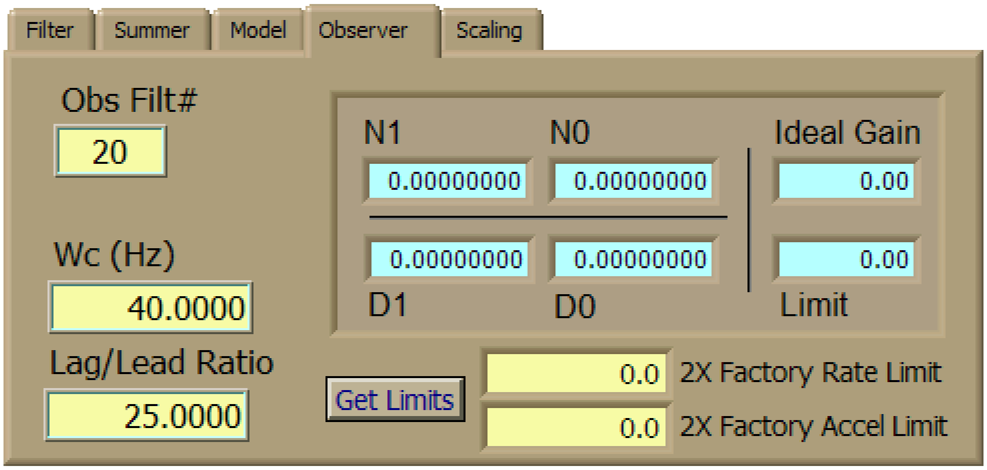


Figure 4-58 OBSERVER Sub-Panel

4.4.4.5.5 SCALING

The **SCALING** Sub-Panel (see Figure 4-59) is used for configuration of the plant normalization parameters. The **SCALING** Sub-Panel is only for use in system integration and Acutronic should be consulted prior to making any changes.

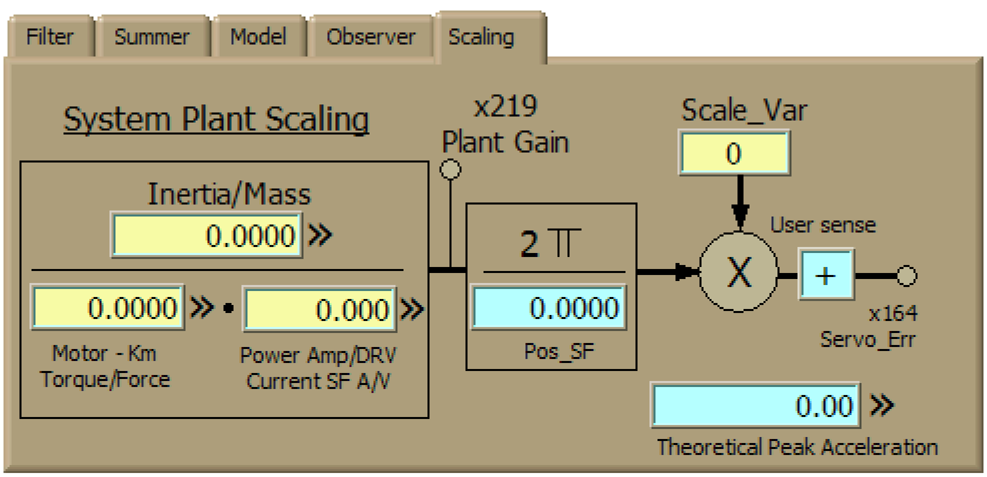


Figure 4-59 Plant SCALING Sub-Panel

4.4.4.6 INTERFACES Sub-Panel

4.4.4.6.1 LOCAL

The LOCAL Sub-Panel (see Figure 4-60) configures the communication between the GUI computer and the RT computer. This is configured during system integration and should never be changed or loss of system control may result.

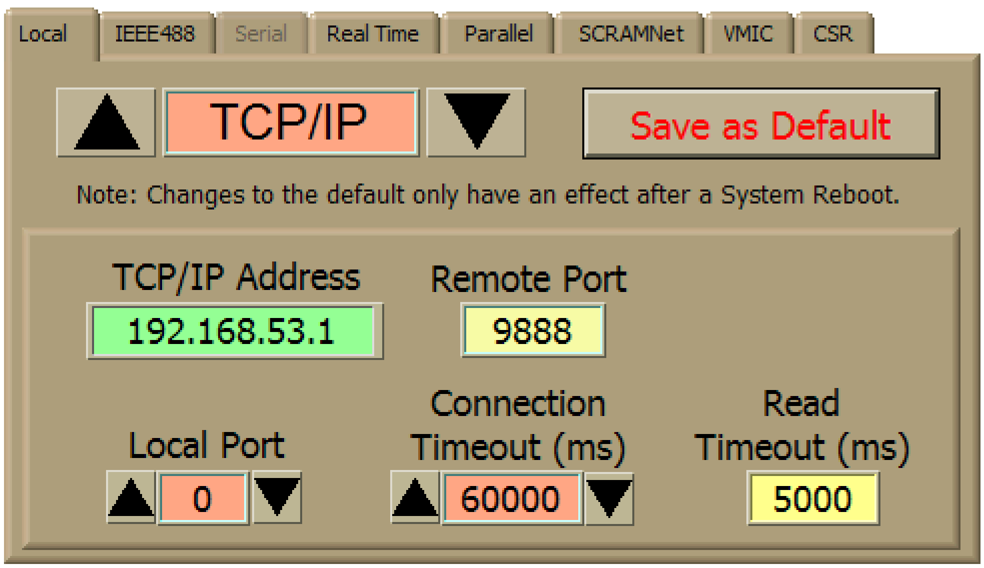


Figure 4-60 GUI Communications Configuration Sub-Panel

4.4.4.6.2 IEEE488

The IEEE488 Sub-Panel (see Figure 4-61) is used to configure the IEEE-488 ACL interface.

- To define the **IEEE488 Address**, use the numeric keypad to enter the address and press Enter.
- To enable the HS488 protocol on the Acutrol3000, select YES from the **High Speed Device** pickbox and press Enter.
- To make any changes permanent, the system configuration must be saved. See Section 4.4.4.7.3.
- To cancel any pending operations, or to recall the current settings, press Query.

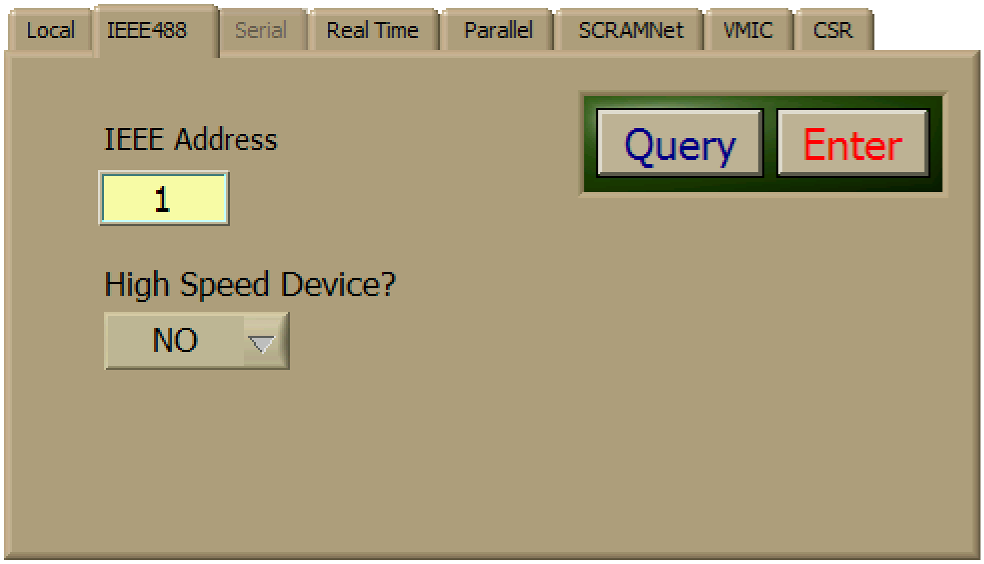


Figure 4-61 IEEE488 Communications Configuration Sub-Panel

4.4.4.6.3 SERIAL

The **SERIAL** Sub-Panel is for future expansion and is not currently used.

