SECTION 4 - THE DELTA DRIVE MENU

The Delta Driver is an integral component of the DeltaMax. In this configuration the built in keypad and display of the Delta Drive can be used to monitor and display various drive settings and parameters.

The easy to use menu scheme allows the user to:

- Review drive settings
- Monitor key parameters

The driver's keypad and display are shown in **Figure 4.1**. The functions are as follows:

- **LED DISPLAY** is a 5-digit unit that displays coded messages, alarms and parameter values. Messages are displayed in coded bit patterns, hexadecimal, decimal and coded letters.
- **UP-ARROW** is used to navigate around the minor menu loops, to increase the value of a parameter and in combination with other keys for special functions.
- **DOWN-ARROW** is used to navigate around the minor menu loops, to decrease the value of a parameter and in combination with other keys for special functions.
- **MODE** is used to navigate the main menu loop and to return to the main menu loop from the minor loops.
- **FLASHING DECIMAL POINT** indicates that an alarm is active.

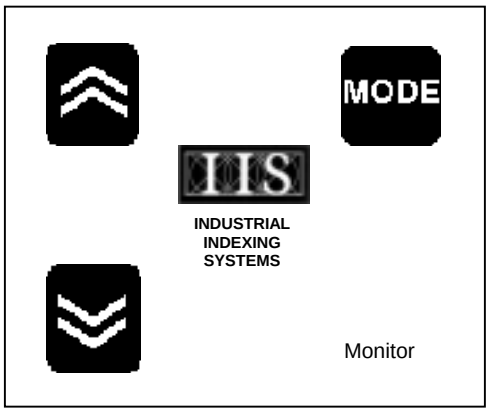


Figure 4.1 - DeltaMax Keypad and Display

4.1 NAVIGATING THE DRIVER'S MENU

The menu structure for the driver consists of a main menu loop with several minor menu loops. The main menu loop and partial sections of the minor loops are shown in **Figure 4.2**.

The major loop is shown vertically on the left side of the diagram. There are four major items on the main menu loop. Each of these items are the starting point for minor menu loops.

- **STATUS DISPLAY** minor menu loop contains drive and motor status displays such as motor speed, motor position, following error, etc.
- **DIAGNOSTIC DISPLAY** minor menu loop provides diagnostic information such as I/O status, alarms and alarm history.
- **ADJUST PARAMETER** minor menu loop contains parameters that are typically adjusted by the user. Parameters include speed scaling, servo tuning values and load inertia setting.
- **USER PARAMETER** minor menu loop contains basic configuration parameters that are usually set once per application such as control mode, motor type, electronic gear ratio and analog polarity.

The MODE key is used to move around the main menu loop. Once the main menu is positioned on the first parameter of a minor loop the ⌃ and ⌄ keys are used to move around the minor menu loop. The MODE mode key can be used to move from anywhere in the minor menu back to the main menu loop.