4.4.4.6.4 REAL TIME

The **Real Time** Sub-Panel (see Figure 4-62) is used to define the behavior of the real time communication algorithms. The settings of the **Real Time** algorithms are beyond the scope of this manual. See *TM-9374, Acutrol3000 Real Time Data Communications, Technical Manual* for detailed instructions.

Figure 4-62 Real Time Configuration Sub-Panel

4.4.4.6.5 PARALLEL

The **PARALLEL** Sub-Panel (Figure 4-63) is used to define the behavior of the 16-bit parallel real time interface. The settings of the parallel interface are beyond the scope of this manual. See *TM-9374, Acutrol3000 Real Time Data Communications, Technical Manual* for detailed instructions.

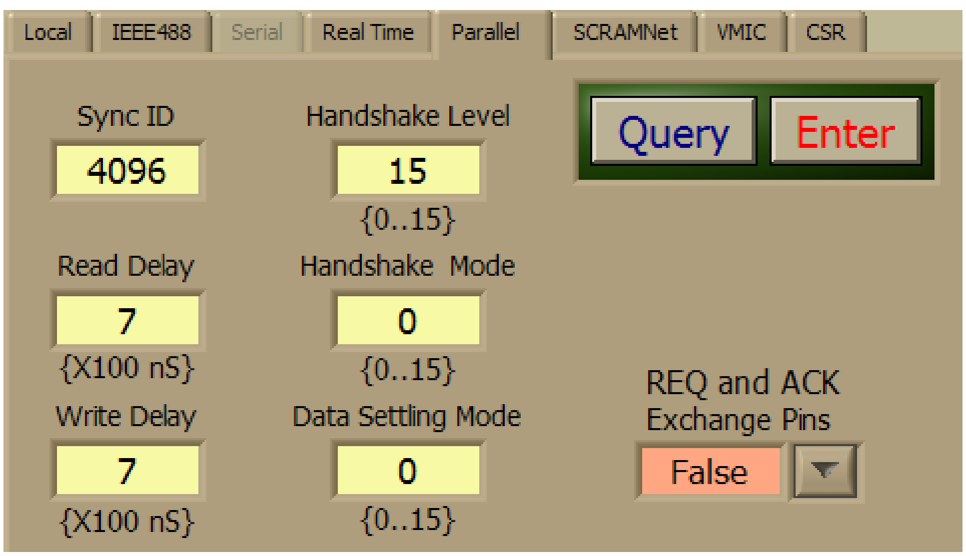


Figure 4-63 Parallel Interface Configuration Sub-Panel

4.4.4.6.6 SCRAMNET

The **SCRAMNet** Sub-Panel (Figure 4-64) is used to define the behavior of the SCRAMNet+ reflective memory interface. The settings of the SCRAMNet+ interface are beyond the scope of this manual. See *TM-9374, Acutrol3000 Real Time Data Communications, Technical Manual* for detailed instructions.

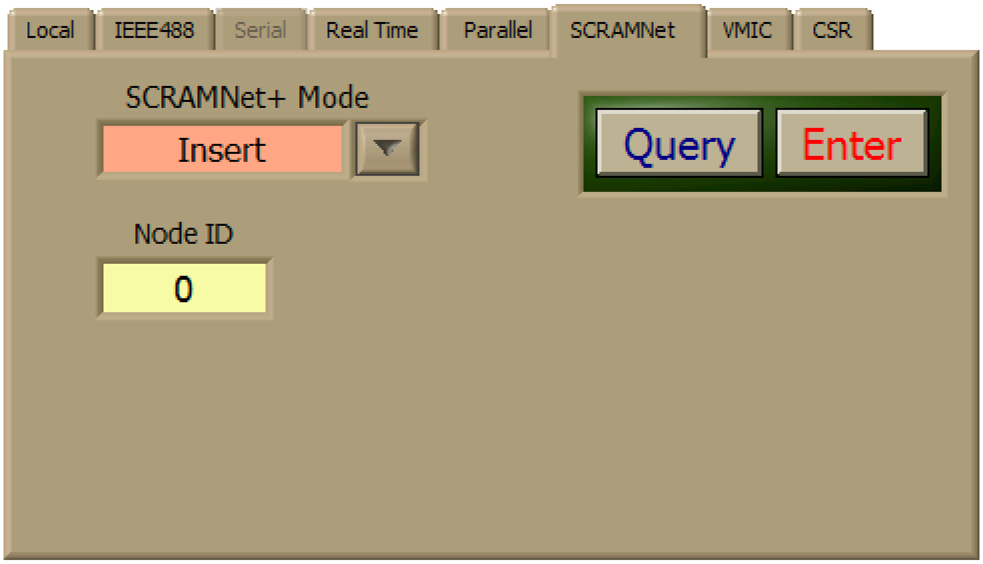


Figure 4-64 SCRAMNet Interface Sub-Panel

4.4.4.6.7 VMIC

The **VMIC** Sub-Panel (Figure 4-65) is used to define the behavior of the VMIC reflective memory interface. The settings of the VMIC interface are beyond the scope of this manual. See *TM-9374, Acutrol3000 Real Time Data Communications, Technical Manual* for detailed instructions.

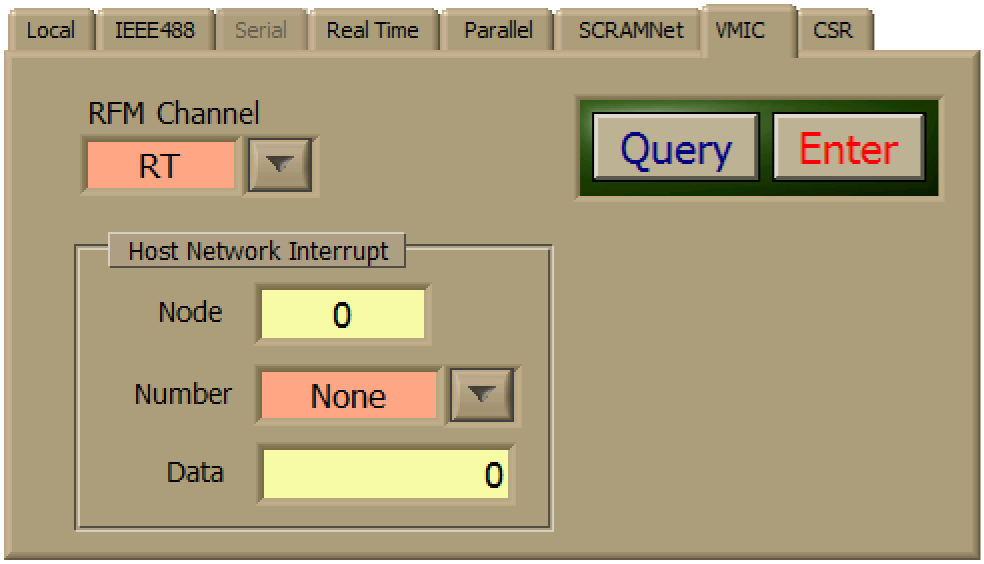


Figure 4-65 VMIC Configuration Sub-Panel

4.4.4.6.8 CSR

The **CSR** Sub-Panel (Figure 4-66) is used to monitor the Control/Status registers of the SCRAMNet reflective memory interface. The interpretation of the Control/Status registers are beyond the scope of this manual. See *TM-9374, Acutrol3000 Real Time Data Communications, Technical Manual* for detailed instructions.

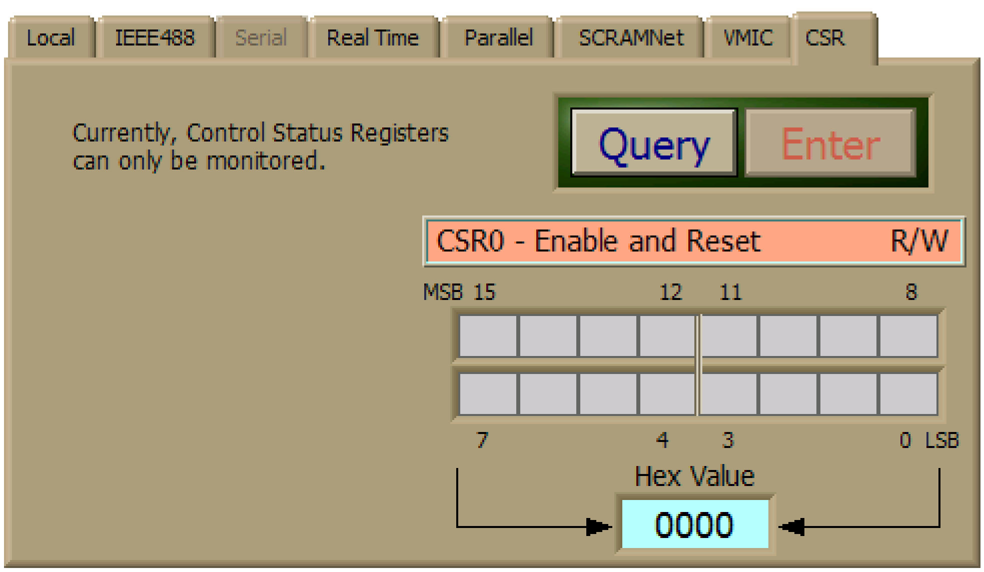


Figure 4-66 CSR Sub-Panel

4.4.4.7 SYSTEM Sub-Panel

The **SYSTEM** Sub-Panel (see Figure 4-67) is used for setting the security level of the GUI, configuration of system timing, and management of the controller configuration files. These panels are only intended for advanced users and Acutronic should be consulted prior to making any changes.

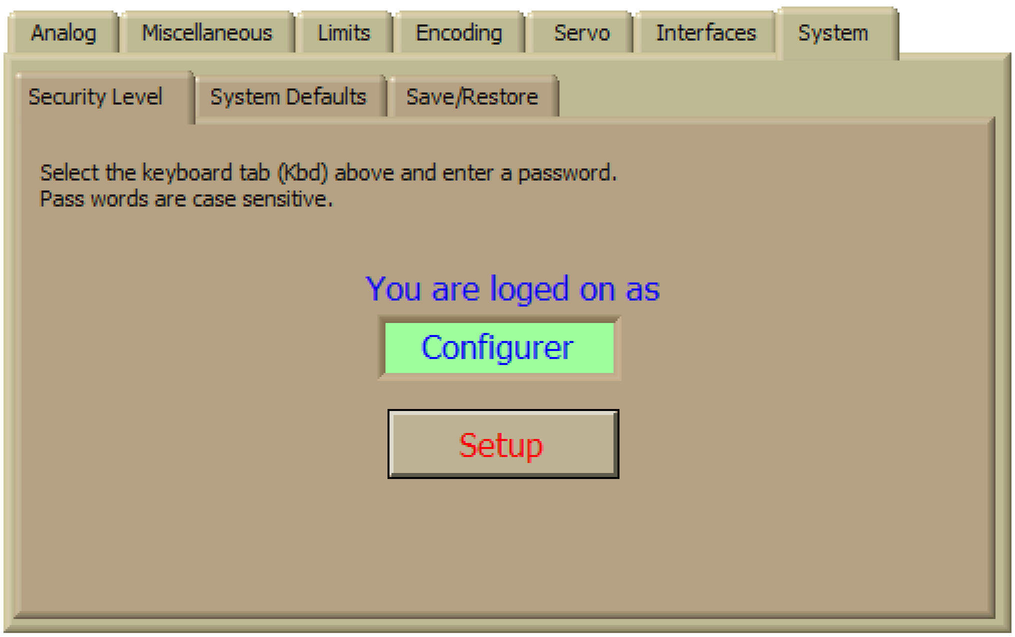


Figure 4-67 SYSTEM Sub-Panel

4.4.4.7.1 SECURITY LEVEL

The **SECURITY LEVEL** Sub-Panel (see Figure 4-68) is used for setting the security level of the GUI. The **SECURITY LEVEL** Sub-Panel is only for use in system integration and Acutronic should be consulted prior to making any changes.

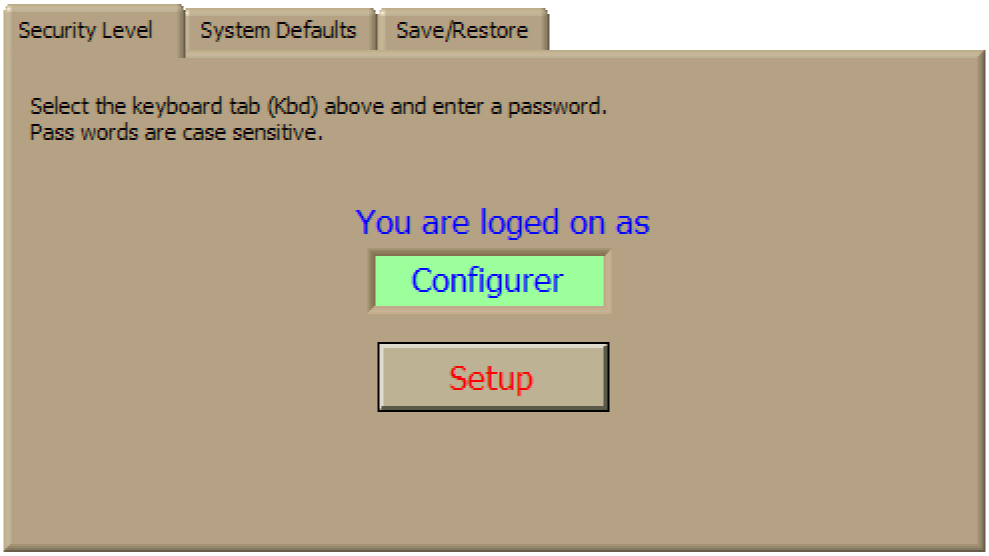


Figure 4-68 Security Level Sub-Panel

4.4.4.7.2 SYSTEM DEFAULTS

The **SYSTEM DEFAULTS** Sub-Panel (see Figure 4-69) is used for configuration of the system timing and other miscellaneous parameters. The **SYSTEM DEFAULTS** Sub-Panel is only for use in system integration and Acutronic should be consulted prior to making any changes.