4.1 NAVIGATING THE DRIVER'S MENU (cont'd)

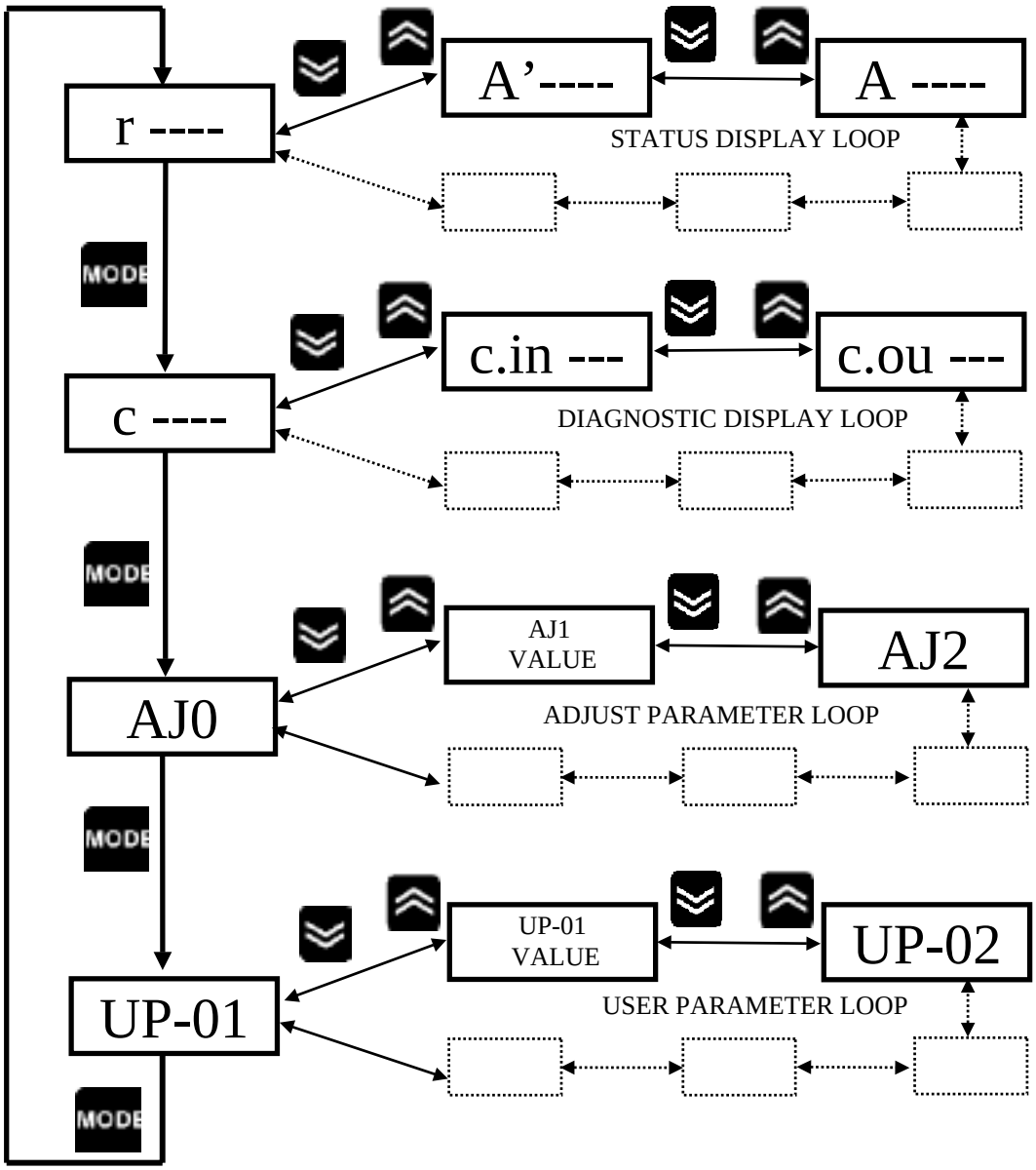


Figure 4.2 - Main Menu Loop and Minor Loops

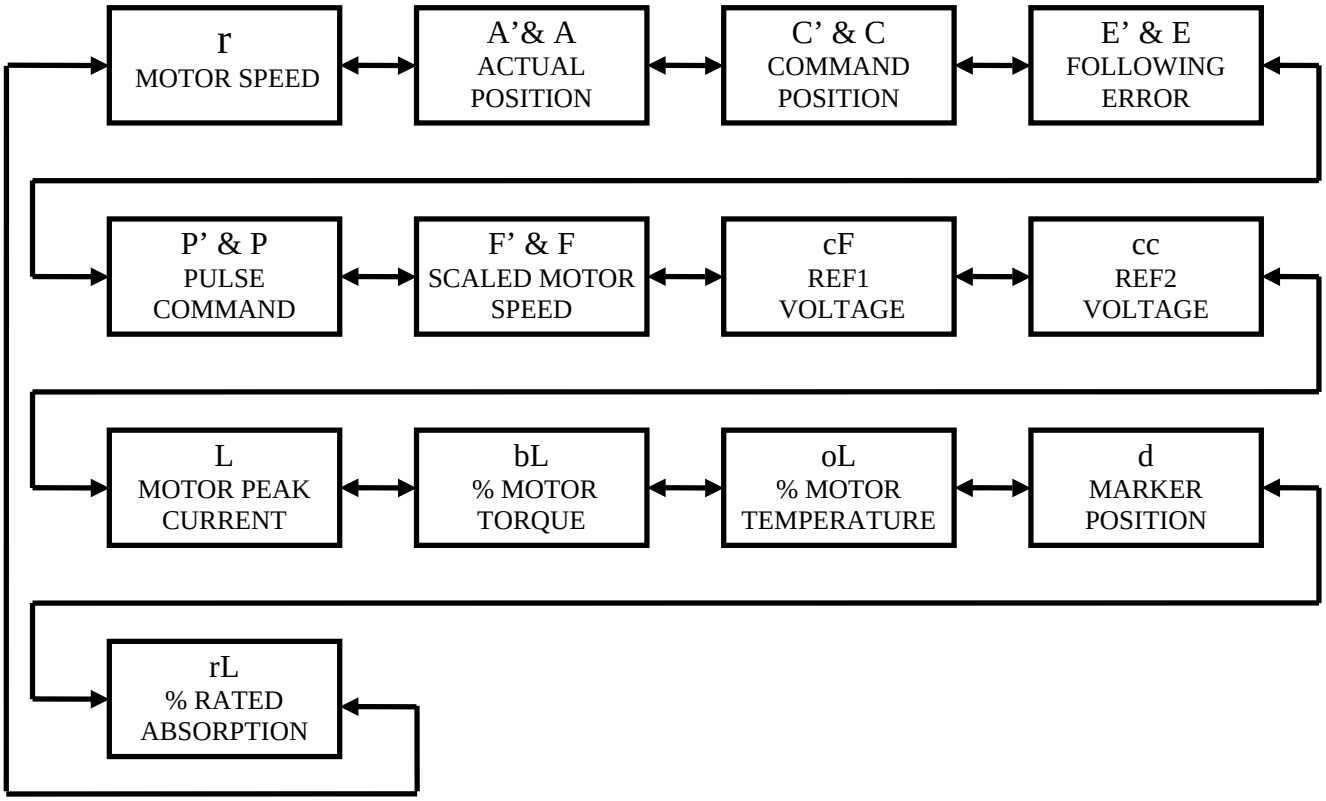
4.1.1 STATUS DISPLAY MENU LOOP

The Status Display Menu Loop provides a real time display of motor and driver status. The display format uses the left most digits for a coded message of the item to be displayed and the right most digits are the value. The coded item on the left will flash indicating negative (-) value. The sign convention is (+) is CCW and (-) is CW.

Some of the display values, such as A' & A, are too large for a single display so they are broken into two sections and are displayed on two successive menu displays. The prime (') symbol indicates the upper four (4) digits or most significant section and the non-prime symbol indicates lower four (4) digits. For example, if successive displays reads [A' 1466] and [A 6789], the ACTUAL POSITION is 14666789.

The driver is set to the (r) Motor Speed at power application. Any alarm will overwrite the display.

The Status Display Menu is organized as follows:



4.1.1 STATUS DISPLAY MENU LOOP (cont'd)

Status Display Descriptions:

DISPLAY ITEM	SYMBOL	RANGE & UNITS	CONTENTS
Motor rpm	**r**	±4000 RPM	Displays the speed of motor.
Actual Position	**A' A**	±9999999 Bits	Displays the actual position of the motor scaled by UP-05/UP-04 * 24000 bits/rev (driver is always 24000 bits/rev internally). With resolver feedback, the 0.0 positions at power up are referenced to the nearest resolver 0.0. The Delta motors have a 2X resolver, and have two 0.0 points or markers per motor shaft rotation. When the count exceeds display range, 9999999 appear.