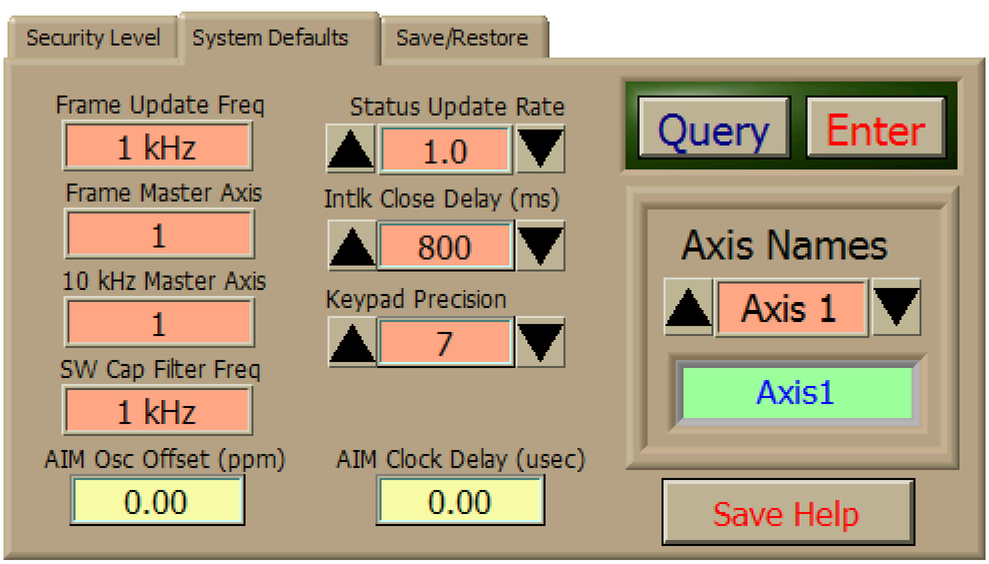


Figure 4-69 System Defaults Sub-Panel

4.4.4.7.3 SAVE/RESTORE

The **SAVE/RESTORE** Sub-Panel (see Figure 4-70) is used to Save and Restore Global System configuration.

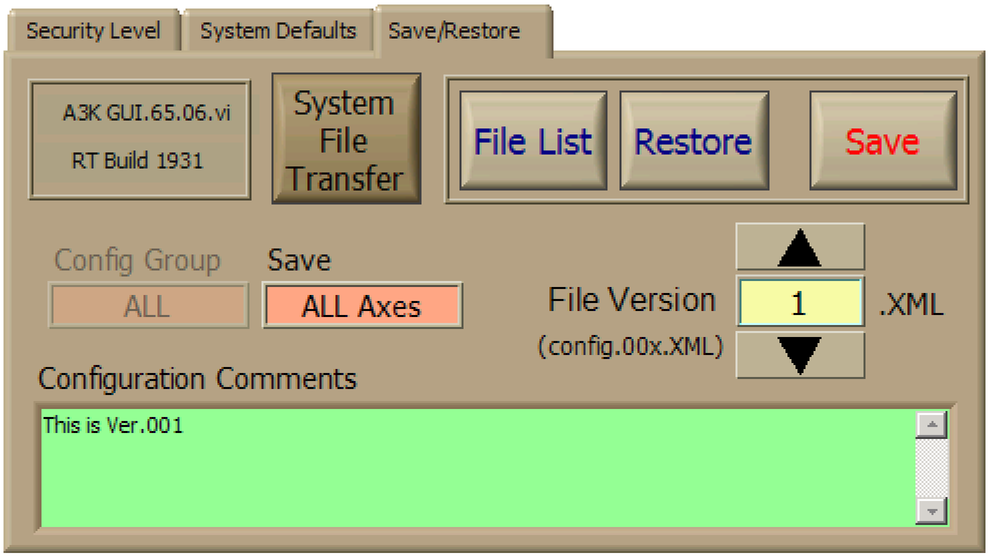


Figure 4-70 SAVE/RESTORE Sub-Panel

The Global Parameters are stored in two XML Files on the RT-Computer. System Parameters are stored in the system.xml File. These are all parameters that are axis independent such as Axis Names, System Default configuration, and Interface configuration.

Axis dependent parameters are stored in the config.xml File. These are data such as Servo settings, encoder settings, and limits.

The **Save** pickbox allows the user to select between saving ALL Axes, Selected Axis or System. Selected Axis saves the parameters of the selected Axis only. System saves axis independent parameters to the system.xml file.

Through the **Configuration Comments** field, a comment can be given to the saved file. Use the Kbd display panel to enter comment, and press the green comment field.

File Version allows the user to give a number to the file to be Saved or Restored. Select the desired XML file number before hitting the Save or Restore button.

Press File List to display the list of the stored configuration files.

To Save a File, enter the comment if necessary, select the XML File Version, select the Selected Axis or System from the **Save** pickbox and press the Save button.

To Restore parameters from a saved file, select the desired XML File version, the **Axis** and press Restore. The current controller settings will be overwritten with the settings from the restored file.

The **Save/Restore** Sub-Panel also shows the current RT and GUI Interface Software versions.

4.4.4.7.3.1 SYSTEM FILE TRANSFER

The **System File Transfer** Sub-Panel (see Figure 4-71) allows the user to backup system configuration of the RT Computer as well as GUI computer to an external memory device such as a USB Flash Drive for archival storage.

The **System File Transfer** Sub-Panel can be accessed from the **Save/Restore** Sub-Panel by pushing the System File Transfer button.

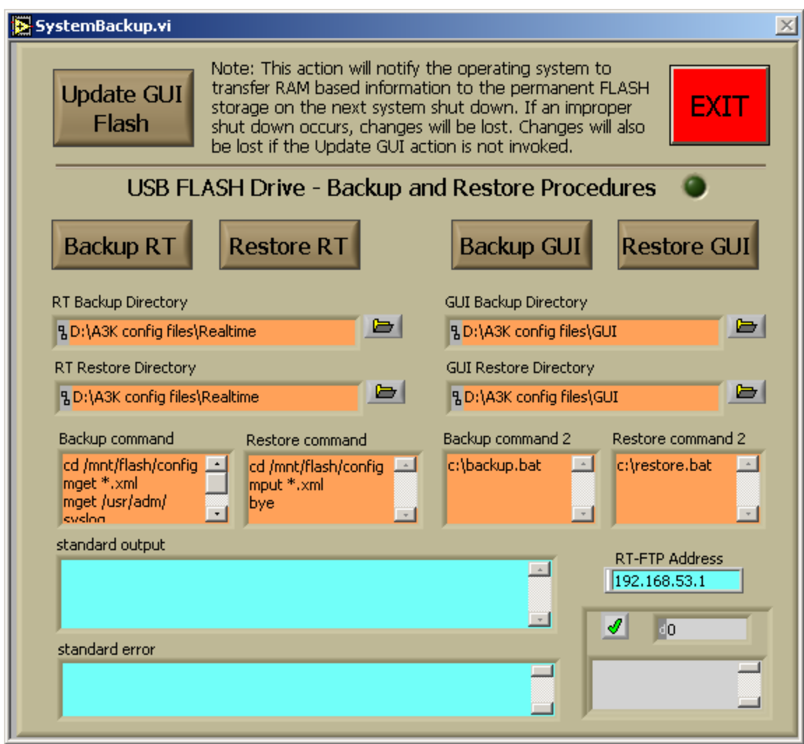
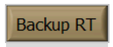
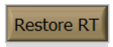


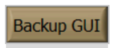
Figure 4-71 SYSTEM FILE TRANSFER Sub-Panel



transfers all the configuration data from the RT-Computer to the Location defined in the **RT Backup Directory** which by default is a USB Flash Drive that is inserted into the USB connector on the front panel of the Acutrol.



restores the configuration data from the **RT Restore Directory** which by default is the USB Flash Drive. Restoring data overwrites the data stored on the RT computer.



and 

backup and restores the GUI Computer configuration to or from the selected location which by default is the USB Flash drive.

has to be pushed when data stored in the GUI Computer such as Readout configurations, Help Text, or Macros have changed. Once the User Interface shuts down, the changed data is stored on to the GUI Computers Compact Flash memory drive to be available at the next system startup.

4.4.5 MACRO Panel

The **MACRO** Panel (see Figure 4-72) provides a method for programming a sequence of commands than can be saved, loaded at some future time and executed. The ACL (Acutrol Command Language) script used in MACROS is the same protocol used in all the remote interfaces. This allows MACROS to be useful to test and debug programs before trying them over the communication interfaces.

NOTE: Through ACL commands you have the potential to make changes to the system that might otherwise be blocked or range protected. Please use caution when issuing ACL commands

Refer to *TM-8004 Acutrol3000 Command Language (ACL) Programming Manua*l for command line details, syntax, and programming assistance.

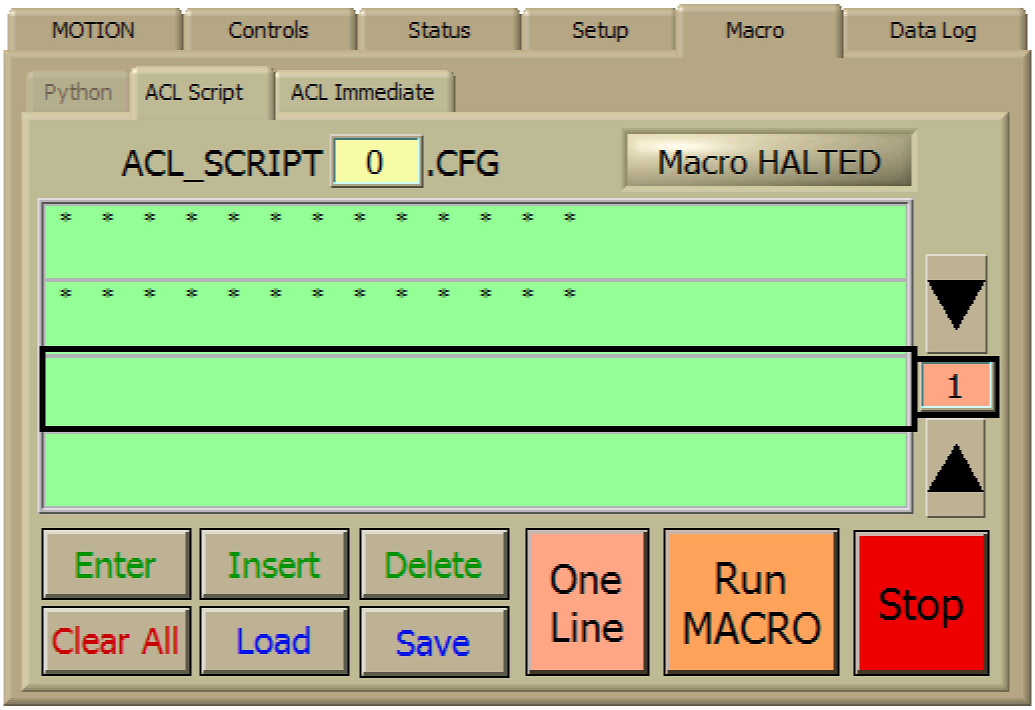


Figure 4-72 MACRO Panel

The **ACL Immediate** Sub-Panel allows the user to send an ACL command directly to the RT-Computer. The **ACL Script** Sub-Panel allows the user to create a MACRO with a sequence of ACL Commands and send the sequence to the RT Computer step by step.

4.4.5.1 PYTHON

This screen reserves future functionality for the GUI and has not yet been implemented.

4.4.5.2 ACL SCRIPT

For the MACRO language script generation, all ACL commands defined in the *TM-8004 ACL Programming Manual* can be used. In addition to that, the following instructions are also possible:

Instruction	**Description**
%abc	Adds the comment ” abc” to the Macro
Delay 15	Waits for 15 Seconds
Repeat	Causes the entire macro to be repeated from the beginning until the STOP button is pushed

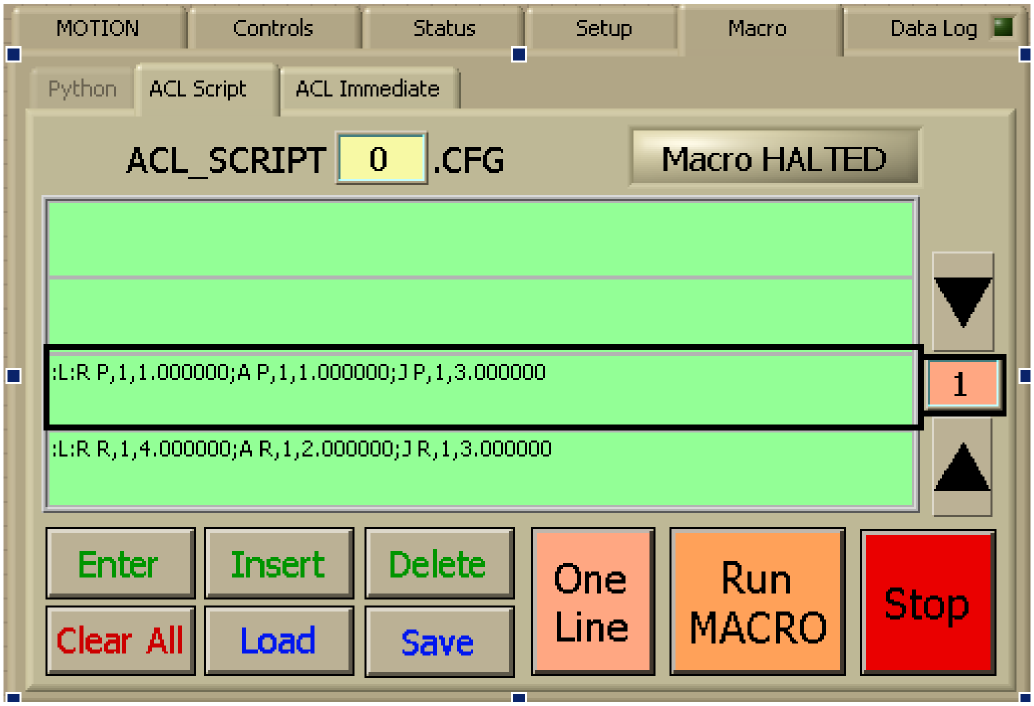


Figure 4-73 ACL Script Sub-Panel

To enter a Macro, use the Kbd of the Readout Panel. Type in the Command and hit the Enter button. It is also possible to use a keyboard which is connected to the GUI Computer.

Run MACRO executes the whole MACRO from beginning to end. When a MACRO is running a " MACRO Running" window pops up and stays on top of the screen to remind the operator that a MACRO is being executed. Touching this window will cause the MACRO to halt execution.

One Line executes the command in the black framed line.

Press Stop to halt execution of a MACRO.

The Number field at the **ACL_SCRIPT 0.CFG** defines the MACRO Number which is being used for Saving and Restoring Macros.

4.4.5.3 ACL IMMEDIATE

The ACL IMMEDIATE Sub-Panel (see Figure 4-74) gives the operator a means to send any ACL command to the Acutrol3000 RT computer and display the corresponding response. Illegal or syntactically incorrect commands will result in an error and subsequently a trip to the **GUI STATUS** Operator Interface Error panel. Clearing the error will allow the user to return to this panel, view the response message, and correct the command to try again.

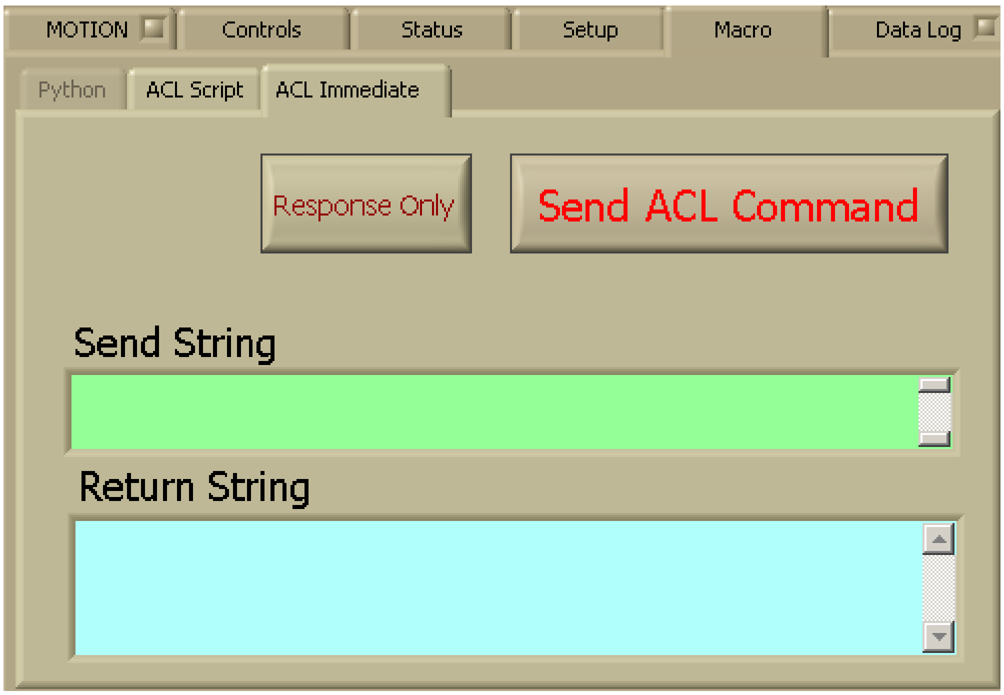


Figure 4-74 ACL Immediate Sub-Panel

4.4.6 DATALOG Panel

All variables that can be displayed in the readout windows can also be logged and analyzed with the Acutrol3000. There are two different ways of doing data logging: Readout logging and Real Time data logging.

Readout data logging is a simple type of data logging. It simply plots the selected readout values of the User Interface onto a graph. The logging is done only in the User Interface and gets updated at a maximum rate of the readout window update. See Section 4.4.6.7.

Real Time Data logging is done in the RT System and can be done as fast as one sample per RT Frame. There are different channels to which variables can be assigned to for the data logging. This logging can be used for simply logging one variable up to using multiple data variables for an FFT Analysis of the System. See Sections 4.4.6.1 - 4.4.6.6.

4.4.6.1 CONFIGURE

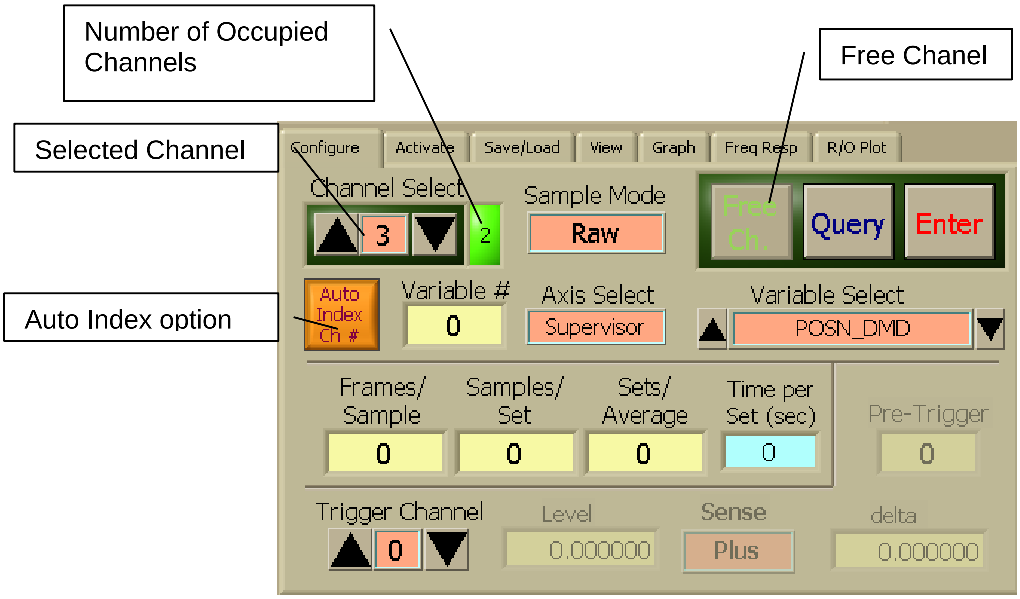
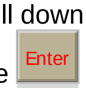


Figure 4-75 Configure Datalogging Sub-Panel

There are 32 channels available that can be used for data logging. To assign a variable to a channel, select the variable and axis through the pull down menus or enter it in to the **Variable #** field. Confirm the selection with the  Button.

The  can be used to automatically jump to the next channel, once  has been pressed.

Sample Mode can be selected between:

Raw (Default)	Use this option to have each data set overwrite the previous value
Average	Use this option to take multiple data sets and record the average of each sample value.
Min	Use this option to take multiple data sets and record the minimum value (on an absolute value basis) of each sample.
Max	Use this option to take multiple data sets and record the maximum value (on an absolute value basis) of each sample.

Frame / Sample defines on which frame interval a sample is logged. (e.g. 1 means sample every frame, 2 means sample every other frame, 3 every 3 rd frame, etc.)

Samples / Set sets the number of samples to be taken

Sets/ Average defines the number of data sets to acquire.

A trigger can be used to start the Data logging process. The **Trigger Channel** can be set to any channel that has been defined for data logging. The **Level** defines the trigger threshold level that is being monitored. Once the value of the Channel crosses the threshold, the data logging starts. Either a positive or negative slope can be defined with the **Sense**.

Delta is the amount that **Level** should be changed at the end of each data set, if not pre-triggering (i.e., **Pre-Trigger** equals 0). In other words, the first data set is triggered when the channel variable's value passes through **Level**, the second set when the value passes through **Level** + **Delta**, …, the nth set when the value passes through “**Level**” + n*” **Delta**”.

Pre-Trigger allows the user to set the number of samples that are logged before the trigger occurs.

4.4.6.2 ACTIVATE

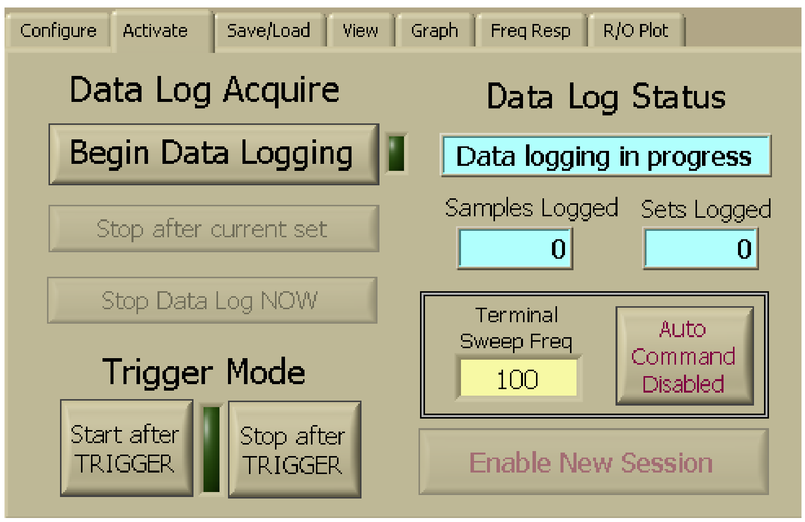


Figure 4-76 ACTIVATE Sub-Panel

To start Data logging Begin Data Logging has to be pressed for a manual start.

For a Trigger start, the Start after TRIGGER is used.

The Data logging can be stopped at any time during the logging process by pressing Stop Data Log NOW (immediate stop) or Stop after current set (stops when the current set is finished).

After a session is completed and a new session wants to be logged, enable a new session with the Enable New Session button.

When using the data logging for Frequency sweep (e.g. for Bandwidth measurements) there is an additional feature that makes the Frequency sweep easier. First set up the axis in Synthesis mode with interlock closed and the frequency and amplitude demand set to the starting value. Then activate the 

and set the **Terminal Sweep Frequency** that the sweep needs to achieve. Once 

is pressed, the Acutrol will automatically sweep up to the set **Terminal Sweep Frequency** and then switch to Position Mode.

4.4.6.3 SAVE/LOAD

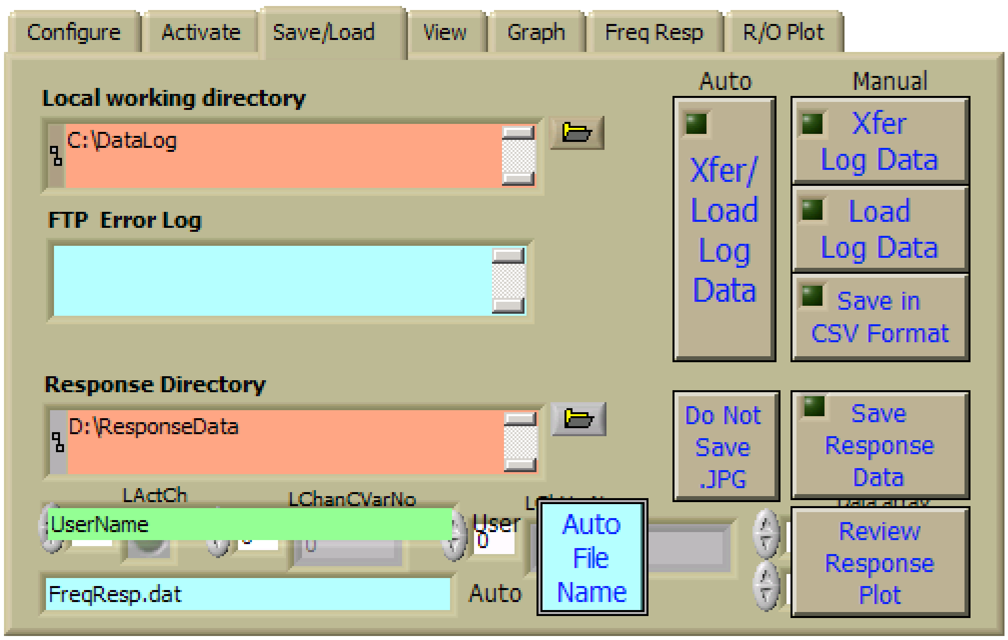
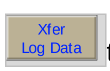
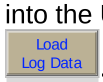


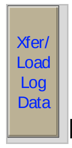
Figure 4-77 Save/Load Datalog Sub-Panel

After the Data logging has been completed, the dataset needs to be transferred from the RT Computer to the GUI Computer in order to display the results.



transfers the Log file from the RT to the GUI Computer (file transfer only). The green light indicates that the transfer is in progress. To load the data into the User Interface for display and analysis it has to be loaded with the 

. With this same button a previous saved Data Set can be loaded if needed. The Log.dat file always has the same name when it is transferred to the User Interface. If the previous dataset has to be available for later analysis, it has to be renamed. (in the Explorer which opens when loading a data set)

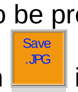
The 

button combines the Save and Load function from above.

The 

button will save the data from the datalog file into a comma separated value (.csv) file.

Frequency response data can be saved on a USB Flash by pressing 

. (a USB Flash has to be present in the USB connector on the front panel of the Acutrol3000). When 

is selected then a JPEG image and the data points are stored.

4.4.6.4 VIEW

The VIEW Sub-Panel (see Figure 4-78) allows the user to look at the logged data points in a table.

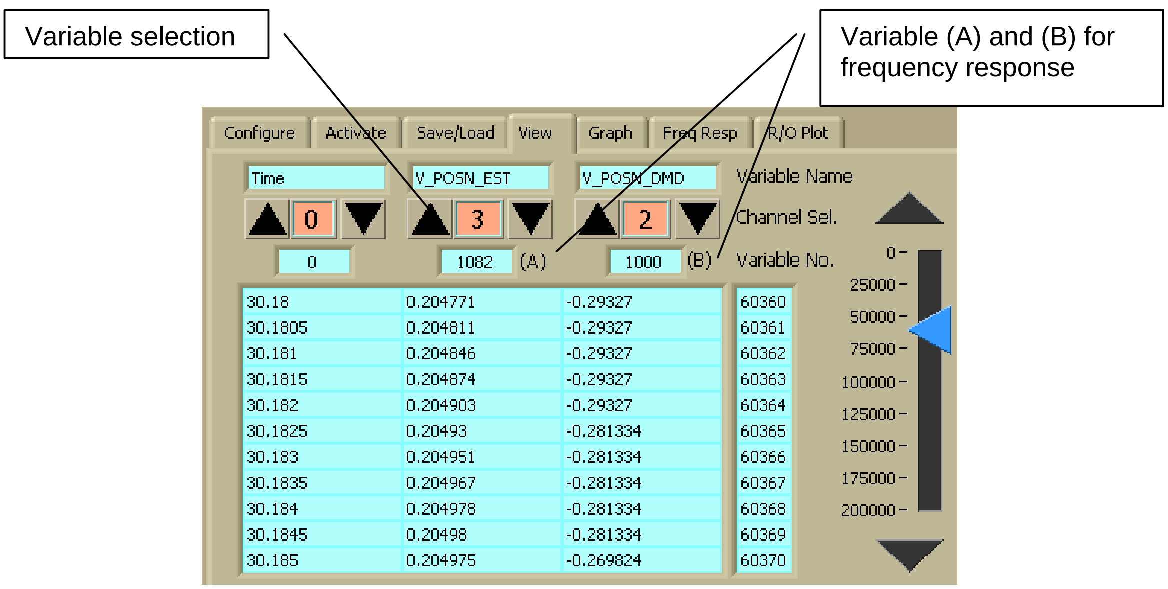


Figure 4-78 VIEW Sub-Panel

With the Variable selections controls and the slider on the right, all the logged data can be viewed.

4.4.6.5 GRAPH

The Graph Sub-Panel (see Figure 4-79) allows the user to look at the logged data. It works similar to the R/O Plot Graph.

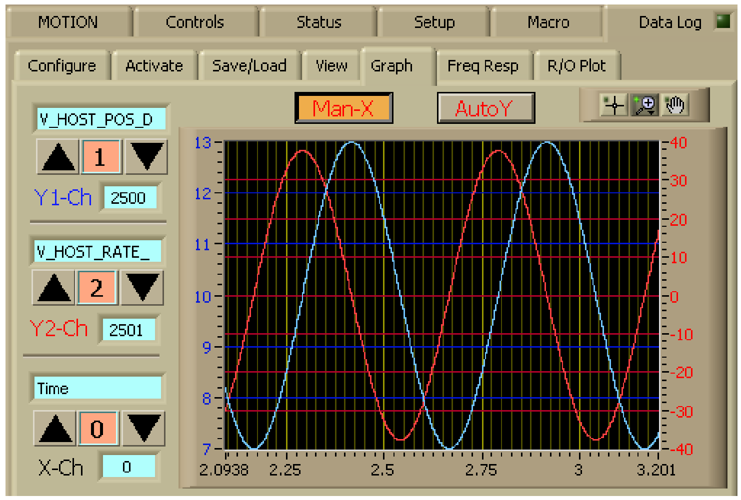


Figure 4-79 GRAPH Sub-Panel

4.4.6.6 FREQ RESPONSE

Frequency response calculates and displays the Frequency Response of two variables. The variables are defined in the [View] tab as (A) and (B), and the response curve displays the result of B/A. In addition to the various zoom functions, a cursor can be set to read out frequency, gain or phase data. See *TM-9392, Measuring Frequency Responses on the Acutrol3000, Technical Manual* for more detailed information on using the Acutrol3000 to obtain axis or UUT frequency response measurements.