Command Position	**C' C**	±9999999 Bits	Displays the command position of the driver (scaled by UP-05/UP-04 similar to A' A above). When the count exceeds display range, 9999999 appear.
Following Error	**E' E**	±9999999 Bits	Displays the difference between command position and actual position (scaled by UP-05/UP-04 similar to A' A above). Used in position control modes only.
Pulse Command	**P' P**	+32767~ 32768 Pulses	Displays the pulse command input register in position control mode. This counter is a signed 16-bit counter with a range of +32767 to -32768. Counter rolls over when it reaches the maximum count (ring counter).
Scaled Motor Speed	**F' F**	±9999999 RPM	Displays the speed of the motor scaled by HP-41/HP-42. This used typically used to display "machine speed" if the speed exceeds display range, 9999999 appears.
REF1 Voltage	**cF**	±10.0 V	Displays the input voltage REF1 (speed command or speed limit depending on mode of operation).
REF2 Voltage	**cc**	±10.0 V	Displays the input voltage REF2 (torque command, torque limit or speed command depending on mode of operation).
Motor Peak Current	**L**	±160.0 A (peak)	Displays the output current to motor. "A (peak)" shows the peak value of AC current.
% Motor Torque	**bL**	0~255%	Displays the load ratio (output torque/rated torque) * 100%. The time constant for calculating this ratio is set by HP-33.
% Motor Temperature	**oL**	0~110%	Displays calculated motor temperature as a % of the maximum rating. The electronic motor thermal limit alarm activates at 110% (AL-17). **oL** initializes to 90% at power on.