4.4.6.7 R/O PLOT

The following Plot Modes are available for the R/O Plot:

Plot Mode	Description
1 Plot x Time	Plots one Readout (y) versus Time (x)
2 Plots x Time	Plots two Readout (y) versus Time (x)
Scatter Plot1	Plots Readout Select #1 (y) versus Readout Selection # 2 (x). Points are connected with lines
Scatter Plot2	Plots Readout Select #1 (y) versus Readout Selection # 2 (x). Points are **not** connected with lines.

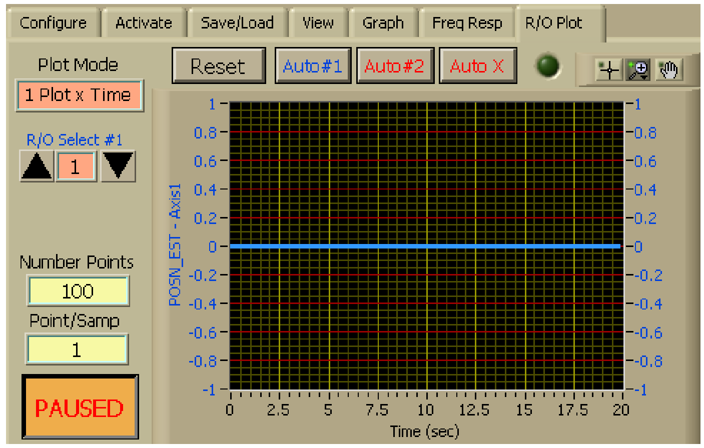


Figure 4-80 R/O PLOT Sub-Panel

- Select the Readout Number(s) that needs to be logged.
- Set the **Number of Points** that should to be displayed on the screen.
- The update rate can be modified by changing the Update Frame/s parameter located on the **CONFIG** Panel of the Display Selection Toolbar.
- The **Points/Samp** represents the interval at which the sampling is done. A 5 Point/Samp means that one sample is logged every 5 GUI Readout updates.
- Use the **Pause** Button to start and stop the Sampling.

4.4.6.8 Zoom Operation

The Graph Display has various Zoom options.

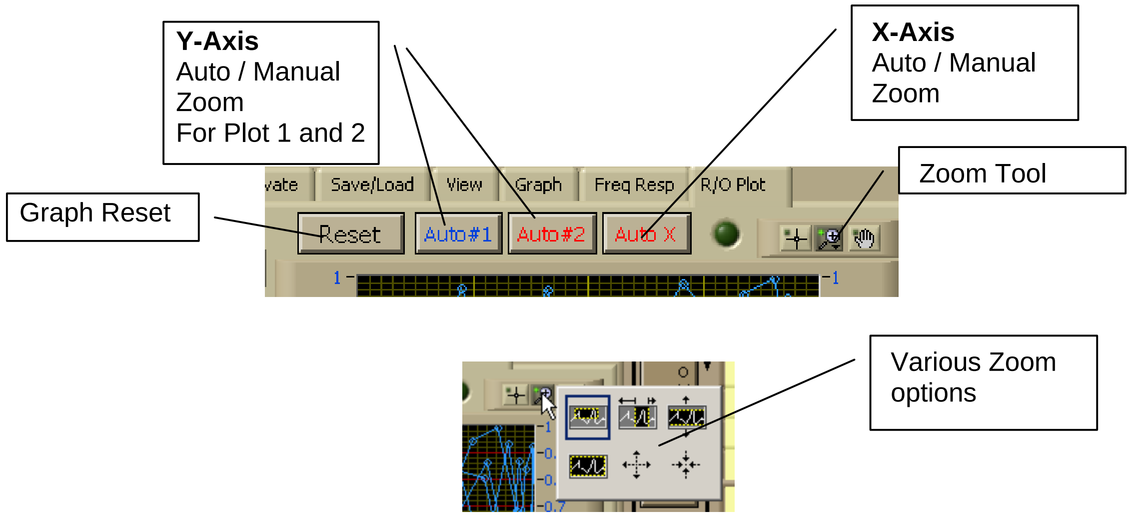


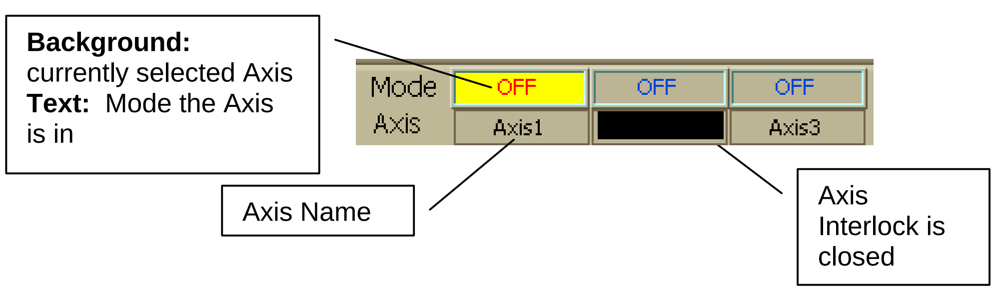
Figure 4-81 Graph Zoom Options

With **Auto#1** and **Auto#2** set the **Y-Axis** is automatically adjusted so that all points fit. When turned to manual (**Man#1** and **Man#2**) the zoom can be done individually with the various zoom options of the “Zoom Tool”.

In **X-Axis**, the **Auto X** is being used to switch between Automatic and Manual Zoom.

4.5 The Axis Selection and Mode Display Toolbar

Selection of the Axis can be done in the “Axis Select and Status Bar”” at the bottom of the User Interface. Through touching of the Axis Name field, the selection (yellow color) moves to the new axis.



4.6 The Numeric Data Input Panel and Status Display

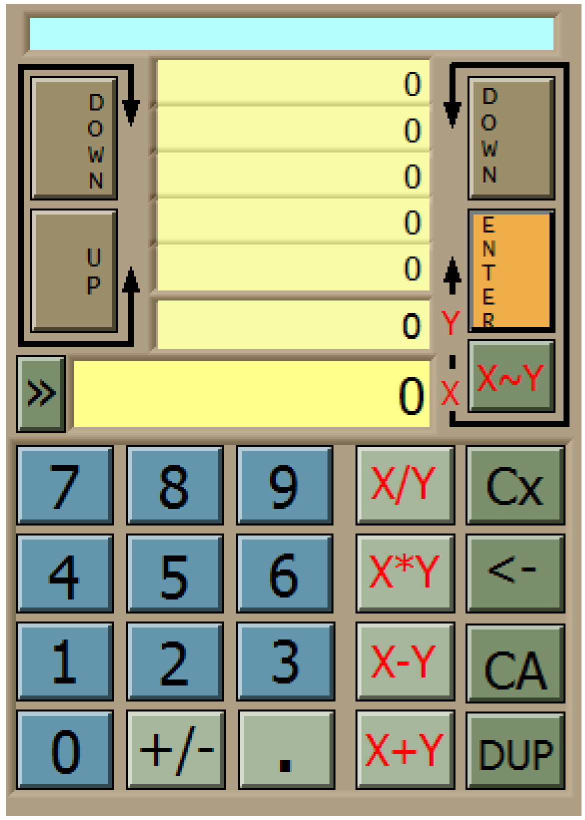


Figure 4-82 Numeric Data Input Panel

The Numeric Data Input Panel is used for entry of all numerical data. Additionally, math operations as defined by the keypad can be used to modify the data or perform calculations. The text window at the top of the keypad is used to provide feedback to the user on status the system.