4.1.1 STATUS DISPLAY MENU LOOP (cont'd)

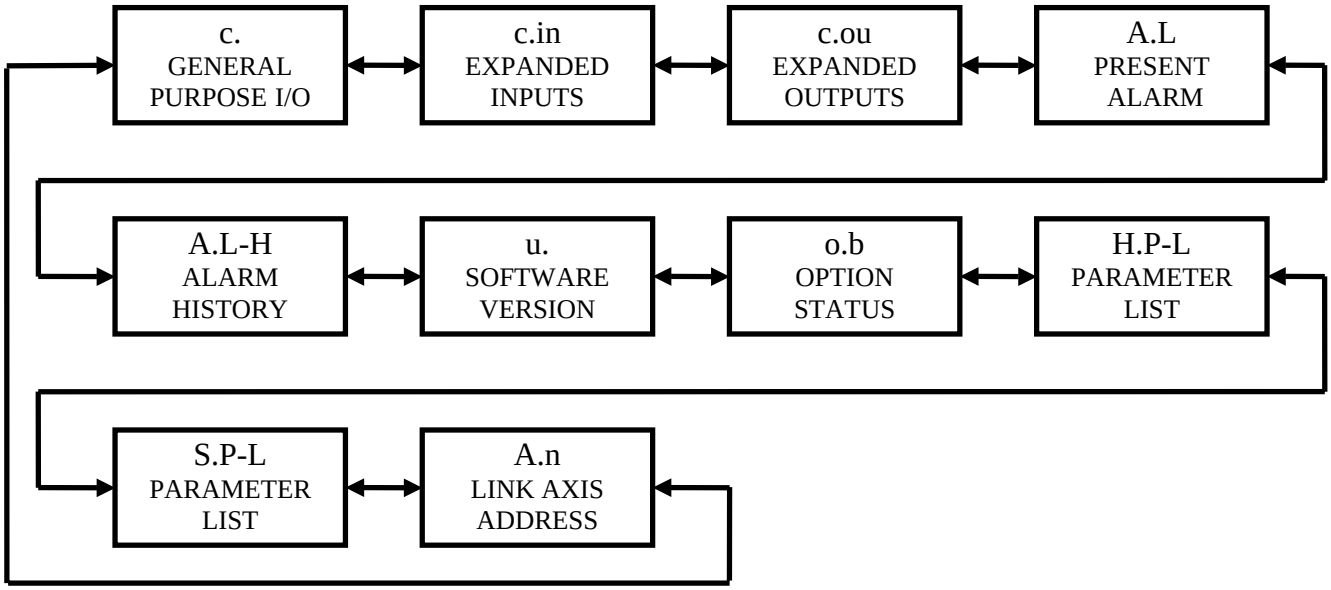
Status Display Descriptions (cont'd):

DISPLAY ITEM	SYMBOL	RANGE & UNITS	CONTENTS
Marker Position	**d**	0~359.9 deg	Displays the motor shaft angle from the motor marker ZPD position. The driver has N marker ZPD positions depending on the resolver/encoder installed in the motor. (i.e. a motor with a 2X resolver has 2 ZPD positions per motor revolution, see motor drawings in **Appendix A.6, A.7 & A.8**). If the motor has 3X resolver and 3 ZPD positions, this display will go from 0.0 to 359.9 degrees 3 times per motor rotation.
% Rated Absorption	**rL**	0~100%	For DMAX-1.5, DMAX-4.25, DMAX-8.5 and DMAX-17.5 the display is (motor absorption torque/motor rated torque) * 100%. For DMAX-35 and up the display is % rating of the regeneration resistor capacity (UL-31).

4.1.2 DIAGNOSTIC DISPLAY MENU LOOP

The Diagnostic Display Menu Loop provides a real time display of I/O points, alarms, and alarm history and driver configurations. The display format uses the left most digits for a coded message of the item to be displayed and the right most digits are the value.

The Diagnostic Display Menu Loop is organized as follows:



4.1.2 DIAGNOSTIC DISPLAY MENU LOOP (cont'd)

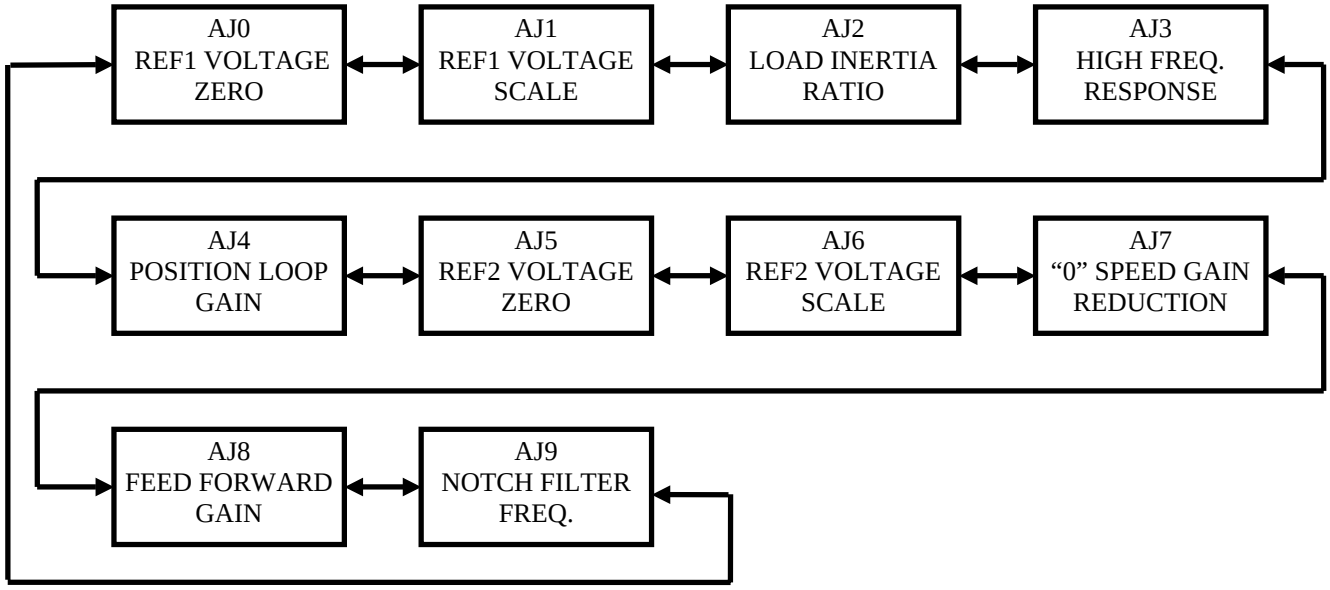
Diagnostic Display Descriptions:

DISPLAY ITEM	SYMBOL	CONTENTS
General purpose I/O	**c.**	Displays the current I/O status using the vertical segment bars in the display. The top half of the segment bar are inputs and the bottom half are outputs. The right most vertical bar is IN0 (top half) and OUT0 (bottom half). The vertical bar just to the right of the **c.** is IN7 (top half) and OUT7 (bottom half). When the bar is illuminated the I/O point is ON. The I/O point can be inverted using HP-44 & HP-45. IN7 ▌▌▌▌▌▌▌▌ IN0 OUT7 ▌▌▌▌▌▌▌▌ OUT0
General Purpose Input	**c.in**	Not used for the modes described in the manual.
General Purpose Output	**c.out**	Not used for the modes described in the manual.
Alarm	**A.L**	Displays the current alarm if present. **A.L** with no numbers indicates that there is no current alarm. **A.L #** indicates a current alarm code #. See **Section 12** for alarm code descriptions and reset method.
Alarm History	**A.L-H** **0-E**	N/A in this configuration.
Software Version	**u.**	Displays the revision of the operating system software.
Option Status	**o.b**	Displays the status of any option modules installed. 00: No options 02: 14 bit A/D converter
HP Parameter Change History	**H.P-L**	N/A in this configuration.
SP Parameter Change List	**S.P-L**	Displays a history of the SP that has been changed. When SEL key and ↵ key are concurrently pressed the display changes to a list of SP-# parameters that have been changed. The history log is 65 deep. The history log can be scrolled forward and backward using the ⌃⌃ and ⌄⌄ keys.
Link Axis No.	**A.n**	N/A to the Delta driver without option module.

4.1.3 ADJUSTMENT PARAMETER MENU LOOP

The Adjustment Parameter Menu Loop provides access to setup and tuning parameters that are commonly used. Each parameter is displayed in two successive displays. The coded parameter name appears on the first display and the parameter value appears on the second display. The ⏫ key will always move from the parameter-coded name to the parameter value. The ⏬ key will always move from the parameter value to the coded parameter name. If the parameter value is negative, a (-) sign appears in the left most digit of the display.

The Adjustment Parameter Menu Loop is organized as follows:



The Adjustment Parameters have different meaning and content depending on the mode of operation of the driver.

4.1.4 USER PARAMETER MENU LOOP

The User Parameter Menu Loop provides access to basic setup parameters that are commonly used. Each parameter is displayed in two successive displays. The coded parameter name appears on the first display and the parameter value appears on the second display. The ⏫ key will always move from the parameter-coded name to the parameter value. The ⏬ key will always move from the parameter value to the coded parameter name.

4.1.4 USER PARAMETER MENU LOOP (cont'd)

The User Parameter Menu Loop is organized as follows: