

**ACCEL500  
ACM WINDER APPLICATION SOFTWARE**

**Part Number 695120.V10**

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Cleveland, Ohio**

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AVTRON INDUSTRIAL AUTOMATION, INC.  
Cleveland, Ohio

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**AVTRON ACCEL500**  
**ACM WINDER APPLICATION SOFTWARE**  
**Part Number 695120.V10**

## **SECTION I**

### **INTRODUCTION AND GENERAL INFORMATION**

The ACCel500 ACM Winder software is the standard application used by Avtron for center-driven web applications for non-driven sections. The software is designed to be used with the ACCel500 micro-processor board and option boards with no base power components. The main features of the software are to as follows:

- Auto stop
  - Roll Set diameter
  - Roll Set footage
- Roll Set diameter calculations by Rider roll position
- Unwind diameter calculation
  - Utilizing two encoders
  - Utilizing reference encoder and Unwind Uni-pulser
- Unwind brake control
  - Open loop torque setpoint
    - Taper torque
    - Diameter compensation
    - Fixed and variable inertia compensation
    - Tare compensation
    - ESTOP setpoint
  - Closed loop
    - Dancer or load cell
    - Dancer loading table
    - Adaptive gain by diameter

Communications options:

- Ethernet (Modbus TCP, Ethernet IP, EGD)
- Devicenet
- Profibus DP
- Modbus
- System Bus (Fiber)

Spare operation blocks:

- Variety of logic blocks including , Ands, Ors, Inverts, and latches
- Comparators
- Non-linear table functions
- Switches
- Gains

Firmware Options enabled:

- Fault FIFO
- Signal analyzer with trigger

**IMPORTANT:**

Configuration information in this manual is provided to assist users in designing their own operational/functional schemes. It is deemed to be correct, however, if any errors or omissions exist, Avtron and/or Avtron representatives will not be liable to provide “warranty” on-site support. If one is designing his own configuration, or using one of the examples, it is highly recommended to test the operation prior to putting the drive into production.

## SECTION II

### SELECTING THE CONTROL MODE

The drive Run is used to set the Run logic diagram only. Future outer speed control can be added to the software. The computer run does not work as no power section is present.

- Remote (from I/O or communications)
- Local drive keypad
- Computer diagnostic software ( Not applicable )

The drive out of the box is defaulted to the local mode. When the mode is changed, it is stored even through power failure (retentive).

The drive is set up so control location can not be switched while the drive is running.

#### 2-1 REMOTE OPERATION

To transfer to remote operation, press the **loc/rem** button on the keypad while the drive is not running. The remote green LED should be on and the display should have the message “I/O term” displayed. If the **loc/rem** button is pressed while running in remote mode, the display will flash “Locked while RUNNING”.

Pressing the **start** button on the keypad will display a message “Keypad Control NOT ACTIVE”

*Control Place = 0* in this mode.

For Winder software, the first digital input is defaulted for RUN command and *Run Stpt* is the speed reference.

#### 2-2 LOCAL DRIVE KEYPAD

To transfer to local operation, press the **loc/rem** button on the keypad while the drive is not running. The local green LED should be on and the display should have the message “Keypad” displayed.

If the **loc/rem** button is pressed while running in local mode the display will flash “Locked while RUNNING”.

The **start/stop** buttons will now work and the drive will run at the entered keypad reference setpoint.

Set the keypad control parameters (Keypad Speed Direction, Keypad Speed Reference, Keypad Torque Direction, and Keypad Torque Reference) using menu M3 (Keypad Control).

If keypad communications goes down while in the local mode, the drive will fault (Keypad Comm).

*Control Place* = 1 in this mode.

## SECTION III

### KEYPAD AND PARAMETER DESCRIPTIONS

#### 3-1 ACCel500 KEYPAD OPERATION

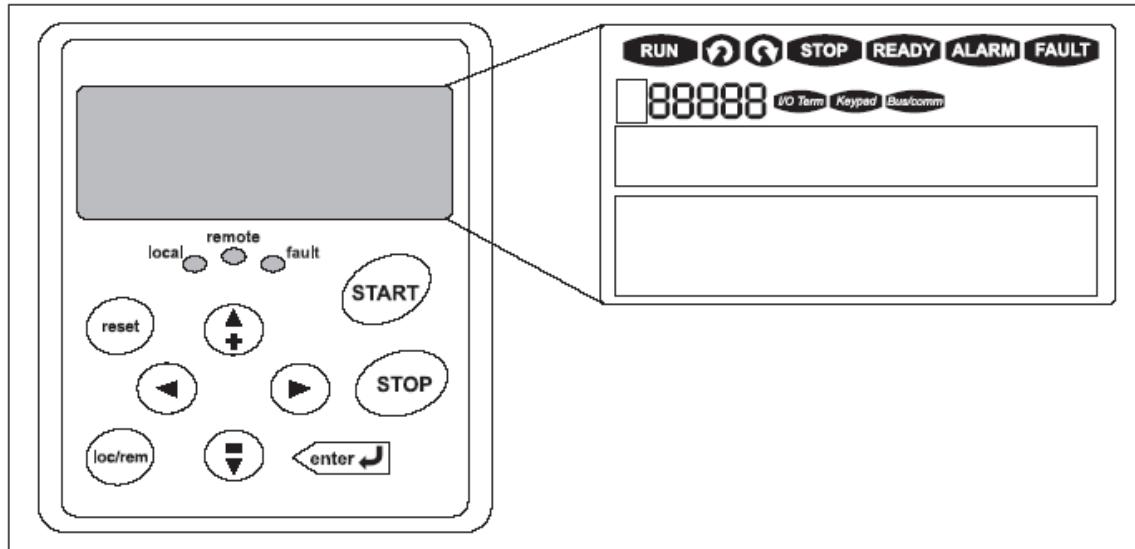


Figure 3-1. Keypad and Display

TABLE 3-1. NAVIGATION BUTTONS

| <b>Button</b>   | <b>Description</b>  |
|---|---|
|    | <p><b>Start</b><br/> This button operates as the START button for normal operation when “local” is selected as the active control.</p>  |
|    | <p><b>Enter</b><br/> This button is used in the parameter edit mode to save the parameter setting and move to the next parameter ...</p> <ul style="list-style-type: none"> <li>• to reset the Fault History if pressed while in the “Fault History” menu.</li> <li>• to confirm the acceptance of a change.</li> <li>• to change a virtual button status while in the “Button” menu.</li> <li>• to confirm the start-up list at the end of the Start-Up Wizard.</li> <li>• when the “Operate” menu is active, to exit the “Operate” submenu.</li> </ul>  |
|    | <p><b>Stop</b><br/> This button has two integrated operations. The button operates as STOP button during normal (local) operation ...</p> <ul style="list-style-type: none"> <li>• motor STOP from the keypad</li> </ul> <p>Note that if the STOP button is depressed for 3 seconds, a Stop Fault will occur in any control mode.</p>   |
|    | <p><b>Reset</b><br/> Resets the active faults.</p>  |
|  | <p><b>Local/Remote</b><br/> Switches between LOCAL and REMOTE control for start, speed reference and reverse functions.</p>   |
|  | <p><b>Left Arrow</b></p> <ul style="list-style-type: none"> <li>• navigation button, movement to left.</li> <li>• in parameter edit mode, exits mode, backs up one step.</li> <li>• cancels edited parameter (exit from a parameter edit mode).</li> <li>• When in “Operate” menu, will move backward through menu.</li> <li>• At end of “Start-Up Wizard”, repeats the “Start-Up Wizard” setup menu.</li> </ul>  |
|  | <p><b>Right Arrow</b></p> <ul style="list-style-type: none"> <li>• navigation button, movement to right.</li> <li>• enter parameter group mode.</li> <li>• enter parameter mode from group mode.</li> </ul>   |
|  | <p><b>Up and Down Arrows</b></p> <ul style="list-style-type: none"> <li>• move either up or down a menu list to select the desired menu item.</li> <li>• editing a parameter/password, while the active digit/character is scrolled.</li> <li>• increase/decrease the reference value of the selected parameter.</li> <li>• in the “Operate” menu, will cause the display of the current reference source and value and allow its change if the keypad is the active reference source. Used to set the password (if defined) when leaving the “Operate” menu.</li> <li>• scroll through the “Active Faults” menu when the ACCEL500 is stopped.</li> </ul> |

TABLE 3-2. LCD STATUS INDICATORS

| Indicator   | Description   |
|---|---|
|  <b>RUN</b>                        | <b>Run</b><br>Not applicable as no power section.   |
|  <b>Counterclockwise Operation</b> | The output phase rotation is BAC, corresponding to counterclockwise rotation of most motors.    |
|  <b>Clockwise Operation</b>        | The output phase rotation is ABC, corresponding to clockwise rotation of most motors.           |
|  <b>STOP</b>                       | <b>Stop</b><br>Indicates that the ACCel500 is stopped and not controlling the load.             |
|  <b>READY</b>                      | <b>Ready</b><br>Not applicable as no power section.   |
|  <b>ALARM</b>                      | <b>Alarm</b><br>Indicates that there is one or more active drive alarm(s).                      |
|  <b>FAULT</b>                      | <b>Fault</b><br>Indicates that there is one or more active drive fault(s).                      |
|  <b>I/O Terminal*</b>              | <b>I/O Terminal*</b><br>Indicates that the I/O terminals have been chosen for control (remote). |
|  <b>Keypad*</b>                    | <b>Keypad*</b><br>Indicates that the keypad has been chosen for control (local).                |

\*Both “I/O Terminal” and “Keypad” will be on and flashing when ADDaptACC is chosen for control.

TABLE 3-3. LED STATUS INDICATORS

| Indicator     | Description   |
|---------------|---|
| <b>local</b>  | <b>Local*</b><br>Indicates that the ACCel500 is ready to be started and operated from the Local mode. |
| <b>remote</b> | <b>Remote*</b><br>Indicates that the ACCel500 is operating and controlling the load remotely.         |
| <b>fault</b>  | <b>Fault</b><br>Indicates that there are one or more active drive fault(s).                           |

\*Both “local” and “remote” will be flashing when ADDaptACC is chosen for control.

## 3-2 MENU NAVIGATION

### 3-2.1 NAVIGATION TIPS

- To navigate within one level of a menu, use the up and down arrows.
- To move deeper into the menu structure and back out, use the right and left arrows.
- To edit a parameter, navigate to show that parameter’s value, and press the right arrow button to enter the edit mode. When in edit mode, the parameter value will flash.
- When in edit mode, the parameter value can be changed by pressing the up or down arrow keys.

- When in edit mode, pressing the right arrow a second time will allow you to edit the parameter value digit by digit.
- To confirm the parameter change, you must press the **enter** button. The value will not change unless the **enter** button is pushed.
- Some parameters cannot be changed while the ACCEL500 drive is running. The screen will display **LOCKED** if you attempt to edit these parameters while the drive is running. Stop the drive to edit these parameters.
- Appendix B lists all parameters for the application in menu order.

### 3-2.2 MAIN MENU

The data on the control keypad are arranged in menus and submenus. The first menu level consists of M1 to M8 and is called the Main Menu. The structure of these menus and their submenus is illustrated in Figure 3-2.

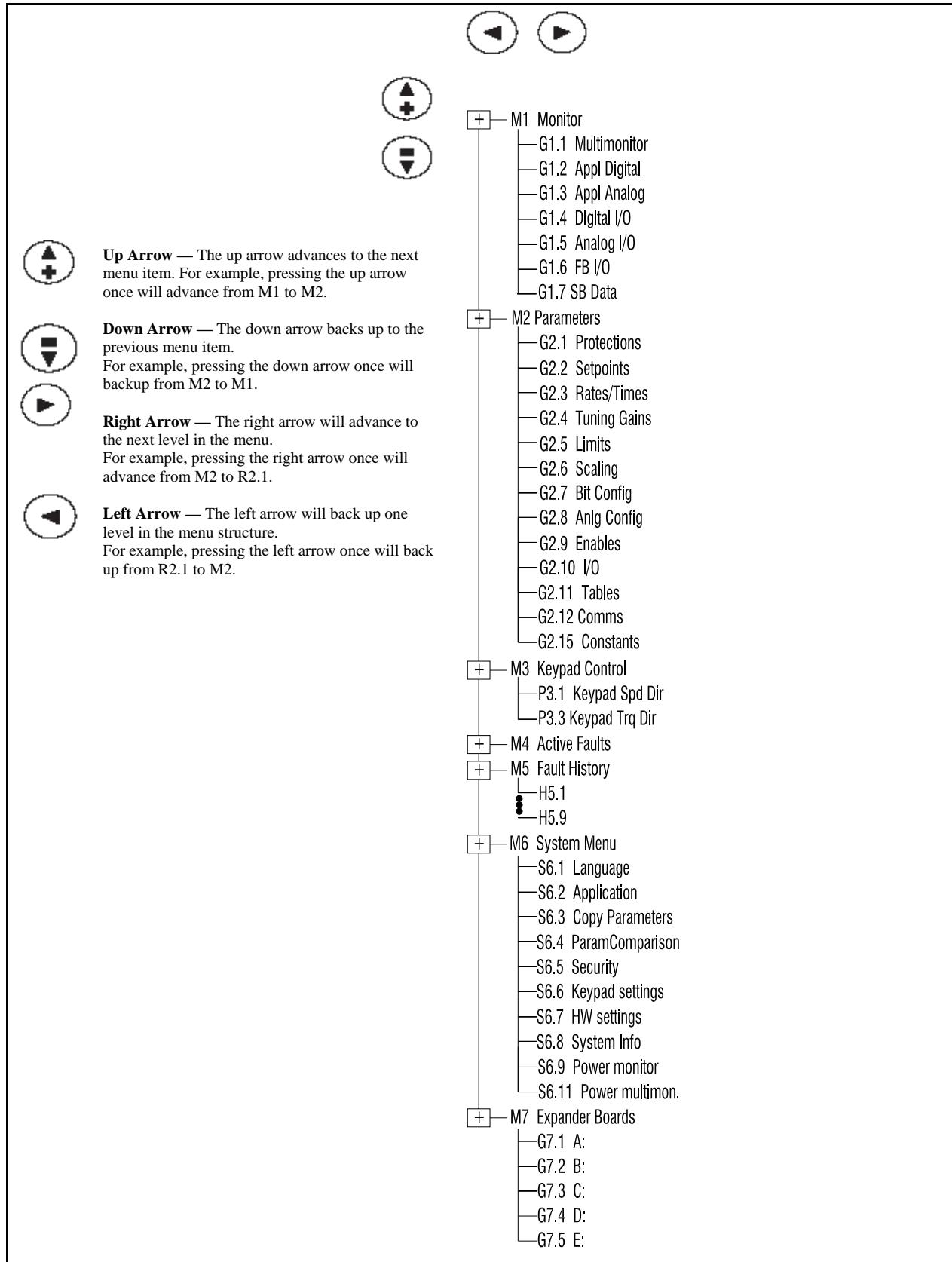


Figure 3-2. Main Menu Navigation

### 3-2.3 MONITOR MENU (M1)

The Monitoring Menu items are meant for viewing parameter values during operation. Monitored values are updated every 0.3 sec. Monitored items are identified by item numbers V1.1 to V1.xx, where “xx” varies by application.

Monitored parameters are not editable from this menu (See Parameter Menu [M2] to change parameter values).

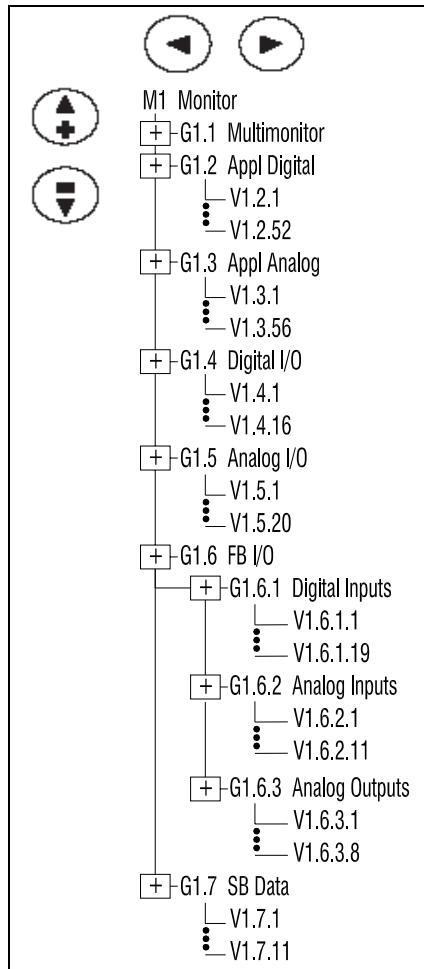


Figure 3-3. Monitor Menu Structure Example

#### Multimonitor (G1.1)

This parameter allows the viewing and selection (if allowed by System menu item, S6.11) of three simultaneously monitored items from the Monitored Menu Items. Use the right arrow key to select the item to be modified and then the up or down arrow keys to select the new item. Press the **enter** key to accept the change.

### 3-2.4 PARAMETER MENU (M2)

The Parameter Menu is a single or multi-level menu dependent upon the application in use, arranged by the parameter group items. See Figure 3-4. Parameters and parameter groups are explained in further detail in the ACCel500 Application Manual.

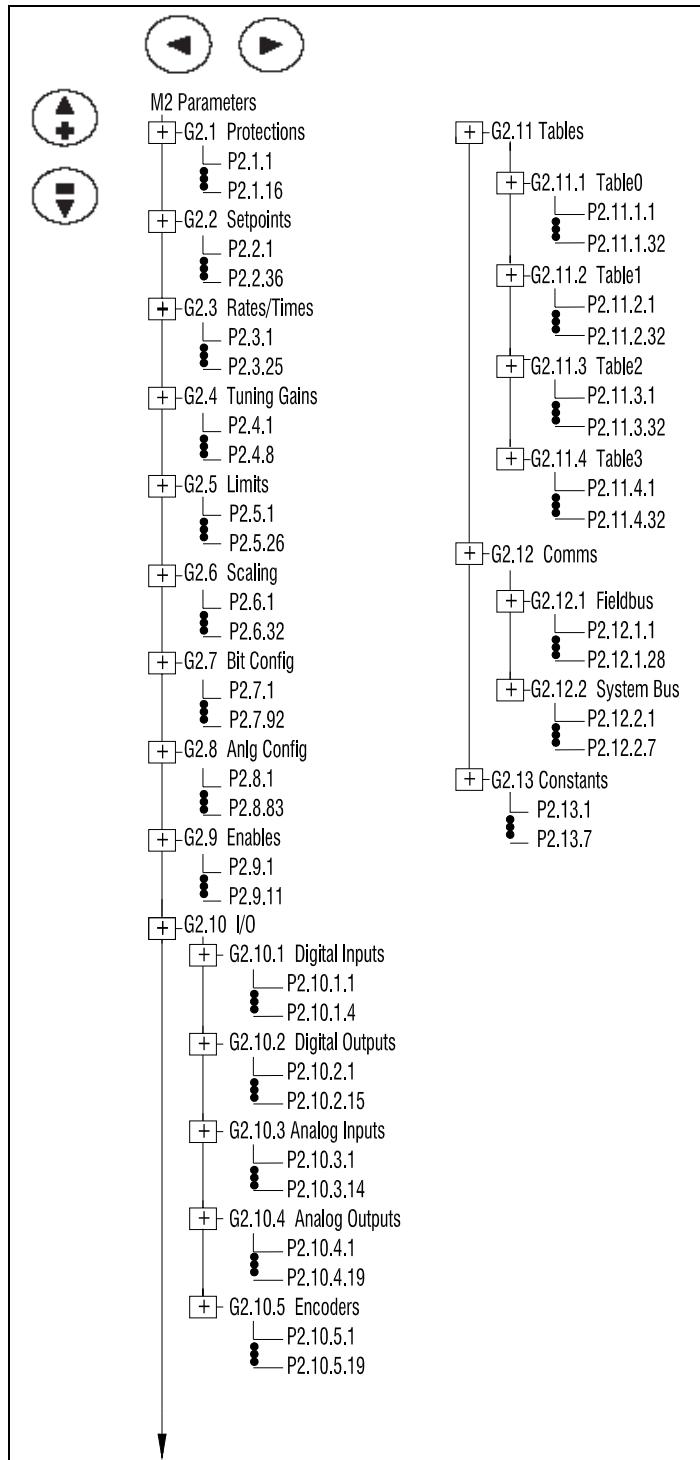


Figure 3-4. Parameter Menu

### **3-2.5 KEYPAD CONTROL MENU (M3)**

In the Keypad Control Menu, you can set the frequency reference, choose the motor direction for keypad operation when “local” mode is in operation. See Figure 3-5.

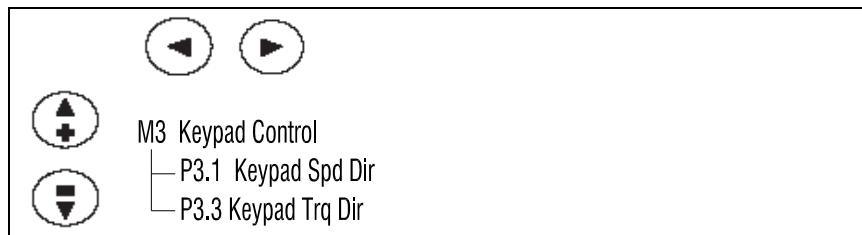


Figure 3-5. Keypad Control Menu

**P3.1** Range: Forward, Reverse  
**Keypad Spd Dir**

This allows the operator to change the rotation direction of the motor. This setting will not influence the rotation direction of the motor unless the keypad has been selected as the active control place.

**P3.2** Range: 0.00 to 60.00  
**Keypad\_Spd\_ref** Units: Hertz (Hz)

**P3.3** Range: Forward, Reverse  
**Keypad Trq Dir**

**P3.4** Range: 0.0 to 100.0  
**Keypad Trq Ref** Units: Percent (%)

### 3-2.6 ACTIVE FAULTS MENU (M4)

When a fault occurs, the ACCEL500 drive stops. The sequence indication F1, the fault code, a short description of the fault and the fault type symbol will appear on the display. In addition, the indication FAULT or ALARM is displayed and, in case of a FAULT, the red LED on the keypad starts to blink. If several faults occur simultaneously, the sequence of active faults can be browsed with the Browser buttons. See Figure 3-6.

The active faults memory can store the maximum of 10 faults in the sequential order of appearance. The fault remains active until it is cleared with either the STOP or reset buttons or with a reset signal from the I/O terminal. Upon fault reset the display will be cleared and will return to the same state it was before the fault trip.

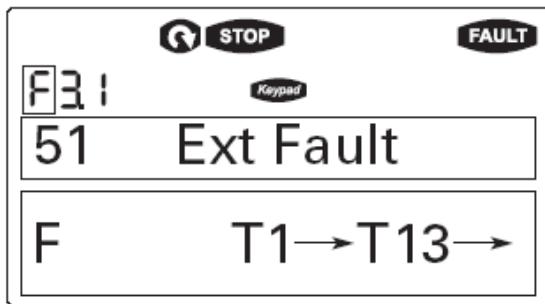


Figure 3-6. Active Fault Display Example

\*\*\*\*\*

### **W A R N I N G**

Remove any External Start signals or permissives before resetting the fault to prevent an unintentional restart of the ACCEL500, which could result in personal injury or equipment damage.

\*\*\*\*\*

**Fault Type** Range: A, F, AR, FT

There are four different types of faults. See Table 3-4.

TABLE 3-4. FAULT TYPES

| <b>Fault Type</b> | <b>Fault Name</b>  | <b>Description</b>   |
|-------------------|--------------------|--|
| A                 | Alarm              | This type of fault is a sign of an unusual operating condition. It does not cause the drive to stop, nor does it require any special actions. The “A fault” remains in the display for about 30 seconds. |
| F                 | Fault              | An “F fault” is a kind of fault that makes the drive stop. Actions need to be taken in order to restart the drive.   |
| AR                | Auto-Restart Fault | If an “AR fault” occurs the drive will also stop immediately. The fault is reset automatically and the drive tries to restart the motor. If the restart is not successful, a fault trip (FT) occurs.     |
| FT                | Fault Trip         | If the drive is unable to restart the motor after an AR fault, an FT fault occurs. The effect of the “FT fault” is the same as that of the F fault — the drive is stopped.                               |

**Fault Code** Range: 1 – 54

Fault codes indicate the cause of the fault. A list of fault codes, their descriptions, and possible solutions can be found in Appendix E — Application-Specific Faults.

**Fault Time** Range: T.1 – T.13**Data Record** Most of this data is not applicable due to no power section.

TABLE 3-5. FAULT TIME DATA

| Data             | Units           | Description   |
|------------------|-----------------|---|
| T.1 <sup>1</sup> | D               | Counted operation days (Fault 43: Additional code)            |
| T.2 <sup>1</sup> | hh:mm:ss<br>(d) | Counted operation hours<br>(Fault 43: Counted operation days) |
| T.3              | Hz<br>hh:mm:ss  | Output frequency<br>(Fault 43: Counted operation hours)       |
| T.4              | A               | Motor current   |
| T.5              | V               | Motor voltage   |
| T.6              | %               | Motor power   |
| T.7              | %               | Motor torque  |
| T.8              | V               | DC bus voltage  |
| T.9              | °C              | Unit temperature  |
| T.10             | —               | Run status  |
| T.11             | —               | Direction   |
| T.12             | —               | Warnings  |
| T.13             | —               | Zero speed  |

<sup>1</sup>Real time record.

### **3-2.7 FAULT HISTORY MENU (M5)**

All faults are stored in the Fault History Menu, which can be viewed by using the Browser buttons. Additionally, the Fault time data record pages are accessible for each fault as in the Active Faults Menu described above. See Figure 3-7.

The ACCel500 drive's memory can store a maximum of 30 faults, in the order of appearance. If there are 30 uncleared faults in the memory, the next occurring fault will erase the oldest fault from the memory.

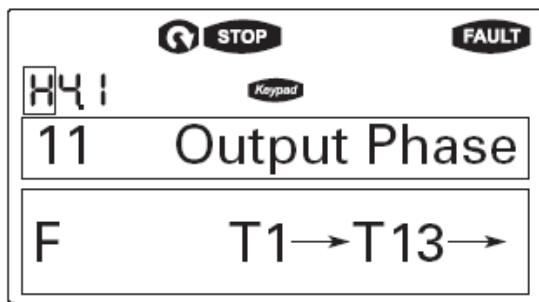


Figure 3-7. Sample Fault History Display

### 3-2.8 SYSTEM MENU (M6)

The controls associated with the general use of the drive, such as application selection, customized parameter sets or information about the hardware and software are located in the System Menu. Password protection can be activated by parameter P6.5.1.

Descriptions of the system menu parameters are illustrated in Figure 3-8.

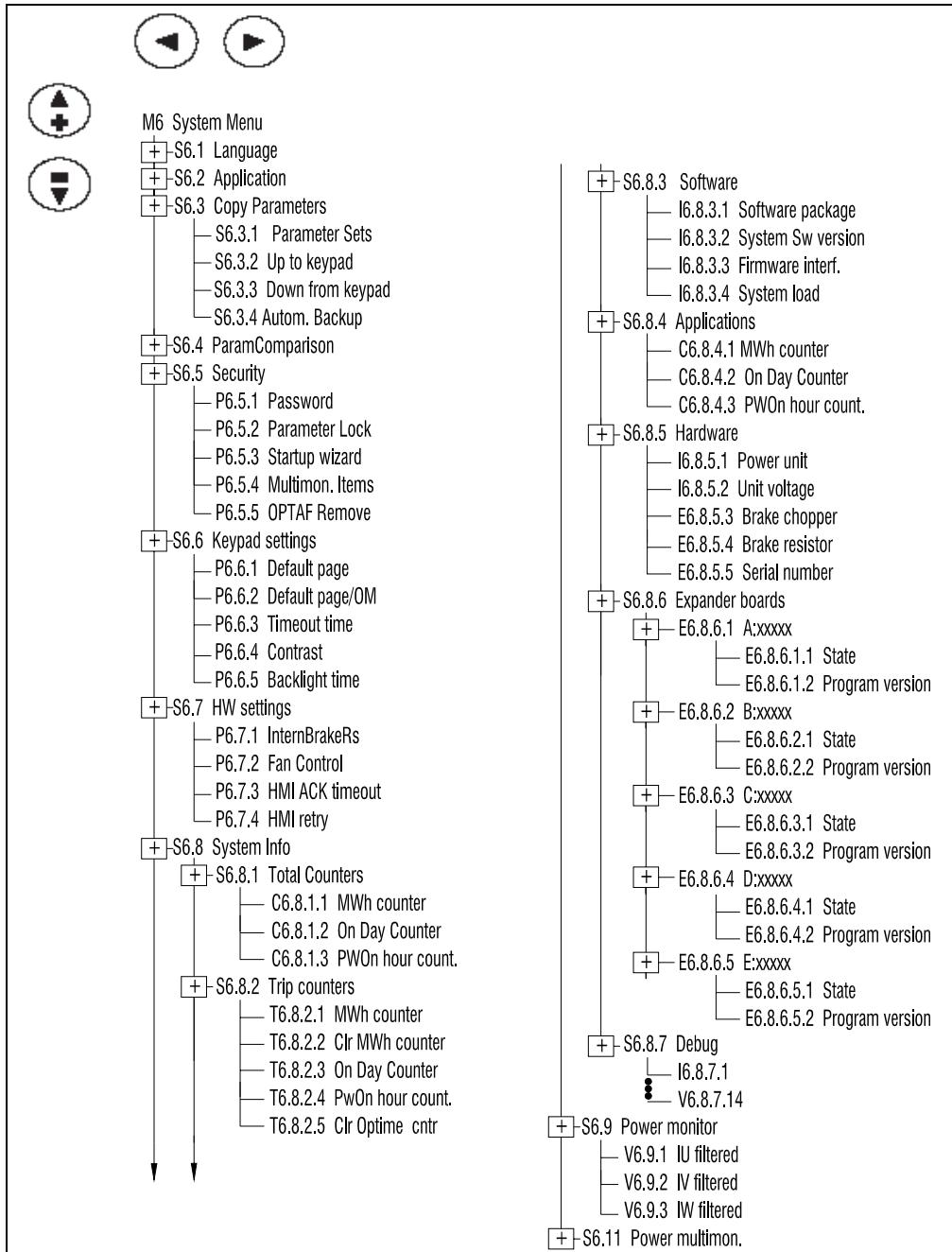


Figure 3-8. System Menu Structure

## System Menu Parameters

- S6.1** Range: English, Spanish, French, Portuguese      Default: English  
**Language Selection** This parameter offers the ability to control the ACCEL500 through the keypad in the language of your choice. Available languages are: English. See Avtron for future languages.
- S6.2** Range: ACM Winder  
**Application** This parameter sets the active application.

### Parameter Comparison Options (S6.4)

- S6.4**  
**Parameter Comparison** With the Parameter Comparison function, you can compare the actual parameter values to the values of your customized parameter sets and those loaded to the control keypad.
- The actual parameter values are first compared to those of the customized parameter Set1. If no differences are detected, a “0” is displayed on the lowermost line of the keypad.
- If any of the parameter values differ from those of the Set1 parameters, the number of the deviations is displayed together with symbol P (e.g. P1 Æ P5 = five deviating values).
- By pressing the right arrow button once again, you will see both the actual value and the value it was compared to. In this display, the value on the Description line (in the middle) is the default value, and the one on the value line (lowermost line) is the edited value. You can also edit the actual value by pushing the right arrow button.
- Actual values can also be compared to Set2, Factory Settings and the Keypad Set values.

### Security Parameter Options (S6.5)

The Security submenu is protected with a password. Store the password in a safe place.

- S6.5.1** Range: 0 – 65535      Default: 0  
**Password** The application selection can be protected against unauthorized changes with the Password function. When the password function is enabled, the user will be prompted to enter a password before application changes, parameter value changes, or password changes.
- By default, the password function is not in use. If you want to activate the password, change the value of this parameter to any number between 1 and 65535. The password will be activated after the Timeout time (Timeout Time) has expired.
- To deactivate the password, reset the parameter value to 0.
- P6.5.2** Range: ChangeEnable, ChangeDisabl      Default: ChangeDisabl  
**Parameter Lock** This function allows the user to prohibit changes to the parameters. If the parameter lock is activated, the text \*locked\* will appear on the display if you try to edit a parameter value.
- This function does not prevent unauthorized editing of parameter values.

|                        |   |                       |
|------------------------|---|-----------------------|
| <b>P6.5.3</b>          | Range: Yes, No  | Default: No           |
| <b>Start-up Wizard</b> | The Start-Up Wizard facilitates commissioning the ACCEL500. If selected active, the Start-Up Wizard prompts the operator for the language and application desired and then advances through the start-up parameter list. After completion, it allows the user to repeat the Start-Up Wizard or return to the default page, the Operate Menu. The Start-Up Wizard is always active for the initial power up of the ACCEL500. |                       |
| <b>P6.5.4</b>          | Range: ChangeEnable, ChangeDisabl   | Default: ChangeEnable |
| <b>Multimon. Items</b> | The keypad display can display three actual monitored values at the same time. This parameter determines if the operator is allowed to replace the values being monitored with other values.  |                       |

### Keypad Settings (S6.6)

There are five parameters (Default Page to Backlight Time) associated with the keypad operation:

|                        |   |             |
|------------------------|---|-------------|
| <b>P6.6.1</b>          |   | Default: 0  |
| <b>Default page</b>    | This parameter sets the view to which the display automatically moves as the Timeout Time expires or when the keypad power is switched on. If the Default Page value is 0, this function is not activated, i.e., the last displayed page remains on the keypad display. |             |
| <b>P6.6.2</b>          |   |             |
| <b>Default page/OM</b> | Here you can set the location in the Operating menu to which the display automatically moves as the set Timeout Time expires, or when the keypad power is switched on. See setting of Default Page parameter above.   |             |
| <b>P6.6.3</b>          | Range: 0 – 65535  | Default: 30 |
| <b>Timeout time</b>    | Units: Seconds  |             |
|                        | The Timeout Time setting defines the time after which the keypad display returns to the Default Page. If the Default Page value is 0, the Timeout Time setting has no effect.   |             |
| <b>P6.6.4</b>          |   |             |
| <b>Contrast</b>        | If the display is not clear, you can adjust the keypad contrast with this parameter.  |             |
| <b>P6.6.5</b>          | Range: 1 – 65535 or Forever   | Default: 10 |
| <b>Backlight time</b>  | Units: Minutes  |             |
|                        | This parameter determines how long the backlight stays on before going out. You can select any time between 1 and 65535 minutes or “Forever”.   |             |

**Hardware Settings (S6.7)**

The Hardware Settings submenu (S6.7) provides parameters for setting information on Internal brake resistor connection, Fan control, Keypad acknowledge timeout and Keypad retries.

|   |  |   |
|---|--|---|
| <b>P6.7.1</b>                                     | Range: Connected – Not Connected<br><b>InternBrakeRs</b><br>Not applicable.  | Default: Connected  |
| <b>P6.7.2</b>                                     | Range: Continuous, Temperature<br><b>Fan Control</b><br>No fan present.  | Default: Continuous   |
|   |  | The fan runs continuously, regardless of this setting, when the ACCel500 drive is in RUN state.   |
| <b>P6.7.3</b><br><b>HMI ACK</b><br><b>timeout</b> | Range: 200 – 5,000<br>Keypad Units: ms<br>This function allows the user to change the timeout of the Keypad acknowledgement time.  | Default: 200  |
|   |  | If the ACCel500 drive has been connected to a PC with a serial cable, the default values of Keypad Acknowledge Timeout and Number of Retries to Receive Keypad Acknowledgement must not be changed. |
|   |  | If the ACCel500 drive has been connected to a PC via a modem and there is delay in transferring messages, the value of Keypad Acknowledge Timeout must be set according to the delay as follows:    |
|   | Example:   |   |
|   | <ul style="list-style-type: none"> <li>• Transfer delay between the ACCel500 drive and the PC is found to be = 600 ms</li> <li>• The value of Keypad Acknowledge Timeout is set to 1200 ms (2 x 600, sending delay + receiving delay)</li> <li>• The corresponding setting is then entered in the [Misc] section of the file ACCELDRIVE.INI:<br/>Retries = 5<br/>AckTimeOut = 1200<br/>TimeOut = 5000</li> </ul> |   |
|   |  | It must also be considered that intervals shorter than the Keypad Acknowledge Timeout time cannot be used in ACCel500 drive monitoring.   |
| <b>P6.7.4</b><br><b>HMI retry</b>                 | Range: 1 – 10<br>With this parameter, you can set the number of times the drive will try to receive an acknowledgement when it has not been received within the acknowledgement time (Keypad Acknowledge Timeout) or if the received acknowledgement is faulty.  | Default: 5  |

**System Information (S6.8)**

This section contains hardware and software information as well as operation information.

**S6.8.1**

**Total Counters** In the Total Counters page you will find information related to the ACCel500 operating times, i.e., the total numbers of MWh, operating days, and operating hours. See Table 3-6.

Unlike the counters for the Trip Counters, these counters cannot be reset.

The Power On time counters, days and hours, operate whenever power is applied to the ACCel500 drive.

TABLE 3-6. TOTAL COUNTERS

| Number          | Name             | Description  |
|-----------------|------------------|--|
| <b>C6.8.1.1</b> | MWh counter      | Not applicable   |
| <b>C6.8.1.2</b> | On Day counter   | Number of days the ACCel500 drive has been supplied with power |
| <b>C6.8.1.3</b> | PWOn hour count. | Not applicable   |

**S6.8.2**

**Trip counters** The Trip Counters are counters whose values can be reset to zero. The resettable counters are shown in Table 3-7.

TABLE 3-7. TRIP COUNTERS

| Number          | Name                  | Description  |
|-----------------|-----------------------|--|
| <b>T5.8.2.1</b> | MWh counter           | Not applicable   |
| <b>P5.8.2.2</b> | Clear MWh counter     | Not applicable   |
| <b>T5.8.2.3</b> | Power On day counter  | Number of days the ACCel500 drive has been run since the last reset  |
| <b>T5.8.2.4</b> | Power On hour counter | Number of hours the ACCel500 drive has been run since the last reset |
| <b>P5.8.2.5</b> | Clr Optime cntr       | Resets the operating day and hour counters                           |

Note: The Trip Counters operate only when the motor is running.

**S6.8.3**

**Software** The Software information page includes information on the following software related topics:

TABLE 3-8. SOFTWARE INFORMATION

| Number          | Name              | Description  |
|-----------------|-------------------|--------------|
| <b>I6.8.3.1</b> | Software package  | ACC00031V003 |
| <b>I6.8.3.2</b> | System Sw version | 11.53.6536   |
| <b>I6.8.3.3</b> | Firmware interf.  | 4.37         |
| <b>I6.8.3.4</b> | System load       | G9.1         |

**S6.8.4**

**Applications** The Application information page includes information on not only the application currently in use but also all other applications loaded into the ACCel500. The information available is shown in Table 3-9. Note that the “x” in the table refers to the sequential number of the application in the list.

TABLE 3-9. APPLICATIONS INFORMATION

| Number            | Content            |
|-------------------|--------------------|
| <b>A6.8.4.x</b>   | Application name   |
| <b>D6.8.4.x.1</b> | Application ID     |
| <b>D6.8.4.x.2</b> | Version            |
| <b>D6.8.4.x.3</b> | Firmware interface |

**S6.8.5**

**Hardware** Not applicable.

**S6.8.6**

**Expander boards** This parameter and its sub-items provide information about the basic and option boards plugged into the control board as shown in Table 3-11. Note that the “x” in the table refers to the sequential number of the slot, with slot A being “1” and slot E being “5”.

TABLE 3-11. EXPANDER BOARD INFORMATION

| Number            | Content                       |
|-------------------|-------------------------------|
| <b>E6.8.6.x</b>   | Slot “x” board identification |
| <b>E6.8.6.x.1</b> | Operating state               |
| <b>E6.8.6.x.2</b> | Software version              |

**S6.8.7 Debug Menu**

This menu is meant for advanced users and application designers. Contact the factory for any assistance needed.

Power Monitor (S6.9)

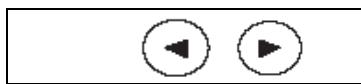
Not applicable.

**3-2.9 EXPANDER BOARD MENU (M7)**

The Expander Board Menu makes it possible for the user:

- to see what expander boards are connected to the control board and
- to access and edit the parameters associated with the expander board.
- to monitor option board values.

Each option board has its own set of parameters.



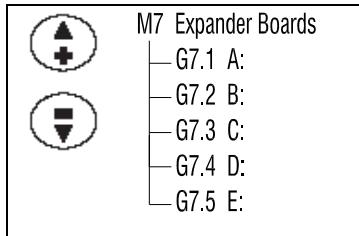


Figure 3-9. Expander Board Menu Structure

### Example of Expander Board Parameters for Option Board A9

|                 |                                 |            |
|-----------------|---------------------------------|------------|
| <b>P7.1.1.1</b> | Range: 1 – 5                    | Default: 3 |
| <b>AI1 Mode</b> | Analog Input 1 input options:   |            |
| 1               | 0 to 20 mA                      |            |
| 2               | 4 to 20 mA                      |            |
| 3               | 0 to 10V                        |            |
| 4               | 2 to 10V                        |            |
| 5               | -10 to +10VP                    |            |
| <b>P7.1.1.2</b> | Range: 1 – 5                    | Default: 1 |
| <b>AI2 Mode</b> | Analog Input 2 input options:   |            |
| 1               | 0 to 20 mA                      |            |
| 2               | 4 to 20 mA                      |            |
| 3               | 0 to 10V                        |            |
| 4               | 2 to 10V                        |            |
| 5               | -10 to +10VP                    |            |
| <b>P7.1.1.3</b> | Range: 1 – 4                    | Default: 1 |
| <b>AO1 Mode</b> | Analog Output 1 output options: |            |
| 1               | 0 to 20 mA                      |            |
| 2               | 4 to 20 mA                      |            |
| 3               | 0 to 10V                        |            |
| 4               | 2 to 10V                        |            |

### 3-2.10 EDITING A NUMERIC VALUE

Use the following procedure to edit numeric parameter values.

1. To edit a parameter, navigate to show that parameter and its value.
2. Press the right arrow button to enter the edit mode. In edit mode, the parameter value will flash.
3. Pressing the up or down arrow keys to change the parameter value.

If you press the right arrow a second time, the right most digit of the parameter value will flash. You can then use the up or down arrow keys to change the value of the flashing digit.

Press the right arrow again to select the next digit, and repeat the process to change the rest of the digits in the parameter value.

4. When you are finished, you must press the **enter** button to confirm the parameter change.  
**The new value will not be saved unless the enter button is pushed.**

### 3-2.11 EDITING A CONFIGURATION VALUE

A configuration parameter gets its data from the parameter whose ID number you enter here. Parameter ID numbers are listed in Appendix D.

Configuration parameters can have values ranging from 1 to 2000. Values 1 to 1000 indicate firmware values; values 1001 to 2000 indicate application values.

Use the following procedure to edit configuration parameter values.

1. To edit a parameter, navigate to show that parameter and its value.
2. Press the right arrow button to enter the edit mode. In edit mode, the parameter value will flash.
3. Pressing the up or down arrow keys to change the parameter value.

If you press the right arrow a second time, the rightmost digit of the parameter value will flash. You can then use the up or down arrow keys to change the value of the flashing digit.

Press the left arrow to select the next digit, and repeat the process to change the rest of the digits in the parameter value.

4. When you are finished, you must press the **enter** button to confirm the parameter change.  
**The new value will not be saved unless the enter button is pushed.**

### 3-2.12 EDITING A SELECTION VALUE

Some parameter values are displayed as text. For example, parameter S6.1 (Language) can be set to four values: English, Español (Spanish), Français (French), or Português (Portuguese). Use the following procedure to edit a parameter selection value.

1. To edit a parameter, navigate to show that parameter and its value.
2. Press the right arrow button to enter the edit mode. In edit mode, the parameter value will flash.
3. Pressing the up or down arrow keys to change the parameter value.
4. When you are finished, you must press the **enter** button to confirm the parameter change.  
**The new value will not be saved unless the enter button is pushed.**

### 3-2.13 KEYPAD REMOVAL WHILE DRIVE IS RUNNING

If the keypad is removed while the drive is running, a Keypad Comm fault (52) will result. The drive will also be placed in remote control mode. Clear the Keypad Comm fault by pressing the **reset** button. To restore local keypad control, press the **loc/rem** button.

### 3-2.14 STOP FAULT

The Keypad **stop** button will fault the drive and operate as a coast stop if held for three seconds, regardless which mode is active.

### 3-2.15 REMOTE KEYPAD

The Control Keypad is removable. It can be mounted externally and connected with the appropriate cable.

## SECTION IV

### I/O PARAMETER DESCRIPTIONS ( See Appendix A-4 )

#### 4-1 ANALOG INPUTS

| Parameters                          | Type | Default     |
|-------------------------------------|------|-------------|
| <i>AIN3 Slot ID to AIN4 Slot ID</i> | ACFG | 0           |
| <i>AIN1 Gain to AIN4 Gain</i>       | CAL  | 1.00        |
| <i>AIN1 Off to AIN4 Off</i>         | CAL  | 0.0         |
| <i>AIN1 Tc to AIN4 Tc</i>           | CAL  | 0.1 seconds |
| <i>AI1 Type to AI4 Type</i>         | APB  |             |
| <i>AIN1 to AIN4</i>                 | APB  |             |
| <i>AIN1 Fault to AIN4 Fault</i>     | DPB  |             |

#### Description

Four analog inputs are available in this software. Two of the analog inputs are available with the standard board in slot A. The other two require additional I/O boards to take advantage of them.

The slot ID configures the location of the analog input. The first digit of the ID is the slot location: Slot A-E = 1-5. The second digit is the order of the input on the board. 0 = first analog input. The first two analog inputs are hard set Slot A input 0 and 1.

Before scaling, the value of the analog inputs are scaled 0-10,000; +/-10,000 for +/-10 volt boards.

The Type of board is read from the I/O slot and can be viewed as *AI1 Type -AI4 Type* as follows:

| <u>Mode</u> |
|-------------|
| 0 = Unknown |
| 1 = 0-20 ma |
| 2 = 4-20 ma |
| 3 = 0-10 V  |
| 4 = 2-10 V  |
| 5 = +/-10 V |

Scaling for the first analog input is done as follows:

$$\text{Value 1} = (\text{AI1} \times \text{AIN1 Gain} / 100) + \text{AIN1 Off}$$

*AIN1 Tc* is a low pass filter on the input, entered in seconds.

*AIN1* is the value after scaling and filtering.

*AIN1 Fault* bit will go high only in modes 2 or 4.

Mode 2 will fault when the input voltage is less than 4 mA.

Mode 4 will fault when the input voltage is less than 2 V.

## 4-2 ANALOG OUTPUTS

| Parameters                                   | Type | Default   |
|--|------|---|
| <i>AOUT1 ID</i> to <i>AOUT4 ID</i>           | ACFG | 1575 = Bidir Cdiam<br>1528 = Counter1<br>1200, 1200 = Zero-Analog |
| <i>AOUT1 Zero</i> to <i>AOUT4 Zero</i>       | CAL  | 0.0   |
| <i>AOUT1 Cal</i> to <i>AOUT4 Cal</i>         | CAL  | 1.00  |
| <i>AOUT1 TC</i> to <i>AOUT4 TC</i>           | CAL  | 0.10 seconds  |
| <i>AOUT2 Slot ID</i> to <i>AOUT4 Slot ID</i> | ACFG | 0   |
| <i>AOUT1 Val</i> to <i>AOUT4 Val</i>         | APB  |   |

### Description

Four analog outputs are available in this software. One analog output is available with the standard board in slot A. The other three require additional I/O boards to take advantage of them.

The ID configures which parameter value to map to the analog output.

The slot ID configures the location of the analog output. First digit of the ID is the slot location: Slot A-E = 1-5. Second digit is the order of the output on the board; 0 = first analog output. The first analog output is hard set to Slot A first output.

After scaling, the value can be viewed as *AOUTx\_Val* with a range of 0-10,000; +/-10,000 for ±10 volt boards.

The Type of board must be known for the scaling factor:

- 0 = Unknown
- 1 = 0-20 mA = 0-10,000 value
- 2 = 4-20 mA = 0-10,000 value
- 3 = 0-10 V = 0-10,000 value
- 4 = 2-10 V = 0-10,000 value
- 5 = +/-10 V = 0-10,000 value

Scaling for the first analog output is done as follows:

$$\text{Value 1} = (\text{AOUT1 ID value} + \text{AOUT1 Zero}) \times \text{AOUT1 Cal} / 100$$

Note: 10,000 is the board's full output.

*AOUTx Tc* is a low-pass filter on the output entered in seconds.

### 4-3 DIGITAL INPUTS

| Parameters                   | Type | Default |
|------------------------------|------|---------|
| DIN7 Slot ID to DIN8 Slot ID | ACFG | 0       |
| DIN 1 to DIN 8               | DPB  |         |
| Not DIN 1 to Not DIN 8       | DPB  |         |

#### Description

Eight digital inputs are available in this software. Six digital inputs are available with the standard board in slot A. The other two require additional I/O boards to take advantage of them.

The slot ID configures the location of the digital input. The first digit of the ID is the slot location: Slot A-E = 1-5. The second digit is the order of the input on the board; 0 = first digital input. The first six digital inputs are hard set to Slot A digital inputs.

The digital inputs and their invert can be viewed as *DIN x* and *Not DIN x*.

### 4-4 DIGITAL OUTPUTS

| Parameters                     | Type | Default   |
|--------------------------------|------|---|
| DOUT1 ID to DOUT6 ID           | BCFG | 111 6= MC_Fault = Drive fault<br>1064 = Stop Cmd = Auto Stop<br>1002,1002, 1002, 1002 = Zero Bit<br>0 |
| DOUT1 Inv to DOUT6 Inv         | En   | 0   |
| DOUT4 Slot ID to DOUT6 Slot ID | ACFG |   |

#### Description

Six digital outputs are set up in the software. Three digital outputs are available with the standard board in slot A or B. The other three require additional I/O boards to take advantage of them.

The ID configures which parameter to map to the digital output.

The slot ID configures the location of the digital output. The first digit of the ID is the slot location: Slot A-E = 1-5. The second digit is the order of the output on the board; 0 = first digital output. The first three digital outputs are hard set to the default boards ( One output in slot A and two in slot B ).

The value bit can be inverted before being sent out by *DOUTx\_Inv* parameters.

## 4.5 ENCODER COUNTER INPUTS

| Parameters                          | Type | Default           |
|-------------------------------------|------|-------------------|
| <i>Enc1 Slot ID, Enc2 Slot ID</i>   | ACFG | 0                 |
| <i>Enc1 Mlt, Enc2 Mlt</i>           | CAL  | 1000              |
| <i>Enc1 Div, Enc2 Div</i>           | CAL  | 1000              |
| <i>C_Enc2_Add</i>                   | CAL  | 0                 |
| <i>Enc1 Tc, Enc2 Tc</i>             | CAL  | 1 ms              |
| <i>Counter1 Dec, Counter2 Dec</i>   | CAL  | 0                 |
| <i>Counter1 Mult, Counter2 Mult</i> | BCFG | 1                 |
| <i>Counter1 Hld, Counter2 Hld</i>   | BCFG | 1                 |
| <i>Counter1 Res, Counter2 Res</i>   | En   | 1002 ( Zero Bit ) |
| <i>Counter1, Counter2</i>           | Cal  | 0 ( Disabled )    |
| <i>Enc1_Out, Enc2_Out</i>           | APB  |                   |
| <i>Counter1, Counter2</i>           | APB  |                   |

### Frequency Description:

Two encoder inputs are available in this software, but require additional option boards to enable.

When closed loop speed control is requested, the first encoder feedback is always selected for speed feedback. This is taken from the board, and is not affected by the parameter scalings.

The slot ID configures the location of the encoder input. First digit of the ID is the slot location: Slot A – E = 1 – 5. Second digit is the order of the output on the board. 0 = first encoder input. On option board A7, the second frequency input is input 3 of the board.

The frequency feedback is scaled by the option board by entering the proper PPR in the option board parameters. It is assumed that the encoder is mounted directly to the motor with no gear ratio and value read from the board is in motor rotation in hertz for speed feedback.

$$\text{Value from board} = \frac{(\text{Frequency Hz}) \times (60 \text{ s/m}) \times (\text{Nominal motor frequency Hz})}{(\text{PPR}) \times (\text{Nominal motor speed RPM})}$$

Both frequency feedbacks can be scaled and filtered and used for other functions such as speed reference.

*Enc1\_Out* = first encoder input scaled by (motor Hz x *Enc1 Mult / Enc1 Div*) with a low pass filter of time constant *Enc1 Tc*.

*Enc2\_Out* = second encoder input scaled by ((motor Hz + *Enc2 ADD*) x *Enc2 Mult / Enc2 Div*) with a low pass filter of time constant *Enc2 Tc*.

A typical application will have a second encoder input as the line speed reference. Comparing the two encoder feedbacks is the basis for the diameter calculation.

**Counter Description:**

Both encoder inputs have pulse counters associated with them. These are bi-directional counters with hold and reset bits. The values of the counters will be stored and recalled through drive power loss (retentive).

Three words read from the encoder board contain the raw motor rotations. The first two offer complete revolution counter and the third is the fraction of rotation.

*Counter1* = Motor rotations x *Counter1 Mult* / *Counter1 Dec*

*Counter2* = Motor rotations x *Counter2 Mult* / *Counter2 Dec*

*Counter1 Hld*, *Counter2 Hld* will hold their respective counters at their current count when high.

*Counter1 Res*, *Counter2 Res* will reset their respective counters to zero when high.



## SECTION V

### LOGIC SEQUENCE ( See Appendix A-5 )

#### 5-1 MISCELLANEOUS LOGIC

*Zero Bit* - Set to FALSE. ID number for this bit is 1002.

*One Bit* - Set to TRUE. ID number for this bit is 1001.

*Zero Analog* = 0

*One Analog* = 1

*Int Ten* = 10

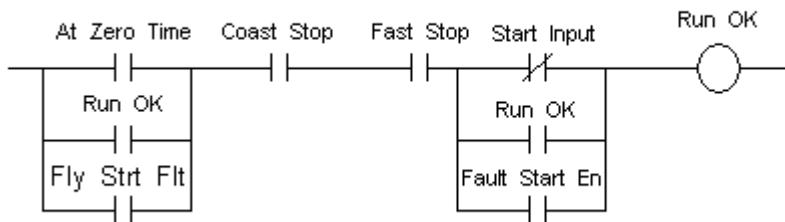
*Int Hundred* = 100

*Int Thousand* = 1000

#### 5-2 REMOTE OPERATION

There are four basic run commands for the ACCEL500 drive. Run and thread are maintained. Jog forward and Jog reverse are momentary. This logic is used internally for reference and brake control but can also be used external devices by using digital outputs or communications.

##### 5-2.1 Run OK



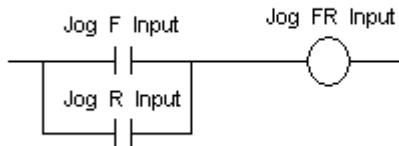
The *Run \_OK* bit is used to stop the drive in any control mode.

If the *Fly Start Flt* bit is enabled, then the drive can be restarted after a fault without first going to zero speed.

The *Fault Start En* bit allows the drive to start running as soon as the fault is cleared. If it is disabled, the runs must first be removed before they can be energized again. This bit should be disabled when the runs come from a communication port rather than direct I/O. This will force the communications to come up and remove the runs before you can safely run.

*Coast Stop* and *Fast Stop* are defaulted to *One Bit*.

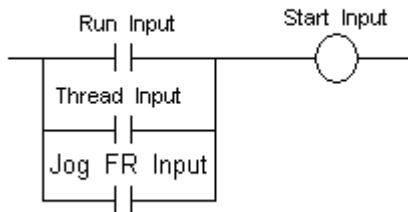
### 5-2.2 Jog FR Input



The *Jog FR Input* is active when either of the Jog inputs are a TRUE.

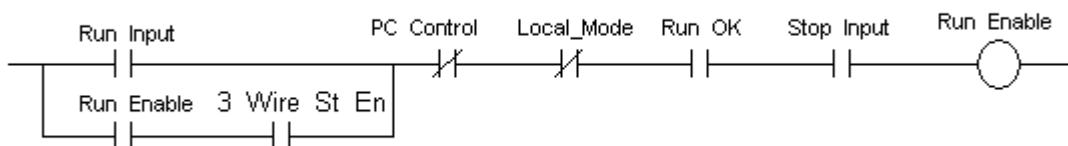
*Jog F Input* is defaulted to the second digital input. *Jog R Input* is defaulted to *Zero Bit*.

### 5-2.3 Start Input



*Start Input* is TRUE when any of the drive run inputs are active.

### 5-2.4 Run Enable

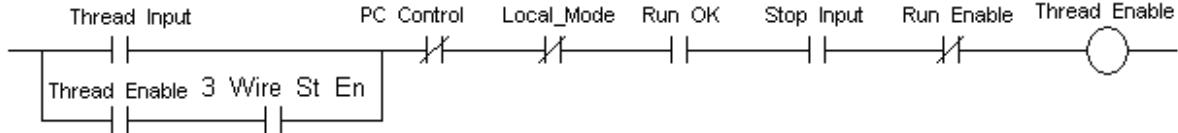


The *Run Input* will energize the *Run Enable* if all interlocks are met.

The *Stop Input* defaults to TRUE. This can be set to a normally closed stop input along with enabling the *3\_Wire\_St\_En* to implement a three wire start/stop circuit. *Start\_Stop\_3\_En* is defaulted to FALSE.

*Run Input* is defaulted to the first digital input.

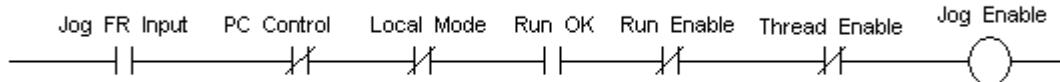
### 5-2.5 Thread Enable



*Thread Enable* is setup similar to the *RunEnable*. *Run\_Enable* takes priority. If in Thread and the *Run\_Input* goes high the control will transfer to the Run mode.

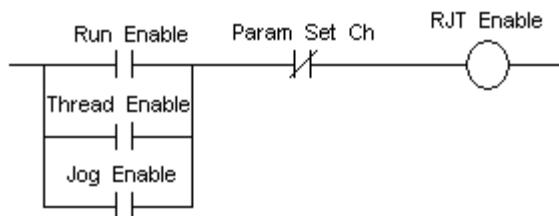
*Thread Input* is defaulted to *Zero Bit* which disables this function.

### 5-2.6 Jog Enable



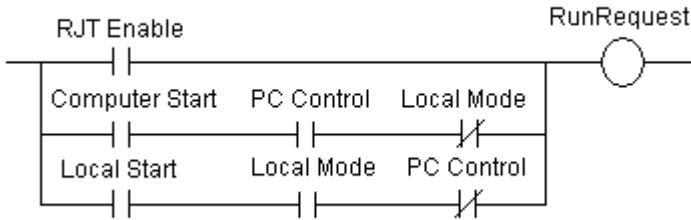
The *Jog Enable* is not maintained. Removing the input turns off the enable. Also, Thread and Run Enables have a higher priority.

### 5-2.7 RJT Enable



*RJT Enable* is high if any of the modes are enabled and the drive is done with a parameter change. This makes sure all proper values are in place before proceeding.

### 5-2.8 RunRequest



*RunRequest* is high if *RJT Enable* is High or if the drive is commanded to run from either the local mode or computer ADDaptACC mode.

### 5-2.9 Cntrl Inhib

*Cntrl Inhib* is *RunRequest* is off and *At Zero Time* has expired..

### 5-2.10 Fast Stop

Not used in current application.

### 5-2.11 Coast Stop

The drive will coast stop under the following conditions:

- Not in *PC Control* and *Coast Stop* goes low.
- In *PC Control* and the user presses the coast stop button in ADDaptACC.
- Drive faults out and the response is setup for coast stop.
- Removal of the run if the *Stop Funct* parameter is set to Coast.

### 5-2.12 Cntrl Mode

*Cntrl Mode* is an integer based on the following:

- 0 = Not enabled
- 1 = *Run Enable*
- 2 = *Thread Enable*
- 3 = *Jog F En*
- 4 = *Jog R En*

This is used for the reference select blocks.

## 5-3 LOCAL DRIVE KEYPAD

### 5-3.1 LOCAL RUN MODE

The drive can be put into the local mode by pressing the local/remote button on the keyboard. This will transfer control as long as the drive is not in PC control or running at the time.

Pressing the Start button on the keypad when in the local mode will initiate a drive Run as long as *MC Ready* is high and the drive is not faulted (*MC Fault* is low)

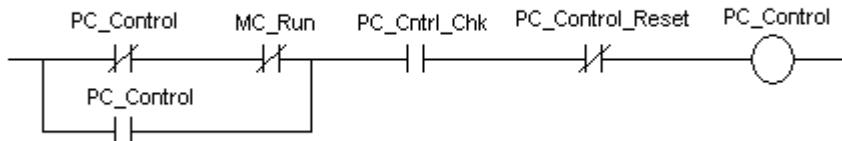
Pressing the Stop Button on the keypad will initiate a local stop. This does not stop the drive in remote or PC control. See button Stop fault in next section.

### 5-3.2 BUTTON STOP FAULT

In any mode, if the Stop button is pressed for 4 seconds a button stop fault will occur.

## 5-4 ADDaptACC SOFTWARE CONTROL

### 5-4.1 PC Control



*PC Control* is enabled by the ADDaptACC diagnostic software package. It will transfer into this mode only if the drive is not running. The drive will transfer out of *PC Control* if communications are lost to the computer.



## SECTION VI

# REFERENCING AND OUTER CONTROL LOOP

### 6-1 SPEED REFERENCE ( See Appendix A-1)

#### 6-1.1 RUN REFERENCE INPUTS

| Parameters        | Type | Default                   |
|-------------------|------|---------------------------|
| <i>Draw Inp</i>   | Acfg | <i>Draw Stpt</i> = 1.00   |
| <i>Master Ref</i> | Acfg | <i>Run Speed</i> = 20.00% |

#### Description:

Two inputs are available to set the drives speed while in Run mode. *Master Ref* is the normal speed input and it is defaulted to the calibration value *Run Speed*. *Draw Inp* is the other input and this is defaulted to be a ratio draw input defaulted to a calibration value *Draw Stpt*. Several options are available to manipulate these two inputs including digital increase/decrease, ramping and changing to difference draw as described in the next three sections.

#### 6-1.2 INCREASE / DECREASE COMMANDS

| Parameters              | Type | Default                 |
|-------------------------|------|-------------------------|
| <i>Run Stpt Up</i>      | E/D  | Disabled                |
| <i>Draw Inp</i>         | Acfg | <i>Draw Stpt</i> = 1.00 |
| <i>Run Inc Rate</i>     | Cal  | 5.00 Draw/S             |
| <i>Run Dec Rate</i>     | Cal  | 5.00 Draw/S             |
| <i>Run Stpt Res</i>     | Bcfg | <i>Cntrl Inhib</i>      |
| <i>Max Run Stpt</i>     | Cal  | 60.00 draw              |
| <i>Min Run Stpt</i>     | Cal  | - 60.00 draw            |
| <i>Run Stpt Inc Inp</i> | Bcfg | Zero Bit                |
| <i>Run Stpt Dec Inp</i> | Bcfg | Zero Bit                |
| <i>Run Stpt Dif</i>     | Apb  |                         |
| <i>Draw Ref</i>         | Apb  |                         |
| <i>Run In Max</i>       | Dpb  |                         |
| <i>Run In Min</i>       | Dpb  |                         |

Description:

*Draw Ref* is the value of *Draw Inp* after modifications by increase or decrease commands. The drive is defaulted so the commands are not active. To activate the commands see the following:

- Set *Run Stpt Inc Inp* to the digital increase command input.
- Set *Run Stpt Dec Inp* to the digital decrease command input.
- Set the rates to ramp the draw by *Run Inc Rate* and *Run Dec Rate*.
- Set *Max Run Stpt* and *Min Run Stpt* as output limits for *Draw Ref*.
- The increase /decrease setting is defaulted to reset on removal of the drive run. Changing *Run Stpt Res* to desired function to reset. Set to *Zero Bit* to disable reset of the draw.
- *Run Stpt Up* is used if a draw is set by both an operator display and increase / decrease commands. If this bit is enabled then the increase / decrease value will be reset upon changes in *Draw Inp*.

## 6-1.3 RATIO / DIFFERENCE DRAW

| Parameters           | Type | Default                    |
|----------------------|------|----------------------------|
| <i>Draw Ref</i>      | Apb  |                            |
| <i>Slv No Rmp</i>    | Bcfg | <i>One Bit</i>             |
| <i>Master Ref</i>    | Acfg | <i>Run_Speed</i> = 20.00 % |
| <i>Slv Rate Lim</i>  | Cal  | 10 % / Sec                 |
| <i>Ratio Draw En</i> | E/D  | Enabled                    |
| <i>Ratio Div</i>     | CAL  | 100                        |
| <i>Run Stpt</i>      | Apb  |                            |

Description:

*Master Ref* is the speed reference input for most applications. *Slv Rate Lim* is provided to allow for a slower ramp rate other than the internally ramp block. Note that if *Slv No Rmp* is enabled ( Set low ) and *Slv Rate Lim* is set to zero the output will not update.

If *Ratio Draw En* is disabled *Master Ref* is added to the output of the inc/dec block to become *Run Stpt*.

If *Ratio Draw En* is enabled *Master Ref* is multiplied with the output of the inc/dec block divided by *Ratio Div* to become *Run Stpt*. Default has the output of the inc/dec = 1.00 and Ratio Div as 1.00 so *RunStpt* = *Master Ref*.

#### 6-1.4 SPEED REFERENCE SELECTION

| Parameters         | Type | Default                       |
|--------------------|------|-------------------------------|
| <i>Run Stpt</i>    | APB  |                               |
| <i>Cntrl Mode</i>  | APB  |                               |
| <i>Thread Ref</i>  | Acfg | <i>Thread Speed = 10.00 %</i> |
| <i>Jog F Ref</i>   | Acfg | <i>Jog F Speed = 5.00 %</i>   |
| <i>Jog R Ref</i>   | Acfg | <i>Jog R Speed = -5.00 %</i>  |
| <i>RJT Ref</i>     | APB  |                               |
| <i>ABS_RJT_Ref</i> | APB  |                               |
| <i>Neg Spd Ref</i> | DPB  |                               |

Description:

*Cntrl Mode* from the Run logic determines the value of *RJT Ref* as follows:

- 0 = 0.00%
- 1 = *Run Stpt*
- 2 = *Thread Ref*
- 3 = *Jog F Ref*
- 4 = *Jog R Ref*

The drive is defaulted so the first digital input enables the run and the second digital input enables the jog forward.

*ABS\_RJT\_Ref* then becomes the absolute value of *RJT Ref*.

*Neg Spd Ref* goes high if *RJT Ref* is negative.

#### 6-1.5 REVERSE

| Parameters            | Type | Default         |
|-----------------------|------|-----------------|
| <i>Reverse Inp</i>    | BCFG | <i>Zero Bit</i> |
| <i>Jog enable</i>     | DPB  |                 |
| <i>Control Place</i>  | APB  |                 |
| <i>Keypad Spd Dir</i> | DPB  |                 |
| <i>Reverse</i>        | DPB  |                 |

Description:

Reverse command is dependant on *Control Place* as follows:

- *Control Place* = 0 = Remote Control - Reverse comes from *Reverse Inp* (the reverse input configuration point). This is not used when jogging since there is a separate jog forward and jog reverse. Reverse can also be commanded by having a negative speed reference.
- *Control Place* = 1 = Panel Control – *Keypad Spd Dir* command. This is changed via the keypad.
- *Control Place* = 2 = Computer Control - Reverse comes from a check box on the control pad screen from ADDaptACC

## 6-1.6 REFERENCE SELECTION AND RAMP HOLD

| Parameters           | Type | Default            |
|----------------------|------|--------------------|
| <i>Control Place</i> | APB  |                    |
| <i>ABS RJT Ref</i>   | APB  |                    |
| <i>LS to Freq</i>    | CAL  | 60                 |
| <i>LS Scl Div</i>    | CAL  | 100                |
| <i>Min Frequency</i> | CAL  | 0.00 Hz            |
| <i>Freq Max</i>      | CAL  | 60.00 Hz           |
| <i>Min Dia</i>       | CAL  | 50.00              |
| <i>SRef Dia Scl</i>  | ACFG | 1575 = Bidir CDiam |
| <i>FreqReference</i> | APB  |                    |

### Description:

The Speed reference is dependent on *Control Place* as follows:

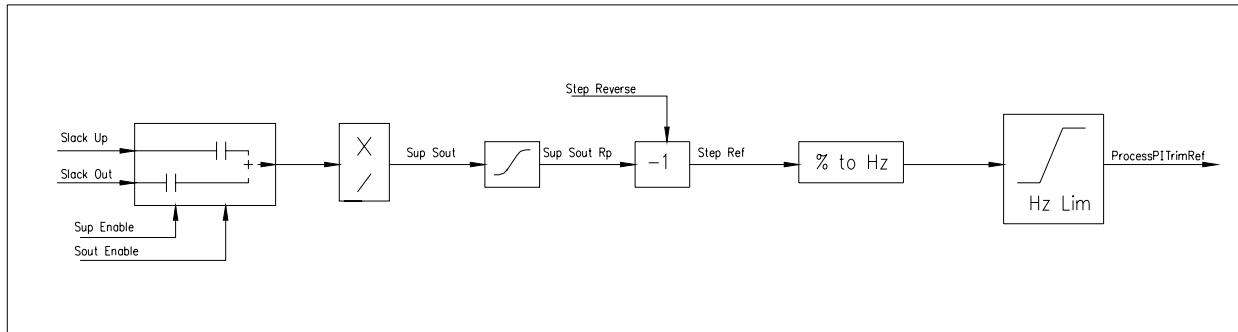
- *Control Place* = 0 = Remote control - Derived from the Run, Jog, Thread reference *ABS RJT Ref*.
- *Control Place* = 1 = Panel control - Set from the keypad speed reference.
- *Control Place* = 2 = Computer control - Set from the computer control slider bar from ADDaptACC.

The Speed reference is scaled in percent line speed. The reference is then modified by diameter using parameters *Min Dia* and *SRef Dia Scl*. The speed reference should be 100% at minimum diameter at 100% line speed. After the diameter scaling, the reference then gets scaled to motor hertz using parameters *Ls to Freq* and *Ls Scl Div*.

*FreqReference*. Either *Reverse* or *Neg Spd Ref* will invert the reference.

## 6-2 SPEED STEP REFERENCE ( See Appendix A-2)

*Freq Ramp Out* is the final ramped speed reference after the limiters. Droop and step inputs are then added to this value before going to the velocity controller. Depending if the section is configured for open or closed loop, this section varies slightly.



### 6-2.1 SPEED STEP REFERENCES

| Parameters         | Type | Default                      |
|--------------------|------|------------------------------|
| <i>Sup Enable</i>  | BCFG | Zero Bit                     |
| <i>Sout Enable</i> | BCFG | Zero Bit                     |
| <i>Slack Up</i>    | ACFG | <i>Spd Slk Up</i> = 10.00 %  |
| <i>Slack Out</i>   | ACFG | <i>Spd Slk Out</i> = -10.00% |
| <i>Slack Mult</i>  | ACFG | Int Hundred = 1.00           |
| <i>Slack Div</i>   | CAL  | 100                          |
| <i>Sup Sout</i>    | APB  |                              |
| <i>Slk No Ramp</i> | BCFG | One Bit                      |
| <i>Slack Rate</i>  | CAL  | 10.0 % / second              |
| <i>Sup Sout Rp</i> | APB  |                              |

#### Description:

*Slack Up* and *Slack Out* inputs are available to inject step changes into the speed reference. If both are enabled the values are added. These can be used for tuning or current sharing. The outer tension loop can also be configured to one of these inputs for speed trim control.

*Slack Mult* and *Slack Div* are available to scale or multiply the slack reference. This can be used to provide a percentage step. *Sup Sout* = the enabled input  $\times$  *Slack Mult* / *Slack Div*. *Slack Div* is used to keep the decimal points correct.

A rate-of-change limit can then be applied to *Sup Sout* to become *Sup Sout Rp*. This can be used if a pure step is too harsh for the system. *Slack Rate* is the rate and is entered in percent change per second. The ramp limit is defaulted to be bypassed ( *Slk No Ramp* = One Bit ).

## 6-2.2 SPEED STEP SCALING, REVERSE AND LIMITS

| Parameters              | Type | Default                   |
|-------------------------|------|---------------------------|
| <i>Sup Sout Rp</i>      | APB  |                           |
| <i>Step Reverse</i>     | BCFG | <i>Zero Bit</i>           |
| <i>Step Ref</i>         | APB  |                           |
| <i>LS_to_Freq</i>       | CAL  | 60                        |
| <i>LS_Scl_Div</i>       | CAL  | 100                       |
| <i>Freq Max</i>         | CAL  | 60 Hz                     |
| <i>Min Dia</i>          | CAL  | 50.00                     |
| <i>SRef Dia Scl</i>     | ACFG | 1575 = <i>Bidir CDiam</i> |
| <i>ProcessPITrimRef</i> | APB  |                           |

### Description:

*Step Reverse* enables the inverse polarity of *Sup Sout Rp*. The signal then becomes *Step Ref*.

The Speed reference is scaled in percent line speed. The reference is then modified by diameter using parameters *Min Dia* and *SRef Dia Scl*. The speed reference should be 100% at minimum diameter at 100% line speed. After the diameter scaling, the reference then gets scaled to motor hertz using parameters *Ls to Freq* and *Ls Scl Div*.

**Caution:** The same scaling factors are used to re-scale the speed ramp reference.

Since this reference gets added to the ramped speed reference and goes directly to the speed loop error, limit checking must be done. The limits are set to plus or minus.

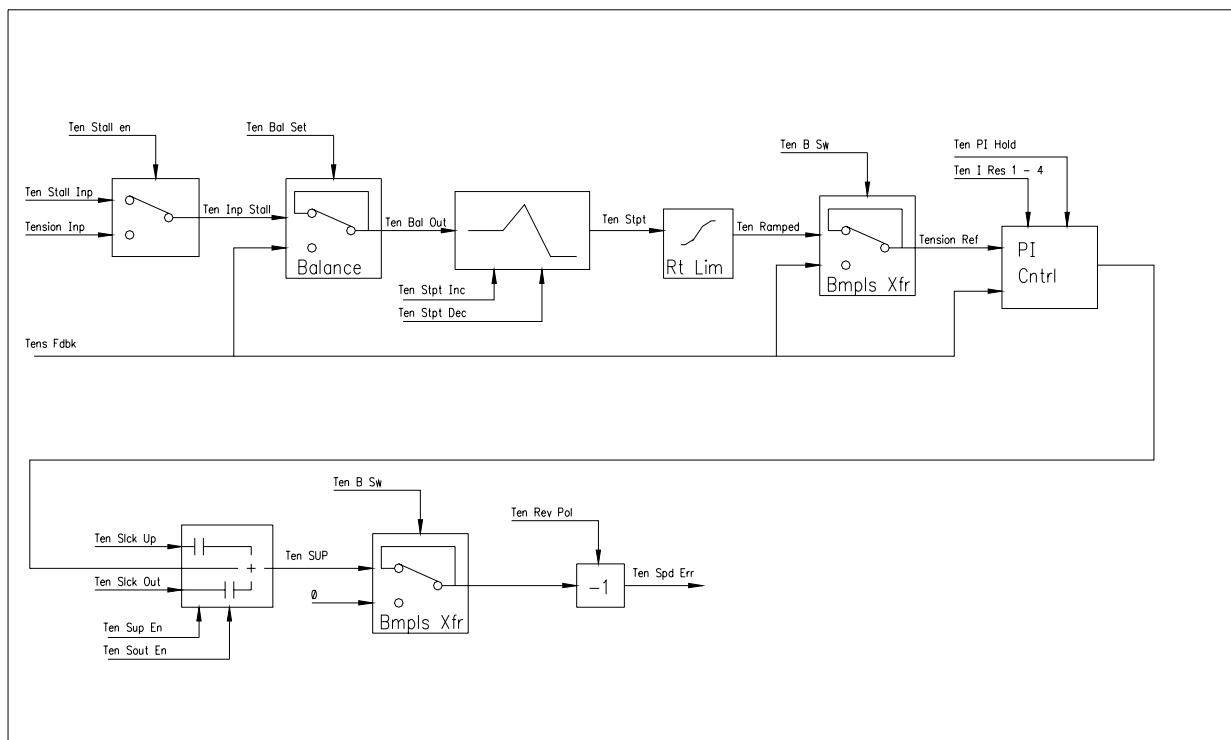
## 6-3 TENSION LOOP ( See Appendix A-3)

The tension loop is fully configurable to be used as tension or control for the winder software.

The output of the tension loop can control the drive as a speed trim, speed reference, or torque reference.

The output can also be configured to an analog output or to the communications words to control an external function not related to the drive, such as an unwind brake regulator.

The tension loop is broken down into tension reference blocks, open loop torque reference, and tension loop blocks.



### 6-3.1 TENSION REFERENCE – SETPOINTS

| Parameters    | Type | Default            |
|---------------|------|--------------------|
| Ten Stall En  | BCFG | Zero Bit           |
| Ten Stall Inp | ACFG | Ten Stall = 10.00% |
| Tension Inp   | ACFG | Win Tbl Out        |
| Ten Inp Stall | APB  |                    |
| Ten Bal Ret   | BCFG | Zero Bit           |
| Ten Bal Dif   | APB  |                    |
| Ten Bal Set   | BCFG | One Bit            |
| Tens Fdbk     | ACFG | Zero Analog        |
| Ten Bal Out   | APB  |                    |
| Ten Spt Up    | E    | Disable            |

|                     |      |                         |
|---------------------|------|-------------------------|
| <i>Ten Dec Rate</i> | CAL  | 5.00 %/s                |
| <i>Ten Inc Rate</i> | CAL  | 5.00 %/s                |
| <i>Ten Stpt Res</i> | BCFG | <i>Zero Bit</i>         |
| <i>Ten Stpt Max</i> | CAL  | 100.00 %                |
| <i>Ten Stpt Min</i> | CAL  | 0.00%                   |
| <i>Ten Stpt Inc</i> | BCFG | <i>Zero Bit</i>         |
| <i>Ten Stpt Dec</i> | BCFG | <i>Zero Bit</i>         |
| <i>Ten Stpt Dif</i> | APB  |                         |
| <i>Ten Stpt</i>     | APB  |                         |
| <i>Ten Stpt Max</i> | DPB  |                         |
| <i>Ten Stpt Min</i> | DPB  |                         |
| <i>Win Input</i>    | ACFG | <i>Ten Ref = 50.00%</i> |
| <i>Win Ref Xin</i>  | ACFG | <i>Bidir Cdiam</i>      |
| <i>Win Tbl Div</i>  | CAL  | 1.00                    |
| <i>Win Tbl Out</i>  | APB  |                         |

Description:

The table block is used to allow the tension reference to be tapered by diameter. Sixteen points are available for creating a taper curve from table 3 points.

$$\text{Win Tbl Out} = \text{Win Input} \times F(x) / \text{Win Tbl Div}$$

Where  $F(x)$  = the Y value from Table 3 x, y points based on *Win Ref XIn* value. If *Win Ref XIn* is between two x points the software interpolates the value between the two y points.

The tension reference can come from any combination of inputs.

- Selection between *Ten Stall Inp* or *Tension Inp*. Both of these can be left at their default calibration value or configured to get its reference from an external source.
- The balance block can be used to sample *Tens Fdbk* and use that value as the reference. It can then be modified by changing *Tension Inp*. This is used when the operator gets the machine to where he likes the running conditions then switches it over to tension control to hold it there.
- The setpoint block is used either to set the tension reference from increase/decrease push buttons or modify the input reference. The block has settable rates and limits along with auto reset on input updates.

### 6-3.2 TENSION REFERENCE – RAMP AND TRANSFER

| Parameters           | Type | Default            |
|----------------------|------|--------------------|
| <i>Ten Stpt</i>      | APB  |                    |
| <i>Ten Rmp Res</i>   | BCFG | <i>Zero Bit</i>    |
| <i>Ten Ramp Rate</i> | CAL  | 5 s                |
| <i>Ten Ramped</i>    | APB  |                    |
| <i>Ten B Sw</i>      | BCFG | <i>One Bit</i>     |
| <i>Ten B Rate</i>    | CAL  | 5.00 s             |
| <i>Tens Fdbk</i>     | ACFG | <i>Zero Analog</i> |
| <i>Tension Ref</i>   | APB  |                    |

Description:

The tension reference (*Ten Stpt*) goes through a linear ramp with an adjustable rate called *Ten Ramp Rate*. From here the value is enabled via the bumpless switch. This ramps the reference from the feedback value to its running value when tension is enabled. This provides a smooth transition into tension mode. The rate of the transfer is set by *Ten B Rate*. Once the transition is complete, the block passes its input to the output. *Tension Ref* then goes to the tension PI block.

## 6-3.3 TENSION LOOP

| Parameters             | Type | Default                      |
|------------------------|------|------------------------------|
| <i>Ten I Res 1</i>     | BCFG | <i>Cntrl Inhib</i>           |
| <i>Ten I Res 2</i>     | BCFG | <i>One Bit</i>               |
| <i>Ten I Res 3</i>     | BCFG | <i>Zero Bit</i>              |
| <i>Ten I Res 4</i>     | BCFG | <i>Zero Bit</i>              |
| <i>Ten PI Hold</i>     | BCFG | <i>Zero Bit</i>              |
| <i>Ten Res Bit</i>     | DPB  |                              |
| <i>Ten Preload</i>     | ACFG | <i>Zero Analog</i>           |
| <i>Win Stl Gn Sel</i>  | BCFG | <i>Zero Bit</i>              |
| <i>Ten P Inp</i>       | ACFG | <i>Ten P Gain = 0.01</i>     |
| <i>Ten P Stl Gn</i>    | CAL  | 0.01                         |
| <i>Ten I Inp</i>       | ACFG | <i>Ten I Gain = 1.00 sec</i> |
| <i>Ten I Stl Gn</i>    | CAL  | 1.00 sec                     |
| <i>Ten PI Out</i>      | APB  |                              |
| <i>Ten Max Lmt</i>     | CAL  | 10.00 %                      |
| <i>Ten Min Lmt</i>     | CAL  | -10.00%                      |
| <i>Ten PI Gn Scale</i> | CAL  | 1                            |
| <i>Tension Ref</i>     | APB  |                              |
| <i>Tens Fdbk</i>       | ACFG | <i>Zero Analog</i>           |
| <i>Ten PI Min</i>      | DPB  |                              |
| <i>Ten PI Max</i>      | DPB  |                              |

Description:

The PI regulator can be reset from one of four selectable bits. The defaults are:

- *Cntrl Inhib*, which goes high after the drive is stopped.
- *One Bit*, which disables the loop unless needed.
- The last two inputs are set to zero for future need.

When reset, the output can be set to a preload value by setting *Ten Preload* to the desired input.

When *Ten PI Hold* goes high, the tension regulator is held at its last output. The reset inputs have a higher priority than the hold input.

The proportional gain value of 1.0 will produce an output of 1 with an error of 1. The I gain is in repeats per gain. With an I gain value of 5.00 and an error of 10, the output will ramp by 10 every five seconds.

A second set of gains can be used by enabling *Win Stl Gn Sel*. The second set is usually used for running at zero speed or for a specialty grade of material.

*Ten PI Gn Scale* is a direct multiply on the error. This has the net affect of increasing both the P and the I gains.

The output of the regulator is limited by *Ten Max Lmt* and *Ten Min Lmt*. If the output is a speed reference trim, then these limits affect the amount the speed can change.

#### 6-3.4 TENSION LOOP - OUTPUT

| Parameters          | Type | Default         |
|---------------------|------|-----------------|
| <i>Ten PI Out</i>   | APB  |                 |
| <i>Win Gn Not D</i> | EN   |                 |
| <i>Win Gn Dia</i>   | EN   |                 |
| <i>Ten SUP</i>      | APB  |                 |
| <i>Spd Bump Sw</i>  | BCFG | <i>Zero Bit</i> |
| <i>Spd B Rate2</i>  | CAL  | 5.00 %/s        |
| <i>Ten Rev Pol</i>  | BCFG | <i>Zero Bit</i> |
| <i>Ten Spd Err</i>  | APB  |                 |

##### Description:

The output of the tension loop can be multiplied by diameter divided by *Gn With Dia* by enabling *Win Gn Dia En*. This should be used when tension control is used. Do not use with dancer control.

The bumpless switch is used to smoothly transfer out of tension control back to speed control. It will ramp its output to zero by the *Spd B Rate2* value in % per second.

*Ten Rev Pol* corrects *Ten Spd Err* for the proper polarity to the control reference.

*Ten Spd Err* can be configured to become a speed reference trim or torque reference, or configured to an analog output for external control.

### 6-3.5 TENSION LOOP – FEEDBACK COMPARATOR

| <b>Parameters</b>     | <b>Type</b> | <b>Default</b>               |
|-----------------------|-------------|------------------------------|
| <i>Ten Cmp Stp</i>    | ACFG        | <i>Max Tension</i> = 100.00% |
| <i>Max Ten Set</i>    | CAL         | 90.00%                       |
| <i>Min Ten Set</i>    | CAL         | 10.00%                       |
| <i>Max Ten Hys</i>    | CAL         | 5.00%                        |
| <i>Tens Fdbk</i>      | ACFG        | Zero_Analog                  |
| <i>Ten_HL_Decimal</i> | CAL         | 2                            |
| <i>Ten At Max</i>     | DPB         |                              |
| <i>Ten At Min</i>     | DPB         |                              |

Description:

The tension feedback comparator can be used to shut down the line on over-tension or perform a web loss detection. It can also be used on dancer control to take the section out of tension control and add a speed slack up until the dancer is lifted. The compare block setting is a percentage of *Ten Cmp Stp*.

*Ten At Max* will go high when *Tens Fdbk* goes above the *Max Ten Set* percentage of *Ten Cmp Stp*.

*Ten At Min* will go high when *Tens Fdbk* goes below the *Min Ten Set* percentage of *Ten Cmp Stp*.

### 6-3.6 WINDER OPEN LOOP REFERENCE

| <b>Parameters</b>   | <b>Type</b> | <b>Default</b>              |
|---------------------|-------------|-----------------------------|
| <i>Win Ffd Inp</i>  | ACFG        | = 1375 = <i>Opn Lp Stpt</i> |
| <i>Win Ffd Dia</i>  | ACFG        | <i>Bidr Cdiam</i>           |
| <i>Win Fd Gn I</i>  | ACFG        | <i>Win Fd Gain</i> = 1.000  |
| <i>Win Gn Out</i>   | APB         |                             |
| <i>Win Ffd En</i>   | BCFG        | <i>One Bit</i>              |
| <i>Win Boost En</i> | BCFG        | <i>Zero Bit</i>             |
| <i>Win Aux En</i>   | BCFG        | <i>Zero Bit</i>             |
| <i>Win Boost</i>    | CAL         | 0.0 %                       |
| <i>Win Aux Ref</i>  | ACFG        | <i>Ten Spd Err</i>          |
| <i>Full Trq En</i>  | BCFG        | <i>One Bit</i>              |
| <i>ESTOP Trq</i>    | CAL         | 100.00%                     |
| <i>Win Ffd Rev</i>  | BCFG        | <i>Zero Bit</i>             |
| <i>Win Fd Fwd</i>   | APB         |                             |

Description:

The Winder open loop reference is to produce the required motor torque to maintain proper material tension.

*Win Ffd Inp* is usually set to the tension reference variable *Tension Ref*. The value is multiplied by the diameter input *Win Ffd Dia* to produce a torque reference. This value is then scaled to correct percent motor torque by the scaling factor input *Win Fd Gn I*.

The sum block takes the open loop torque command and adds an optional boost command and the closed loop output. The boost command can be used for turret winders to boost torque during knife cut. The Closed loop command comes from *Ten Spd Err* and is input to the sum block with *Win Aux Ref*.

On an ESTOP condition *Full Trq En* can be set to force the output to *ESTOP Trq* setpoint.

The final torque reference is then checked for polarity before becoming the torque reference *Win Fd Fwd*. See the torque reference section of this manual for the reset of the torque references which include losses and inertia compensation.

## 6-4 SPARE BLOCKS ( See Appendix A-6)

Two pages of spare blocks are added to the application. These are broken down into logic blocks and reference blocks.

### 6-4.1 SPARE REFERENCE BLOCKS

#### Parameters      Type      Default

##### **Table Block**

|                    |       |                    |
|--------------------|-------|--------------------|
| <i>Sp_Tbl0 Inp</i> | ACFG  | <i>One Analog</i>  |
| <i>Sp_Tbl0 Xin</i> | ACFG  | <i>Zero Analog</i> |
| <i>Sp_Tbl0 Gn</i>  | CAL   | 1.00               |
| <i>Table 0</i>     | Array | Table 0 32 values  |
| <i>Sp Tbl0 Out</i> | APB   |                    |

##### **Table Block**

|                    |       |                    |
|--------------------|-------|--------------------|
| <i>Sp_Tbl1 Inp</i> | ACFG  | <i>One Analog</i>  |
| <i>Sp_Tbl1 Xin</i> | ACFG  | <i>Zero Analog</i> |
| <i>Sp_Tbl1 Gn</i>  | CAL   | 1.00               |
| <i>Table 1</i>     | Array | Table 1 32 values  |
| <i>Sp Tbl1 Out</i> | APB   |                    |

##### **Table Block**

|                    |       |                    |
|--------------------|-------|--------------------|
| <i>Sp_Tbl2 Inp</i> | ACFG  | <i>One Analog</i>  |
| <i>Sp_Tbl2 Xin</i> | ACFG  | <i>Zero Analog</i> |
| <i>Sp_Tbl2 Gn</i>  | CAL   | 1.00               |
| <i>Table 2</i>     | Array | Table 2 32 values  |
| <i>Sp Tbl2 Out</i> | APB   |                    |

##### **Muldiv Block**

|                   |      |                          |
|-------------------|------|--------------------------|
| <i>Sp MD1 Val</i> | ACFG | <i>Zero Analog</i>       |
| <i>Sp MD1 Mul</i> | ACFG | <i>Sp MD1 Mlt = 1.00</i> |
| <i>Sp MD1 Div</i> | ACFG | <i>Sp MD1 Dv = 1.00</i>  |
| <i>Sp MD1 Out</i> | APB  |                          |

##### **Muldiv Block**

|                   |      |                          |
|-------------------|------|--------------------------|
| <i>Sp MD2 Val</i> | ACFG | <i>Zero Analog</i>       |
| <i>Sp MD2 Mul</i> | ACFG | <i>Sp MD2 Mlt = 1.00</i> |
| <i>Sp MD2 Div</i> | ACFG | <i>Sp MD2 Dv = 1.00</i>  |
| <i>Sp MD2 Out</i> | APB  |                          |

##### **Add Block**

|                    |      |                          |
|--------------------|------|--------------------------|
| <i>Sp Add1 In1</i> | ACFG | <i>Sp Add Val = 0.00</i> |
| <i>Sp Add1 In2</i> | ACFG | <i>Sp Add Val = 0.00</i> |
| <i>Sp Add1 Out</i> | APB  |                          |

##### **Sub Block**

|                    |      |                          |
|--------------------|------|--------------------------|
| <i>Sp Sub1 In1</i> | ACFG | <i>Sp Sub Val = 0.00</i> |
| <i>Sp Sub1 In2</i> | ACFG | <i>Sp Sub Val = 0.00</i> |
| <i>Sp Sub1 Out</i> | APB  |                          |

##### **Low Pass Block**

|                     |      |                    |
|---------------------|------|--------------------|
| <i>Sp LP Fil TC</i> | CAL  | 0.1 sec            |
| <i>Sp LP Fil In</i> | ACFG | <i>Zero Analog</i> |

*Sp LP Fil Out* APB

**ABS Block**

|                   |      |                    |
|-------------------|------|--------------------|
| <i>Sp ABS In</i>  | ACFG | <i>Zero Analog</i> |
| <i>Sp ABS Out</i> | APB  |                    |

**Sum Block**

|                    |      |                           |
|--------------------|------|---------------------------|
| <i>Sp Sum1 EnA</i> | BCFG | <i>Zero_Bit</i>           |
| <i>Sp Sum1 EnB</i> | BCFG | <i>Zero_Bit</i>           |
| <i>Sp Sum1 EnB</i> | BCFG | <i>Zero_Bit</i>           |
| <i>Sp Sum1 InA</i> | ACFG | <i>Sp Sum1 StA = 0.00</i> |
| <i>Sp Sum1 InB</i> | ACFG | <i>Sp Sum1 StB = 0.00</i> |
| <i>Sp Sum1 InC</i> | ACFG | <i>Sp Sum1 StC = 0.00</i> |
| <i>Sp Sum1 Out</i> | APB  |                           |

**Bumpless Block**

|                     |      |                       |
|---------------------|------|-----------------------|
| <i>Sp Bmp Sw</i>    | BCFG | <i>Zero_Bit</i>       |
| <i>Sp Bmp In1</i>   | ACFG | <i>Sp Bmp St1 = 0</i> |
| <i>Sp Bmp Rate1</i> | CAL  | 0                     |
| <i>Sp Bmp In2</i>   | ACFG | <i>Sp Bmp St2 = 0</i> |
| <i>Sp Bmp Rate2</i> | CAL  | 0                     |
| <i>Sp Bmp Hold</i>  | BCFG | <i>Zero Bit</i>       |
| <i>Sp Bmp Dn1</i>   | DPB  |                       |
| <i>Sp Bmp Dn2</i>   | DPB  |                       |
| <i>Sp Bmp Out</i>   | APB  |                       |

**Sel Block**

|                    |      |                        |
|--------------------|------|------------------------|
| <i>Sp Sel1 En1</i> | BCFG | <i>Zero_Bit</i>        |
| <i>Sp Sel1 In0</i> | ACFG | <i>Sp Sel1 ST0 = 0</i> |
| <i>Sp Sel1 In1</i> | ACFG | <i>Sp Sel1 ST1 = 0</i> |
| <i>Sp Sel1 Out</i> | APB  |                        |

**Sel Block**

|                    |      |                        |
|--------------------|------|------------------------|
| <i>Sp Sel2 En1</i> | BCFG | <i>Zero_Bit</i>        |
| <i>Sp Sel2 In0</i> | ACFG | <i>Sp Sel2 ST0 = 0</i> |
| <i>Sp Sel2 In1</i> | ACFG | <i>Sp Sel2 ST1 = 0</i> |

**Lim Block**

|                   |      |                    |
|-------------------|------|--------------------|
| <i>Sp Lim Min</i> | CAL  | -100.00            |
| <i>Sp Lim Max</i> | CAL  | 100.00             |
| <i>Sp Lim Inp</i> | ACFG | <i>Zero_Analog</i> |
| <i>Sp Lim Out</i> | APB  |                    |

**Write Param Block**

|                     |      |   |
|---------------------|------|---|
| <i>Sp WPVal ID</i>  | ACFG | 0 |
| <i>Sp WPVal Inp</i> | ACfG | 0 |

**Write Param Block**

|                      |      |   |
|----------------------|------|---|
| <i>Sp WPVal2 ID</i>  | ACFG | 0 |
| <i>Sp WPVal2 Inp</i> | ACfG | 0 |

## 6-4.2 SPARE LOGIC BLOCKS

| <b>Parameters</b>    | <b>Type</b> | <b>Default</b>              |
|----------------------|-------------|-----------------------------|
| <b>HL Comp Block</b> |             |                             |
| <i>Sp HL Setpt</i>   | ACFG        | <i>Sp HL Stpt</i> = 100.00  |
| <i>Sp HL High</i>    | CAL         | <i>Sp HL High</i> = 90.00   |
| <i>Sp HL Low</i>     | CAL         | <i>Sp HL Low</i> = 10.00    |
| <i>Sp HL Hyst</i>    | CAL         | <i>Sp HL Hyst</i> = 1.00    |
| <i>Sp HL Inp</i>     | ACFG        | <i>Zero Analog</i>          |
| <i>Sp LH Decimal</i> | CAL         | 2                           |
| <i>Sp HL Max</i>     | DPB         |                             |
| <i>Sp HL Min</i>     | DPB         |                             |
| <b>Comp Block</b>    |             |                             |
| <i>Sp Cmp1 In</i>    | ACFG        | <i>Sp Cmp1 Stpt</i> = 50.00 |
| <i>Sp Cmp1 Thres</i> | ACFG        | <i>Sp Cmp1 Stpt</i> = 50.00 |
| <i>Sp Cmp1 Hyst</i>  | CAL         | 1.00                        |
| <i>Sp Cmp1 Out</i>   | DPB         |                             |
| <i>Sp Cmp1 Eq</i>    | DPB         |                             |
| <b>Comp Block</b>    |             |                             |
| <i>Sp Cmp2 In</i>    | ACFG        | <i>Sp Cmp2 Stpt</i> = 50.00 |
| <i>Sp Cmp2 Thres</i> | ACFG        | <i>Sp Cmp2 Stpt</i> = 50.00 |
| <i>Sp Cmp2 Hyst</i>  | CAL         | 1.00                        |
| <i>Sp Cmp2 Out</i>   | DPB         |                             |
| <i>Sp Cmp2 Eq</i>    | DPB         |                             |
| <b>Delay Block</b>   |             |                             |
| <i>Sp Dly1 TON</i>   | CAL         | 0.100 seconds               |
| <i>Sp Dly1 TOFF</i>  | CAL         | 0.100 seconds               |
| <i>Sp Dly1 In</i>    | BCFG        | <i>Zero Bit</i>             |
| <i>Sp Dly1 Out</i>   | DPB         |                             |
| <b>Delay Block</b>   |             |                             |
| <i>Sp Dly2 TON</i>   | CAL         | 0.100 seconds               |
| <i>Sp Dly2 TOFF</i>  | CAL         | 0.100 seconds               |
| <i>Sp Dly2 In</i>    | BCFG        | <i>Zero Bit</i>             |
| <i>Sp Dly2 Out</i>   | DPB         |                             |
| <b>Latch Block</b>   |             |                             |
| <i>Sp Ltch1 L</i>    | BCFG        | <i>Zero Bit</i>             |
| <i>Sp Ltch1 H1</i>   | BCFG        | <i>One Bit</i>              |
| <i>Sp Ltch1 H2</i>   | BCFG        | <i>One Bit</i>              |
| <i>Sp Ltch1 Out</i>  | DPB         |                             |
| <b>Latch Block</b>   |             |                             |
| <i>Sp Ltch2 L</i>    | BCFG        | <i>Zero Bit</i>             |
| <i>Sp Ltch2 H1</i>   | BCFG        | <i>One Bit</i>              |
| <i>Sp Ltch2 H2</i>   | BCFG        | <i>One Bit</i>              |
| <i>Sp Ltch2 Out</i>  | DPB         |                             |
| <b>Latch Block</b>   |             |                             |
| <i>Sp Ltch3 L</i>    | BCFG        | <i>Zero Bit</i>             |

| <b>Parameters</b>   | <b>Type</b> | <b>Default</b> |
|---------------------|-------------|----------------|
| <i>Sp Ltch3 H1</i>  | BCFG        | <i>One Bit</i> |
| <i>Sp Ltch3 H2</i>  | BCFG        | <i>One Bit</i> |
| <i>Sp Ltch3 Out</i> | DPB         |                |

| <b>BInv Block</b>  |      |                 |
|--------------------|------|-----------------|
| <i>Sp Inv1 In</i>  | BCFG | <i>Zero Bit</i> |
| <i>Sp Inv1 Out</i> | DPB  |                 |

| <b>BInv Block</b>  |      |                 |
|--------------------|------|-----------------|
| <i>Sp Inv2 In</i>  | BCFG | <i>Zero Bit</i> |
| <i>Sp Inv2 Out</i> | DPB  |                 |

| <b>BInv Block</b>  |      |                 |
|--------------------|------|-----------------|
| <i>Sp Inv3 In</i>  | BCFG | <i>Zero Bit</i> |
| <i>Sp Inv3 Out</i> | DPB  |                 |

| <b>Or Block</b>    |      |                 |
|--------------------|------|-----------------|
| <i>Sp Or1 In1</i>  | BCFG | <i>Zero Bit</i> |
| <i>Sp Or1 In2</i>  | BCFG | <i>Zero Bit</i> |
| <i>Sp Or1 Nin3</i> | BCFG | <i>One Bit</i>  |
| <i>Sp Or1 Out</i>  | DPB  |                 |

| <b>Or Block</b>    |      |                 |
|--------------------|------|-----------------|
| <i>Sp Or2 In1</i>  | BCFG | <i>Zero Bit</i> |
| <i>Sp Or2 In2</i>  | BCFG | <i>Zero Bit</i> |
| <i>Sp Or2 Nin3</i> | BCFG | <i>One Bit</i>  |
| <i>Sp Or2 Out</i>  | DPB  |                 |

| <b>Or Block</b>    |      |                 |
|--------------------|------|-----------------|
| <i>Sp Or3 In1</i>  | BCFG | <i>Zero Bit</i> |
| <i>Sp Or3 In2</i>  | BCFG | <i>Zero Bit</i> |
| <i>Sp Or3 Nin3</i> | BCFG | <i>One Bit</i>  |
| <i>Sp Or3 Out</i>  | DPB  |                 |

| <b>And Block</b>    |      |                 |
|---------------------|------|-----------------|
| <i>Sp And1 In1</i>  | BCFG | <i>One Bit</i>  |
| <i>Sp And1 In2</i>  | BCFG | <i>One Bit</i>  |
| <i>Sp And1 Nin3</i> | BCFG | <i>Zero Bit</i> |
| <i>Sp And1 Out</i>  | DPB  |                 |

| <b>And Block</b>    |      |                 |
|---------------------|------|-----------------|
| <i>Sp And2 In1</i>  | BCFG | <i>One Bit</i>  |
| <i>Sp And2 In2</i>  | BCFG | <i>One Bit</i>  |
| <i>Sp And2 Nin3</i> | BCFG | <i>Zero Bit</i> |
| <i>Sp And2 Out</i>  | DPB  |                 |

| <b>And Block</b>    |      |                 |
|---------------------|------|-----------------|
| <i>Sp And3 In1</i>  | BCFG | <i>One Bit</i>  |
| <i>Sp And3 In2</i>  | BCFG | <i>One Bit</i>  |
| <i>Sp And3 Nin3</i> | BCFG | <i>Zero Bit</i> |
| <i>Sp And3 Out</i>  | DPB  |                 |

## SECTION VII

### MOTOR CONTROL MODE

#### 7-1 TORQUE REFERENCE ( See Appendix A-2)

The torque reference is used when *Motor Ctrl Mode* / *Motor Ctrl Mode2* is selected as torque control. The reference can be used with speed control as a torque limit.

##### 7-1.1 TORQUE REFERENCE BLOCKS

| Parameters            | Type | Default                    |
|-----------------------|------|----------------------------|
| <i>En Trq RefA</i>    | BCFG | <i>Zero Bit</i>            |
| <i>En Trq RefB</i>    | BCFG | <i>Zero Bit</i>            |
| <i>En Trq RefC</i>    | BCFG | <i>Zero Bit</i>            |
| <i>Trq Ref</i>        | ACFG | <i>Trq Ref StA = 0.0</i>   |
| <i>Trq RefB</i>       | ACFG | <i>Trq Ref StB = 0.0</i>   |
| <i>Trq RefB Mlt</i>   | ACFG | <i>Trq RefB MSt = 1.00</i> |
| <i>Trq RefB Div</i>   | CAL  | 1.00                       |
| <i>Trq Ref C</i>      | ACFG | <i>Trq Ref StB = 0.0</i>   |
| <i>Control Place</i>  | CAL  | 0                          |
| <i>Trq Dir</i>        | BCFG | <i>Zero Bit</i>            |
| <i>Keypad_Trq_Dir</i> | DPB  |                            |

*Control Place* determines if the reference is coming from the keypad or from the reference sum block. It also determines where the invert reference bit comes from.

A sum block adds together the inputs that are enabled. The main torque reference is usually configured to *Trq Ref*. *Trq RefB* and *Trq Ref C* are used for load sharing. *Trq RefB* is used if a ratio load share is desired, while *Trq Ref C* is used for a difference sharing.

If *Control Place* is set for local control, then the torque reference comes from the drive's keypad.

The torque polarity is set by either *Trq Dir* or *Keypad Trq Dir* depending on *Control Place*.

### 7-1.2 TORQUE REFERENCE ENABLE, RAMP AND LIMITS

| Parameters              | Type | Default         |
|-------------------------|------|-----------------|
| <i>Trq Ref En</i>       | BCFG | <i>Zero Bit</i> |
| <i>Trq No Ramp</i>      | BCFG | <i>One Bit</i>  |
| <i>Trq Rmp Rate</i>     | CAL  | 5 % / second    |
| <i>Trq_Ref_Min</i>      | CAL  | 100.0%          |
| <i>Trq Ref Max</i>      | CAL  | 0%              |
| <i>Torque Reference</i> | APB  |                 |

To enable the torque reference, *Motor Ctrl Mode* must be selected as torque control and *Trq Ref En* must be set high.

The Torque reference can go through an optional ramp limiter. To enable this, set *Trq No Ramp* to *Zero Bit*. *Trq Rmp Rate* is entered in % torque per second rate.

The reference is then checked for its limits before going to the firmware as *Torque Reference*.

## SECTION VIII

### MISCELLANEOUS CONTROL BLOCKS

This section deals with all the control blocks and firmware parameters that do not fit into any other category.

#### **8-1 OVER SPEED AND AT ZERO SPEED** ( See Appendix A-8)

*Spd Fdbk* is defaulted to *Motor Speed* but can be reconfigured to an encoder input or analog input. This needs to be scaled into motor hertz with two decimal places.

*Spd Fdbk* is passed through a low pass filter with a time constant of *Spd Cmp Fil TC* before it goes to the speed comparator.

The speed comparator setpoints are a percentage of the value *Ovr Spd Inp*, which is defaulted to parameter *Freq Max*. *Freq Max* is scaled in motor hertz with two decimal places.

The zero speed setpoint is defined by *Zero Detect* which is defaulted to 2.00%. *At Zero Spd* bit will go high when the percentage of *Spd Fdbk* falls below this value minus the hysteresis value *Spd Hyst*.

The over speed setpoint is defined by *Ovr Spd Stp*, which is defaulted to 110.00%. *Over Speed* bit will go high when the percentage of *Spd Fdbk* goes above this value plus the hysteresis value *Spd Hyst*.

*Spd Decimal* is defaulted to 2. Modify this if the compare block setpoint decimal place needs to be moved due to integer limitations.

#### **8-2 INERTIA CALCULATION** ( See Appendix A-2)

| Parameters         | Type | Default                   |
|--------------------|------|---------------------------|
| <i>Calc Dia</i>    | ACFG | <i>Bidir Cdiam</i>        |
| <i>Core Dia</i>    | ACFG | <i>Start Dia = 50.00%</i> |
| <i>Width Inp</i>   | ACFG | <i>Width Stpt = 100%</i>  |
| <i>Var Wk Inp</i>  | ACFG | <i>Var Wk StPt = 0%</i>   |
| <i>Fix Wk Inp</i>  | ACFG | <i>Fix Wk StPt = 0%</i>   |
| <i>Win Ref Tch</i> | ACFG | <i>Enc2 Out</i>           |
| <i>DDT Fil</i>     | CAL  | 0.100 seconds             |
| <i>DDT Mult</i>    | CAL  | 1000                      |
| <i>DDT Div Inp</i> | ACFG | <i>DDT Div – 10.00</i>    |
| <i>DDT Lim</i>     | CAL  | 1000                      |
| <i>Spd Ramp</i>    | APB  |                           |
| <i>Accel TC</i>    | APB  |                           |
| <i>Win WK</i>      | APB  |                           |

### Inertia Calculation

The inertia of the load is broken into two parts, fixed and variable. The fixed inertia includes the motor, gear box, shafts, and core. Variable inertial is the material which varies by diameter and width.

$$\text{Accel TC} = (\text{Var Wk Inp}) (\text{Width Inp}) (\text{Calc Dia}^4 - \text{Core Dia}^4) + \text{Fix Wk Inp}$$

#### Setup:

Set *Start Dia* to the percentage of the core dia to full roll.

Keep *Width* at 100% unless it varies then configure to the proper input and scale it in percentage.

Tune *Fix Wk StPt* with no material. Speed loop error should be constant during acceleration when tuned properly.

Tune *Var Wk StPt* with full roll taped off. Speed loop error should be constant during acceleration when tuned properly.

### Rate Calculation

The winder speed reference (*Win Ref Tch*) passes through a third order low pass filter with a time constant of *DDT Fil* before its rate of change is determined.

The rate is then scaled by *DDT Mult* and *DDT Div Inp*. *DDT Div Inp* is usually set to the center drive winder diameter to adjust for the rotational rate of change.

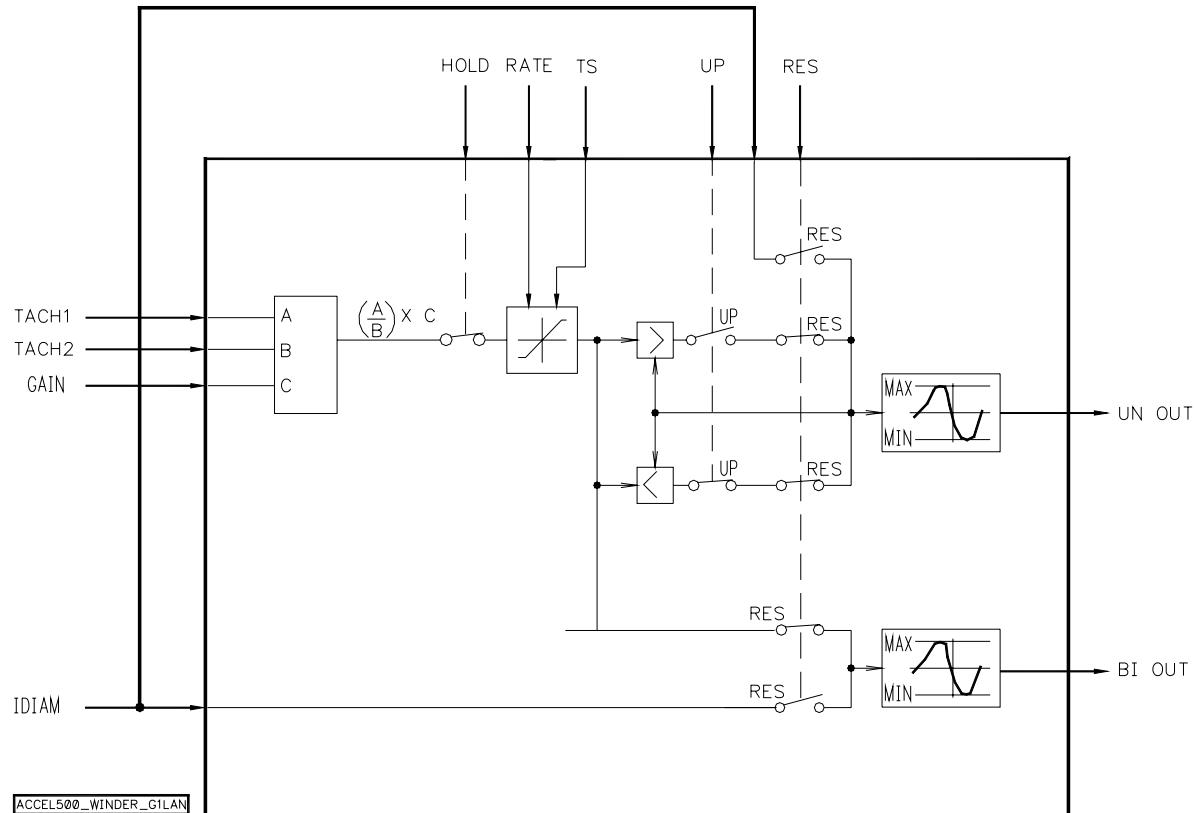
An output limit (*DDT Lim*) is applied to the rate to become *Spd Ramp*.

### Final WK Torque

The inertia value (*Accel TC*) is multiplied by the acceleration rate of the roll (*Spd Ramp*) divided by 1000 to become the final torque setpoint (*Win WK*).

## 8-3 RATIO ( See Appendix A-9)

The Ratio block calculates the diameter of a center-driven winder. It can be used for a winder or an unwinder. The initial diameter is a preset input value to obtain the correct diameter starting speed.



| Parameters   | Type | Default            |
|--------------|------|--------------------|
| Init Dia     | ACFG | Start Dia = 50.00% |
| Win Ref Tch  | ACFG | Enc2_Out           |
| Win Fdk Tch  | ACFG | Enc1_Out           |
| Dia Gn Inp   | ACFG | Dia Gn St = 1.00   |
| Max Dia      | CAL  | 100.00 %           |
| Min Dia      | CAL  | 50.00 %            |
| Dia Rate Lim | CAL  | 1.00 % / sec       |
| Dia Or 1     | BCFG | Cntrl Inhib        |
| Dia Or 2     | BCFG | At Zero Spd        |
| Dia Or 3     | BCFG | Zero Bit           |
| Dia Or 4     | BCFG | Zero Bit           |
| Up Dwn       | BCFG | Zero Bit           |
| Dia Reset    | BCFG | Cntrl Inhib        |
| Dia Ret      | E    | Enable             |
| Bidir Cdiam  | APB  |                    |
| Undir Cdiam  | APB  |                    |

### Description

$[(\text{Win Ref Tch}/\text{Win Fdk Tch}) \times \text{Dia Gn Inp}] = \text{Bidir Cdiam}$  if it is within *Min Dia* and *Max Dia*, else *Bidir Cdiam* will equal the limit value. *Bidir Cdiam* is rate limited by the *Dia Rate Lim*

value. *Dia Rate Lim* is entered in %/second and should be set at maximum rate of change at core at max speed.

If any of the four hold bits goes high, *Bidir Cdiam* and *Undir Cdiam* will be held at their current values. Releasing this bit lets the block resume calculations.

If *Up Dwn* is high, then *Undir Cdiam* equals the highest *Bidir Cdiam* since the last reset. If the *Up Dwn* is low, then the *Undir Cdiam* equals the lowest *Bidir Cdiam* since the last reset.

The *Dia Reset* bit is used to reset both *Bidir Cdiam* and *Undir Cdiam* to the *init Dia* value. It stays at this value as long as the *Dia Reset* bit is high. The *Dia Reset* bit has a higher priority than the hold bits.

Set *Dia Ret* to enable to have the diameter values hold during power loss.

## 8-4 DIAMETER BY ENCODER AND UNI-PULSER ( See Appendix A-9)

This block takes a reference encoder counter and a once per revolution input to determine the diameter of a roll. The equation is simply the length counted divided by PI is the diameter. Scaling and limit parameters are also available.

| Parameters           | Type | Default                     |
|----------------------|------|-----------------------------|
| <i>Unipulser Inp</i> | ACFG | <i>Slot 0</i>               |
| <i>Counter2</i>      | APB  | <i>Second encoder input</i> |
| <i>Uni Dia Gn</i>    | CAL  | 100                         |
| <i>Uni Dia Div</i>   | CAL  | 100                         |
| <i>Max Dia</i>       | CAL  | 100.00                      |
| <i>Min Dia</i>       | CAL  | 50.00                       |
| <i>Uni Dia</i>       | APB  |                             |

Every time *Unipulser Inp* goes high *counter2* is sampled. The difference between its count and the last count divided by PI is the roll diameter. This diameter is then scaled by *Uni Dia Gn* and *Uni Dia Div*. It is then compared to the limits *Max Dia* and *Min Dia* before becoming *Uni Dia*.

## 8-5 ROLL SET DIAMETER ( See Appendix A-9)

The Roll Set diameter is a special equation used for two drum winder applications. It takes in the machine information along with the rider roll position to determine the diameter of the Roll Set.

| Parameters        | Type | Default       |
|-------------------|------|---------------|
| <i>Drum Gap</i>   | CAL  | = 1.0         |
| <i>RD Dia</i>     | CAL  | = 12.0        |
| <i>RR Pos Inp</i> | ACFG | = 1602 = AIN2 |
| <i>RR Dia Mlt</i> | CAL  | = 1000        |
| <i>RR Dia Div</i> | CAL  | = 1000        |
| <i>RS Dia</i>     | APB  |               |

All inputs need to be scaled in the same units such as inches. The *RR Pos Inp* must be scaled in the same process units ( inches ) from the center of the drums to the bottom of the rider roll.

## 8-6 AUTO STOP EQUATIONS

The drive has built in equations to auto stop by either a length or by a diameter. Three separate equations are required to perform this task ( Length to stop, Caliper, Diameter to stop )

*Stop Cmd* will go high if:

*Auto Stop En* is high and *Stop by Ft* is selected and *Ft Stop Set* trips or  
*Auto Stop En* is high and *Stop by Ft* is not selected and *Dia Stop Set* trips.

### Length to stop

| Parameters              | Type | Default                             |
|-------------------------|------|-------------------------------------|
| <i>Decel Time</i>       | ACFG | =104 = <i>Decel Time</i> 1 = 10.0 s |
| <i>DecelerationTime</i> | APB  |                                     |
| <i>Max Spd Sec</i>      | CAL  | = 100.00                            |
| <i>Smooth ratio</i>     | CAL  | = 0.1 seconds                       |
| <i>Enc2 Out</i>         | APB  |                                     |
| <i>Counter 2</i>        | APB  |                                     |
| <i>Stp Ft Mlt</i>       | CAL  | = 10                                |
| <i>Stop Ft Inp</i>      | ACFG | = 1239 = <i>Stop Ft Stpt</i>        |
| <i>Ft to Stop</i>       | APB  |                                     |
| <i>Ft Stop Set</i>      | DPB  |                                     |

Proper units must be used for each input. If feet is the preferred units.

*Max Spd Sec* is the maximum line speed in feet per second.

*Enc2 Out* must be in Feet per second.

*Counter 2* must be in feet.

*Decel time* is the time in seconds to reach *Max Spd Sec*.

*Smooth ratio* is the time in seconds to reach *Decel Time*.

*Stop Ft Inp* might reach over 32765 feet which would cause an overflow. In this case set the stop footage to 10's of feet and set the *Stp Ft Mlt* = 10.

The output is equal to the footage to stop for a given speed divided by *Stp Ft Mlt*.

*Ft Stop Set* goes high when the *Ft to Stop* plus the *Counter 1* input is greater than *Stop Ft Inp*.

### Caliper

| Parameters             | Type | Default                             |
|------------------------|------|-------------------------------------|
| <i>Caliper Inp</i>     | ACFG | =1238 = <i>Caliper Stpt</i> = 0.002 |
| <i>Counter 2</i>       | APB  |                                     |
| <i>Init RS Dia Inp</i> | ACFG | = 1242 = <i>Init RS Dia</i> = 4.0   |
| <i>RS Dia Inp</i>      | ACFG | = 1537 = <i>RS Dia</i>              |

|                      |     |            |
|----------------------|-----|------------|
| <i>RSDia Mult</i>    | CAL | = 1000     |
| <i>RSDia Div</i>     | CAL | = 1000     |
| <i>Caliper Max</i>   | CAL | = 0.0050   |
| <i>Caliper Min</i>   | CAL | = 0.001    |
| <i>Caliper Div</i>   | CAL | = 10000    |
| <i>Auto Cal Calc</i> | E   | = Disabled |
| <i>Caliper</i>       | APB |            |

If enabled the Caliper equation determines the thickness of the material by using the change in diameter along with the footage of material in that range. The equation must be scaled in the same units as the stop by footage. Limit checking is done before it is outputted.

If not enabled the Caliper input is used after limit checking.

Example: units of feet:

*Caliper Inp* is divided by *Caliper Div* to convert it into feet. Used if *Auto Cal Calc* is disabled. *Counter 1* scaled in feet.

The diameter inputs can be scaled in different units such as inches and are scaled by *RSDIA Mult* and *RSDIA Div* to convert them into feet.

The calculated caliper is checked to be between *Caliper Max* and *Caliper Min*. It then gets multiplied by *Caliper Div* before becoming the value *Caliper*.

#### Diameter to stop

| Parameters             | Type | Default                       |
|------------------------|------|-------------------------------|
| <i>Caliper</i>         | APB  |                               |
| <i>Stop RS Dia Inp</i> | ACFG | = 1241 = Stop Dia Stpt = 40.0 |
| <i>RS Dia Inp</i>      | ACFG | = 1537 = RS Dia               |
| <i>RSDia Mult</i>      | CAL  | = 1000                        |
| <i>RSDia Div</i>       | CAL  | = 1000                        |
| <i>Stp Ft Mlt</i>      | CAL  | = 10                          |
| <i>Ft Stop Set</i>     | APB  |                               |
| <i>Ft to Dia</i>       | APB  |                               |
| <i>Dia Stop Set</i>    | DPB  |                               |

The stop by diameter equation uses the same units as the first two equations. It also uses both outputs to determine the diameter to stop change. The *Dia Stop Set* will go high when *Counter 1* plus *Ft to Dia* is greater than *Dia Stop Set*.

Example units in feet:

*Caliper* is calculated in feet from previous equation.

*RSDia Mult* and *RSDia Div* are used to scale *Stop RS Dia Inp* and *RS Dia Inp* into feet.

*Ft to Dia* is footage to stop divided by *Stp Ft Mlt*.

## 8-7 PARAMETER SETS

The Keypad can store two sets of parameter values. These can be downloaded or saved via the keypad menu. The drive can not be running during this transition. The logic in control block diagrams Param\_Set\_1 and Param\_Set\_2 prevents the transitions or starting a run before the transition is complete.

Warning: The drive does not know which parameter set is loaded.



## SECTION IX

# COMMUNICATIONS

The drive can communicate through a wide variety of communication boards that can be inserted into slots D and E. Examples of some of the protocols include:

- Ethernet – Modbus TCP
- Devicenet
- System Bus – Master Slave
- Profibus DP
- Modbus serial link

Each communication board has its own manual that details the protocol and connections. This section will discuss the generic software control blocks that are used for each protocol.

There are usually two methods of reading and writing data to the drive. The protocols either have preset messages such as defined in the EDS sheets for Devicenet or they can read or write to a particular address. The parameter ID number represents its address in most of the message structures. The drive appendices include the ID number with the parameter name. Not all parameters have an ID number.

ID numbers 0 – 1000 are designated for firmware variables.

ID numbers 1001 – 2000 are designated for the application variables.

### 9-1 READ AND WRITE STANDARD ID NUMBERS ( See Appendix A-7)

The following parameters are set aside for write messages to the drive. The addresses are grouped together so one write message can get them all. The drive can then be configured to use these locations for proper function.

There are four words where bits can be written to:

- 1) *FB Fix Cntl Wrd* (ID 1621) – Depending on which protocol is used, several of these bits are predetermined.
- 2) *FB Gen Cntl Wrd* (ID 1630) – None of the bits are predefined and open to user choice.
- 3) *FB Word Out 8* (ID 1618) – Alternate word if more than one communication channel needs to write bits.
- 4) *SB In Cntl Word* (ID 1530) – Used for input bits from the system bus.

The above words can be unpacked to the following bits based on the selector.

| <b>ID</b> | <b>Parameter Name</b> | <b>Bit Location</b> | <b>Selector</b>     |
|-----------|-----------------------|---------------------|---------------------|
| 1040      | <i>FB Bit00</i>       | 0                   | <i>FB Bit Sel 1</i> |
| 1041      | <i>FB Bit01</i>       | 1                   | <i>FB Bit Sel 1</i> |
| 1042      | <i>FB Bit02</i>       | 2                   | <i>FB Bit Sel 1</i> |
| 1043      | <i>FB Bit03</i>       | 3                   | <i>FB Bit Sel 1</i> |
| 1044      | <i>FB Bit04</i>       | 4                   | <i>FB Bit Sel 2</i> |
| 1045      | <i>FB Bit05</i>       | 5                   | <i>FB Bit Sel 2</i> |
| 1046      | <i>FB Bit06</i>       | 6                   | <i>FB Bit Sel 2</i> |
| 1047      | <i>FB Bit07</i>       | 7                   | <i>FB Bit Sel 2</i> |
| 1048      | <i>FB Bit08</i>       | 8                   | <i>FB Bit Sel 3</i> |
| 1049      | <i>FB Bit09</i>       | 9                   | <i>FB Bit Sel 3</i> |
| 1050      | <i>FB Bit10</i>       | 10                  | <i>FB Bit Sel 3</i> |
| 1051      | <i>FB Bit11</i>       | 11                  | <i>FB Bit Sel 3</i> |
| 1052      | <i>FB Bit12</i>       | 12                  | <i>FB Bit Sel 4</i> |
| 1053      | <i>FB Bit13</i>       | 13                  | <i>FB Bit Sel 4</i> |
| 1054      | <i>FB Bit14</i>       | 14                  | <i>FB Bit Sel 4</i> |
| 1055      | <i>FB Bit15</i>       | 15                  | <i>FB Bit Sel 4</i> |

Each bit selector unpacks four bits from any of the four field bus words.

Example:

If *FB Bit Sel 1* is set to Gen Ctrl W then *FB Bit00 – FB Bit03* is unpacked from the first 4 bits of *FB Gen Cntl Wrds*.

Write integer to the drive:

| <b>ID</b> | <b>Parameter Name</b> |
|-----------|-----------------------|
| 1611      | <i>FB Word In 1</i>   |
| 1612      | <i>FB Word In 2</i>   |
| 1613      | <i>FB Word In 3</i>   |
| 1614      | <i>FB Word In 4</i>   |
| 1615      | <i>FB Word In 5</i>   |
| 1616      | <i>FB Word In 6</i>   |
| 1617      | <i>FB Word In 7</i>   |
| 1618      | <i>FB Word In 8</i>   |
| 1619      | <i>FB Word In 9</i>   |
| 1620      | <i>FB Word In 10</i>  |

The following parameters are set aside for read messages from the drive. The addresses are grouped together so one read message can get them all. Any parameter with an ID number can be configured to these locations.

16 configurable points are available to pack bits into two words for reading by the communications. The bits are directly written in order to *FB Gen Sts Word*. All the bits except for the lower 4 are written to *SB Out Cntl Word*.

Read bits from the drive:

| Configuration Parameter | Bit Set |
|-------------------------|---------|
| <i>FB Bit Cfg Out00</i> | 00      |
| <i>FB Bit Cfg Out01</i> | 01      |
| <i>FB Bit Cfg Out02</i> | 02      |
| <i>FB Bit Cfg Out03</i> | 03      |
| <i>FB Bit Cfg Out04</i> | 04      |
| <i>FB Bit Cfg Out05</i> | 05      |
| <i>FB Bit Cfg Out06</i> | 06      |
| <i>FB Bit Cfg Out07</i> | 07      |
| <i>FB Bit Cfg Out08</i> | 08      |
| <i>FB Bit Cfg Out09</i> | 09      |
| <i>FB Bit Cfg Out10</i> | 10      |
| <i>FB Bit Cfg Out11</i> | 11      |
| <i>FB Bit Cfg Out12</i> | 12      |
| <i>FB Bit Cfg Out13</i> | 13      |
| <i>FB Bit Cfg Out14</i> | 14      |
| <i>FB Bit Cfg Out15</i> | 15      |

Read integer from the drive:

| ID   | Parameter Name       | Configuration Parameter |
|------|----------------------|-------------------------|
| 1622 | <i>FB Word Out 1</i> | <i>FB Word Cfg Out1</i> |
| 1623 | <i>FB Word Out 2</i> | <i>FB Word Cfg Out2</i> |
| 1624 | <i>FB Word Out 3</i> | <i>FB Word Cfg Out3</i> |
| 1625 | <i>FB Word Out 4</i> | <i>FB Word Cfg Out4</i> |
| 1626 | <i>FB Word Out 5</i> | <i>FB Word Cfg Out5</i> |
| 1627 | <i>FB Word Out 6</i> | <i>FB Word Cfg Out6</i> |
| 1628 | <i>FB Word Out 7</i> | <i>FB Word Cfg Out7</i> |
| 1629 | <i>FB Word Out 8</i> | <i>FB Word Cfg Out8</i> |

## 9-2 SPECIAL FIELD BUS VARIABLES

For certain predefined field bus messages, certain parameters are used in the firmware.

*FB Spd Ref* is defaulted to get the desired reference by some field bus protocols. *Master Ref* needs to be configured to this to become the drives speed reference.

## 9-3 FAULTS

- A) Slot Fault – FB Fault Act is set when either SlotDBoardStatus or SlotEBoardStatus indicates a problem. This bit can go to a fault block that can be configured for a drive warning or a fault.
- B) Watchdog Bit - Logic is built into the drive to allow for an external device to toggle a bit to create a communication watchdog. The system bus has separate watchdog timer logic.

Configure *Watchdog In* to the field bus input bit that the PLC is going to toggle.  
 Configure the fieldbus output bit to *Watchdog Out*.

The external device should read bit *Watchdog Out* and return the inverse of the bit that gets configured to *Watchdog In*.

When *Com WD* is enabled, Com WD fault will go high ( *WD Trip* ) after the bit stops toggling for *WD Com Dly* amount of time in ms.

*WD Init Dly Tim* delays this fault on power up to give the communications a chance to establish.

Set *WD Flt Response* for the action the drive will take on a communication failure.

#### 9-4 SYSTEM BUS ( See Appendix A-7)

The Winder software supports the Master/Slave configuration of the system bus.

Each node on the network must have an ID from 0 to 63. *SBI*d sets the section ID. Also set *SBNextId* parameter for the next section's ID.

The parameter *SB Mode* determines if a drive is the master or a slave section. Only one master can be set up on the fiber network. The master sends out five integers which all slaves connected read and can act upon.

##### A) Master Section Output Packet

| Integer | Parameter name          | Description            |
|---------|-------------------------|------------------------|
| 1       | <i>SB Out Cnt1 Word</i> | Control Bits           |
| 2       | <i>Freq out</i>         | Ramped speed reference |
| 3       | <i>Trq Ref Act</i>      | Torque reference       |
| 4       | <i>SB Out Int1</i>      | Configurable variable  |
| 5       | <i>SB Out Int2</i>      | Configurable variable  |

##### B) Slave Section Input Packet

| Integer | Parameter name         | Description                    |
|---------|------------------------|--------------------------------|
| 1       | <i>SB In Cnt1 Word</i> | Control Bits                   |
| 1 bit 2 | <i>MD Run Enable</i>   | From master <i>Run Enable</i>  |
| 1 bit 3 | <i>MD Watchdog</i>     | From master <i>SB WD Pulse</i> |
| 2       | <i>SB In Freq Ref</i>  | Optional speed reference       |
| 3       | <i>SB In Trq Ref</i>   | Optional torque reference      |
| 4       | <i>SB In Int1</i>      | Unused variable                |
| 5       | <i>SB In Int2</i>      | Unused variable                |

## C) Faults and Watchdog timer bit

The Master section sends out a watch dog bit called *SB WD Pulse* which toggles every 100 ms. This comes into the slave as *MD Watchdog* which is the default to *MD WD*. If the bit does not toggle in 1 second, then *MD WD OK* will go low, which can be used to stop the section or fault the drive out.

*The MD\_Watchdog and SB Comm Lost bits are used to create SB Comm Flt after failure for SB Comm Flt Tim ms. When SB Comm Flt goes low, SB Comm Flt Resp will set a warning or fault the drive out.*



## SECTION X

### FAULT CODES

( See Appendix A-8)

Drive faults can be derived from either hard coded firmware faults or from the application Fault block.

The firmware faults have no options associated with them. They will fault the drive with a coast stop and record the event in the FIFOs. *MC Fault* bit will go high when a fault has occurred and has not been reset. *MC Warning* goes high when a drive warning is active.

The application Fault block allows different options such as drive action, Stop type, recording, and ability to reset the fault. See the Fault block in the function block library for in depth description of the Fault block. Fault block triggers can come from either the firmware or from the application program.

#### 10-1 FAULT ACTIONS

Fault action is decided by the FMode input of the Fault block. There are three options available.

0 = Disabled

1 = Warning – No drive action but the information is stored in the Fault FIFO

2 = Fault – Drive performs a stop.

#### 10-2 STOP ACTION

The type of drive stop command is decided with the Stop input of the Fault block. There are three options available.

0 = Coast stop – Highest priority if multiple faults occur

1 = Normal stop mode

2 = Ramp stop.

#### 10-3 FAULT RESET

A fault can be reset by several methods. The parameter *Fault Reset* will reset all active faults.

Each fault block also has an individual fault reset input, called Reset, that can be used.

## 10-4 RECORDING

There are two fault FIFOs: active fault FIFO which records 10 faults, and history table FIFO that records 30 faults/warnings.

The Hist input of the Fault block determines how it is recorded into the FIFO. There are 4 options available:

- 0 = Fault always will be stored.
- 1 = If a fault occurs several times, each event will be logged unless they occur within the time frame defined by the Wait input. The wait input is set in 10 ms increments.
- 2 = Fault will be recorded if different than the previous fault recorded.
- 3 = Not recorded.

The last active fault code can be viewed at *Active Flt Last* value.

## 10-5 DRIVE FAULTS

| Fault Code | Fault Text           | Possible Cause   | Solution  |
|------------|----------------------|--|---|
| 8          | System Fault         | Additional information will be stored in FIFOs.<br>- Component Failure         | - Replace processor board.  |
| 22/23      | Chksum Flt           | EEPROM has checksum fault.   | - Verify parameters are set properly<br>- Replace microprocessor board.   |
| 24         | Changed data warning | Changes may have occurred during power interruption.                           | - Check parameters against saved file<br>- re-download parameters<br>- Replace microprocessor board.                                      |
| 25         | Micro Watchdog       | Microprocessor timed out.  | - Redownload the system and application software.<br>- Replace microprocessor board.  |
| 37         | Device Change        | Option board changed.  | - Enter correct parameters for new option board.<br>- Check I/O board seating<br>- Replace option board.                                  |
| 38         | Device Added         | Option board or different drive size changed.                                  | - Enter correct parameters for new hardware.<br>- Check I/O board seating.<br>- Check microprocessor board connection.<br>- Replace drive |
| 39         | Device Removed       | Option board or drive removed from microprocessor.                             | - Check I/O board seating<br>- Check microprocessor board connection.<br>Replace drive.   |
| 40         | Device Unknown       | Unknown option board added to the drive.                                       | - Check I/O board seating<br>- Replace I/O board  |
| 50         | Anlg In Flt          | Analog input is below its low limit.   | - Check signal source<br>- Check connections<br>- Verify correct option board and jumpers.<br>- Replace option board                      |
| 51         | Ext Fault            | User configured PB_Ext_Fault_Inp is high.                                      | - Determine external fault reason<br>- Verify proper external fault setup   |
| 52         | Keypad Comm          | Connection between keypad and drive is broken.                                 | - Verify keypad cable connections or proper seating of keypad<br>- Replace keypad<br>- Replace microprocessor board.                      |
| 53         | FBCommunicat         | Field bus fault from D_FB_Fault bit.<br>Bit is set when board failure is noted | - Check fieldbus board seating.<br>- Replace fieldbus board   |
| 54         | Slot Communic        | Communication to a smart I/O option board is lost                              | - Check board seating in slots C-E.<br>- Replace option boards<br>- Replace microprocessor board  |
| 60         | Com Watchdog         | Communication watchdog bit is not toggling                                     | - Verify communications is working.<br>- Verify watchdog bit is being toggled by host device.   |
| 61         | User Fault 1         | PB_User_Flt_1 is configured to a value that is High.                           | - Check configuration for function.   |
| 62         | User Fault 2         | PB_User_Flt_2 is configured to a value that is High.                           | - Check configuration for function.   |
| 63         | User Fault 3         | PB_User_Flt_3 is configured to a value that is High.                           | - Check configuration for function.   |

| <b>Fault Code</b> | <b>Fault Text</b> | <b>Possible Cause</b>                                | <b>Solution</b>   |
|-------------------|-------------------|--|---|
| 64                | User Fault 4      | PB_User_Flt_4 is configured to a value that is High. | - Check configuration for function.   |
| 65                | Overspeed Flt     | Drive tripped out on overspeed.                      | - Check for sudden loss of load.<br>- verify proper speed feedback device and scaling.<br>- Check overspeed setup                                       |
| 66                | SB Comm Fault     | System bus watchdog trip or board failure.           | - Verify all drives on the system bus is up and running.<br>- Verify system bus cabling.<br>- Replace system bus cabling<br>- Replace system bus board. |
| 70                | Loc Stop Flt      | Keypad stop button pressed for two seconds.          | - Replace keypad.   |

## 10-6 DRIVE FAULT OPTIONS

| Fault Code | Fault Text           | Fault Mode              | Stop Mode               | Warning Bit |
|------------|----------------------|-------------------------|-------------------------|-------------|
| 6          | Emergency Stop       | Fault                   | Coast Stop              |             |
| 8          | System Fault         | Fault                   | Coast Stop              |             |
| 22/23      | Chksum Flt           | Fault                   | Coast Stop              |             |
| 24         | Changed data warning | Fault                   | Coast Stop              |             |
| 25         | Micro Watchdog       | Fault                   | Coast Stop              |             |
| 37         | Device Change        | Fault                   | Coast Stop              |             |
| 38         | Device Added         | Fault                   | Coast Stop              |             |
| 39         | Device Removed       | Fault                   | Coast Stop              |             |
| 40         | Device Unknown       | Fault                   | Coast Stop              |             |
| 50         | Anlg In Flt          | Fault                   | Coast Stop              |             |
| 51         | Ext Fault            | <i>Ext Flt Resp</i>     | <i>Ext Flt Resp</i>     |             |
| 52         | Keypad Comm          | Fault                   | Normal Stop             |             |
| 53         | FBCommunicat         | <i>FBComm.FaultResp</i> | <i>FBComm.FaultResp</i> |             |
| 54         | Slot Communic        | <i>SPI Flt Resp</i>     | <i>SPI Flt Resp</i>     |             |
| 57         | Identification       | Warning                 | Coast Stop              |             |
| 60         | Com Watchdog         | <i>WD Flt Response</i>  | <i>WD Flt Response</i>  |             |
| 61         | User Fault 1         | <i>User Flt1 Resp</i>   | <i>User Flt1 Resp</i>   |             |
| 62         | User Fault 2         | <i>User Flt2 Resp</i>   | <i>User Flt2 Resp</i>   |             |
| 63         | User Fault 3         | <i>User Flt3 Resp</i>   | <i>User Flt3 Resp</i>   |             |
| 64         | User Fault 4         | <i>User Flt4 Resp</i>   | <i>User Flt4 Resp</i>   |             |
| 65         | Overspeed Flt        | <i>Overspeed Resp</i>   | <i>Overspeed Resp</i>   |             |
| 66         | SB Comm Fault        | <i>SB Comm Flt Resp</i> | <i>SB Comm Flt Resp</i> |             |
| 70         | Loc Stop Flt         | Fault                   | Coast Stop              |             |

**10-7 SPECIFIC FAULT SETUP**      ( See Appendix A-8)

## 10-7.1 User Faults

| <b>Parameters</b>     | <b>Type</b> | <b>Default</b>  |
|-----------------------|-------------|-----------------|
| <i>Ext Fault Inp</i>  | BCFG        | <i>Zero Bit</i> |
| <i>Ext Warn</i>       | DPB         |                 |
| <i>Ext Flt Resp</i>   | E           | 2 = Fault       |
| <i>User Flt 1</i>     | BCFG        | <i>Zero Bit</i> |
| <i>User Flt 2</i>     | BCFG        | <i>Zero Bit</i> |
| <i>User Flt 3</i>     | BCFG        | <i>Zero Bit</i> |
| <i>User Flt 4</i>     | BCFG        | <i>Zero Bit</i> |
| <i>User Flt1 Resp</i> | E           | 2 = Fault       |
| <i>User Flt2 Resp</i> | E           | 2 = Fault       |
| <i>User Flt3 Resp</i> | E           | 2 = Fault       |
| <i>User Flt4 Resp</i> | E           | 2 = Fault       |

*Ext Fault Inp* and the four user faults can be configured to any bit ID to trigger a drive fault. The drive will fault if the response is set = 2 Fault and the input goes high.

When *Ext Flt Resp* is set to warning *Ext Warn* will go high when Ext Fault Inp goes high.

## APPENDIX A

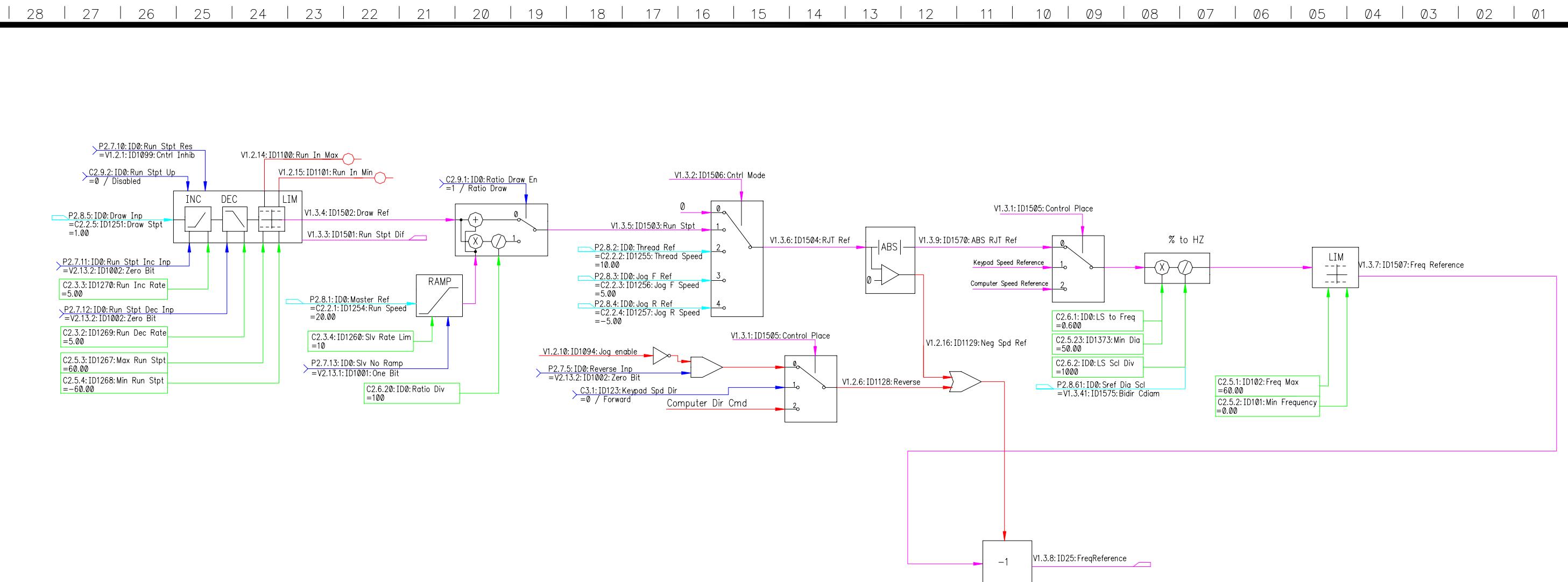
### CONTROL BLOCK DIAGRAMS

Accel500 ACM Winder Application Software control block diagrams are available upon request.  
Please contact the Avtron Customer Help Desk for assistance.

Phone: (216) 642-1230 ext. 1369

FAX: (216) 642-6037





## Speed Reference

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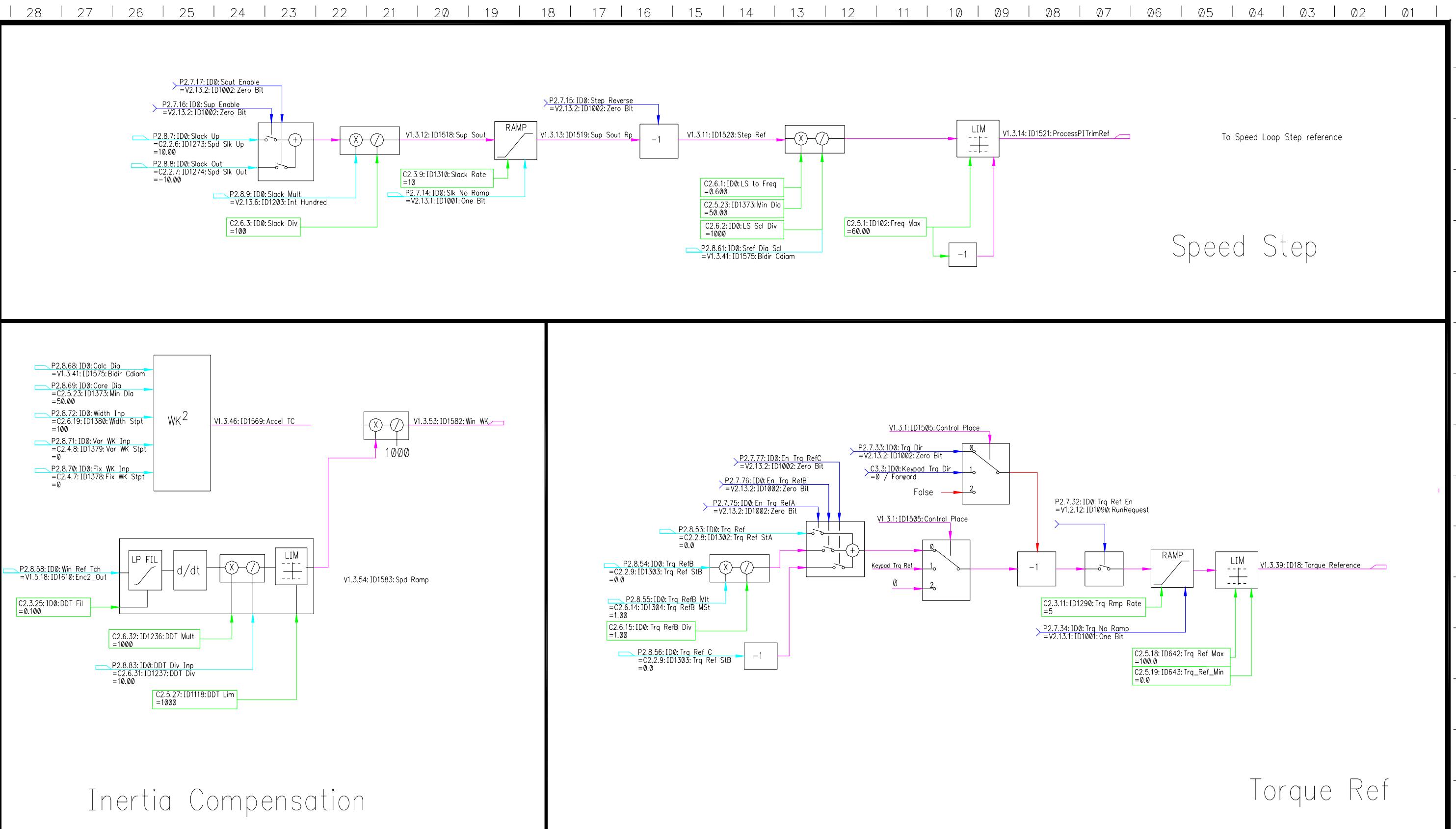
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CAGE NO. 01014

SIZE B

DWG. NO. 512010A1

FIGURE NO. A-1



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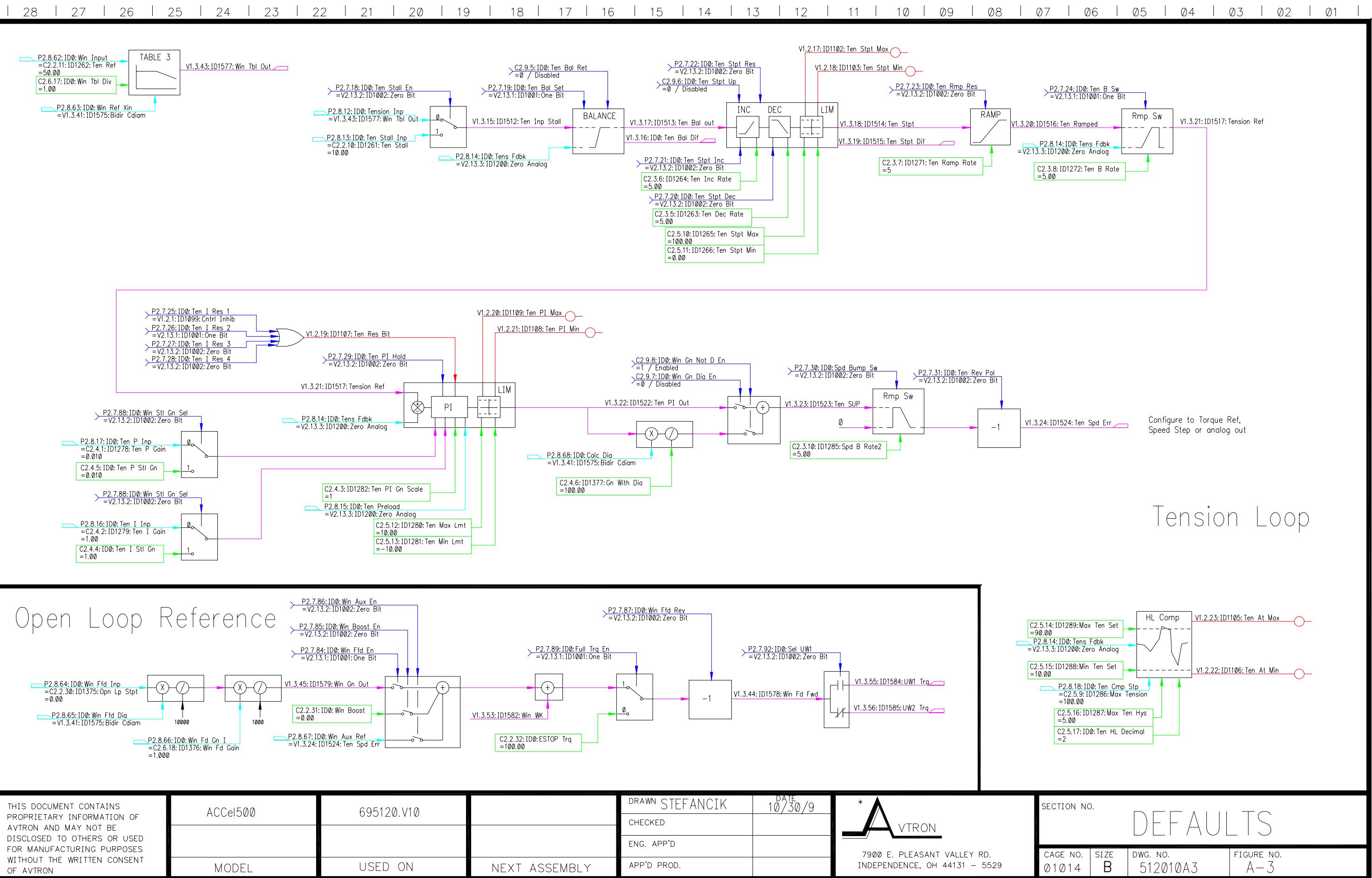
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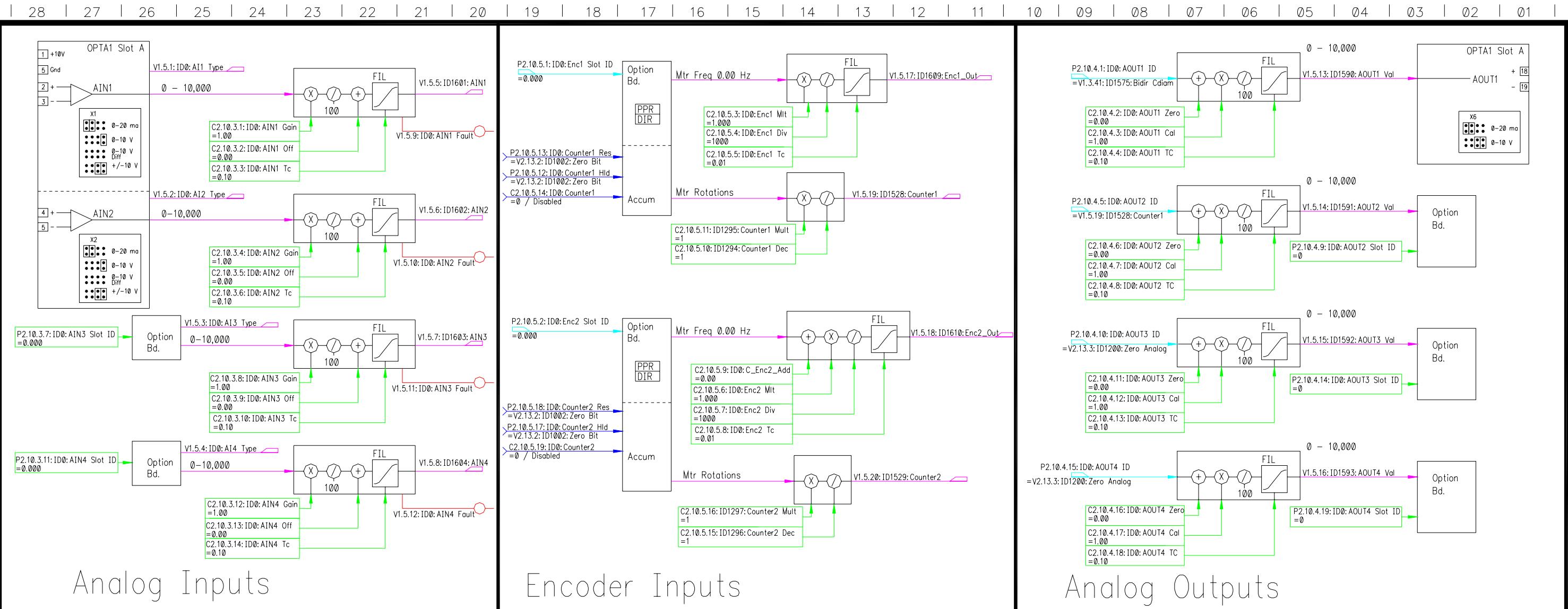
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SIZE B

DWG. NO. 512010A2

FIGURE NO. A-2

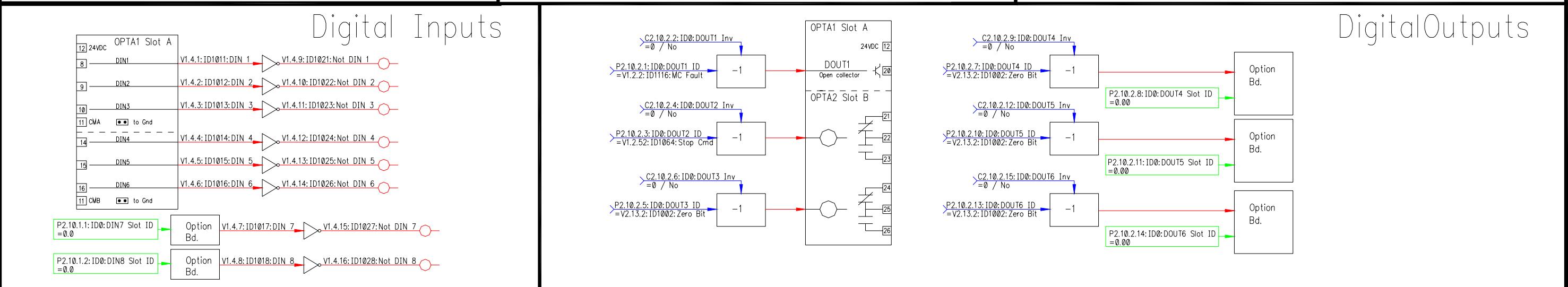




Analog Inputs

Encoder Inputs

Analog Outputs



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MODEL

USED ON

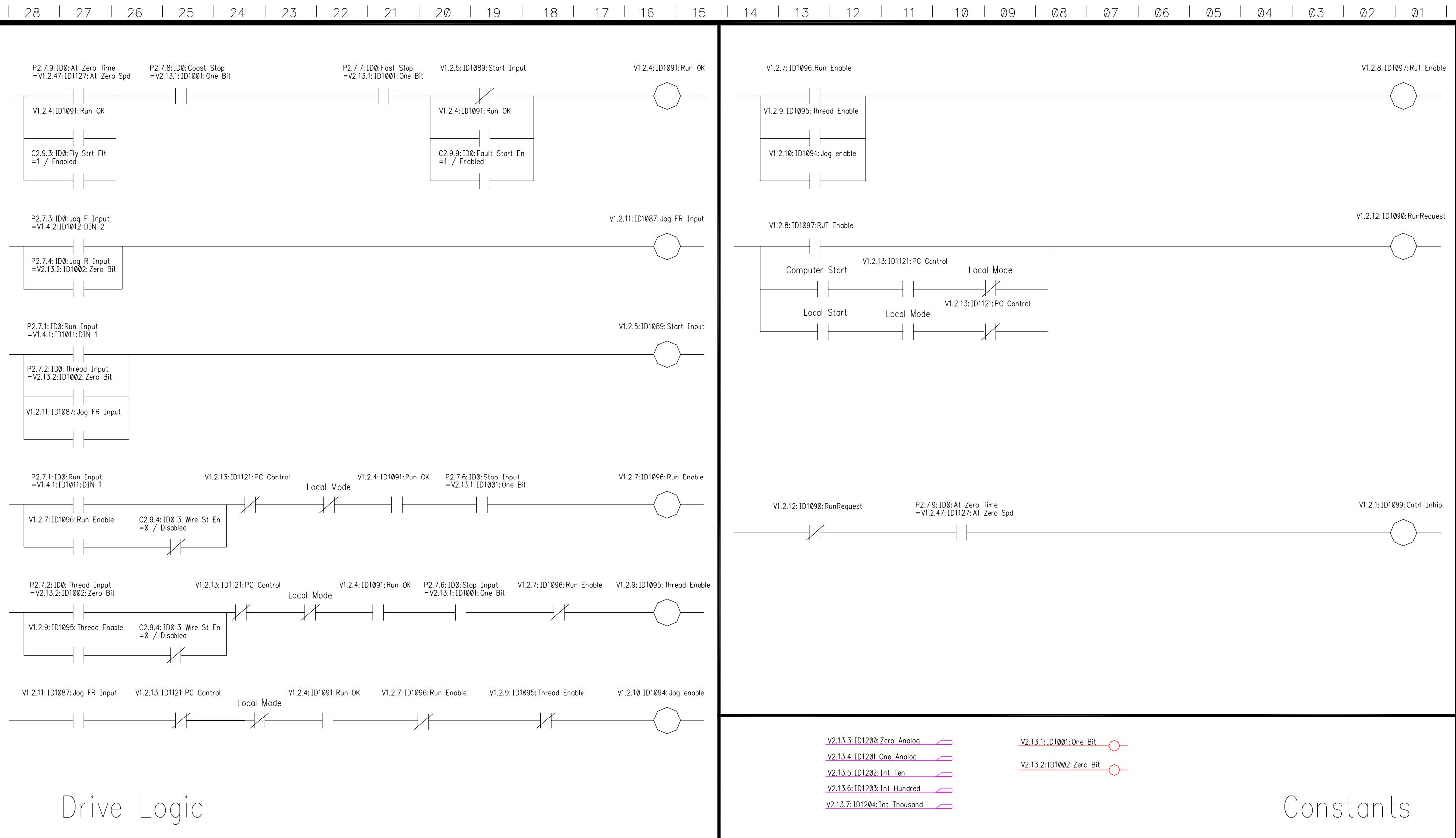
NEXT ASSEMBLY

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CAGE NO. 01014 SIZE B DWG. NO. 512010A4 FIGURE NO. A-4



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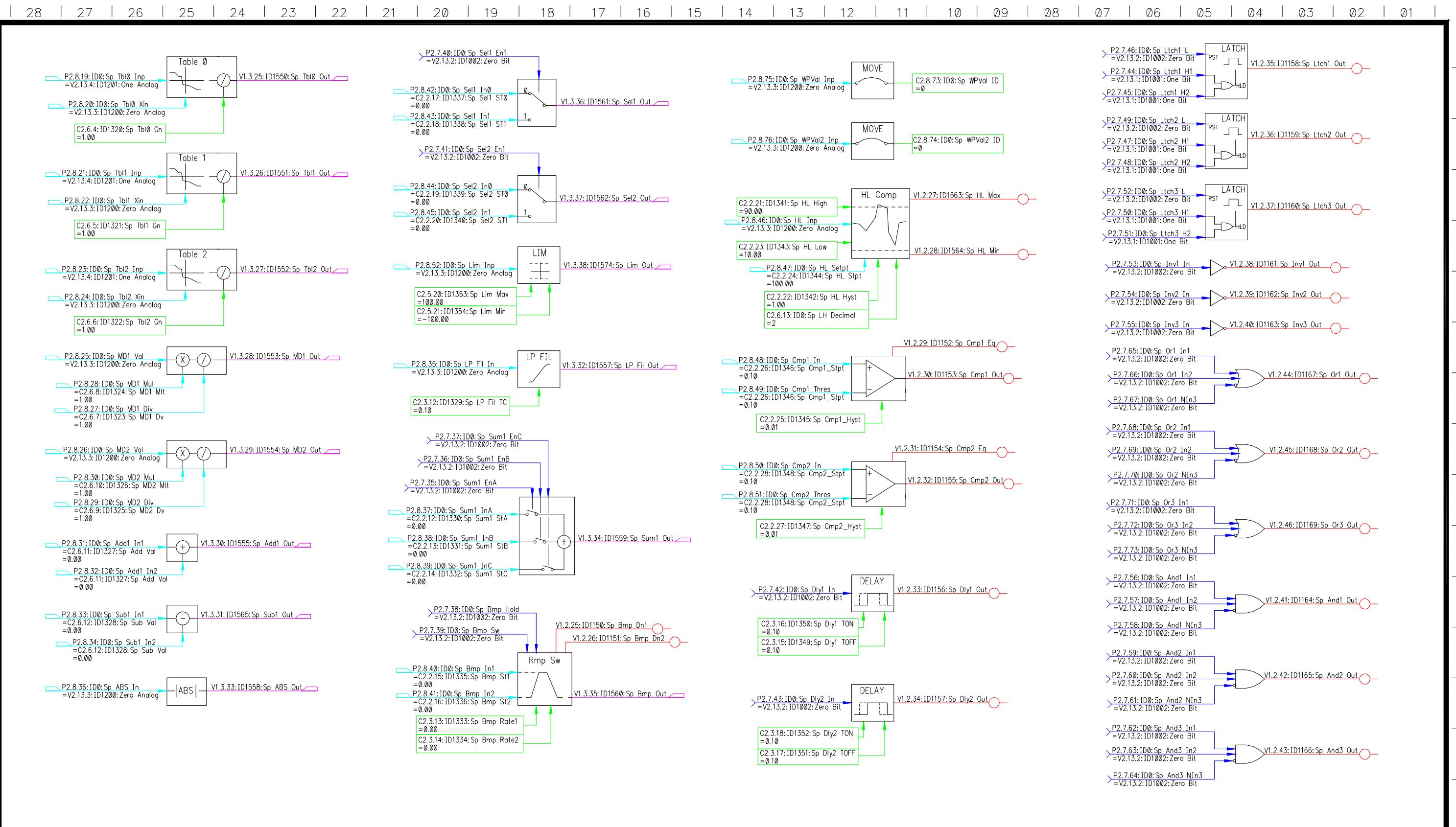
DEFUALTS

CAGE NO. 01014

SIZE B

DWG. NO. 512010A5

FIGURE NO. A-5



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INDEPENDENCE, OH 44131 - 5529

SECTION NO.

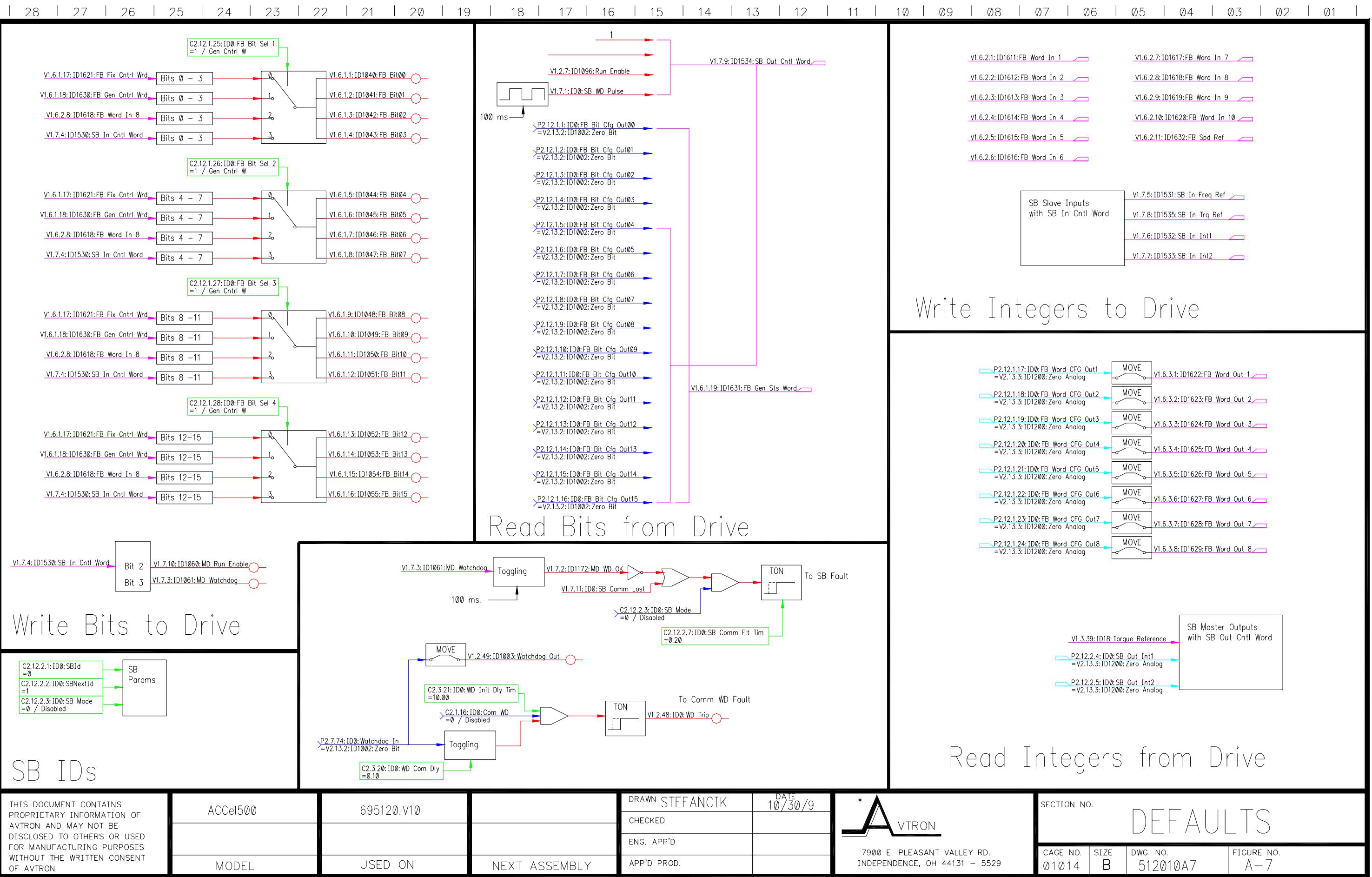
DEFAULTS

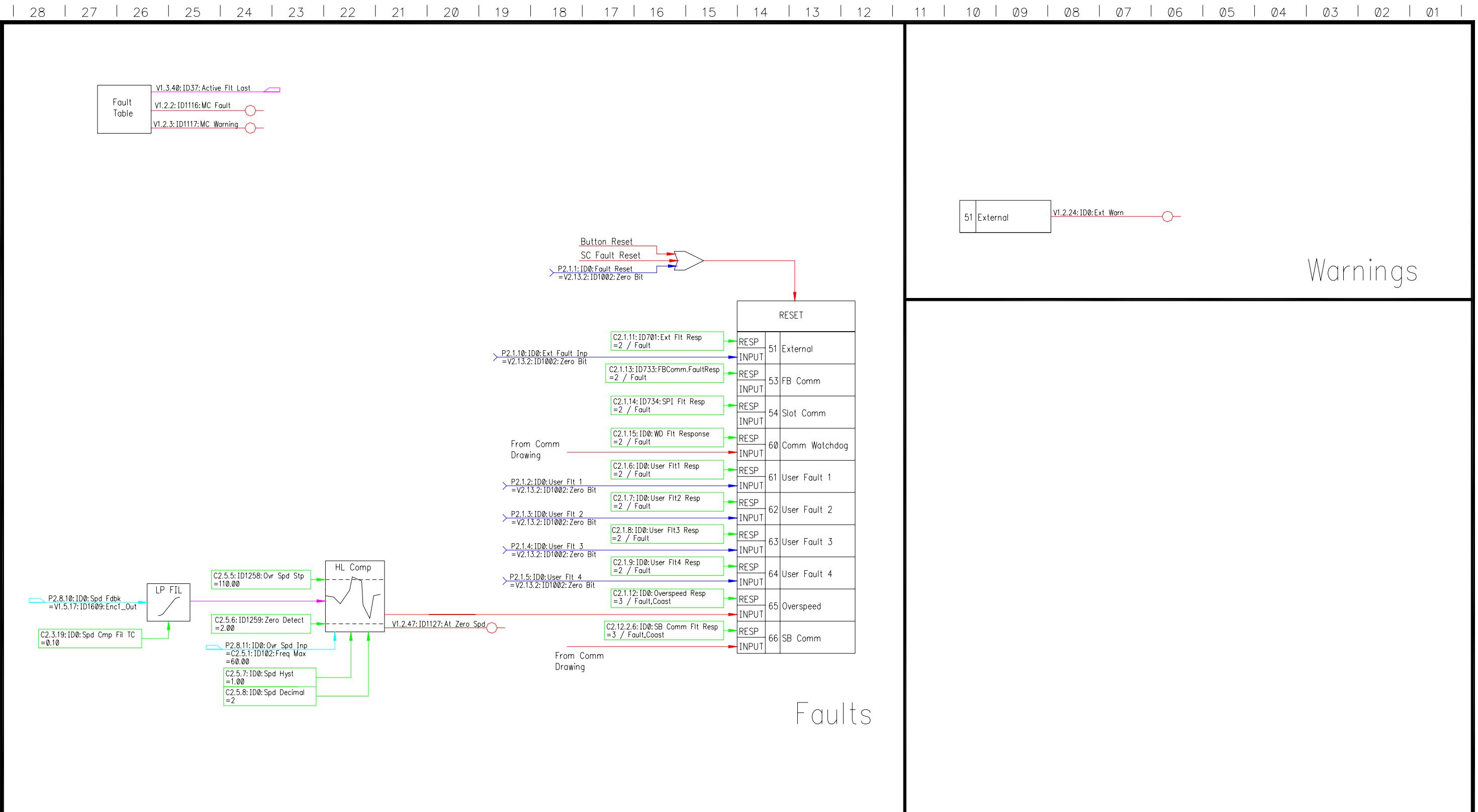
|          |      |          |            |
|----------|------|----------|------------|
| CAGE NO. | SIZE | DWG. NO. | FIGURE NO. |
| 01014    | B    | 512010A6 | A-6        |

MODEL

USED ON

NEXT ASSEMBLY





THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION OF AVTRON AND MAY NOT BE DISCLOSED TO OTHERS OR USED FOR MANUFACTURING PURPOSES WITHOUT THE WRITTEN CONSENT OF AVTRON

ACCEL500

695120.V10

DRAWN STEFANCIK

DATE 10/30/9

CHECKED

ENG. APP'D

APP'D PROD.



7900 E. PLEASANT VALLEY RD.  
INDEPENDENCE, OH 44131 - 5529

SECTION NO.

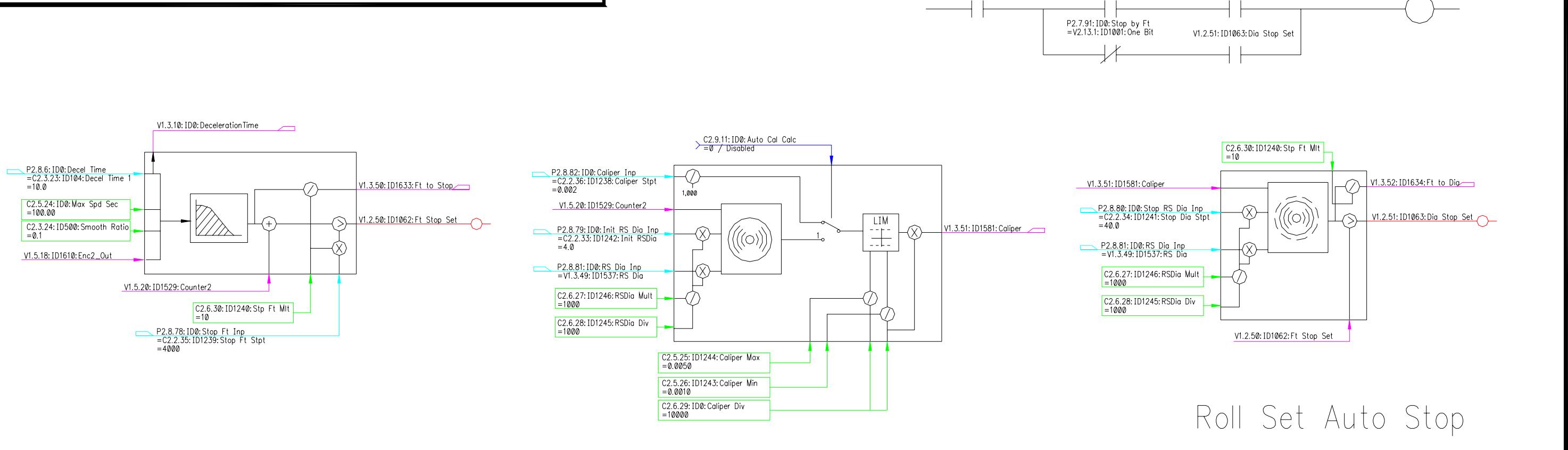
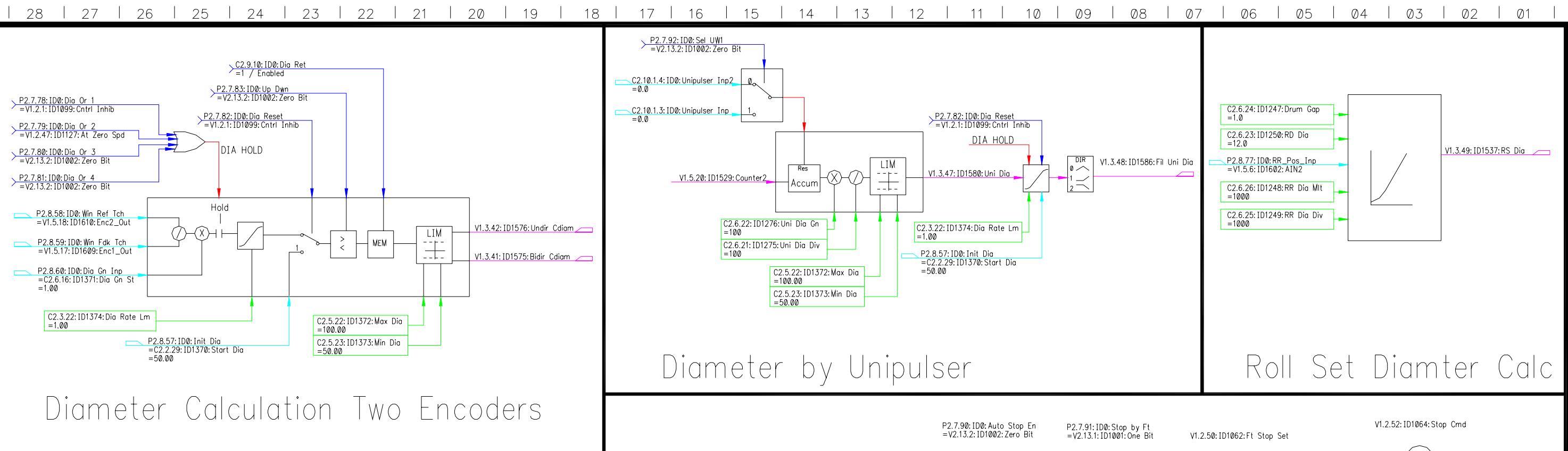
DEFAULTS

CAGE NO. 01014

SIZE B

DWG. NO. 512010A8

FIGURE NO. A-8



|  |          |               |  |   |   |
|--|----------|---------------|--|---|---|
| THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION OF AVTRON AND MAY NOT BE DISCLOSED TO OTHERS OR USED FOR MANUFACTURING PURPOSES WITHOUT THE WRITTEN CONSENT OF AVTRON | ACCEL500 | 695120.V10    | DRAWN STEFANCIK DATE 10/30/9<br>CHECKED<br>ENG. APP'D<br>APP'D PROD. | VTRON<br>7900 E. PLEASANT VALLEY RD.<br>INDEPENDENCE, OH 44131 - 5529 | SECTION NO.<br>DEFUALTS<br>CAGE NO. 01014 SIZE B DWG. NO. 512010A9 FIGURE NO. A-9 |
| MODEL  | USED ON  | NEXT ASSEMBLY |  |   |   |

| 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 |

| S  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
|--|--|--|----------|--|--|---------------|--|--|-----------------|--|--|--|--|--|----------------|--|--|-------------|--|--|--------------------|--|--|-----------------|--|--|
| R  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| P  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| N  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| M  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| L  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| K  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| J  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| H  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| G  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| F  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| E  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| D  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| C  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| B  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| A  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
|  |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| Table Arrays   |  |  |          |  |  |               |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION OF AVTRON AND MAY NOT BE DISCLOSED TO OTHERS OR USED FOR MANUFACTURING PURPOSES WITHOUT THE WRITTEN CONSENT OF AVTRON |  |  | ACCEL500 |  |  | 695120.V10    |  |  |                 |  |  |  |  |  |                |  |  |             |  |  |                    |  |  |                 |  |  |
| MODEL  |  |  | USED ON  |  |  | NEXT ASSEMBLY |  |  | DRAWN STEFANCIK |  |  | DATE 10/30/9   |  |  | * A VTRON      |  |  | SECTION NO. |  |  | DEFUALTS           |  |  |                 |  |  |
| APP'D PROD.  |  |  | CHECKED  |  |  | ENG. APP'D    |  |  | APP'D PROD.     |  |  | 7900 E. PLEASANT VALLEY RD.<br>INDEPENDENCE, OH 44131 - 5529 |  |  | CAGE NO. 01014 |  |  | SIZE B      |  |  | DWG. NO. 512010A10 |  |  | FIGURE NO. A-10 |  |  |

## APPENDIX B

### PARAMETER LIST

| MENU   | NAME          | ID   | MIN | MAX | DEFAULT | DESCRIPTION  |
|--------|---------------|------|-----|-----|---------|--|
| 1      | Monitor       |      |     |     |         | Menu Name  |
| 1.1    | Multimonitor  |      |     |     |         | Menu Name  |
| 1.2    | Appl Digital  |      |     |     |         | Menu Name  |
| 1.2.1  | Cntrl Inhib   | 1099 | 0   | 1   |         | Inverse of MC_Run. Used to reset loops when drive is off.                                    |
| 1.2.2  | MC Fault      | 1116 | 0   | 1   |         | Drive is in a fault condition.   |
| 1.2.3  | MC Warning    | 1117 | 0   | 1   |         | Drive is in a warning state. Bit from status word from firmware                              |
| 1.2.4  | Run OK        | 1091 | 0   | 1   |         | All the interlocks are met to enable a run command.  |
| 1.2.5  | Start Input   | 1089 | 0   | 1   |         | Run jog or thread is requested.  |
| 1.2.6  | Reverse       | 1128 | 0   | 1   |         | Reverse commanded by remote, keypad or computer.   |
| 1.2.7  | Run Enable    | 1096 | 0   | 1   |         | Run is commanded and it is enabled.  |
| 1.2.8  | RJT Enable    | 1097 | 0   | 1   |         | Run jog or thread commanded and enabled.   |
| 1.2.9  | Thread Enable | 1095 | 0   | 1   |         | Thread mode is commanded and enabled.  |
| 1.2.10 | Jog enable    | 1094 | 0   | 1   |         | Jog enabled  |
| 1.2.11 | Jog FR Input  | 1087 | 0   | 1   |         | Either jog forward or jog reverse is commanded.  |
| 1.2.12 | RunRequest    | 1090 | 0   | 1   |         | Run request: 0=no, 1=yes   |
| 1.2.13 | PC Control    | 1121 | 0   | 1   |         | Control has been transferred to the PC.  |
| 1.2.14 | Run In Max    | 1100 | 0   | 1   |         | In max draw limit  |
| 1.2.15 | Run In Min    | 1101 | 0   | 1   |         | In minimum draw limit  |
| 1.2.16 | Neg Spd Ref   | 1129 | 0   | 1   |         | Speed reference is negative  |
| 1.2.17 | Ten Stpt Max  | 1102 | 0   | 1   |         | Tension setpoint block in its maximum limit  |
| 1.2.18 | Ten Stpt Min  | 1103 | 0   | 1   |         | Tension setpoint block in its minimum limit  |
| 1.2.19 | Ten Res Bit   | 1107 | 0   | 1   |         | Reset Tension PI loop from one of 4 configurable IDs.  |
| 1.2.20 | Ten PI Max    | 1109 | 0   | 1   |         | Tension PI regulator has reached its max limit. Not implemented in this version.             |
| 1.2.21 | Ten PI Min    | 1108 | 0   | 1   |         | Tension PI regulator has reached its min limit. Not implemented in this version.             |
| 1.2.22 | Ten At Min    | 1106 | 0   | 1   |         | Tension below its minimum setpoint.  |
| 1.2.23 | Ten At Max    | 1105 | 0   | 1   |         | Tension feedback is higher than its maximum setpoint   |
| 1.2.24 | Ext Warn      | 0    | 0   | 1   |         | External warning detected. See Ext Fault Response for action.                                |
| 1.2.25 | Sp Bmp Dn1    | 1150 | 0   | 1   |         | Spare bumpless block is done ramping to the first input.                                     |
| 1.2.26 | Sp Bmp Dn2    | 1151 | 0   | 1   |         | Spare bumpless block is done ramping to the second input.                                    |
| 1.2.27 | Sp HL Max     | 1563 | 0   | 1   |         | Spare High/Low comparator above its max setpoint.  |
| 1.2.28 | Sp HL Min     | 1564 | 0   | 1   |         | Spare High/Low comparator below its min setpoint.  |
| 1.2.29 | Sp Cmp1 Eq    | 1152 | 0   | 1   |         | First spare comparator input and threshold difference is within the hysteresis value.        |
| 1.2.30 | Sp Cmp1 Out   | 1153 | 0   | 1   |         | First spare comparator input is greater than the threshold plus/minus the hysteresis value.  |
| 1.2.31 | Sp Cmp2 Eq    | 1154 | 0   | 1   |         | Second spare comparator input and threshold difference is within the hysteresis value.       |
| 1.2.32 | Sp Cmp2 Out   | 1155 | 0   | 1   |         | Second spare comparator input is greater than the threshold plus/minus the hysteresis value. |
| 1.2.33 | Sp Dly1 Out   | 1156 | 0   | 1   |         | First spare delay block output bit.  |
| 1.2.34 | Sp Dly2 Out   | 1157 | 0   | 1   |         | Second spare delay block output bit.   |
| 1.2.35 | Sp Ltch1 Out  | 1158 | 0   | 1   |         | First spare latch block output.  |
| 1.2.36 | Sp Ltch2 Out  | 1159 | 0   | 1   |         | Second spare latch block output.   |
| 1.2.37 | Sp Ltch3 Out  | 1160 | 0   | 1   |         | Third spare latch block output.  |
| 1.2.38 | Sp Inv1 Out   | 1161 | 0   | 1   |         | First spare bit invert output.   |
| 1.2.39 | Sp Inv2 Out   | 1162 | 0   | 1   |         | Second spare bit invert output.  |
| 1.2.40 | Sp Inv3 Out   | 1163 | 0   | 1   |         | Third spare bit invert output.   |
| 1.2.41 | Sp And1 Out   | 1164 | 0   | 1   |         | First spare and output.  |
| 1.2.42 | Sp And2 Out   | 1165 | 0   | 1   |         | Second spare and output.   |

| MENU   | NAME             | ID   | MIN     | MAX    | DEFAULT | DESCRIPTION   |
|--------|------------------|------|---------|--------|---------|---|
| 1.2.43 | Sp And3 Out      | 1166 | 0       | 1      |         | Third spare and output.   |
| 1.2.44 | Sp Or1 Out       | 1167 | 0       | 1      |         | First spare or output.  |
| 1.2.45 | Sp Or2 Out       | 1168 | 0       | 1      |         | Second spare or output.   |
| 1.2.46 | Sp Or3 Out       | 1169 | 0       | 1      |         | Third spare or output.  |
| 1.2.47 | At Zero Spd      | 1127 | 0       | 1      |         | Speed feedback is near zero speed.  |
| 1.2.48 | WD Trip          | 0    | 0       | 1      |         | Communications watch dog timer is in fault condition.   |
| 1.2.49 | Watchdog Out     | 1003 | 0       | 1      |         | Read by the PLC. PLC should then invert the bit and send it back to Watchdog in for comm verification.          |
| 1.2.50 | Ft Stop Set      | 1062 | 0       | 1      |         | Footage is at stopping point.   |
| 1.2.51 | Dia Stop Set     | 1063 | 0       | 1      |         | Dia is right for stopping   |
| 1.2.52 | Stop Cmd         | 1064 | 0       | 1      |         | Stop command by footage or diameter if enabled.   |
| 1.3    | Appl Analog      |      |         |        |         | Menu Name   |
| 1.3.1  | Control Place    | 1505 | 1       | 3      |         | Location of reference. 0 = remote, 1 = keypad, 2 = computer   |
| 1.3.2  | Cntrl Mode       | 1506 | 0       | 4      |         | 0 = Off, 1 = Run, 2 = Thread, 3 = Jog F, 4 = Jog R  |
| 1.3.3  | Run Stpt Dif     | 1501 | -327.67 | 327.67 |         | Draw from setpoint block. Either in Hz difference or ratio  |
| 1.3.4  | Draw Ref         | 1502 | -327.67 | 327.67 |         | Output of Setpoint block in Hz.   |
| 1.3.5  | Run Stpt         | 1503 | -327.67 | 327.67 |         | Run setpoint after draw   |
| 1.3.6  | RJT Ref          | 1504 | -327.67 | 327.67 |         | RJT thread reference  |
| 1.3.7  | Freq Reference   | 1507 | 0.00    | 320.00 |         | Speed reference after checking for skip frequency   |
| 1.3.8  | FreqReference    | 25   | -320.00 | 320.00 |         | [W] Frequency reference to motor control, f[Hz] = FreqRef/FreqScale//If FreqScale=100 then 5000 equals 50.00 Hz |
| 1.3.9  | ABS RJT Ref      | 1570 | 0.00    | 327.67 |         | Absolute value of speed reference   |
| 1.3.10 | DecelerationTime | 0    | 0.1     | 3000.0 |         | Deceleration time in RampTimeScale,<br>Deceleration=FreqRamp[Hz]/DecelerationTime[s]                            |
| 1.3.11 | Step Ref         | 1520 | -327.67 | 327.67 |         | Step speed reference before limit check   |
| 1.3.12 | Sup Sout         | 1518 | -327.67 | 327.67 |         | Slack step references   |
| 1.3.13 | Sup Sout Rp      | 1519 | -327.67 | 327.67 |         | Slack step after ramping  |
| 1.3.14 | ProcessPITrimRef | 1521 | -327.67 | 327.67 |         | Process PI Trim Frequency reference (in FreqScale)  |
| 1.3.15 | Ten Inp Stall    | 1512 | -327.67 | 327.67 |         | Either tension or stall reference   |
| 1.3.16 | Ten Bal Dif      | 0    | -327.67 | 327.67 |         | Difference held by the balance block  |
| 1.3.17 | Ten Bal out      | 1513 | -327.67 | 327.67 |         | Output of the tension balance block   |
| 1.3.18 | Ten Stpt         | 1514 | -327.67 | 327.67 |         | Ten reference after inc/dec block   |
| 1.3.19 | Ten Stpt Dif     | 1515 | -327.67 | 327.67 |         | Tension Inc/Dec block difference.   |
| 1.3.20 | Ten Ramped       | 1516 | -327.67 | 327.67 |         | Ten reference after ramping   |
| 1.3.21 | Tension Ref      | 1517 | -327.67 | 327.67 |         | Tension reference to error block  |
| 1.3.22 | Ten PI Out       | 1522 | -327.67 | 327.67 |         | Output of Tension PI regulator  |
| 1.3.23 | Ten SUP          | 1523 | -327.67 | 327.67 |         | Output of the tension loop with slacks.   |
| 1.3.24 | Ten Spd Err      | 1524 | -327.67 | 327.67 |         | Output of the tension loop regulator. Can be used as a speed trim, torque reference or analog out.              |
| 1.3.25 | Sp Tbl0 Out      | 1550 | -327.67 | 327.67 |         | Output of the first spare table block   |
| 1.3.26 | Sp Tbl1 Out      | 1551 | -327.67 | 327.67 |         | Output of the second spare table block  |
| 1.3.27 | Sp Tbl2 Out      | 1552 | -327.67 | 327.67 |         | Output of the third spare table block   |
| 1.3.28 | Sp MD1 Out       | 1553 | -327.67 | 327.67 |         | First spare MULDIV output   |
| 1.3.29 | Sp MD2 Out       | 1554 | -327.67 | 327.67 |         | Second spare MULDIV output  |
| 1.3.30 | Sp Add1 Out      | 1555 | -327.67 | 327.67 |         | Spare Add block output  |
| 1.3.31 | Sp Sub1 Out      | 1565 | -327.67 | 327.67 |         | Spare sub block output.   |
| 1.3.32 | Sp LP Fil Out    | 1557 | -327.67 | 327.67 |         | Output of spare low pass filter   |
| 1.3.33 | Sp ABS Out       | 1558 | 0.00    | 327.67 |         | Spare ABS block output  |
| 1.3.34 | Sp Sum1 Out      | 1559 | -327.67 | 327.67 |         | Sp sum block output   |
| 1.3.35 | Sp Bmp Out       | 1560 | -327.67 | 327.67 |         | Spare bump block output   |
| 1.3.36 | Sp Sel1 Out      | 1561 | -327.67 | 327.67 |         | First spare select block output.  |
| 1.3.37 | Sp Sel2 Out      | 1562 | -327.67 | 327.67 |         | Second spare select block output.   |
| 1.3.38 | Sp Lim Out       | 1574 | -327.67 | 327.67 |         | Spare limit value output  |
| 1.3.39 | Torque Reference | 18   | -300.0  | 300.0  |         | Torque reference 3000 = 300%  |
| 1.3.40 | Active Fit Last  | 37   | 0       | 2000   |         | [R] Last active fault code.   |
| 1.3.41 | Bidir Cdiam      | 1575 | 0.00    | 327.67 |         | Bidirectional calculated diameter. Percentage of maximum diameter.  |
| 1.3.42 | Undir Cdiam      | 1576 | 0.00    | 327.67 |         | Unidirectional calculated diameter. In percentage of maximum diameter.  |
| 1.3.43 | Win Tbl Out      | 1577 | -327.67 | 327.67 |         | Output of the winder tension taper table in percent of full tension   |

| MENU    | NAME           | ID   | MIN     | MAX    | DEFAULT | DESCRIPTION   |
|---------|----------------|------|---------|--------|---------|---|
| 1.3.44  | Win Fd Fwd     | 1578 | -327.67 | 327.67 |         | Open loop torque reference added with boost and close loop control in percent motor torque. |
| 1.3.45  | Win Gn Out     | 1579 | -327.67 | 327.67 |         | Open loop torque reference in percent motor torque.   |
| 1.3.46  | Accel TC       | 1569 | 0       | 32767  |         | Accel inertia value   |
| 1.3.47  | Uni Dia        | 1580 | 0.00    | 327.67 |         | Diameter based on a reference encoder and unipulser   |
| 1.3.48  | Fil Uni Dia    | 1586 | 0.00    | 327.65 |         | Filtered Unwind diameter  |
| 1.3.49  | RS Dia         | 1537 | 0.0     | 3276.5 |         | Roll Set diameter from rider roll sensor.   |
| 1.3.50  | Ft to Stop     | 1633 | -32765  | 32765  |         | Footage to stop.  |
| 1.3.51  | Caliper        | 1581 | 0.00    | 327.67 |         | Caliper multiplied by Caliper Div.  |
| 1.3.52  | Ft to Dia      | 1634 | -32765  | 32765  |         | Footage to Roll Set diameter.   |
| 1.3.53  | Win WK         | 1582 | -327.65 | 327.65 |         | Inertia compensation for the Unwind.  |
| 1.3.54  | Spd Ramp       | 1583 | -327.65 | 327.65 |         | Output of the speed ddt block   |
| 1.3.55  | UW1 Trq        | 1584 | -327.65 | 327.65 |         | First unwind brake output   |
| 1.3.56  | UW2 Trq        | 1585 | -327.65 | 327.65 |         | Second unwind brake output  |
| 1.4     | Digital IO     |      |         |        |         | Menu Name   |
| 1.4.1   | DIN 1          | 1011 | 0       | 1      |         | First digital input value.  |
| 1.4.2   | DIN 2          | 1012 | 0       | 1      |         | Second digital input value.   |
| 1.4.3   | DIN 3          | 1013 | 0       | 1      |         | Third digital input value.  |
| 1.4.4   | DIN 4          | 1014 | 0       | 1      |         | Fourth digital input value.   |
| 1.4.5   | DIN 5          | 1015 | 0       | 1      |         | Fifth digital input value.  |
| 1.4.6   | DIN 6          | 1016 | 0       | 1      |         | Sixth digital input value.  |
| 1.4.7   | DIN 7          | 1017 | 0       | 1      |         | Seventh digital input value. Default to zero. Used for additional digital input boards.     |
| 1.4.8   | DIN 8          | 1018 | 0       | 1      |         | Eighth digital input value. Default to zero. Used for additional digital input boards.      |
| 1.4.9   | Not DIN 1      | 1021 | 0       | 1      |         | Inverse of digital input 1  |
| 1.4.10  | Not DIN 2      | 1022 | 0       | 1      |         | Inverse of digital input 2  |
| 1.4.11  | Not DIN 3      | 1023 | 0       | 1      |         | Inverse of digital input 3  |
| 1.4.12  | Not DIN 4      | 1024 | 0       | 1      |         | Inverse of digital input 4  |
| 1.4.13  | Not DIN 5      | 1025 | 0       | 1      |         | Inverse of digital input 5  |
| 1.4.14  | Not DIN 6      | 1026 | 0       | 1      |         | Inverse of digital input 6  |
| 1.4.15  | Not DIN 7      | 1027 | 0       | 1      |         | Inverse of digital input 7  |
| 1.4.16  | Not DIN 8      | 1028 | 0       | 1      |         | Inverse of digital input 8  |
| 1.5     | Analog IO      |      |         |        |         | Menu Name   |
| 1.5.1   | AI1 Type       | 0    | 0       | 5      |         | First analog input type   |
| 1.5.2   | AI2 Type       | 0    | 0       | 5      |         | Second analog input type  |
| 1.5.3   | AI3 Type       | 0    | 0       | 5      |         | Third analog input type   |
| 1.5.4   | AI4 Type       | 0    | 0       | 5      |         | Fourth analog input type  |
| 1.5.5   | AIN1           | 1601 | -327.67 | 327.67 |         | First analog input after scaling and filtering  |
| 1.5.6   | AIN2           | 1602 | -327.67 | 327.67 |         | Second analog input after scaling and filtering   |
| 1.5.7   | AIN3           | 1603 | -327.67 | 327.67 |         | Third analog input after scaling and filtering  |
| 1.5.8   | AIN4           | 1604 | -327.67 | 327.67 |         | Fourth analog input after scaling and filtering   |
| 1.5.9   | AIN1 Fault     | 0    | 0       | 1      |         | Fault if 4-20ma or 2-10 volt is below min limit   |
| 1.5.10  | AIN2 Fault     | 0    | 0       | 1      |         | Fault if 4-20ma or 2-10 volt is below min limit   |
| 1.5.11  | AIN3 Fault     | 0    | 0       | 1      |         | Fault if 4-20ma or 2-10 volt is below min limit   |
| 1.5.12  | AIN4 Fault     | 0    | 0       | 1      |         | Fault if 4-20ma or 2-10 volt is below min limit   |
| 1.5.13  | AOUT1 Val      | 1590 | -327.67 | 327.67 |         | Value of first analog out. +/- 10,000 to full scale   |
| 1.5.14  | AOUT2 Val      | 1591 | -327.67 | 327.67 |         | Value of second analog out. +/- 10,000 to full scale  |
| 1.5.15  | AOUT3 Val      | 1592 | -327.67 | 327.67 |         | Value of third analog out. +/- 10,000 to full scale   |
| 1.5.16  | AOUT4 Val      | 1593 | -327.67 | 327.67 |         | Value of fourth analog out. +/- 10,000 to full scale  |
| 1.5.17  | Enc1_Out       | 1609 | -327.67 | 327.67 |         | First encoder input after scaling and low pass filter                                       |
| 1.5.18  | Enc2_Out       | 1610 | -327.67 | 327.67 |         | Second encoder input after scaling and low pass filter                                      |
| 1.5.19  | Counter1       | 1528 | -32767  | 32767  |         | First encoder counter output after scaling  |
| 1.5.20  | Counter2       | 1529 | -32767  | 32767  |         | Second encoder counter output after scaling   |
| 1.6     | FB I/O         |      |         |        |         | Menu Name   |
| 1.6.1   | Digital Inputs |      |         |        |         | Menu Name   |
| 1.6.1.1 | FB Bit00       | 1040 | 0       | 1      |         | Bit 0 data from the field bus selected by FB Bit Sel 1                                      |

| MENU     | NAME             | ID   | MIN     | MAX    | DEFAULT | DESCRIPTION  |
|----------|------------------|------|---------|--------|---------|--|
| 1.6.1.2  | FB Bit01         | 1041 | 0       | 1      |         | Bit 1 data from the field bus selected by FB Bit Sel 1   |
| 1.6.1.3  | FB Bit02         | 1042 | 0       | 1      |         | Bit 2 data from the field bus selected by FB Bit Sel 1   |
| 1.6.1.4  | FB Bit03         | 1043 | 0       | 1      |         | Bit 3 data from the field bus selected by FB Bit Sel 1   |
| 1.6.1.5  | FB Bit04         | 1044 | 0       | 1      |         | Bit 4 data from the field bus selected by FB Bit Sel 2   |
| 1.6.1.6  | FB Bit05         | 1045 | 0       | 1      |         | Bit 5 data from the field bus selected by FB Bit Sel 2   |
| 1.6.1.7  | FB Bit06         | 1046 | 0       | 1      |         | Bit 6 data from the field bus selected by FB Bit Sel 2   |
| 1.6.1.8  | FB Bit07         | 1047 | 0       | 1      |         | Bit 7 data from the field bus selected by FB Bit Sel 2   |
| 1.6.1.9  | FB Bit08         | 1048 | 0       | 1      |         | Bit 8 data from the field bus selected by FB Bit Sel 3   |
| 1.6.1.10 | FB Bit09         | 1049 | 0       | 1      |         | Bit 9 data from the field bus selected by FB Bit Sel 3   |
| 1.6.1.11 | FB Bit10         | 1050 | 0       | 1      |         | Bit 10 data from the field bus selected by FB Bit Sel 3  |
| 1.6.1.12 | FB Bit11         | 1051 | 0       | 1      |         | Bit 11 data from the field bus selected by FB Bit Sel 3  |
| 1.6.1.13 | FB Bit12         | 1052 | 0       | 1      |         | Bit 12 data from the field bus selected by FB Bit Sel 4  |
| 1.6.1.14 | FB Bit13         | 1053 | 0       | 1      |         | Bit 13 data from the field bus selected by FB Bit Sel 4  |
| 1.6.1.15 | FB Bit14         | 1054 | 0       | 1      |         | Bit 14 data from the field bus selected by FB Bit Sel 4  |
| 1.6.1.16 | FB Bit15         | 1055 | 0       | 1      |         | Bit 15 data from the field bus selected by FB Bit Sel 4  |
| 1.6.1.17 | FB Fix Cntrl Wrd | 1621 | -32767  | 32767  |         | Control word,bits. Predefined by field bus protocols. Can be used to set FB bits by FB Bit Sel 1-4./B0 - RUN //B1 - DIRECTION//B2 - FaultRST//B3 - FBDIN1 //B4 - FBDIN2 //B5 - FBDIN3 //B6 - FBDIN4 //B7 - FBDIN5 //B8 - BusCtrl//B9 - BusRef//B10 - FBDIN6//B11 - FBDIN7//B12 - FBDIN8//B13 - FBDIN9//B14 - FBD |
| 1.6.1.18 | FB Gen Cntrl Wrd | 1630 | -32767  | 32767  |         | General Control Word. Can be used to select the FB bits if selected by FB Bit Sel 1-4  |
| 1.6.1.19 | FB Gen Sts Word  | 1631 | -32767  | 32767  |         | Status word (bits B0...B15). Set to FB Bit Cfg Out00 - 15//B8 Fieldbuscard & Application specific fieldbus process data in use   |
| 1.6.2    | Analog Inputs    |      |         |        |         | Menu Name  |
| 1.6.2.1  | FB Word In 1     | 1611 | -327.67 | 327.67 |         | First int in from field bus  |
| 1.6.2.2  | FB Word In 2     | 1612 | -327.67 | 327.67 |         | Second int input from field bus  |
| 1.6.2.3  | FB Word In 3     | 1613 | -327.67 | 327.67 |         | Third int input from field bus   |
| 1.6.2.4  | FB Word In 4     | 1614 | -327.67 | 327.67 |         | Fourth int input from field bus  |
| 1.6.2.5  | FB Word In 5     | 1615 | -327.67 | 327.67 |         | Fifth int input from field bus   |
| 1.6.2.6  | FB Word In 6     | 1616 | -327.67 | 327.67 |         | Sixth int input from field bus   |
| 1.6.2.7  | FB Word In 7     | 1617 | -327.67 | 327.67 |         | Seventh int input from field bus   |
| 1.6.2.8  | FB Word In 8     | 1618 | -327.67 | 327.67 |         | Eighth int input from field bus  |
| 1.6.2.9  | FB Word In 9     | 1619 | -327.67 | 327.67 |         | Ninth int input from field bus   |
| 1.6.2.10 | FB Word In 10    | 1620 | -327.67 | 327.67 |         | Tenth int input from field bus   |
| 1.6.2.11 | FB Spd Ref       | 1632 | -327.67 | 327.67 |         | Speed reference from field bus. Enter RPM gets converted to percentage./Typically this value is in percent of the frequency area between the set minimum and maximum frequency.  |
| 1.6.3    | Analog Outputs   |      |         |        |         | Menu Name  |
| 1.6.3.1  | FB Word Out 1    | 1622 | -32767  | 32767  |         | Application Specific process data  |
| 1.6.3.2  | FB Word Out 2    | 1623 | -32767  | 32767  |         | Application Specific process dataApplication Specific process data   |
| 1.6.3.3  | FB Word Out 3    | 1624 | -32767  | 32767  |         | Application Specific process dataApplication Specific process dataApplication Specific process data  |
| 1.6.3.4  | FB Word Out 4    | 1625 | -32767  | 32767  |         | Application Specific process dataApplication Specific process dataApplication Specific process dataApplication Specific process data   |
| 1.6.3.5  | FB Word Out 5    | 1626 | -32767  | 32767  |         | Application Specific process dataApplication Specific process dataApplication Specific process dataApplication Specific process dataApplication Specific process data  |
| 1.6.3.6  | FB Word Out 6    | 1627 | -32767  | 32767  |         | Application Specific process dataApplication Specific process dataApplication Specific process dataApplication Specific process dataApplication Specific process data  |
| 1.6.3.7  | FB Word Out 7    | 1628 | -32767  | 32767  |         | Application Specific process dataApplication Specific process data   |
| 1.6.3.8  | FB Word Out 8    | 1629 | -32767  | 32767  |         | Application Specific process dataApplication Specific process data   |
| 1.7      | SB Data          |      |         |        |         | Menu Name  |

| MENU   | NAME             | ID   | MIN     | MAX    | DEFAULT         | DESCRIPTION   |
|--------|------------------|------|---------|--------|-----------------|---|
| 1.7.1  | SB WD Pulse      | 0    | 0       | 1      |                 | Toggles every 100 ms. Used to tell slaves that the master is still communicating over the system bus. |
| 1.7.2  | MD WD OK         | 1172 | 0       | 1      |                 | Master sections Watchdog is OK.   |
| 1.7.3  | MD Watchdog      | 1061 | 0       | 1      |                 | Watchdog bit toggling from master drive.  |
| 1.7.4  | SB In Cntl Word  | 1530 | 0       | 32767  |                 | System bus control word form the master section.  |
| 1.7.5  | SB In Freq Ref   | 1531 | -327.67 | 327.67 |                 | System Bus frequency reference from the master.   |
| 1.7.6  | SB In Int1       | 1532 | -327.67 | 327.67 |                 | System bus first configurable integer input from master section.                                      |
| 1.7.7  | SB In Int2       | 1533 | -327.67 | 327.67 |                 | System bus second configurable integer input from master section.                                     |
| 1.7.8  | SB In Trq Ref    | 1535 | -327.67 | 327.67 |                 | System Bus torque reference from the master.  |
| 1.7.9  | SB Out Cntl Word | 1534 | 0       | 32767  |                 | System bus control word out of the slave sections   |
| 1.7.10 | MD Run Enable    | 1060 | 0       | 1      |                 | System bus master section Run Enable is high.   |
| 1.7.11 | SB Comm Lost     | 0    | 0       | 1      |                 | System bus is not communicating   |
| 2      | Parameters       |      |         |        |                 | Menu Name   |
| 2.1    | Protections      |      |         |        |                 | Menu Name   |
| 2.1.1  | Fault Reset      | 0    | 0       | 2000   | 1002            | Fault reset. Default to Zero Bit.   |
| 2.1.2  | User Flt 1       | 0    | 0       | 2000   | 1002            | First user fault configuration point. Default to Zero Bit.  |
| 2.1.3  | User Flt 2       | 0    | 0       | 2000   | 1002            | Second user fault configuration point. Default to Zero Bit.   |
| 2.1.4  | User Flt 3       | 0    | 0       | 2000   | 1002            | Third user fault configuration point. Default to Zero Bit.  |
| 2.1.5  | User Flt 4       | 0    | 0       | 2000   | 1002            | Fourth user fault configuration point. Default to Zero Bit.   |
| 2.1.6  | User Flt1 Resp   | 0    | 0       | 3      | 2 / Fault       | Response to the 1st user fault.   |
| 2.1.7  | User Flt2 Resp   | 0    | 0       | 3      | 2 / Fault       | Response to the 2nd user fault.   |
| 2.1.8  | User Flt3 Resp   | 0    | 0       | 3      | 2 / Fault       | Response to the 3rd user fault.   |
| 2.1.9  | User Flt4 Resp   | 0    | 0       | 3      | 2 / Fault       | Response to the 4th user fault.   |
| 2.1.10 | Ext Fault Inp    | 0    | 0       | 2000   | 1002            | External fault input. High for fault. Default to zero bit.  |
| 2.1.11 | Ext Flt Resp     | 701  | 0       | 3      | 2 / Fault       | Set Drive response to an external fault. Ignore, Warn, Fault, Fault coast                             |
| 2.1.12 | Overspeed Resp   | 0    | 0       | 3      | 3 / Fault,Coast | Response to drive overspeed. Default to coast stop and fault the drive.                               |
| 2.1.13 | FBComm.FaultResp | 733  | 0       | 3      | 2 / Fault       | Set Drive response to a field bus fault. Ignore, Warn, Fault, Fault coast                             |
| 2.1.14 | SPI Flt Resp     | 734  | 0       | 3      | 2 / Fault       | Set Drive response to a slot communication fault. Ignore, Warn, Fault, Fault coast                    |
| 2.1.15 | WD Flt Response  | 0    | 0       | 3      | 2 / Fault       | Response to a communication watch dog time out. Default to fault the drive.                           |
| 2.1.16 | Com WD           | 0    | 0       | 1      | 0 / Disabled    | Enables the communications watchdog timer. Default to not run it.                                     |
| 2.2    | Setpoints        |      |         |        |                 | Menu Name   |
| 2.2.1  | Run Speed        | 1254 | -327.67 | 327.67 | 20.00           | Default run speed if a fix value is desired. Default to 0 - 100% speed                                |
| 2.2.2  | Thread Speed     | 1255 | -327.67 | 327.67 | 10.00           | Default thread speed. Used if a fixed value is desired.   |
| 2.2.3  | Jog F Speed      | 1256 | -327.67 | 327.67 | 5.00            | Fixed jog forward speed setpoint.   |
| 2.2.4  | Jog R Speed      | 1257 | -320.00 | 320.00 | -5.00           | Jog reverse speed setpoint.   |
| 2.2.5  | Draw Spt         | 1251 | -327.67 | 327.67 | 1.00            | Draw setpoint. Configurable to ratio or difference draw. Default is ratio of 1.00.                    |
| 2.2.6  | Spd Slk Up       | 1273 | -327.67 | 327.67 | 10.00           | Speed step slack up value   |
| 2.2.7  | Spd Slk Out      | 1274 | -327.67 | 327.67 | -10.00          | Speed step slack out value.   |
| 2.2.8  | Trq Ref StA      | 1302 | -300.0  | 300.0  | 0.0             | Fixed value for the first torque reference input if desired. Enter in percent torque.                 |
| 2.2.9  | Trq Ref StB      | 1303 | -300.0  | 300.0  | 0.0             | Fixed value for the second torque reference input if desired. Enter in percent torque.                |
| 2.2.10 | Ten Stall        | 1261 | -327.67 | 327.67 | 10.00           | Tension stall setpoint value.   |
| 2.2.11 | Ten Ref          | 1262 | -327.67 | 327.67 | 50.00           | Tension setpoint if a fixed value is desired.   |
| 2.2.12 | Sp Sum1 StA      | 1330 | -327.67 | 327.67 | 0.00            | Sp sum blocks first inputs default calibration value..  |
| 2.2.13 | Sp Sum1 StB      | 1331 | -327.67 | 327.67 | 0.00            | Sp sum blocks second inputs default calibration value..   |
| 2.2.14 | Sp Sum1 StC      | 1332 | -327.67 | 327.67 | 0.00            | Sp sum blocks third inputs default calibration value..  |
| 2.2.15 | Sp Bmp St1       | 1335 | -327.67 | 327.67 | 0.00            | Spare bumpless block default calibration value for the first input.                                   |
| 2.2.16 | Sp Bmp St2       | 1336 | -327.67 | 327.67 | 0.00            | Spare bumpless block default calibration value for the second input.                                  |
| 2.2.17 | Sp Sel1 ST0      | 1337 | -327.67 | 327.67 | 0.00            | First spare select block input 0 default calibration value.   |
| 2.2.18 | Sp Sel1 ST1      | 1338 | -327.67 | 327.67 | 0.00            | First spare select block input 1 default calibration value.   |
| 2.2.19 | Sp Sel2 ST0      | 1339 | -327.67 | 327.67 | 0.00            | Second spare select block input 0 default calibration value.  |
| 2.2.20 | Sp Sel2 ST1      | 1340 | -327.67 | 327.67 | 0.00            | Second spare select block input 1 default calibration value.  |
| 2.2.21 | Sp HL High       | 1341 | 0.00    | 327.67 | 90.00           | Spare High Low comparator High percent.   |
| 2.2.22 | Sp HL Hyst       | 1342 | 0.00    | 327.67 | 1.00            | Spare High Low comparator hysteresis value.   |

| MENU   | NAME            | ID   | MIN     | MAX    | DEFAULT | DESCRIPTION   |
|--------|-----------------|------|---------|--------|---------|---|
| 2.2.23 | Sp HL Low       | 1343 | 0.00    | 327.67 | 10.00   | Spare High Low comparator low percent.  |
| 2.2.24 | Sp HL Stpt      | 1344 | 0.00    | 327.67 | 100.00  | Spare High Low comparator default full scale value.   |
| 2.2.25 | Sp Cmp1_Hyst    | 1345 | 0.00    | 327.67 | 0.01    | First spare comparator block Hysteresis value. Plus or minus around the threshold.            |
| 2.2.26 | Sp Cmp1_Stpt    | 1346 | -327.67 | 327.67 | 0.10    | First spare comparator block default setpoint value. Can be used for the input or threshold.  |
| 2.2.27 | Sp Cmp2_Hyst    | 1347 | 0.00    | 327.67 | 0.01    | Second spare comparator block Hysteresis value. Plus or minus around the threshold.           |
| 2.2.28 | Sp Cmp2_Stpt    | 1348 | -327.67 | 327.67 | 0.10    | Second spare comparator block default setpoint value. Can be used for the input or threshold. |
| 2.2.29 | Start Dia       | 1370 | 0.00    | 327.67 | 50.00   | Default start diameter for the calculated diameter reset. Default to 50% of maximum diameter. |
| 2.2.30 | Opn Lp Stpt     | 1375 | -327.67 | 327.67 | 0.00    | Optional open loop torque setpoint.   |
| 2.2.31 | Win Boost       | 0    | -327.67 | 327.67 | 0.00    | Optional motor torque boost. Can be used to increase torque during winder transitions.        |
| 2.2.32 | ESTOP Trq       | 0    | -320.00 | 320.00 | 100.00  | Full torque setting   |
| 2.2.33 | Init RSDia      | 1242 | 0.0     | 3276.5 | 4.0     | Default roll set initial diameter.  |
| 2.2.34 | Stop Dia Stpt   | 1241 | 0.0     | 3276.5 | 40.0    | Roll SET diameter stop setpoint   |
| 2.2.35 | Stop Ft Stpt    | 1239 | 0       | 32765  | 4000    | Stop footage setpoint. Default to be in tens of feet. Example. 100 = 1000 feet.               |
| 2.2.36 | Caliper Stpt    | 1238 | 0.000   | 32.765 | 0.002   | Caliper setpoint for autostop by diameter when auto caliper is turned off.                    |
| 2.3    | Rates / Times   |      |         |        |         | Menu Name   |
| 2.3.1  | Fast Stop Tim   | 503  | 0.1     | 3000.0 | 0.1     | Fast stop ramp time   |
| 2.3.2  | Run Dec Rate    | 1269 | 0.00    | 320.00 | 5.00    | Speed setpoint block decrease rate in hertz per second  |
| 2.3.3  | Run Inc Rate    | 1270 | 0.00    | 320.00 | 5.00    | Speed setpoint block increase rate in hertz per second  |
| 2.3.4  | Slv Rate Lim    | 1260 | 0       | 3200   | 10      | Slave speed rate limit if applicable  |
| 2.3.5  | Ten Dec Rate    | 1263 | 0.00    | 320.00 | 5.00    | Tension setpoint block decrease rate in percent per second                                    |
| 2.3.6  | Ten Inc Rate    | 1264 | 0.00    | 320.00 | 5.00    | Tension setpoint block increase rate in percent per second                                    |
| 2.3.7  | Ten Ramp Rate   | 1271 | 0       | 3200   | 5       | Tension ramp rate in % per second   |
| 2.3.8  | Ten B Rate      | 1272 | 0.00    | 320.00 | 5.00    | Transfer into tension mode rate in % per second   |
| 2.3.9  | Slack Rate      | 1310 | 0       | 320    | 10      | Speed step ramp rate when enabled in hertz per second   |
| 2.3.10 | Spd B Rate2     | 1285 | 0.00    | 320.00 | 5.00    | Rate to smoothly transfer out of tension mode in percent per second                           |
| 2.3.11 | Trq Rmp Rate    | 1290 | 0       | 3200   | 5       | Torque reference ramp limit in percent per second.  |
| 2.3.12 | Sp LP Fil TC    | 1329 | 0.00    | 10.00  | 0.10    | Spare low pass filter time constant. Default to 100 ms.                                       |
| 2.3.13 | Sp Bmp Rate1    | 1333 | 0.00    | 20.00  | 0.00    | Spare bumpless block ramp rate to the input 1. % per second.                                  |
| 2.3.14 | Sp Bmp Rate2    | 1334 | 0.00    | 20.00  | 0.00    | Spare bumpless block ramp rate to the input 2. % per second.                                  |
| 2.3.15 | Sp Dly1 TOFF    | 1349 | 0.00    | 327.67 | 0.10    | First spare timer delay off setting in seconds. Default to 100 ms.                            |
| 2.3.16 | Sp Dly1 TON     | 1350 | 0.00    | 327.67 | 0.10    | First spare timer delay on setting in seconds. Default to 100 ms.                             |
| 2.3.17 | Sp Dly2 TOFF    | 1351 | 0.00    | 327.67 | 0.10    | Second spare timer delay off setting in seconds. Default to 100 ms.                           |
| 2.3.18 | Sp Dly2 TON     | 1352 | 0.00    | 327.67 | 0.10    | Second spare timer delay on setting in seconds. Default to 100 ms.                            |
| 2.3.19 | Spd Cmp Fil TC  | 0    | 0.00    | 10.00  | 0.10    | Spd Comparator low pass filter. Default to 100 ms.  |
| 2.3.20 | WD Com Dly      | 0    | 0.00    | 100.00 | 0.10    | Communications watch dog timer delay. Default to 100 ms.                                      |
| 2.3.21 | WD Init Dly Tim | 0    | 0.00    | 327.67 | 10.00   | Power up delay for the communications watchdog timer. Default to 10 seconds.                  |
| 2.3.22 | Dia Rate Lm     | 1374 | 0.00    | 327.67 | 1.00    | Rate limit on the diameter calculation. Default to 1 percent per second rate change.          |
| 2.3.23 | Decel Time 1    | 104  | 0.1     | 3000.0 | 10.0    | Decel time from amx speed to zero.  |
| 2.3.24 | Smooth Ratio    | 500  | 0.1     | 100.0  | 0.1     | Smooth ratio for S-curves//0 = linear ramps//100 = full acc/dec inc/dec times                 |
| 2.3.25 | DDT Fil         | 0    | 0.001   | 1.000  | 0.100   | Third order low pass filter for the speed ddt block   |
| 2.4    | Tuning Gains    |      |         |        |         | Menu Name   |
| 2.4.1  | Ten P Gain      | 1278 | 0.000   | 32.767 | 0.010   | Tension loop proportional gain.   |
| 2.4.2  | Ten I Gain      | 1279 | 0.00    | 327.67 | 1.00    | Tension loop integral time constant.  |
| 2.4.3  | Ten PI Gn Scale | 1282 | 1       | 32767  | 1       | Modifies the error which results in P and I gain change.                                      |
| 2.4.4  | Ten I Stl Gn    | 0    | 0.00    | 327.67 | 1.00    | Tension loop stall integral time constant.  |
| 2.4.5  | Ten P Stl Gn    | 0    | 0.000   | 32.767 | 0.010   | Tension loop stall proportional gain.   |
| 2.4.6  | Gn With Dia     | 1377 | 0.00    | 327.67 | 100.00  | Used to modify the authority of the gain by diameter. Default is 100% authority when enabled. |
| 2.4.7  | Fix WK Stpt     | 1378 | 0       | 32767  | 0       | Fix inertia setpoint value  |
| 2.4.8  | Var WK Stpt     | 1379 | 0       | 32767  | 0       | Variable inertia compensation setpoint  |
| 2.5    | Limits          |      |         |        |         | Menu Name   |

| MENU   | NAME           | ID   | MIN     | MAX           | DEFAULT | DESCRIPTION   |
|--------|----------------|------|---------|---------------|---------|---|
| 2.5.1  | Freq Max       | 102  | FreqMin | 320.00        | 60.00   | [W] Max output frequency, f[Hz] = FreqMin/FreqScale//Range[FreqMin...32767]//If FreqScale=100 then 5000 equals 50.00 Hz. Init := 5000 |
| 2.5.2  | Min Frequency  | 101  | 0.00    | Max_Frequency | 0.00    | Minimum frequency the speed reference is allowed to go down to in hertz.  |
| 2.5.3  | Max Run Stpt   | 1267 | -320.00 | 320.00        | 60.00   | Speed setpoint block increase allowed limit.  |
| 2.5.4  | Min Run Stpt   | 1268 | -320.00 | 320.00        | -60.00  | Speed setpoint block decrease allowed limit.  |
| 2.5.5  | Ovr Spd Stp    | 1258 | 0.00    | 327.67        | 110.00  | Overspeed setpoint in percentage of max speed. Default to 110%  |
| 2.5.6  | Zero Detect    | 1259 | 0.00    | 200.00        | 2.00    | Speed feedback comparator At zero speed setpoint. Default to 2% of max speed.   |
| 2.5.7  | Spd Hyst       | 0    | 0.00    | 200.00        | 1.00    | Speed feedback comparator hysteresis value. Default to 1%   |
| 2.5.8  | Spd Decimal    | 0    | 0       | 4             | 2       | Speed feedback comparator decimal point resolution. Default to 2.   |
| 2.5.9  | Max Tension    | 1286 | 0.00    | 327.67        | 100.00  | Tension setpoint for feedback out of range comparitor   |
| 2.5.10 | Ten Stpt Max   | 1265 | -327.67 | 327.67        | 100.00  | Tension setpoint block increase allowed limit.  |
| 2.5.11 | Ten Stpt Min   | 1266 | -327.67 | 327.67        | 0.00    | Tension setpoint block decrease allowed limit.  |
| 2.5.12 | Ten Max Lmt    | 1280 | -327.67 | 327.67        | 10.00   | Tension PI Out max limit.   |
| 2.5.13 | Ten Min Lmt    | 1281 | -327.67 | 327.67        | -10.00  | Tension PI min limit.   |
| 2.5.14 | Max Ten Set    | 1289 | 0.00    | 320.00        | 90.00   | Tension feedback High/Low comparator High setpoint.   |
| 2.5.15 | Min Ten Set    | 1288 | 0.00    | 320.00        | 10.00   | Tension feedback High/Low comparator Low setpoint.  |
| 2.5.16 | Max Ten Hys    | 1287 | 0.00    | 320.00        | 5.00    | Tension feedback High/Low comparator hysteresis value.  |
| 2.5.17 | Ten HL Decimal | 0    | 0       | 2             | 2       | Number of decimal places for the input values. Needed to perform the correct percentage division.                                     |
| 2.5.18 | Trq Ref Max    | 642  | -300.0  | 300.0         | 100.0   | Maximum limit for the torque reference. Entered in percent torque.  |
| 2.5.19 | Trq_Ref_Min    | 643  | -300.0  | 300.0         | 0.0     | Minimum limit for the torque reference. Entered in percent torque.  |
| 2.5.20 | Sp Lim Max     | 1353 | -327.67 | 327.67        | 100.00  | Spare limit block maximum value.  |
| 2.5.21 | Sp Lim Min     | 1354 | -327.67 | 327.67        | -100.00 | Spare limit block minimum value.  |
| 2.5.22 | Max Dia        | 1372 | 0.00    | 327.67        | 100.00  | Maximum diameter. usually left at 100%  |
| 2.5.23 | Min Dia        | 1373 | 0.00    | 327.67        | 50.00   | Minimum diameter limit as percentage of maximum diameter. Default to 10%  |
| 2.5.24 | Max Spd Sec    | 0    | 0.01    | 327.65        | 100.00  | Max speed in units per second. Example feet per second.   |
| 2.5.25 | Caliper Max    | 1244 | 0.0000  | 3.2765        | 0.0050  | Maximum caliper in inches   |
| 2.5.26 | Caliper Min    | 1243 | 0.0000  | 3.2765        | 0.0010  | Minimum caliper in inches   |
| 2.5.27 | DDT Lim        | 1118 | 0       | 32000         | 1000    | Limits the output of the ddt block for very large errors.   |
| 2.6    | Scaling        |      |         |               |         | Menu Name   |
| 2.6.1  | LS to Freq     | 0    | -32.767 | 32.767        | 0.600   | Scaling factor to convert speed reference units ( usually % ) to motor units ( Usually motor Hz )                                     |
| 2.6.2  | LS Scl Div     | 0    | -32767  | 32767         | 1000    | Scaling factor to convert speed reference units ( usually % ) to motor units ( Usually motor Hz )                                     |
| 2.6.3  | Slack Div      | 0    | 0       | 32767         | 100     | Divide point for the slack multiply block   |
| 2.6.4  | Sp Tbl0 Gn     | 1320 | -327.67 | 327.67        | 1.00    | Divide value for spare table block 0.   |
| 2.6.5  | Sp Tbl1 Gn     | 1321 | -327.67 | 327.67        | 1.00    | Divide value for spare table block 1.   |
| 2.6.6  | Sp Tbl2 Gn     | 1322 | -327.67 | 327.67        | 1.00    | Divide value for spare table block 2.   |
| 2.6.7  | Sp MD1 Dv      | 1323 | -327.67 | 327.67        | 1.00    | Default value for the first spare MULDIV block divide input.  |
| 2.6.8  | Sp MD1 Mlt     | 1324 | -327.67 | 327.67        | 1.00    | Default value for the first spare MULDIV block multiply input.  |
| 2.6.9  | Sp MD2 Dv      | 1325 | -327.67 | 327.67        | 1.00    | Default value for the second spare MULDIV block divide input.   |
| 2.6.10 | Sp MD2 Mlt     | 1326 | -327.67 | 327.67        | 1.00    | Default value for the second spare MULDIV block multiply input.   |
| 2.6.11 | Sp Add Val     | 1327 | -327.67 | 327.67        | 0.00    | Spare add block optional cal number.  |
| 2.6.12 | Sp Sub Val     | 1328 | -327.67 | 327.67        | 0.00    | Spare sub block optional scaling value.   |
| 2.6.13 | Sp LH Decimal  | 0    | 0       | 2             | 2       | Number of decimal places for the input values. Needed to perform the correct percentage division.                                     |
| 2.6.14 | Trq RefB MSt   | 1304 | -327.67 | 327.67        | 1.00    | Used to scale the second torque reference input for load sharing.   |
| 2.6.15 | Trq RefB Div   | 0    | -327.67 | 327.67        | 1.00    | Denominator for the scaling of the second torque reference input.   |
| 2.6.16 | Dia Gn St      | 1371 | 0.00    | 327.67        | 1.00    | Used to scale the ratio of encoder feedbacks to get proper calculated diameter in % of full scale. Dia = Gain x Tach1 / Tach2         |
| 2.6.17 | Win Tbl Div    | 0    | -327.67 | 327.67        | 1.00    | SCaling divide block to get decimal points correct for winder reference table block.  |
| 2.6.18 | Win Fd Gain    | 1376 | -32.767 | 32.767        | 1.000   | Gain to scale 100% tension at 100% diameter to % motor torque.  |
| 2.6.19 | Width Stpt     | 1380 | 0       | 32767         | 100     | Width setpoint for variable inertia compensation calculations. Percent of maximum width.  |
| 2.6.20 | Ratio Div      | 0    | 1       | 10000         | 100     | Ratio speed reference divide scaling factor.  |

| MENU   | NAME             | ID   | MIN     | MAX    | DEFAULT | DESCRIPTION   |
|--------|------------------|------|---------|--------|---------|---|
| 2.6.21 | Uni Dia Div      | 1275 | 1       | 32000  | 100     | Unipulser diameter scaling divide value.  |
| 2.6.22 | Uni Dia Gn       | 1276 | 1       | 32000  | 100     | Unipulser diameter scaling multiply value.  |
| 2.6.23 | RD Dia           | 1250 | 0.1     | 3276.5 | 12.0    | Drum dia for Rider roll dia calculation.  |
| 2.6.24 | Drum Gap         | 1247 | 0.1     | 3276.5 | 1.0     | Gap between the drums for Roll set diameter calculation.                                    |
| 2.6.25 | RR Dia Div       | 1249 | 1       | 32767  | 1000    | Scales the output of the RR position block.   |
| 2.6.26 | RR Dia Mlt       | 1248 | 1       | 32655  | 1000    | Scales the output of the RR position block.   |
| 2.6.27 | RSDia Mult       | 1246 | 1       | 32765  | 1000    | Used to scale the diameter inputs to proper units.  |
| 2.6.28 | RSDia Div        | 1245 | 1       | 32765  | 1000    | Used to scale the diameter inputs to proper units.  |
| 2.6.29 | Caliper Div      | 0    | 1       | 32765  | 10000   | Used to remove decimal points to the caliper calculations.                                  |
| 2.6.30 | Stp Ft Mlt       | 1240 | 0       | 32765  | 10      | Stop footage multiply to convert to feet.   |
| 2.6.31 | DDT Div          | 1237 | -327.65 | 327.65 | 10.00   | Used to scale the output of the speed DDT block   |
| 2.6.32 | DDT Mult         | 1236 | -32765  | 32765  | 1000    | Used to scale the output of the speed DDT block   |
| 2.7    | Bit Config       |      |         |        |         | Menu Name   |
| 2.7.1  | Run Input        | 0    | 0       | 2000   | 1011    | Enables the drive in run mode. Default to the first digital input                           |
| 2.7.2  | Thread Input     | 0    | 0       | 2000   | 1002    | Enables the drive at the thread speed. Default to zero bit.                                 |
| 2.7.3  | Jog F Input      | 0    | 0       | 2000   | 1012    | Enables jog forward in the drive. Default to second digital input                           |
| 2.7.4  | Jog R Input      | 0    | 0       | 2000   | 1002    | Enables the jog reverse function in the drive. Default to zero bit.                         |
| 2.7.5  | Reverse Inp      | 0    | 0       | 2000   | 1002    | Negates the speed reference. Default to zero bit.   |
| 2.7.6  | Stop Input       | 0    | 0       | 2000   | 1001    | Stop input used for 3 wire control. Stops drive when it goes low. Default to one bit.       |
| 2.7.7  | Fast Stop        | 0    | 0       | 2000   | 1001    | Initiates a stop and switches in faster ramp rates when input goes low. Default to one bit. |
| 2.7.8  | Coast Stop       | 0    | 0       | 2000   | 1001    | Set to input for emergency coast stop. Default to one bit.                                  |
| 2.7.9  | At Zero Time     | 0    | 0       | 2000   | 1127    | Resets the Drive OK after a fault. Default to At Zero Spd                                   |
| 2.7.10 | Run Stpt Res     | 0    | 0       | 2000   | 1099    | Spd stpt inc dec reset input. Default to zero bit   |
| 2.7.11 | Run Stpt Inc Inp | 0    | 0       | 2000   | 1002    | Inc input. Default to zero bit  |
| 2.7.12 | Run Stpt Dec Inp | 0    | 0       | 2000   | 1002    | Spd stpt dec input. Default to zero bit   |
| 2.7.13 | Slv No Ramp      | 0    | 0       | 2000   | 1001    | Disables the slave speed ramp   |
| 2.7.14 | Slk No Ramp      | 0    | 0       | 2000   | 1001    | Disables the rate limit on the speed step inputs. Default to disable                        |
| 2.7.15 | Step Reverse     | 0    | 0       | 2000   | 1002    | Inverts the speed step references when set.   |
| 2.7.16 | Sup Enable       | 0    | 0       | 2000   | 1002    | Enables the speed slack up setpoint.  |
| 2.7.17 | Sout Enable      | 0    | 0       | 2000   | 1002    | Enables the slack out speed setpoint reference  |
| 2.7.18 | Ten Stall En     | 0    | 0       | 2000   | 1002    | Enables stall reference. Default to zero bit  |
| 2.7.19 | Ten Bal Set      | 0    | 0       | 2000   | 1001    | Toggles the balance set block. Default to one bit.  |
| 2.7.20 | Ten Stpt Dec     | 0    | 0       | 2000   | 1002    | Decrease tension setpoint bit. Default zero bit.  |
| 2.7.21 | Ten Stpt Inc     | 0    | 0       | 2000   | 1002    | Increase tension setpoint bit. Default zero bit.  |
| 2.7.22 | Ten Stpt Res     | 0    | 0       | 2000   | 1002    | Tension Inc/Dec reset bit. Default to zero bit.   |
| 2.7.23 | Ten Rmp Res      | 0    | 0       | 2000   | 1002    | Tension ramp reset bit. Default to zero bit   |
| 2.7.24 | Ten B Sw         | 0    | 0       | 2000   | 1001    | Switch into tension bumpless block input. Default to one bit.                               |
| 2.7.25 | Ten I Res 1      | 0    | 0       | 2000   | 1099    | First reset Tension loop input bit. Default to Cntrl Inhib                                  |
| 2.7.26 | Ten I Res 2      | 0    | 0       | 2000   | 1001    | Second reset Tension loop input bit. Default to One Bit to turn it off unless needed.       |
| 2.7.27 | Ten I Res 3      | 0    | 0       | 2000   | 1002    | Third reset Tension loop input bit. Default to Zero Bit.                                    |
| 2.7.28 | Ten I Res 4      | 0    | 0       | 2000   | 1002    | Fourth reset Tension loop input bit. Default to Zero Bit.                                   |
| 2.7.29 | Ten PI Hold      | 0    | 0       | 2000   | 1002    | Holds the Tension loop PI regulator   |
| 2.7.30 | Spd Bump Sw      | 0    | 0       | 2000   | 1002    | Enables the output of the tension loop. Default to zero bit.                                |
| 2.7.31 | Ten Rev Pol      | 0    | 0       | 2000   | 1002    | Inverts the output of the tension loop when enabled.  |
| 2.7.32 | Trq Ref En       | 0    | 0       | 2000   | 1090    | Enables the torque reference. Default to RunRequest   |
| 2.7.33 | Trq Dir          | 0    | 0       | 2000   | 1002    | Reverse the polarity of the torque reference. Default to Zero bit                           |
| 2.7.34 | Trq No Ramp      | 0    | 0       | 2000   | 1001    | Disables the torque reference ramp. Defaults to disable the ramp.                           |
| 2.7.35 | Sp Sum1 EnA      | 0    | 0       | 2000   | 1002    | Enables the first spare sum input. Default to Zero bit.                                     |
| 2.7.36 | Sp Sum1 EnB      | 0    | 0       | 2000   | 1002    | Enables the second spare sum input. Default to Zero bit.                                    |
| 2.7.37 | Sp Sum1 EnC      | 0    | 0       | 2000   | 1002    | Enables the third spare sum input. Default to Zero bit.                                     |
| 2.7.38 | Sp Bmp Hold      | 0    | 0       | 2000   | 1002    | Holds the output of the spare bumpless block when enabled. Default to Zero Bit              |
| 2.7.39 | Sp Bmp Sw        | 0    | 0       | 2000   | 1002    | Switches inputs of the spare bumpless block. Default to Zero Bit                            |
| 2.7.40 | Sp Sel1 En1      | 0    | 0       | 2000   | 1002    | First spare select block enables input 1 configuration point.                               |
| 2.7.41 | Sp Sel2 En1      | 0    | 0       | 2000   | 1002    | Second Spare select block enables input 1 configuration point.                              |

| MENU   | NAME           | ID | MIN | MAX  | DEFAULT | DESCRIPTION  |
|--------|----------------|----|-----|------|---------|--|
| 2.7.42 | Sp Dly1 In     | 0  | 0   | 2000 | 1002    | First delay block input. Default to Zero Bit   |
| 2.7.43 | Sp Dly2 In     | 0  | 0   | 2000 | 1002    | Second delay block input. Default to Zero Bit  |
| 2.7.44 | Sp Ltc1 H1     | 0  | 0   | 2000 | 1001    | First spare latch block first hold bit. Default to One bit.                                      |
| 2.7.45 | Sp Ltc1 H2     | 0  | 0   | 2000 | 1001    | First spare latch block second hold bit. Default to One bit.                                     |
| 2.7.46 | Sp Ltc1 L      | 0  | 0   | 2000 | 1002    | First spare latch block latch input bit. Default to Zero bit.                                    |
| 2.7.47 | Sp Ltc2 H1     | 0  | 0   | 2000 | 1001    | Second spare latch block first hold bit. Default to One bit.                                     |
| 2.7.48 | Sp Ltc2 H2     | 0  | 0   | 2000 | 1001    | Second spare latch block second hold bit. Default to One bit.                                    |
| 2.7.49 | Sp Ltc2 L      | 0  | 0   | 2000 | 1002    | Second spare latch block latch input bit. Default to Zero bit.                                   |
| 2.7.50 | Sp Ltc3 H1     | 0  | 0   | 2000 | 1001    | Third spare latch block first hold bit. Default to One bit.                                      |
| 2.7.51 | Sp Ltc3 H2     | 0  | 0   | 2000 | 1001    | Third spare latch block second hold bit. Default to One bit.                                     |
| 2.7.52 | Sp Ltc3 L      | 0  | 0   | 2000 | 1002    | Third spare latch block latch input bit. Default to Zero bit.                                    |
| 2.7.53 | Sp Inv1 In     | 0  | 0   | 2000 | 1002    | First spare Bit invert blocks input bit.   |
| 2.7.54 | Sp Inv2 In     | 0  | 0   | 2000 | 1002    | Second spare Bit invert blocks input bit.  |
| 2.7.55 | Sp Inv3 In     | 0  | 0   | 2000 | 1002    | Third spare Bit invert blocks input bit.   |
| 2.7.56 | Sp And1 In1    | 0  | 0   | 2000 | 1002    | First spare And block input 1. Default to Zero Bit.  |
| 2.7.57 | Sp And1 In2    | 0  | 0   | 2000 | 1002    | First spare And block input 2. Default to Zero Bit.  |
| 2.7.58 | Sp And1 NIn3   | 0  | 0   | 2000 | 1002    | First spare And block inverted input 3. Default to Zero Bit.                                     |
| 2.7.59 | Sp And2 In1    | 0  | 0   | 2000 | 1002    | Second spareAnd block input 1. Default to Zero Bit.  |
| 2.7.60 | Sp And2 In2    | 0  | 0   | 2000 | 1002    | Second spare and block input 2. Default to Zero Bit.   |
| 2.7.61 | Sp And2 NIn3   | 0  | 0   | 2000 | 1002    | Second spare And block inverted input 3. Default to Zero Bit.                                    |
| 2.7.62 | Sp And3 In1    | 0  | 0   | 2000 | 1002    | Third spare And block input 1. Default to Zero Bit.  |
| 2.7.63 | Sp And3 In2    | 0  | 0   | 2000 | 1002    | Third spare And block input 2. Default to Zero Bit.  |
| 2.7.64 | Sp And3 NIn3   | 0  | 0   | 2000 | 1002    | Third spare And block inverted input 3. Default to Zero Bit.                                     |
| 2.7.65 | Sp Or1 In1     | 0  | 0   | 2000 | 1002    | First spare Or block input 1. Default to Zero Bit.   |
| 2.7.66 | Sp Or1 In2     | 0  | 0   | 2000 | 1002    | First spare Or block input 2. Default to Zero Bit.   |
| 2.7.67 | Sp Or1 NIn3    | 0  | 0   | 2000 | 1002    | First spare Or block inverted input 3. Default to Zero Bit.                                      |
| 2.7.68 | Sp Or2 In1     | 0  | 0   | 2000 | 1002    | Second spareOr block input 1. Default to Zero Bit.   |
| 2.7.69 | Sp Or2 In2     | 0  | 0   | 2000 | 1002    | Second spareOr block input 2. Default to Zero Bit.   |
| 2.7.70 | Sp Or2 NIn3    | 0  | 0   | 2000 | 1002    | Second spare Or block inverted input 3. Default to Zero Bit.                                     |
| 2.7.71 | Sp Or3 In1     | 0  | 0   | 2000 | 1002    | Third spare Or block input 1. Default to Zero Bit.   |
| 2.7.72 | Sp Or3 In2     | 0  | 0   | 2000 | 1002    | Third spareOr block input 2. Default to Zero Bit.  |
| 2.7.73 | Sp Or3 NIn3    | 0  | 0   | 2000 | 1002    | Third spare Or block inverted input 3. Default to Zero Bit.                                      |
| 2.7.74 | Watchdog In    | 0  | 0   | 2000 | 1002    | Communications watchdog timer input from PLC. Default to Zero Bit.                               |
| 2.7.75 | En Trq RefA    | 0  | 0   | 2000 | 1002    | Enables the first torque reference input. Default to Zero Bit                                    |
| 2.7.76 | En Trq RefB    | 0  | 0   | 2000 | 1002    | Enables the second torque reference input. Default to Zero Bit                                   |
| 2.7.77 | En Trq RefC    | 0  | 0   | 2000 | 1002    | Enables the third torque reference input. Default to Zero Bit                                    |
| 2.7.78 | Dia Or 1       | 0  | 0   | 2000 | 1099    | First bit to hold the diameter block. Default to Cntrl Inhib                                     |
| 2.7.79 | Dia Or 2       | 0  | 0   | 2000 | 1127    | Second bit to hold the diameter block. Default to At Zero Speed                                  |
| 2.7.80 | Dia Or 3       | 0  | 0   | 2000 | 1002    | Third bit to hold the diameter block. Default to Zero Bit  |
| 2.7.81 | Dia Or 4       | 0  | 0   | 2000 | 1002    | Fourth bit to hold the diameter block. Default to Zero Bit                                       |
| 2.7.82 | Dia Reset      | 0  | 0   | 2000 | 1099    | Reset for the diameter block. Default to Cntrl Inhib   |
| 2.7.83 | Up Dwn         | 0  | 0   | 2000 | 1002    | Determines if the Unidirectional output will count up or down. Default to Zero Bit = Count down. |
| 2.7.84 | Win Ffd En     | 0  | 0   | 2000 | 1001    | Enables the open loop torque reference. Default to One Bit.                                      |
| 2.7.85 | Win Boost En   | 0  | 0   | 2000 | 1002    | Enables the fixed torque boost setpoint. Default to Zero Bit.                                    |
| 2.7.86 | Win Aux En     | 0  | 0   | 2000 | 1002    | Enables the close loop reference input. Default to Zero Bit.                                     |
| 2.7.87 | Win Ffd Rev    | 0  | 0   | 2000 | 1002    | Reverses the polarity of the winder torque reference. Default to Zero Bit                        |
| 2.7.88 | Win Stl Gn Sel | 0  | 0   | 2000 | 1002    | Enables stall tension P and I gains. Default to Zero Bit   |
| 2.7.89 | Full Trq En    | 0  | 0   | 2000 | 1001    | Sets full torque to winder output when low.  |
| 2.7.90 | Auto Stop En   | 0  | 0   | 2000 | 1002    | Enables the auto stop output.  |
| 2.7.91 | Stop by Ft     | 0  | 0   | 2000 | 1001    | Stop by footage when enabled. Stop by diameter when low.   |
| 2.7.92 | Sel UW1        | 0  | 0   | 2000 | 1002    | Selects between two unwind diameters   |
| 2.8    | Anlg Config    |    |     |      |         | Menu Name  |
| 2.8.1  | Master Ref     | 0  | 0   | 2000 | 1254    | Speed ref - Default to Run Speed   |
| 2.8.2  | Thread Ref     | 0  | 0   | 2000 | 1255    | Thread speed ref. Default to Thread Speed  |
| 2.8.3  | Jog F Ref      | 0  | 0   | 2000 | 1256    | Jog forward ref. Defaulted to Jog F Speed  |
| 2.8.4  | Jog R Ref      | 0  | 0   | 2000 | 1257    | Jog Reverse ref. Default to Jog R Speed  |

| MENU   | NAME          | ID | MIN | MAX  | DEFAULT | DESCRIPTION   |
|--------|---------------|----|-----|------|---------|---|
| 2.8.5  | Draw Inp      | 0  | 0   | 2000 | 1251    | Draw input. Default to Draw_Splt  |
| 2.8.6  | Decel Time    | 0  | 0   | 2000 | 104     | Deceleration rate input. Default to Decel_Time_1 parameter.   |
| 2.8.7  | Slack Up      | 0  | 0   | 2000 | 1273    | Speed slack up input. Default to Spd Slk Up   |
| 2.8.8  | Slack Out     | 0  | 0   | 2000 | 1274    | Slack out input. Default to Spd Slk Out   |
| 2.8.9  | Slack Mult    | 0  | 0   | 2000 | 1203    | Optional multiply input for speed step input. Default = 100   |
| 2.8.10 | Spd Fdbk      | 0  | 0   | 2000 | 1609    | Speed feedback input for over and zero speed comparator.  |
| 2.8.11 | Ovr Spd Inp   | 0  | 0   | 2000 | 102     | Overspeed comparator maximum setpoint. Default to MaxFreq.  |
| 2.8.12 | Tension Inp   | 0  | 0   | 2000 | 1577    | Tension Ref input. Defaulted to Win Tbl Out   |
| 2.8.13 | Ten Stall Inp | 0  | 0   | 2000 | 1261    | Ten stall inp defaulted to Ten Stall  |
| 2.8.14 | Tens Fdbk     | 0  | 0   | 2000 | 1200    | Configure to the outer process loop feedback signal. Default to Zero Analog                               |
| 2.8.15 | Ten Preload   | 0  | 0   | 2000 | 1200    | Preload for the Tension loop. Default to Zero analog.   |
| 2.8.16 | Ten I Inp     | 0  | 0   | 2000 | 1279    | Tension I gain input. Defaulted to Ten I Gain   |
| 2.8.17 | Ten P Inp     | 0  | 0   | 2000 | 1278    | Tension loop P gain. Default to Ten P Gain  |
| 2.8.18 | Ten Cmp Stp   | 0  | 0   | 2000 | 1286    | Setpoint input for tension high/low comparator. Default to Max Tension                                    |
| 2.8.19 | Sp Tbl0 Inp   | 0  | 0   | 2000 | 1201    | First spare table block input configuration point.  |
| 2.8.20 | Sp Tbl0 Xin   | 0  | 0   | 2000 | 1200    | First spare table block x axis configuration point. Default to Zero analog                                |
| 2.8.21 | Sp Tbl1 Inp   | 0  | 0   | 2000 | 1201    | Second spare table block input configuration point.   |
| 2.8.22 | Sp Tbl1 Xin   | 0  | 0   | 2000 | 1200    | Second spare table block x axis configuration point. Default to Zero analog                               |
| 2.8.23 | Sp Tbl2 Inp   | 0  | 0   | 2000 | 1201    | Third spare table block input configuration point.  |
| 2.8.24 | Sp Tbl2 Xin   | 0  | 0   | 2000 | 1200    | Third spare table block x axis configuration point. Default to Zero analog                                |
| 2.8.25 | Sp MD1 Val    | 0  | 0   | 2000 | 1200    | Input for the first spare MULDIV block. Default to Zero analog.   |
| 2.8.26 | Sp MD2 Val    | 0  | 0   | 2000 | 1200    | Input for the second spare MULDIV block. Default to Zero analog.  |
| 2.8.27 | Sp MD1 Div    | 0  | 0   | 2000 | 1323    | First spare MULDIV block divide input. Default to Sp MD1 Dv cal number.                                   |
| 2.8.28 | Sp MD1 Mul    | 0  | 0   | 2000 | 1324    | First spare MULDIV block multiply input. Default to Sp MD1 Mlt cal number.                                |
| 2.8.29 | Sp MD2 Div    | 0  | 0   | 2000 | 1325    | Second spare MULDIV block divide input. Default to Sp MD2 Dv cal number.                                  |
| 2.8.30 | Sp MD2 Mul    | 0  | 0   | 2000 | 1326    | Second spare MULDIV block multiply input. Default to Sp MD2 Mlt cal number.                               |
| 2.8.31 | Sp Add1 In1   | 0  | 0   | 2000 | 1327    | First input of spare Add block.   |
| 2.8.32 | Sp Add1 In2   | 0  | 0   | 2000 | 1327    | Second input of spare Add block.  |
| 2.8.33 | Sp Sub1 In1   | 0  | 0   | 2000 | 1328    | First input of spare Sub block.   |
| 2.8.34 | Sp Sub1 In2   | 0  | 0   | 2000 | 1328    | Second input of spare Sub block.  |
| 2.8.35 | Sp LP Fil In  | 0  | 0   | 2000 | 1200    | Input to the spare low pass filter. Default to zero analog.   |
| 2.8.36 | Sp ABS In     | 0  | 0   | 2000 | 1200    | Spare absolute value block input. Default to Zero Analog  |
| 2.8.37 | Sp Sum1 InA   | 0  | 0   | 2000 | 1330    | Spare sum block first input. Default to Sp Sum1 STA.  |
| 2.8.38 | Sp Sum1 InB   | 0  | 0   | 2000 | 1331    | Spare sum block second input. Default to Sp Sum1 STB.   |
| 2.8.39 | Sp Sum1 InC   | 0  | 0   | 2000 | 1332    | Spare sum block third input. Default to Sp Sum1 STC.  |
| 2.8.40 | Sp Bmp In1    | 0  | 0   | 2000 | 1335    | First input of the spare bumpless block. Default to Sp Bmp ST1.   |
| 2.8.41 | Sp Bmp In2    | 0  | 0   | 2000 | 1336    | Second input of the spare bumpless block. Default to Sp Bmp ST2.  |
| 2.8.42 | Sp Sel1 In0   | 0  | 0   | 2000 | 1337    | First spare select block input 0. Default to Sp Sel1 ST0  |
| 2.8.43 | Sp Sel1 In1   | 0  | 0   | 2000 | 1338    | First spare select block input 1. Default to Sp Sel1 ST1  |
| 2.8.44 | Sp Sel2 In0   | 0  | 0   | 2000 | 1339    | Second spare select block input 0. Default to Sp Sel2 ST0   |
| 2.8.45 | Sp Sel2 In1   | 0  | 0   | 2000 | 1340    | Second spare select block input 1. Default to Sp Sel2 ST1   |
| 2.8.46 | Sp HL Inp     | 0  | 0   | 2000 | 1200    | Spare High/Low comparator input value. Default to Zero Analog   |
| 2.8.47 | Sp HL Splt    | 0  | 0   | 2000 | 1344    | Spare High/Low comparator setpoint value. Default to Sp HL Splt   |
| 2.8.48 | Sp Cmp1 In    | 0  | 0   | 2000 | 1346    | First spare comparator block input parameter to be compared with the threshold. Default to Sp Cmp1 Splt.  |
| 2.8.49 | Sp Cmp1 Thres | 0  | 0   | 2000 | 1346    | First spare comparator block threshold parameter to be compared with the input. Default to Sp Cmp1 Splt.  |
| 2.8.50 | Sp Cmp2 In    | 0  | 0   | 2000 | 1348    | Second spare comparator block input parameter to be compared with the threshold. Default to Sp Cmp2 Splt. |
| 2.8.51 | Sp Cmp2 Thres | 0  | 0   | 2000 | 1348    | Second spare comparator block threshold parameter to be compared with the input. Default to Sp Cmp2 Splt. |
| 2.8.52 | Sp Lim Inp    | 0  | 0   | 2000 | 1200    | Spare limit input. Default to Zero Analog   |
| 2.8.53 | Trq Ref       | 0  | 0   | 2000 | 1302    | Torque reference. Default to C_Trq_Ref_STA  |
| 2.8.54 | Trq RefB      | 0  | 0   | 2000 | 1303    | Second Torque reference input configuration. Default to C_Trq_Ref_STB                                     |
| 2.8.55 | Trq RefB Mlt  | 0  | 0   | 2000 | 1304    | Second Torque reference scaling configuration. Default to C_Trq_RefB_MST                                  |
| 2.8.56 | Trq Ref C     | 0  | 0   | 2000 | 1303    | Third Torque reference input configuration. Default to C_Trq_Ref_STC                                      |
| 2.8.57 | Init Dia      | 0  | 0   | 2000 | 1370    | Input for the initial diameter when the calculated diameter block is reset. Default to C_Start_Dia        |

| MENU     | NAME            | ID | MIN | MAX              | DEFAULT        | DESCRIPTION   |
|----------|-----------------|----|-----|------------------|----------------|---|
| 2.8.58   | Win Ref Tch     | 0  | 0   | 2000             | 1610           | Winder reference encoder input for diameter claculation. Default to A_Enc2_Out                              |
| 2.8.59   | Win Fdk Tch     | 0  | 0   | 2000             | 1609           | Winder feedback encoder input for diameter calculation. Default to A_Enc1_Out                               |
| 2.8.60   | Dia Gn Inp      | 0  | 0   | 2000             | 1371           | Diameter scaling input to scale calculated diameter to 100% maximum value. Default to C_Dia_Gn_St           |
| 2.8.61   | Sref Dia Scl    | 0  | 0   | 2000             | 1575           |   |
| 2.8.62   | Win Input       | 0  | 0   | 2000             | 1262           | Winder reference input. Default to C_Ten_Ref  |
| 2.8.63   | Win Ref Xin     | 0  | 0   | 2000             | 1575           | X axis input to winder taper table. Default to Bidir CDiam.   |
| 2.8.64   | Win Ffd Inp     | 0  | 0   | 2000             | 1375           | Open loop torque input. Default to C_Opn_Lp_Stpt. Usually changed to A_Tension_Ref = 1517                   |
| 2.8.65   | Win Ffd Dia     | 0  | 0   | 2000             | 1575           | Diameter input for converting Tension refernece to torque. Default to Bidir Cdiam.                          |
| 2.8.66   | Win Fd Gn I     | 0  | 0   | 2000             | 1376           | Scaling factor input to convert 100% tension x 100% diameter to % motor torque. Default to C_Win_Fd_Gain    |
| 2.8.67   | Win Aux Ref     | 0  | 0   | 2000             | 1524           | Close loop input to motor torque. reference. Default to A_Ten_Spd_Err                                       |
| 2.8.68   | Calc Dia        | 0  | 0   | 2000             | 1575           | Diameter input used for tension loop gain change. Default to Bidr Cdiam                                     |
| 2.8.69   | Core Dia        | 0  | 0   | 2000             | 1373           | Core diameter for variable inertia compensation calculation. Default to Min Dia                             |
| 2.8.70   | Fix WK Inp      | 0  | 0   | 2000             | 1378           | Input for fixed inertia compensation value. Default to C_Fix_WK_Stpt  |
| 2.8.71   | Var WK Inp      | 0  | 0   | 2000             | 1379           | Variable inertia compensation value input. Default to C_Var_WK_Stpt   |
| 2.8.72   | Width Inp       | 0  | 0   | 2000             | 1380           | Width input for variable inertia compensation calculations. Default to C_Width_Stpt                         |
| 2.8.73   | Sp WPVal ID     | 0  | 0   | 2000             | 0              | Spare Write param value ID where to send the data to.   |
| 2.8.74   | Sp WPVal2 ID    | 0  | 0   | 2000             | 0              | Spare Write param 2 value ID where to send the data to.   |
| 2.8.75   | Sp WPVal Inp    | 0  | 0   | 2000             | 1200           | Spare Write Param Val input ID where to get the data from   |
| 2.8.76   | Sp WPVal2 Inp   | 0  | 0   | 2000             | 1200           | Spare Write Param Val 2 input ID where to get the data from   |
| 2.8.77   | RR_Pos_Inp      | 0  | 0   | 2000             | 1602           | Rider roll sensor input for Roll set dia calculation. Default to Analog in 2                                |
| 2.8.78   | Stop Ft Inp     | 0  | 0   | 2000             | 1239           | Stop footage input  |
| 2.8.79   | Init RS Dia Inp | 0  | 0   | 4000             | 1242           | Initial roll set dimater.   |
| 2.8.80   | Stop RS Dia Inp | 0  | 0   | 4000             | 1241           | Stop dia setpoint input.  |
| 2.8.81   | RS Dia Inp      | 0  | 0   | 4000             | 1537           | Roll Set diameter input   |
| 2.8.82   | Caliper Inp     | 0  | 0   | 2000             | 1238           | Caliper input when auto caliper not selected.   |
| 2.8.83   | DDT Div Inp     | 0  | 0   | 2000             | 1237           | Scaling input for the DDT block. Default to DDT Div. May need to set to Unwind diameter for proper results. |
| 2.9      | Enables         |    |     |                  |                | Menu Name   |
| 2.9.1    | Ratio Draw En   | 0  | 0   | 1                | 1 / Ratio Draw | Ratio or difference draw selection  |
| 2.9.2    | Run Stpt Up     | 0  | 0   | 1                | 0 / Disabled   | Spd stpt block update input   |
| 2.9.3    | Fly Strt Flt    | 0  | 0   | 1                | 1 / Enabled    | Enables the ability to start into a spinning motor after a fault  |
| 2.9.4    | 3 Wire St En    | 0  | 0   | 1                | 0 / Disabled   | Enables three wire start stop logic   |
| 2.9.5    | Ten Bal Ret     | 0  | 0   | 1                | 0 / Disabled   | Enables the balance block to be retentive   |
| 2.9.6    | Ten Stpt Up     | 0  | 0   | 1                | 0 / Disabled   | Tension block update enable bit   |
| 2.9.7    | Win Gn Dia En   | 0  | 0   | 1                | 0 / Disabled   | Enables the winder loop gain modified by diameter. Default to disabled.                                     |
| 2.9.8    | Win Gn Not D En | 0  | 0   | 1                | 1 / Enabled    | Enables the winder loop output to pass through without diameter compensation. Default to enabled.           |
| 2.9.9    | Fault Start En  | 0  | 0   | 1                | 1 / Enabled    | Enable restart of the drive after a fault without toggling run inputs                                       |
| 2.9.10   | Dia Ret         | 0  | 0   | 1                | 1 / Enabled    | Enables retentive capability of the diameter claculation.   |
| 2.9.11   | Auto Cal Calc   | 0  | 0   | 1                | 0 / Disabled   | Turns on auto caliper calculations.   |
| 2.9.12   | Uni Type        | 0  | 0   | 2                | 0 / Bidir      | Unipulser direction 0 = bi 1 = up , 2 = down  |
| 2.10     | I/O             |    |     |                  |                | Menu Name   |
| 2.10.1   | Digital Inputs  |    |     |                  |                | Menu Name   |
| 2.10.1.1 | DIN7 Slot ID    | 0  | 0.0 | CrossCon_Ma<br>x | 0.0            | Configure to the the desired I/O slot and position for the seventh digital input. Default to zero.          |

| MENU          | NAME                   | ID | MIN     | MAX              | DEFAULT | DESCRIPTION  |
|---------------|------------------------|----|---------|------------------|---------|--|
| 2.10.1.2      | DIN8 Slot ID           | 0  | 0.0     | CrossCon_Ma<br>x | 0.0     | Configure to the desired I/O slot and position for the eighth digital input. Default to zero.                            |
| 2.10.1.3      | Unipulser Inp          | 0  | 0.0     | CrossCon_Ma<br>x | 0.0     | Unipulser Digital input configuration point.   |
| 2.10.1.4      | Unipulser Inp2         | 0  | 0.0     | CrossCon_Ma<br>x | 0.0     | Unipulser Digital input configuration point for second Unwind  |
| <b>2.10.2</b> | <b>Digital Outputs</b> |    |         |                  |         | <b>Menu Name</b>   |
| 2.10.2.1      | DOUT1 ID               | 0  | 0       | 2000             | 1116    | First digital output configuration point. Default to Drive fault   |
| 2.10.2.2      | DOUT1 Inv              | 0  | 0       | 1                | 0 / No  | Inverts the first digital output when enabled.   |
| 2.10.2.3      | DOUT2 ID               | 0  | 0       | 2000             | 1064    | Second digital output configuration point. Default to Auto Stop.   |
| 2.10.2.4      | DOUT2 Inv              | 0  | 0       | 1                | 0 / No  | Inverts the second digital output when enabled.  |
| 2.10.2.5      | DOUT3 ID               | 0  | 0       | 2000             | 1002    | Third digital output configuration point. Default to Zero Bit.   |
| 2.10.2.6      | DOUT3 Inv              | 0  | 0       | 1                | 0 / No  | Inverts the third digital output when enabled.   |
| 2.10.2.7      | DOUT4 ID               | 0  | 0       | 2000             | 1002    | Fourth digital output configuration point. Default to zero bit   |
| 2.10.2.8      | DOUT4 Slot ID          | 0  | 0.00    | CrossCon_Ma<br>x | 0.00    | Configure fourth digital output to actual I/O location. Default to no slot. Need additional I/O board.                   |
| 2.10.2.9      | DOUT4 Inv              | 0  | 0       | 1                | 0 / No  | Inverts the fourth digital output when enabled.  |
| 2.10.2.10     | DOUT5 ID               | 0  | 0       | 2000             | 1002    | Fifth digital output configuration point. Default to zero bit  |
| 2.10.2.11     | DOUT5 Slot ID          | 0  | 0.00    | CrossCon_Ma<br>x | 0.00    | Configure fifth digital output to actual I/O location. Default to no slot. Need additional I/O board.                    |
| 2.10.2.12     | DOUT5 Inv              | 0  | 0       | 1                | 0 / No  | Inverts the fifth digital output when enabled.   |
| 2.10.2.13     | DOUT6 ID               | 0  | 0       | 2000             | 1002    | Sixth digital output configuration point. Default to zero bit  |
| 2.10.2.14     | DOUT6 Slot ID          | 0  | 0.00    | CrossCon_Ma<br>x | 0.00    | Configure sixth digital output to actual I/O location. Default to no slot. Need additional I/O board.                    |
| 2.10.2.15     | DOUT6 Inv              | 0  | 0       | 1                | 0 / No  | Inverts the sixth digital output when enabled.   |
| <b>2.10.3</b> | <b>Analog Inputs</b>   |    |         |                  |         | <b>Menu Name</b>   |
| 2.10.3.1      | AIN1 Gain              | 0  | -100.00 | 100.00           | 1.00    | Gain. 100 equals multiply by one.  |
| 2.10.3.2      | AIN1 Off               | 0  | -100.00 | 100.00           | 0.00    | Offset for analog input  |
| 2.10.3.3      | AIN1 Tc                | 0  | 0.00    | 5.00             | 0.10    | Low pass filter time constant.   |
| 2.10.3.4      | AIN2 Gain              | 0  | -100.00 | 100.00           | 1.00    | Gain. 100 equals multiply by one.  |
| 2.10.3.5      | AIN2 Off               | 0  | -100.00 | 100.00           | 0.00    | Offset for analog input  |
| 2.10.3.6      | AIN2 Tc                | 0  | 0.00    | 5.00             | 0.10    | Low pass filter time constant.   |
| 2.10.3.7      | AIN3 Slot ID           | 0  | 0.000   | CrossCon_Ma<br>x | 0.000   | Configure to the desired I/O slot and position for the third analog input. Default to 0. Need additional option boards.  |
| 2.10.3.8      | AIN3 Gain              | 0  | -100.00 | 100.00           | 1.00    | Gain. 100 equals multiply by one.  |
| 2.10.3.9      | AIN3 Off               | 0  | -100.00 | 100.00           | 0.00    | Offset for analog input  |
| 2.10.3.10     | AIN3 Tc                | 0  | 0.00    | 5.00             | 0.10    | Low pass filter time constant.   |
| 2.10.3.11     | AIN4 Slot ID           | 0  | 0.000   | CrossCon_Ma<br>x | 0.000   | Configure to the desired I/O slot and position for the fourth analog input. Default to 0. Need additional option boards. |
| 2.10.3.12     | AIN4 Gain              | 0  | -100.00 | 100.00           | 1.00    | Gain. 100 equals multiply by one.  |
| 2.10.3.13     | AIN4 Off               | 0  | -100.00 | 100.00           | 0.00    | Offset for analog input  |
| 2.10.3.14     | AIN4 Tc                | 0  | 0.00    | 5.00             | 0.10    | Low pass filter time constant.   |
| <b>2.10.4</b> | <b>Analog Outputs</b>  |    |         |                  |         | <b>Menu Name</b>   |
| 2.10.4.1      | AOUT1 ID               | 0  | 0       | 2000             | 1575    | Select value for first analog output. Default to Unwind Dia  |
| 2.10.4.2      | AOUT1 Zero             | 0  | -327.67 | 327.67           | 0.00    | Offset for the first analog output.  |
| 2.10.4.3      | AOUT1 Cal              | 0  | -327.67 | 327.67           | 1.00    | Multiply for first analog output. 100 equals 1.00  |
| 2.10.4.4      | AOUT1 TC               | 0  | 0.00    | 5.00             | 0.10    | Filter time constant for the first analog out. 100 equals one second.  |
| 2.10.4.5      | AOUT2 ID               | 0  | 0       | 2000             | 1528    | Select value for second analog output. Default to footage  |
| 2.10.4.6      | AOUT2 Zero             | 0  | -327.67 | 327.67           | 0.00    | Offset for the second analog output.   |
| 2.10.4.7      | AOUT2 Cal              | 0  | -327.67 | 327.67           | 1.00    | Multiply for second analog output. 100 equals 1.00   |
| 2.10.4.8      | AOUT2 TC               | 0  | 0.00    | 5.00             | 0.10    | Filter time constant for the second analog out. 100 equals one second.   |
| 2.10.4.9      | AOUT2 Slot ID          | 0  | 0       | CrossCon_Ma<br>x | 0       | Selects which slot and address the second analog out goes to. Default to 0. Need additional option boards.               |
| 2.10.4.10     | AOUT3 ID               | 0  | 0       | 2000             | 1200    | Select value for third analog output. Default to Zero analog   |
| 2.10.4.11     | AOUT3 Zero             | 0  | -327.67 | 327.67           | 0.00    | Offset for the third analog output.  |
| 2.10.4.12     | AOUT3 Cal              | 0  | -327.67 | 327.67           | 1.00    | Multiply for third analog output. 100 equals 1.00  |
| 2.10.4.13     | AOUT3 TC               | 0  | 0.00    | 5.00             | 0.10    | Filter time constant for the third analog out. 100 equals one second.  |
| 2.10.4.14     | AOUT3 Slot ID          | 0  | 0       | CrossCon_Ma<br>x | 0       | Selects which slot and address the third analog out goes to. Default to 0. Need additional option boards.                |

| MENU      | NAME          | ID   | MIN     | MAX              | DEFAULT         | DESCRIPTION  |
|-----------|---------------|------|---------|------------------|-----------------|--|
| 2.10.4.15 | AOUT4 ID      | 0    | 0       | 2000             | 1200            | Select value for fourth analog output. Default to Zero analog  |
| 2.10.4.16 | AOUT4 Zero    | 0    | -327.67 | 327.67           | 0.00            | Offset for the fourth analog output.   |
| 2.10.4.17 | AOUT4 Cal     | 0    | -327.67 | 327.67           | 1.00            | Multiply for fourth analog output. 100 equals 1.00   |
| 2.10.4.18 | AOUT4 TC      | 0    | 0.00    | 5.00             | 0.10            | Filter time constant for the fourth analog out. 100 equals one second.                                     |
| 2.10.4.19 | AOUT4 Slot ID | 0    | 0       | CrossCon_Ma<br>x | 0               | Selects which slot and address the fourth analog out goes to. Default to 0. Need additional option boards. |
| 2.10.5    | Encoders      |      |         |                  |                 | Menu Name  |
| 2.10.5.1  | Enc1 Slot ID  | 0    | 0.000   | CrossCon_Ma<br>x | 0.000           | First encoder slot ID. Default to not present.   |
| 2.10.5.2  | Enc2 Slot ID  | 0    | 0.000   | CrossCon_Ma<br>x | 0.000           | Second encoder slot ID. Default to not present.  |
| 2.10.5.3  | Enc1 Mlt      | 0    | 0.000   | 32.767           | 1.000           | First encoder scaling multiply value. Used with Enc1_Div   |
| 2.10.5.4  | Enc1 Div      | 0    | 0       | 32767            | 1000            | First encoder scaling divide value. Used with Enc1_Mlt   |
| 2.10.5.5  | Enc1 Tc       | 0    | 0.00    | 10.00            | 0.01            | First encoder low pass filter time constant. Default to 10 ms.   |
| 2.10.5.6  | Enc2 Mlt      | 0    | 0.000   | 32.767           | 1.000           | Second encoder scaling multiply value. Used with Enc2_Div  |
| 2.10.5.7  | Enc2 Div      | 0    | 0       | 32767            | 1000            | Second encoder scaling divide value. Used with Enc2_Mlt  |
| 2.10.5.8  | Enc2 Tc       | 0    | 0.00    | 10.00            | 0.01            | Second encoder low pass filter time constant. Default to 10 ms.  |
| 2.10.5.9  | C_Enc2_Add    | 0    | -327.67 | 327.67           | 0.00            | Offset for the second encoder input.   |
| 2.10.5.10 | Counter1 Dec  | 1294 | 1       | 10000            | 1               | Divide number for the first counter scaling. Should be power of tens.                                      |
| 2.10.5.11 | Counter1 Mult | 1295 | 0       | 30000            | 1               | Gain factor for first counter. Used with Counter1 Dec .  |
| 2.10.5.12 | Counter1 Hld  | 0    | 0       | 2000             | 1002            | Holds the first counter when high  |
| 2.10.5.13 | Counter1 Res  | 0    | 0       | 2000             | 1002            | Resets the first counter when high   |
| 2.10.5.14 | Counter1      | 0    | 0       | 1                | 0 /<br>Disabled | Enables the first footage counter  |
| 2.10.5.15 | Counter2 Dec  | 1296 | 1       | 10000            | 1               | Divide number for the second counter scaling. Should be power of tens.                                     |
| 2.10.5.16 | Counter2 Mult | 1297 | 0       | 30000            | 1               | Gain factor for second counter. Used with Counter2 Dec .   |
| 2.10.5.17 | Counter2 Hld  | 0    | 0       | 2000             | 1002            | Holds the second counter when high   |
| 2.10.5.18 | Counter2 Res  | 0    | 0       | 2000             | 1002            | Resets the second counter when high  |
| 2.10.5.19 | Counter2      | 0    | 0       | 1                | 0 /<br>Disabled | Enables the second footage counter   |
| 2.11      | Tables        |      |         |                  |                 | Menu Name  |
| 2.11.1    | Table0        |      |         |                  |                 | Menu Name  |
| 2.11.1.1  | T0_X0         | 1700 | -327.67 | 327.67           | -1.00           | Table 0 - X0 - Value. See table block descr for details.   |
| 2.11.1.2  | T0_X1         | 1701 | -327.67 | 327.67           | -0.90           | Table 0 - X1 - Value. See table block descr for details.   |
| 2.11.1.3  | T0_X2         | 1702 | -327.67 | 327.67           | -0.75           | Table 0 - X2 - Value. See table block descr for details.   |
| 2.11.1.4  | T0_X3         | 1703 | -327.67 | 327.67           | -0.60           | Table 0 - X3 - Value. See table block descr for details.   |
| 2.11.1.5  | T0_X4         | 1704 | -327.67 | 327.67           | -0.45           | Table 0 - X4 - Value. See table block descr for details.   |
| 2.11.1.6  | T0_X5         | 1705 | -327.67 | 327.67           | -0.30           | Table 0 - X5 - Value. See table block descr for details.   |
| 2.11.1.7  | T0_X6         | 1706 | -327.67 | 327.67           | -0.15           | Table 0 - X6 - Value. See table block descr for details.   |
| 2.11.1.8  | T0_X7         | 1707 | -327.67 | 327.67           | 0.00            | Table 0 - X7 - Value. See table block descr for details.   |
| 2.11.1.9  | T0_X8         | 1708 | -327.67 | 327.67           | 0.15            | Table 0 - X8 - Value. See table block descr for details.   |
| 2.11.1.10 | T0_X9         | 1709 | -327.67 | 327.67           | 0.30            | Table 0 - X9 - Value. See table block descr for details.   |
| 2.11.1.11 | T0_X10        | 1710 | -327.67 | 327.67           | 0.45            | Table 0 - X10 - Value. See table block descr for details.  |
| 2.11.1.12 | T0_X11        | 1711 | -327.67 | 327.67           | 0.60            | Table 0 - X11 - Value. See table block descr for details.  |
| 2.11.1.13 | T0_X12        | 1712 | -327.67 | 327.67           | 0.75            | Table 0 - X12 - Value. See table block descr for details.  |
| 2.11.1.14 | T0_X13        | 1713 | -327.67 | 327.67           | 0.90            | Table 0 - X13 - Value. See table block descr for details.  |
| 2.11.1.15 | T0_X14        | 1714 | -327.67 | 327.67           | 1.00            | Table 0 - X14 - Value. See table block descr for details.  |
| 2.11.1.16 | T0_X15        | 1715 | -327.67 | 327.67           | 1.00            | Table 0 - X15 - Value. See table block descr for details.  |
| 2.11.1.17 | T0_Y0         | 1716 | -327.67 | 327.67           | 0.01            | Table 0 - Y0 - Value. See table block descr for details.   |
| 2.11.1.18 | T0_Y1         | 1717 | -327.67 | 327.67           | 0.01            | Table 0 - Y1 - Value. See table block descr for details.   |
| 2.11.1.19 | T0_Y2         | 1718 | -327.67 | 327.67           | 0.01            | Table 0 - Y2 - Value. See table block descr for details.   |
| 2.11.1.20 | T0_Y3         | 1719 | -327.67 | 327.67           | 0.01            | Table 0 - Y3 - Value. See table block descr for details.   |
| 2.11.1.21 | T0_Y4         | 1720 | -327.67 | 327.67           | 0.01            | Table 0 - Y4 - Value. See table block descr for details.   |
| 2.11.1.22 | T0_Y5         | 1721 | -327.67 | 327.67           | 0.01            | Table 0 - Y5 - Value. See table block descr for details.   |
| 2.11.1.23 | T0_Y6         | 1722 | -327.67 | 327.67           | 0.01            | Table 0 - Y6 - Value. See table block descr for details.   |
| 2.11.1.24 | T0_Y7         | 1723 | -327.67 | 327.67           | 0.01            | Table 0 - Y7 - Value. See table block descr for details.   |
| 2.11.1.25 | T0_Y8         | 1724 | -327.67 | 327.67           | 0.01            | Table 0 - Y8 - Value. See table block descr for details.   |
| 2.11.1.26 | T0_Y9         | 1725 | -327.67 | 327.67           | 0.01            | Table 0 - Y9 - Value. See table block descr for details.   |

| MENU      | NAME   | ID   | MIN     | MAX    | DEFAULT | DESCRIPTION   |
|-----------|--------|------|---------|--------|---------|---|
| 2.11.1.27 | T0_Y10 | 1726 | -327.67 | 327.67 | 0.01    | Table 0 - Y10 - Value. See table block descr for details. |
| 2.11.1.28 | T0_Y11 | 1727 | -327.67 | 327.67 | 0.01    | Table 0 - Y11 - Value. See table block descr for details. |
| 2.11.1.29 | T0_Y12 | 1728 | -327.67 | 327.67 | 0.01    | Table 0 - Y12 - Value. See table block descr for details. |
| 2.11.1.30 | T0_Y13 | 1729 | -327.67 | 327.67 | 0.01    | Table 0 - Y13 - Value. See table block descr for details. |
| 2.11.1.31 | T0_Y14 | 1730 | -327.67 | 327.67 | 0.01    | Table 0 - Y14 - Value. See table block descr for details. |
| 2.11.1.32 | T0_Y15 | 1731 | -327.67 | 327.67 | 0.01    | Table 0 - Y15 - Value. See table block descr for details. |
| 2.11.2    | Table1 |      |         |        |         | Menu Name   |
| 2.11.2.1  | T1_X0  | 1732 | -327.67 | 327.67 | -1.00   | Table 1 - X0 - Value. See table block descr for details.  |
| 2.11.2.2  | T1_X1  | 1733 | -327.67 | 327.67 | -0.90   | Table 1 - X1 - Value. See table block descr for details.  |
| 2.11.2.3  | T1_X2  | 1734 | -327.67 | 327.67 | -0.75   | Table 1 - X2 - Value. See table block descr for details.  |
| 2.11.2.4  | T1_X3  | 1735 | -327.67 | 327.67 | -0.60   | Table 1 - X3 - Value. See table block descr for details.  |
| 2.11.2.5  | T1_X4  | 1736 | -327.67 | 327.67 | -0.45   | Table 1 - X4 - Value. See table block descr for details.  |
| 2.11.2.6  | T1_X5  | 1737 | -327.67 | 327.67 | -0.30   | Table 1 - X5 - Value. See table block descr for details.  |
| 2.11.2.7  | T1_X6  | 1738 | -327.67 | 327.67 | -0.15   | Table 1 - X6 - Value. See table block descr for details.  |
| 2.11.2.8  | T1_X7  | 1739 | -327.67 | 327.67 | 0.00    | Table 1 - X7 - Value. See table block descr for details.  |
| 2.11.2.9  | T1_X8  | 1740 | -327.67 | 327.67 | 0.15    | Table 1 - X8 - Value. See table block descr for details.  |
| 2.11.2.10 | T1_X9  | 1741 | -327.67 | 327.67 | 0.30    | Table 1 - X9 - Value. See table block descr for details.  |
| 2.11.2.11 | T1_X10 | 1742 | -327.67 | 327.67 | 0.45    | Table 1 - X10 - Value. See table block descr for details. |
| 2.11.2.12 | T1_X11 | 1743 | -327.67 | 327.67 | 0.60    | Table 1 - X11 - Value. See table block descr for details. |
| 2.11.2.13 | T1_X12 | 1744 | -327.67 | 327.67 | 0.75    | Table 1 - X12 - Value. See table block descr for details. |
| 2.11.2.14 | T1_X13 | 1745 | -327.67 | 327.67 | 0.90    | Table 1 - X13 - Value. See table block descr for details. |
| 2.11.2.15 | T1_X14 | 1746 | -327.67 | 327.67 | 1.00    | Table 1 - X14 - Value. See table block descr for details. |
| 2.11.2.16 | T1_X15 | 1747 | -327.67 | 327.67 | 1.00    | Table 1 - X15 - Value. See table block descr for details. |
| 2.11.2.17 | T1_Y0  | 1748 | -327.67 | 327.67 | 0.01    | Table 1 - Y0 - Value. See table block descr for details.  |
| 2.11.2.18 | T1_Y1  | 1749 | -327.67 | 327.67 | 0.01    | Table 1 - Y1 - Value. See table block descr for details.  |
| 2.11.2.19 | T1_Y2  | 1750 | -327.67 | 327.67 | 0.01    | Table 1 - Y2 - Value. See table block descr for details.  |
| 2.11.2.20 | T1_Y3  | 1751 | -327.67 | 327.67 | 0.01    | Table 1 - Y3 - Value. See table block descr for details.  |
| 2.11.2.21 | T1_Y4  | 1752 | -327.67 | 327.67 | 0.01    | Table 1 - Y4 - Value. See table block descr for details.  |
| 2.11.2.22 | T1_Y5  | 1753 | -327.67 | 327.67 | 0.01    | Table 1 - Y5 - Value. See table block descr for details.  |
| 2.11.2.23 | T1_Y6  | 1754 | -327.67 | 327.67 | 0.01    | Table 1 - Y6 - Value. See table block descr for details.  |
| 2.11.2.24 | T1_Y7  | 1755 | -327.67 | 327.67 | 0.01    | Table 1 - Y7 - Value. See table block descr for details.  |
| 2.11.2.25 | T1_Y8  | 1756 | -327.67 | 327.67 | 0.01    | Table 1 - Y8 - Value. See table block descr for details.  |
| 2.11.2.26 | T1_Y9  | 1757 | -327.67 | 327.67 | 0.01    | Table 1 - Y9 - Value. See table block descr for details.  |
| 2.11.2.27 | T1_Y10 | 1758 | -327.67 | 327.67 | 0.01    | Table 1 - Y10 - Value. See table block descr for details. |
| 2.11.2.28 | T1_Y11 | 1759 | -327.67 | 327.67 | 0.01    | Table 1 - Y11 - Value. See table block descr for details. |
| 2.11.2.29 | T1_Y12 | 1760 | -327.67 | 327.67 | 0.01    | Table 1 - Y12 - Value. See table block descr for details. |
| 2.11.2.30 | T1_Y13 | 1761 | -327.67 | 327.67 | 0.01    | Table 1 - Y13 - Value. See table block descr for details. |
| 2.11.2.31 | T1_Y14 | 1762 | -327.67 | 327.67 | 0.01    | Table 1 - Y14 - Value. See table block descr for details. |
| 2.11.2.32 | T1_Y15 | 1763 | -327.67 | 327.67 | 0.01    | Table 1 - Y15 - Value. See table block descr for details. |
| 2.11.3    | Table2 |      |         |        |         | Menu Name   |
| 2.11.3.1  | T2_X0  | 1764 | -327.67 | 327.67 | -1.00   | Table 2 - X0 - Value. See table block descr for details.  |
| 2.11.3.2  | T2_X1  | 1765 | -327.67 | 327.67 | -0.90   | Table 2 - X1 - Value. See table block descr for details.  |
| 2.11.3.3  | T2_X2  | 1766 | -327.67 | 327.67 | -0.75   | Table 2 - X2 - Value. See table block descr for details.  |
| 2.11.3.4  | T2_X3  | 1767 | -327.67 | 327.67 | -0.60   | Table 2 - X3 - Value. See table block descr for details.  |
| 2.11.3.5  | T2_X4  | 1768 | -327.67 | 327.67 | -0.45   | Table 2 - X4 - Value. See table block descr for details.  |
| 2.11.3.6  | T2_X5  | 1769 | -327.67 | 327.67 | -0.30   | Table 2 - X5 - Value. See table block descr for details.  |
| 2.11.3.7  | T2_X6  | 1770 | -327.67 | 327.67 | -0.15   | Table 2 - X6 - Value. See table block descr for details.  |
| 2.11.3.8  | T2_X7  | 1771 | -327.67 | 327.67 | 0.00    | Table 2 - X7 - Value. See table block descr for details.  |
| 2.11.3.9  | T2_X8  | 1772 | -327.67 | 327.67 | 0.15    | Table 2 - X8 - Value. See table block descr for details.  |
| 2.11.3.10 | T2_X9  | 1773 | -327.67 | 327.67 | 0.30    | Table 2 - X9 - Value. See table block descr for details.  |
| 2.11.3.11 | T2_X10 | 1774 | -327.67 | 327.67 | 0.45    | Table 2 - X10 - Value. See table block descr for details. |
| 2.11.3.12 | T2_X11 | 1775 | -327.67 | 327.67 | 0.60    | Table 2 - X11 - Value. See table block descr for details. |
| 2.11.3.13 | T2_X12 | 1776 | -327.67 | 327.67 | 0.75    | Table 2 - X12 - Value. See table block descr for details. |
| 2.11.3.14 | T2_X13 | 1777 | -327.67 | 327.67 | 0.90    | Table 2 - X13 - Value. See table block descr for details. |
| 2.11.3.15 | T2_X14 | 1778 | -327.67 | 327.67 | 1.00    | Table 2 - X14 - Value. See table block descr for details. |
| 2.11.3.16 | T2_X15 | 1779 | -327.67 | 327.67 | 1.00    | Table 2 - X15 - Value. See table block descr for details. |
| 2.11.3.17 | T2_Y0  | 1780 | -327.67 | 327.67 | 0.01    | Table 2 - Y0 - Value. See table block descr for details.  |

| MENU      | NAME             | ID   | MIN     | MAX    | DEFAULT | DESCRIPTION   |
|-----------|------------------|------|---------|--------|---------|---|
| 2.11.3.18 | T2_Y1            | 1781 | -327.67 | 327.67 | 0.01    | Table 2 - Y1 - Value. See table block descr for details.                |
| 2.11.3.19 | T2_Y2            | 1782 | -327.67 | 327.67 | 0.01    | Table 2 - Y2 - Value. See table block descr for details.                |
| 2.11.3.20 | T2_Y3            | 1783 | -327.67 | 327.67 | 0.01    | Table 2 - Y3 - Value. See table block descr for details.                |
| 2.11.3.21 | T2_Y4            | 1784 | -327.67 | 327.67 | 0.01    | Table 2 - Y4 - Value. See table block descr for details.                |
| 2.11.3.22 | T2_Y5            | 1785 | -327.67 | 327.67 | 0.01    | Table 2 - Y5 - Value. See table block descr for details.                |
| 2.11.3.23 | T2_Y6            | 1786 | -327.67 | 327.67 | 0.01    | Table 2 - Y6 - Value. See table block descr for details.                |
| 2.11.3.24 | T2_Y7            | 1787 | -327.67 | 327.67 | 0.01    | Table 2 - Y7 - Value. See table block descr for details.                |
| 2.11.3.25 | T2_Y8            | 1788 | -327.67 | 327.67 | 0.01    | Table 2 - Y8 - Value. See table block descr for details.                |
| 2.11.3.26 | T2_Y9            | 1789 | -327.67 | 327.67 | 0.01    | Table 2 - Y9 - Value. See table block descr for details.                |
| 2.11.3.27 | T2_Y10           | 1790 | -327.67 | 327.67 | 0.01    | Table 2 - Y10 - Value. See table block descr for details.               |
| 2.11.3.28 | T2_Y11           | 1791 | -327.67 | 327.67 | 0.01    | Table 2 - Y11 - Value. See table block descr for details.               |
| 2.11.3.29 | T2_Y12           | 1792 | -327.67 | 327.67 | 0.01    | Table 2 - Y12 - Value. See table block descr for details.               |
| 2.11.3.30 | T2_Y13           | 1793 | -327.67 | 327.67 | 0.01    | Table 2 - Y13 - Value. See table block descr for details.               |
| 2.11.3.31 | T2_Y14           | 1794 | -327.67 | 327.67 | 0.01    | Table 2 - Y14 - Value. See table block descr for details.               |
| 2.11.3.32 | T2_Y15           | 1795 | -327.67 | 327.67 | 0.01    | Table 2 - Y15 - Value. See table block descr for details.               |
| 2.11.4    | Table3           |      |         |        |         | Menu Name   |
| 2.11.4.1  | T3_X0            | 1796 | -327.67 | 327.67 | 0.00    | Table 3 - X0 - Value. See table block descr for details.                |
| 2.11.4.2  | T3_X1            | 1797 | -327.67 | 327.67 | 10.00   | Table 3 - X1 - Value. See table block descr for details.                |
| 2.11.4.3  | T3_X2            | 1798 | -327.67 | 327.67 | 20.00   | Table 3 - X2 - Value. See table block descr for details.                |
| 2.11.4.4  | T3_X3            | 1799 | -327.67 | 327.67 | 30.00   | Table 3 - X3 - Value. See table block descr for details.                |
| 2.11.4.5  | T3_X4            | 1800 | -327.67 | 327.67 | 40.00   | Table 3 - X4 - Value. See table block descr for details.                |
| 2.11.4.6  | T3_X5            | 1801 | -327.67 | 327.67 | 50.00   | Table 3 - X5 - Value. See table block descr for details.                |
| 2.11.4.7  | T3_X6            | 1802 | -327.67 | 327.67 | 60.00   | Table 3 - X6 - Value. See table block descr for details.                |
| 2.11.4.8  | T3_X7            | 1803 | -327.67 | 327.67 | 70.00   | Table 3 - X7 - Value. See table block descr for details.                |
| 2.11.4.9  | T3_X8            | 1804 | -327.67 | 327.67 | 80.00   | Table 3 - X8 - Value. See table block descr for details.                |
| 2.11.4.10 | T3_X9            | 1805 | -327.67 | 327.67 | 90.00   | Table 3 - X9 - Value. See table block descr for details.                |
| 2.11.4.11 | T3_X10           | 1806 | -327.67 | 327.67 | 100.00  | Table 3 - X10 - Value. See table block descr for details.               |
| 2.11.4.12 | T3_X11           | 1807 | -327.67 | 327.67 | 110.00  | Table 3 - X11 - Value. See table block descr for details.               |
| 2.11.4.13 | T3_X12           | 1808 | -327.67 | 327.67 | 110.00  | Table 3 - X12 - Value. See table block descr for details.               |
| 2.11.4.14 | T3_X13           | 1809 | -327.67 | 327.67 | 110.00  | Table 3 - X13 - Value. See table block descr for details.               |
| 2.11.4.15 | T3_X14           | 1810 | -327.67 | 327.67 | 110.00  | Table 3 - X14 - Value. See table block descr for details.               |
| 2.11.4.16 | T3_X15           | 1811 | -327.67 | 327.67 | 110.00  | Table 3 - X15 - Value. See table block descr for details.               |
| 2.11.4.17 | T3_Y0            | 1812 | -327.67 | 327.67 | 1.00    | Table 3 - Y0 - Value. See table block descr for details.                |
| 2.11.4.18 | T3_Y1            | 1813 | -327.67 | 327.67 | 1.00    | Table 3 - Y1 - Value. See table block descr for details.                |
| 2.11.4.19 | T3_Y2            | 1814 | -327.67 | 327.67 | 1.00    | Table 3 - Y2 - Value. See table block descr for details.                |
| 2.11.4.20 | T3_Y3            | 1815 | -327.67 | 327.67 | 1.00    | Table 3 - Y3 - Value. See table block descr for details.                |
| 2.11.4.21 | T3_Y4            | 1816 | -327.67 | 327.67 | 1.00    | Table 3 - Y4 - Value. See table block descr for details.                |
| 2.11.4.22 | T3_Y5            | 1817 | -327.67 | 327.67 | 1.00    | Table 3 - Y5 - Value. See table block descr for details.                |
| 2.11.4.23 | T3_Y6            | 1818 | -327.67 | 327.67 | 1.00    | Table 3 - Y6 - Value. See table block descr for details.                |
| 2.11.4.24 | T3_Y7            | 1819 | -327.67 | 327.67 | 1.00    | Table 3 - Y7 - Value. See table block descr for details.                |
| 2.11.4.25 | T3_Y8            | 1820 | -327.67 | 327.67 | 1.00    | Table 3 - Y8 - Value. See table block descr for details.                |
| 2.11.4.26 | T3_Y9            | 1821 | -327.67 | 327.67 | 1.00    | Table 3 - Y9 - Value. See table block descr for details.                |
| 2.11.4.27 | T3_Y10           | 1822 | -327.67 | 327.67 | 1.00    | Table 3 - Y10 - Value. See table block descr for details.               |
| 2.11.4.28 | T3_Y11           | 1823 | -327.67 | 327.67 | 1.00    | Table 3 - Y11 - Value. See table block descr for details.               |
| 2.11.4.29 | T3_Y12           | 1824 | -327.67 | 327.67 | 1.00    | Table 3 - Y12 - Value. See table block descr for details.               |
| 2.11.4.30 | T3_Y13           | 1825 | -327.67 | 327.67 | 1.00    | Table 3 - Y13 - Value. See table block descr for details.               |
| 2.11.4.31 | T3_Y14           | 1826 | -327.67 | 327.67 | 1.00    | Table 3 - Y14 - Value. See table block descr for details.               |
| 2.11.4.32 | T3_Y15           | 1827 | -327.67 | 327.67 | 1.00    | Table 3 - Y15 - Value. See table block descr for details.               |
| 2.12      | Comms            |      |         |        |         | Menu Name   |
| 2.12.1    | Fieldbus         |      |         |        |         | Menu Name   |
| 2.12.1.1  | FB Bit Cfg Out00 | 0    | 0       | 2000   | 1002    | Out FB bit configuration point to FB Gen Sts Word.                      |
| 2.12.1.2  | FB Bit Cfg Out01 | 0    | 0       | 2000   | 1002    | Out FB bit configuration point to FB Gen Sts Word.                      |
| 2.12.1.3  | FB Bit Cfg Out02 | 0    | 0       | 2000   | 1002    | Out FB bit configuration point to FB Gen Sts Word.                      |
| 2.12.1.4  | FB Bit Cfg Out03 | 0    | 0       | 2000   | 1002    | Out FB bit configuration point to FB Gen Sts Word.                      |
| 2.12.1.5  | FB Bit Cfg Out04 | 0    | 0       | 2000   | 1002    | Out FB bit configuration point to FB Gen Sts Word and SB Out Cntrl Word |
| 2.12.1.6  | FB Bit Cfg Out05 | 0    | 0       | 2000   | 1002    | Out FB bit configuration point to FB Gen Sts Word and SB Out Cntrl Word |
| 2.12.1.7  | FB Bit Cfg Out06 | 0    | 0       | 2000   | 1002    | Out FB bit configuration point to FB Gen Sts Word and SB Out Cntrl Word |

| MENU      | NAME             | ID   | MIN  | MAX   | DEFAULT         | DESCRIPTION   |
|-----------|------------------|------|------|-------|-----------------|---|
| 2.12.1.8  | FB Bit Cfg Out07 | 0    | 0    | 2000  | 1002            | Out FB bit configuration point to FB Gen Sts Word and SB Out Cntrl Word             |
| 2.12.1.9  | FB Bit Cfg Out08 | 0    | 0    | 2000  | 1002            | Out FB bit configuration point to FB Gen Sts Word and SB Out Cntrl Word             |
| 2.12.1.10 | FB Bit Cfg Out09 | 0    | 0    | 2000  | 1002            | Out FB bit configuration point to FB Gen Sts Word and SB Out Cntrl Word             |
| 2.12.1.11 | FB Bit Cfg Out10 | 0    | 0    | 2000  | 1002            | Out FB bit configuration point to FB Gen Sts Word and SB Out Cntrl Word             |
| 2.12.1.12 | FB Bit Cfg Out11 | 0    | 0    | 2000  | 1002            | Out FB bit configuration point to FB Gen Sts Word and SB Out Cntrl Word             |
| 2.12.1.13 | FB Bit Cfg Out12 | 0    | 0    | 2000  | 1002            | Out FB bit configuration point to FB Gen Sts Word and SB Out Cntrl Word             |
| 2.12.1.14 | FB Bit Cfg Out13 | 0    | 0    | 2000  | 1002            | Out FB bit configuration point to FB Gen Sts Word and SB Out Cntrl Word             |
| 2.12.1.15 | FB Bit Cfg Out14 | 0    | 0    | 2000  | 1002            | Out FB bit configuration point to FB Gen Sts Word and SB Out Cntrl Word             |
| 2.12.1.16 | FB Bit Cfg Out15 | 0    | 0    | 2000  | 1002            | Out FB bit configuration point to FB Gen Sts Word and SB Out Cntrl Word             |
| 2.12.1.17 | FB Word CFG Out1 | 0    | 0    | 2000  | 1200            | Configuration to send to FBProcessDataOUT1  |
| 2.12.1.18 | FB Word CFG Out2 | 0    | 0    | 2000  | 1200            | Configuration to send to FBProcessDataOUT2  |
| 2.12.1.19 | FB Word CFG Out3 | 0    | 0    | 2000  | 1200            | Configuration to send to FBProcessDataOUT3  |
| 2.12.1.20 | FB Word CFG Out4 | 0    | 0    | 2000  | 1200            | Configuration to send to FBProcessDataOUT4  |
| 2.12.1.21 | FB Word CFG Out5 | 0    | 0    | 2000  | 1200            | Configuration to send to FBProcessDataOUT5  |
| 2.12.1.22 | FB Word CFG Out6 | 0    | 0    | 2000  | 1200            | Configuration to send to FBProcessDataOUT6  |
| 2.12.1.23 | FB Word CFG Out7 | 0    | 0    | 2000  | 1200            | Configuration to send to FBProcessDataOUT7  |
| 2.12.1.24 | FB Word CFG Out8 | 0    | 0    | 2000  | 1200            | Configuration to send to FBProcessDataOUT8  |
| 2.12.1.25 | FB Bit Sel 1     | 0    | 0    | 3     | 1 / Gen Cntrl W | Selects where the first 4 field bus bits comes from                                 |
| 2.12.1.26 | FB Bit Sel 2     | 0    | 0    | 3     | 1 / Gen Cntrl W | Selects where the second 4 field bus bits comes from                                |
| 2.12.1.27 | FB Bit Sel 3     | 0    | 0    | 3     | 1 / Gen Cntrl W | Selects where the third 4 field bus bits comes from                                 |
| 2.12.1.28 | FB Bit Sel 4     | 0    | 0    | 3     | 1 / Gen Cntrl W | Selects where the fourth 4 field bus bits comes from                                |
| 2.12.2    | System Bus       |      |      |       |                 | Menu Name   |
| 2.12.2.1  | SBId             | 0    | 0    | 63    | 0               | SystemBus identification number 0 through 63.                                       |
| 2.12.2.2  | SBNextId         | 0    | 0    | 63    | 1               | SystemBus next devices id number 0 - 63.  |
| 2.12.2.3  | SB Mode          | 0    | 0    | 3     | 0 / Disabled    | System bus mode. 0 = Disabled, 1= Master, 2 = Slave, 3 = Both ( Not supported yet ) |
| 2.12.2.4  | SB Out Int1      | 0    | 0    | 2000  | 1200            | System Bus first configurable output to the slaves.                                 |
| 2.12.2.5  | SB Out Int2      | 0    | 0    | 2000  | 1200            | System Bus second configurable output to the slaves.                                |
| 2.12.2.6  | SB Comm Flt Resp | 0    | 0    | 3     | 3 / Fault,Coast | Response to system bus error.   |
| 2.12.2.7  | SB Comm Flt Tim  | 0    | 0.00 | 10.00 | 0.20            | System bus communication fault timer. Default at 200 ms.                            |
| 2.13      | Constants        |      |      |       |                 | Menu Name   |
| 2.13.1    | One Bit          | 1001 | 0    | 1     |                 | Always set TRUE.  |
| 2.13.2    | Zero Bit         | 1002 | 0    | 0     |                 | Always FALSE.   |
| 2.13.3    | Zero Analog      | 1200 | 0    | 0     |                 | Always zero integer.  |
| 2.13.4    | One Analog       | 1201 | 1    | 1     |                 | Always one integer  |
| 2.13.5    | Int Ten          | 1202 | 10   | 10    |                 | Always 10. Used for scaling   |
| 2.13.6    | Int Hundred      | 1203 | 100  | 100   |                 | Always 100 integer. Used for scaling.   |
| 2.13.7    | Int Thousand     | 1204 | 1000 | 1000  |                 | Always 1000. Used for scaling.  |
| 3         | Keypad Control   |      |      |       |                 | Menu Name   |
| 3.1       | Keypad Spd Dir   | 123  | 0    | 1     | 0 / Forward     | Keypad control direction.   |
| 3.3       | Keypad Trq Dir   | 0    | 0    | 1     | 0 / Forward     | Keypad control torque direction.  |
| 4         | Active Faults    |      |      |       |                 | Menu Name   |
| 5         | Fault History    |      |      |       |                 | Menu Name   |
| 6         | System Menu      |      |      |       |                 | Menu Name   |
| 7         | Expander boards  |      |      |       |                 | Menu Name   |
| 7.1       |                  |      |      |       |                 | Menu Name   |
| 7.2       |                  |      |      |       |                 | Menu Name   |
| 7.3       |                  |      |      |       |                 | Menu Name   |
| 7.4       |                  |      |      |       |                 | Menu Name   |
| 7.5       |                  |      |      |       |                 | Menu Name   |

## APPENDIX C

### ALPHABETICAL AND DRAWING COORDINATE CROSS-REFERENCE

| NAME            | ID   | MENU      | COORDINATES    |
|-----------------|------|-----------|----------------|
| 3 Wire St En    | 0    | 2.9.4     | A5-G25, A5-E25 |
| ABS RJT Ref     | 1570 | 1.3.9     | A1-N12         |
| Accel TC        | 1569 | 1.3.46    | A2-J24         |
| Active Flt Last | 37   | 1.3.40    | A8-S25         |
| AI1 Type        | 0    | 1.5.1     | A4-S25         |
| AI2 Type        | 0    | 1.5.2     | A4-P25         |
| AI3 Type        | 0    | 1.5.3     | A4-M25         |
| AI4 Type        | 0    | 1.5.4     | A4-J25         |
| AIN1            | 1601 | 1.5.5     | A4-S21         |
| AIN1 Fault      | 0    | 1.5.9     | A4-R21         |
| AIN1 Gain       | 0    | 2.10.3.1  | A4-R24         |
| AIN1 Off        | 0    | 2.10.3.2  | A4-R24         |
| AIN1 Tc         | 0    | 2.10.3.3  | A4-P24         |
| AIN2            | 1602 | 1.5.6     | A4-P21, A9-R6  |
| AIN2 Fault      | 0    | 1.5.10    | A4-N21         |
| AIN2 Gain       | 0    | 2.10.3.4  | A4-N24         |
| AIN2 Off        | 0    | 2.10.3.5  | A4-N24         |
| AIN2 Tc         | 0    | 2.10.3.6  | A4-M24         |
| AIN3            | 1603 | 1.5.7     | A4-L21         |
| AIN3 Fault      | 0    | 1.5.11    | A4-K21         |
| AIN3 Gain       | 0    | 2.10.3.8  | A4-L24         |
| AIN3 Off        | 0    | 2.10.3.9  | A4-K24         |
| AIN3 Slot ID    | 0    | 2.10.3.7  | A4-L28         |
| AIN3 Tc         | 0    | 2.10.3.10 | A4-K24         |
| AIN4            | 1604 | 1.5.8     | A4-J21         |
| AIN4 Fault      | 0    | 1.5.12    | A4-H21         |
| AIN4 Gain       | 0    | 2.10.3.12 | A4-H24         |
| AIN4 Off        | 0    | 2.10.3.13 | A4-H24         |
| AIN4 Slot ID    | 0    | 2.10.3.11 | A4-J28         |
| AIN4 Tc         | 0    | 2.10.3.14 | A4-H24         |
| AOUT1 Cal       | 0    | 2.10.4.3  | A4-R8          |
| AOUT1 ID        | 0    | 2.10.4.1  | A4-S9          |
| AOUT1 TC        | 0    | 2.10.4.4  | A4-R8          |
| AOUT1 Val       | 1590 | 1.5.13    | A4-S5          |
| AOUT1 Zero      | 0    | 2.10.4.2  | A4-S8          |
| AOUT2 Cal       | 0    | 2.10.4.7  | A4-N8          |
| AOUT2 ID        | 0    | 2.10.4.5  | A4-P9          |
| AOUT2 Slot ID   | 0    | 2.10.4.9  | A4-N5          |
| AOUT2 TC        | 0    | 2.10.4.8  | A4-M8          |
| AOUT2 Val       | 1591 | 1.5.14    | A4-P5          |
| AOUT2 Zero      | 0    | 2.10.4.6  | A4-N8          |
| AOUT3 Cal       | 0    | 2.10.4.12 | A4-K8          |
| AOUT3 ID        | 0    | 2.10.4.10 | A4-L9          |
| AOUT3 Slot ID   | 0    | 2.10.4.14 | A4-L5          |
| AOUT3 TC        | 0    | 2.10.4.13 | A4-K8          |
| AOUT3 Val       | 1592 | 1.5.15    | A4-L5          |
| AOUT3 Zero      | 0    | 2.10.4.11 | A4-L8          |
| AOUT4 Cal       | 0    | 2.10.4.17 | A4-H8          |
| AOUT4 ID        | 0    | 2.10.4.15 | A4-J10         |
| AOUT4 Slot ID   | 0    | 2.10.4.19 | A4-H5          |
| AOUT4 TC        | 0    | 2.10.4.18 | A4-H8          |
| AOUT4 Val       | 1593 | 1.5.16    | A4-J5          |

| NAME             | ID   | MENU      | COORDINATES  |
|------------------|------|-----------|--|
| AOUT4 Zero       | 0    | 2.10.4.16 | A4-H8  |
| At Zero Spd      | 1127 | 1.2.47    | A5-S28, A5-H10, A8-E21, A9-R28                               |
| At Zero Time     | 0    | 2.7.9     | A5-S28, A5-H10   |
| Auto Cal Calc    | 0    | 2.9.11    | A9-G15   |
| Auto Stop En     | 0    | 2.7.90    | A9-K11   |
| Bidir Cdiam      | 1575 | 1.3.41    | A1-L9, A2-N14, A2-K27, A3-R27, A3-H17, A3-C27, A4-S9, A9-N20 |
| C_Enc2_Add       | 0    | 2.10.5.9  | A4-L16   |
| Calc Dia         | 0    | 2.8.68    | A2-K27, A3-H17   |
| Caliper          | 1581 | 1.3.51    | A9-E11, A9-F8  |
| Caliper Div      | 0    | 2.6.29    | A9-B16   |
| Caliper Inp      | 0    | 2.8.82    | A9-F18   |
| Caliper Max      | 1244 | 2.5.25    | A9-C16   |
| Caliper Min      | 1243 | 2.5.26    | A9-C16   |
| Caliper Stpt     | 1238 | 2.2.36    | A9-F18   |
| Cntrl Inhib      | 1099 | 1.2.1     | A1-R26, A3-L25, A5-H2, A9-S28, A9-R24, A9-R11                |
| Cntrl Mode       | 1506 | 1.3.2     | A1-P16   |
| Coast Stop       | 0    | 2.7.8     | A5-S25   |
| Com WD           | 0    | 2.1.16    | A7-C19   |
| Control Place    | 1505 | 1.3.1     | A1-P10, A1-L15, A2-G11, A2-J11                               |
| Core Dia         | 0    | 2.8.69    | A2-K27   |
| Counter1         | 0    | 2.10.5.14 | A4-P19   |
| Counter1         | 1528 | 1.5.19    | A4-P13, A4-P9  |
| Counter1 Dec     | 1294 | 2.10.5.10 | A4-N16   |
| Counter1 Hld     | 0    | 2.10.5.12 | A4-P19   |
| Counter1 Mult    | 1295 | 2.10.5.11 | A4-N16   |
| Counter1 Res     | 0    | 2.10.5.13 | A4-R19   |
| Counter2         | 0    | 2.10.5.19 | A4-J19   |
| Counter2         | 1529 | 1.5.20    | A4-J13, A9-P16, A9-D26, A9-F18                               |
| Counter2 Dec     | 1296 | 2.10.5.15 | A4-H16   |
| Counter2 Hld     | 0    | 2.10.5.17 | A4-K19   |
| Counter2 Mult    | 1297 | 2.10.5.16 | A4-H16   |
| Counter2 Res     | 0    | 2.10.5.18 | A4-K19   |
| DDT Div          | 1237 | 2.6.31    | A2-D26   |
| DDT Div Inp      | 0    | 2.8.83    | A2-E26   |
| DDT Fil          | 0    | 2.3.25    | A2-F28   |
| DDT Lim          | 1118 | 2.5.27    | A2-D25   |
| DDT Mult         | 1236 | 2.6.32    | A2-E26   |
| Decel Time       | 0    | 2.8.6     | A9-F28   |
| Decel Time 1     | 104  | 2.3.23    | A9-F28   |
| DecelerationTime | 0    | 1.3.10    | A9-G25   |
| Dia Gn Inp       | 0    | 2.8.60    | A9-N27   |
| Dia Gn St        | 1371 | 2.6.16    | A9-N27   |
| Dia Or 1         | 0    | 2.7.78    | A9-S28   |
| Dia Or 2         | 0    | 2.7.79    | A9-R28   |
| Dia Or 3         | 0    | 2.7.80    | A9-R28   |
| Dia Or 4         | 0    | 2.7.81    | A9-P28   |
| Dia Rate Lm      | 1374 | 2.3.22    | A9-M27, A9-N12   |
| Dia Reset        | 0    | 2.7.82    | A9-R24, A9-R11   |
| Dia Ret          | 0    | 2.9.10    | A9-S24   |
| Dia Stop Set     | 1063 | 1.2.51    | A9-E3, A9-J6   |
| DIN 1            | 1011 | 1.4.1     | A4-E25, A5-L28, A5-H28                                       |
| DIN 2            | 1012 | 1.4.2     | A4-E25, A5-N28   |
| DIN 3            | 1013 | 1.4.3     | A4-D25   |
| DIN 4            | 1014 | 1.4.4     | A4-D25   |
| DIN 5            | 1015 | 1.4.5     | A4-C25   |
| DIN 6            | 1016 | 1.4.6     | A4-C25   |
| DIN 7            | 1017 | 1.4.7     | A4-B24   |
| DIN 8            | 1018 | 1.4.8     | A4-B24   |
| DIN7 Slot ID     | 0    | 2.10.1.1  | A4-B27   |
| DIN8 Slot ID     | 0    | 2.10.1.2  | A4-B27   |
| DOUT1 ID         | 0    | 2.10.2.1  | A4-E17   |
| DOUT1 Inv        | 0    | 2.10.2.2  | A4-F16   |
| DOUT2 ID         | 0    | 2.10.2.3  | A4-D17   |

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| DOUT2 Inv        | 0    | 2.10.2.4  | A4-E16                         |
| DOUT3 ID         | 0    | 2.10.2.5  | A4-C17                         |
| DOUT3 Inv        | 0    | 2.10.2.6  | A4-C16                         |
| DOUT4 ID         | 0    | 2.10.2.7  | A4-E11                         |
| DOUT4 Inv        | 0    | 2.10.2.9  | A4-F10                         |
| DOUT4 Slot ID    | 0    | 2.10.2.8  | A4-E8                          |
| DOUT5 ID         | 0    | 2.10.2.10 | A4-D11                         |
| DOUT5 Inv        | 0    | 2.10.2.12 | A4-E10                         |
| DOUT5 Slot ID    | 0    | 2.10.2.11 | A4-D8                          |
| DOUT6 ID         | 0    | 2.10.2.13 | A4-C11                         |
| DOUT6 Inv        | 0    | 2.10.2.15 | A4-C10                         |
| DOUT6 Slot ID    | 0    | 2.10.2.14 | A4-B8                          |
| Draw Inp         | 0    | 2.8.5     | A1-P27                         |
| Draw Ref         | 1502 | 1.3.4     | A1-P23                         |
| Draw Spt         | 1251 | 2.2.5     | A1-P27                         |
| Drum Gap         | 1247 | 2.6.24    | A9-S6                          |
| En Trq RefA      | 0    | 2.7.75    | A2-H14                         |
| En Trq RefB      | 0    | 2.7.76    | A2-H14                         |
| En Trq RefC      | 0    | 2.7.77    | A2-J14                         |
| Enc1 Div         | 0    | 2.10.5.4  | A4-R15                         |
| Enc1 Mlt         | 0    | 2.10.5.3  | A4-R15                         |
| Enc1 Slot ID     | 0    | 2.10.5.1  | A4-S19                         |
| Enc1 Tc          | 0    | 2.10.5.5  | A4-R15                         |
| Enc1_Out         | 1609 | 1.5.17    | A4-S12, A8-F27, A9-N27         |
| Enc2 Div         | 0    | 2.10.5.7  | A4-K16                         |
| Enc2 Mlt         | 0    | 2.10.5.6  | A4-K16                         |
| Enc2 Slot ID     | 0    | 2.10.5.2  | A4-M19                         |
| Enc2 Tc          | 0    | 2.10.5.8  | A4-K16                         |
| Enc2_Out         | 1610 | 1.5.18    | A2-F28, A4-L12, A9-P27, A9-E28 |
| ESTOP Trq        | 0    | 2.2.32    | A3-B18                         |
| Ext Fault Inp    | 0    | 2.1.10    | A8-L19                         |
| Ext Flt Resp     | 701  | 2.1.11    | A8-L16                         |
| Ext Warn         | 0    | 1.2.24    | A8-N8                          |
| Fast Stop        | 0    | 2.7.7     | A5-S21                         |
| Fast Stop Tim    | 503  | 2.3.1     |                                |
| Fault Reset      | 0    | 2.1.1     | A8-M17                         |
| Fault Start En   | 0    | 2.9.9     | A5-R20                         |
| FB Bit Cfg Out00 | 0    | 2.12.1.1  | A7-R17                         |
| FB Bit Cfg Out01 | 0    | 2.12.1.2  | A7-P17                         |
| FB Bit Cfg Out02 | 0    | 2.12.1.3  | A7-P17                         |
| FB Bit Cfg Out03 | 0    | 2.12.1.4  | A7-N17                         |
| FB Bit Cfg Out04 | 0    | 2.12.1.5  | A7-N17                         |
| FB Bit Cfg Out05 | 0    | 2.12.1.6  | A7-M17                         |
| FB Bit Cfg Out06 | 0    | 2.12.1.7  | A7-M17                         |
| FB Bit Cfg Out07 | 0    | 2.12.1.8  | A7-L17                         |
| FB Bit Cfg Out08 | 0    | 2.12.1.9  | A7-L17                         |
| FB Bit Cfg Out09 | 0    | 2.12.1.10 | A7-K17                         |
| FB Bit Cfg Out10 | 0    | 2.12.1.11 | A7-K17                         |
| FB Bit Cfg Out11 | 0    | 2.12.1.12 | A7-J17                         |
| FB Bit Cfg Out12 | 0    | 2.12.1.13 | A7-J17                         |
| FB Bit Cfg Out13 | 0    | 2.12.1.14 | A7-H17                         |
| FB Bit Cfg Out14 | 0    | 2.12.1.15 | A7-H17                         |
| FB Bit Cfg Out15 | 0    | 2.12.1.16 | A7-G17                         |
| FB Bit Sel 1     | 0    | 2.12.1.25 | A7-T24                         |
| FB Bit Sel 2     | 0    | 2.12.1.26 | A7-P24                         |
| FB Bit Sel 3     | 0    | 2.12.1.27 | A7-M24                         |
| FB Bit Sel 4     | 0    | 2.12.1.28 | A7-J24                         |
| FB Bit00         | 1040 | 1.6.1.1   | A7-S21                         |
| FB Bit01         | 1041 | 1.6.1.2   | A7-R21                         |
| FB Bit02         | 1042 | 1.6.1.3   | A7-R21                         |
| FB Bit03         | 1043 | 1.6.1.4   | A7-R21                         |
| FB Bit04         | 1044 | 1.6.1.5   | A7-N21                         |
| FB Bit05         | 1045 | 1.6.1.6   | A7-N21                         |
| FB Bit06         | 1046 | 1.6.1.7   | A7-N21                         |

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|-------------------|------|-----------|---------------------------------------|
| FB Bit07          | 1047 | 1.6.1.8   | A7-M21                                |
| FB Bit08          | 1048 | 1.6.1.9   | A7-L21                                |
| FB Bit09          | 1049 | 1.6.1.10  | A7-K21                                |
| FB Bit10          | 1050 | 1.6.1.11  | A7-K21                                |
| FB Bit11          | 1051 | 1.6.1.12  | A7-K21                                |
| FB Bit12          | 1052 | 1.6.1.13  | A7-H21                                |
| FB Bit13          | 1053 | 1.6.1.14  | A7-H21                                |
| FB Bit14          | 1054 | 1.6.1.15  | A7-H21                                |
| FB Bit15          | 1055 | 1.6.1.16  | A7-G21                                |
| FB Fix Cntrl Wrld | 1621 | 1.6.1.17  | A7-S27, A7-N27, A7-L27, A7-H27        |
| FB Gen Cntrl Wrld | 1630 | 1.6.1.18  | A7-R27, A7-N27, A7-K27, A7-H27        |
| FB Gen Sts Word   | 1631 | 1.6.1.19  | A7-J14                                |
| FB Spd Ref        | 1632 | 1.6.2.11  | A7-R5                                 |
| FB Word CFG Out1  | 0    | 2.12.1.17 | A7-K7                                 |
| FB Word CFG Out2  | 0    | 2.12.1.18 | A7-J7                                 |
| FB Word CFG Out3  | 0    | 2.12.1.19 | A7-J7                                 |
| FB Word CFG Out4  | 0    | 2.12.1.20 | A7-H7                                 |
| FB Word CFG Out5  | 0    | 2.12.1.21 | A7-H7                                 |
| FB Word CFG Out6  | 0    | 2.12.1.22 | A7-G7                                 |
| FB Word CFG Out7  | 0    | 2.12.1.23 | A7-G7                                 |
| FB Word CFG Out8  | 0    | 2.12.1.24 | A7-F7                                 |
| FB Word In 1      | 1611 | 1.6.2.1   | A7-S8                                 |
| FB Word In 10     | 1620 | 1.6.2.10  | A7-R5                                 |
| FB Word In 2      | 1612 | 1.6.2.2   | A7-S8                                 |
| FB Word In 3      | 1613 | 1.6.2.3   | A7-R8                                 |
| FB Word In 4      | 1614 | 1.6.2.4   | A7-R8                                 |
| FB Word In 5      | 1615 | 1.6.2.5   | A7-R8                                 |
| FB Word In 6      | 1616 | 1.6.2.6   | A7-P8                                 |
| FB Word In 7      | 1617 | 1.6.2.7   | A7-S5                                 |
| FB Word In 8      | 1618 | 1.6.2.8   | A7-R27, A7-N27, A7-K27, A7-H27, A7-S5 |
| FB Word In 9      | 1619 | 1.6.2.9   | A7-R5                                 |
| FB Word Out 1     | 1622 | 1.6.3.1   | A7-K4                                 |
| FB Word Out 2     | 1623 | 1.6.3.2   | A7-J4                                 |
| FB Word Out 3     | 1624 | 1.6.3.3   | A7-J4                                 |
| FB Word Out 4     | 1625 | 1.6.3.4   | A7-H4                                 |
| FB Word Out 5     | 1626 | 1.6.3.5   | A7-H4                                 |
| FB Word Out 6     | 1627 | 1.6.3.6   | A7-G4                                 |
| FB Word Out 7     | 1628 | 1.6.3.7   | A7-G4                                 |
| FB Word Out 8     | 1629 | 1.6.3.8   | A7-F4                                 |
| FBCComm.FaultResp | 733  | 2.1.13    | A8-K16                                |
| Fil Uni Dia       | 1586 | 1.3.48    | A9-P8                                 |
| Fix WK Inp        | 0    | 2.8.70    | A2-H27                                |
| Fix WK Stpt       | 1378 | 2.4.7     | A2-H27                                |
| Fly Strt Flt      | 0    | 2.9.3     | A5-R28                                |
| Freq Max          | 102  | 2.5.1     | A1-L6, A2-N12, A8-E24                 |
| Freq Reference    | 1507 | 1.3.7     | A1-N4                                 |
| FreqReference     | 25   | 1.3.8     | A1-G10                                |
| Ft Stop Set       | 1062 | 1.2.50    | A9-E22, A9-C6, A9-K7                  |
| Ft to Dia         | 1634 | 1.3.52    | A9-F3                                 |
| Ft to Stop        | 1633 | 1.3.50    | A9-F22                                |
| Full Trq En       | 0    | 2.7.89    | A3-D17                                |
| Gn With Dia       | 1377 | 2.4.6     | A3-H17                                |
| Init Dia          | 0    | 2.8.57    | A9-L25, A9-N11                        |
| Init RS Dia Inp   | 0    | 2.8.79    | A9-E18                                |
| Init RSDia        | 1242 | 2.2.33    | A9-E18                                |
| Int Hundred       | 1203 | 2.13.6    | A2-P24, A5-B12                        |
| Int Ten           | 1202 | 2.13.5    | A5-B12                                |
| Int Thousand      | 1204 | 2.13.7    | A5-B12                                |
| Jog enable        | 1094 | 1.2.10    | A1-L18, A5-D16, A5-P13                |
| Jog F Input       | 0    | 2.7.3     | A5-N28                                |
| Jog F Ref         | 0    | 2.8.3     | A1-N17                                |
| Jog F Speed       | 1256 | 2.2.3     | A1-N17                                |
| Jog FR Input      | 1087 | 1.2.11    | A5-N16, A5-J28, A5-D28                |
| Jog R Input       | 0    | 2.7.4     | A5-N28                                |

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| Jog R Ref        | 0    | 2.8.4  | A1-M17  |
| Jog R Speed      | 1257 | 2.2.4  | A1-M17  |
| Keypad Spd Dir   | 123  | 3.1    | A1-L18  |
| Keypad Trq Dir   | 0    | 3.3    | A2-H11  |
| LS Scl Div       | 0    | 2.6.2  | A1-L9, A2-N14   |
| LS to Freq       | 0    | 2.6.1  | A1-M9, A2-P14   |
| Master Ref       | 0    | 2.8.1  | A1-M23  |
| Max Dia          | 1372 | 2.5.22 | A9-M22, A9-N14  |
| Max Run Stpt     | 1267 | 2.5.3  | A1-L27  |
| Max Spd Sec      | 0    | 2.5.24 | A9-F28  |
| Max Ten Hys      | 1287 | 2.5.16 | A3-C6   |
| Max Ten Set      | 1289 | 2.5.14 | A3-E7   |
| Max Tension      | 1286 | 2.5.9  | A3-C6   |
| MC Fault         | 1116 | 1.2.2  | A4-E17, A8-R25  |
| MC Warning       | 1117 | 1.2.3  | A8-R25  |
| MD Run Enable    | 1060 | 1.7.10 | A7-F25  |
| MD Watchdog      | 1061 | 1.7.3  | A7-E25, A7-F20  |
| MD WD OK         | 1172 | 1.7.2  | A7-F17  |
| Min Dia          | 1373 | 2.5.23 | A1-L9, A2-P14, A2-K27, A9-L22, A9-M14   |
| Min Frequency    | 101  | 2.5.2  | A1-K6   |
| Min Run Stpt     | 1268 | 2.5.4  | A1-L27  |
| Min Ten Set      | 1288 | 2.5.15 | A3-D7   |
| Neg Spd Ref      | 1129 | 1.2.16 | A1-L12  |
| Not DIN 1        | 1021 | 1.4.9  | A4-E23  |
| Not DIN 2        | 1022 | 1.4.10 | A4-E23  |
| Not DIN 3        | 1023 | 1.4.11 | A4-D23  |
| Not DIN 4        | 1024 | 1.4.12 | A4-D23  |
| Not DIN 5        | 1025 | 1.4.13 | A4-C23  |
| Not DIN 6        | 1026 | 1.4.14 | A4-C23  |
| Not DIN 7        | 1027 | 1.4.15 | A4-B22  |
| Not DIN 8        | 1028 | 1.4.16 | A4-B22  |
| One Analog       | 1201 | 2.13.4 | A5-C12, A6-S27, A6-P27, A6-M27  |
| One Bit          | 1001 | 2.13.1 | A1-L23, A2-P20, A2-E8, A3-S18, A3-S6, A3-L25, A3-D22, A3-D17, A5-S25, A5-S21, A5-H19, A5-F20, A5-C8, A6-S6, A6-R6, A6-P6, A6-N6, A6-N6, A6-S6, A9-K9, A9-J9 |
| Opn Lp Stpt      | 1375 | 2.2.30 | A3-C27  |
| Overspeed Resp   | 0    | 2.1.12 | A8-F16  |
| Ovr Spd Inp      | 0    | 2.8.11 | A8-E24  |
| Ovr Spd Stpt     | 1258 | 2.5.5  | A8-F24  |
| PC Control       | 1121 | 1.2.13 | A5-H24, A5-F24, A5-D26, A5-M11, A5-M10  |
| ProcessPITrimRef | 1521 | 1.3.14 | A2-R8   |
| Ratio Div        | 0    | 2.6.20 | A1-L22  |
| Ratio Draw En    | 0    | 2.9.1  | A1-P20  |
| RD Dia           | 1250 | 2.6.23 | A9-R6   |
| Reverse          | 1128 | 1.2.6  | A1-L13  |
| Reverse Inp      | 0    | 2.7.5  | A1-L18  |
| RJT Enable       | 1097 | 1.2.8  | A5-S2, A5-N13   |
| RJT Ref          | 1504 | 1.3.6  | A1-N14  |
| RR Dia Div       | 1249 | 2.6.25 | A9-P6   |
| RR Dia Mlt       | 1248 | 2.6.26 | A9-P6   |
| RR_Pos_Inp       | 0    | 2.8.77 | A9-R6   |
| RS Dia           | 1537 | 1.3.49 | A9-E18, A9-E8, A9-R2  |
| RS Dia Inp       | 0    | 2.8.81 | A9-E18, A9-E8   |
| RSDia Div        | 1245 | 2.6.28 | A9-D18, A9-D8   |
| RSDia Mult       | 1246 | 2.6.27 | A9-D18, A9-D8   |
| Run Dec Rate     | 1269 | 2.3.2  | A1-M27  |
| Run Enable       | 1096 | 1.2.7  | A5-G28, A5-H16, A5-F18, A5-D21, A5-S13, A7-S17  |
| Run In Max       | 1100 | 1.2.14 | A1-R24  |
| Run In Min       | 1101 | 1.2.15 | A1-P23  |
| Run Inc Rate     | 1270 | 2.3.3  | A1-M27  |
| Run Input        | 0    | 2.7.1  | A5-L28, A5-H28  |
| Run OK           | 1091 | 1.2.4  | A5-R28, A5-R20, A5-S16, A5-H21, A5-F22, A5-D23  |
| Run Speed        | 1254 | 2.2.1  | A1-M23  |
| Run Stpt         | 1503 | 1.3.5  | A1-N17  |

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| Run Stpt Dec Inp | 0    | 2.7.12   | A1-M27                                 |
| Run Stpt Dif     | 1501 | 1.3.3    | A1-N23                                 |
| Run Stpt Inc Inp | 0    | 2.7.11   | A1-N27                                 |
| Run Stpt Res     | 0    | 2.7.10   | A1-R26                                 |
| Run Stpt Up      | 0    | 2.9.2    | A1-R26                                 |
| RunRequest       | 1090 | 1.2.12   | A2-H7, A5-N2, A5-H13                   |
| SB Comm Flt Resp | 0    | 2.12.2.6 | A8-E16                                 |
| SB Comm Flt Tim  | 0    | 2.12.2.7 | A7-D14                                 |
| SB Comm Lost     | 0    | 1.7.11   | A7-E16                                 |
| SB In Cntl Word  | 1530 | 1.7.4    | A7-R27, A7-M27, A7-K27, A7-G27, A7-F28 |
| SB In Freq Ref   | 1531 | 1.7.5    | A7-N5                                  |
| SB In Int1       | 1532 | 1.7.6    | A7-N5                                  |
| SB In Int2       | 1533 | 1.7.7    | A7-M5                                  |
| SB In Trq Ref    | 1535 | 1.7.8    | A7-N5                                  |
| SB Mode          | 0    | 2.12.2.3 | A7-E15, A7-C28                         |
| SB Out Cntl Word | 1534 | 1.7.9    | A7-S13                                 |
| SB Out Int1      | 0    | 2.12.2.4 | A7-D6                                  |
| SB Out Int2      | 0    | 2.12.2.5 | A7-C6                                  |
| SB WD Pulse      | 0    | 1.7.1    | A7-S17                                 |
| SBId             | 0    | 2.12.2.1 | A7-D28                                 |
| SBNExtId         | 0    | 2.12.2.2 | A7-C28                                 |
| Sel UW1          | 0    | 2.7.92   | A3-D13, A9-T16                         |
| Slack Div        | 0    | 2.6.3    | A2-N24                                 |
| Slack Mult       | 0    | 2.8.9    | A2-P24                                 |
| Slack Out        | 0    | 2.8.8    | A2-P25                                 |
| Slack Rate       | 1310 | 2.3.9    | A2-P20                                 |
| Slack Up         | 0    | 2.8.7    | A2-R25                                 |
| Slk No Ramp      | 0    | 2.7.14   | A2-P20                                 |
| Slv No Ramp      | 0    | 2.7.13   | A1-L23                                 |
| Slv Rate Lim     | 1260 | 2.3.4    | A1-M23                                 |
| Smooth Ratio     | 500  | 2.3.24   | A9-E28                                 |
| Sout Enable      | 0    | 2.7.17   | A2-S25                                 |
| Sp ABS In        | 0    | 2.8.36   | A6-D27                                 |
| Sp ABS Out       | 1558 | 1.3.33   | A6-D24                                 |
| Sp Add Val       | 1327 | 2.6.11   | A6-G27, A6-F27                         |
| Sp Add1 In1      | 0    | 2.8.31   | A6-G27                                 |
| Sp Add1 In2      | 0    | 2.8.32   | A6-F27                                 |
| Sp Add1 Out      | 1555 | 1.3.30   | A6-G24                                 |
| Sp And1 In1      | 0    | 2.7.56   | A6-F6                                  |
| Sp And1 In2      | 0    | 2.7.57   | A6-F6                                  |
| Sp And1 NIn3     | 0    | 2.7.58   | A6-E6                                  |
| Sp And1 Out      | 1164 | 1.2.41   | A6-F3                                  |
| Sp And2 In1      | 0    | 2.7.59   | A6-E6                                  |
| Sp And2 In2      | 0    | 2.7.60   | A6-D6                                  |
| Sp And2 NIn3     | 0    | 2.7.61   | A6-D6                                  |
| Sp And2 Out      | 1165 | 1.2.42   | A6-D3                                  |
| Sp And3 In1      | 0    | 2.7.62   | A6-C6                                  |
| Sp And3 In2      | 0    | 2.7.63   | A6-C6                                  |
| Sp And3 NIn3     | 0    | 2.7.64   | A6-B6                                  |
| Sp And3 Out      | 1166 | 1.2.43   | A6-C3                                  |
| Sp Bmp Dn1       | 1150 | 1.2.25   | A6-E17                                 |
| Sp Bmp Dn2       | 1151 | 1.2.26   | A6-E17                                 |
| Sp Bmp Hold      | 0    | 2.7.38   | A6-F20                                 |
| Sp Bmp In1       | 0    | 2.8.40   | A6-D20                                 |
| Sp Bmp In2       | 0    | 2.8.41   | A6-D20                                 |
| Sp Bmp Out       | 1560 | 1.3.35   | A6-D17                                 |
| Sp Bmp Rate1     | 1333 | 2.3.13   | A6-C20                                 |
| Sp Bmp Rate2     | 1334 | 2.3.14   | A6-C20                                 |
| Sp Bmp St1       | 1335 | 2.2.15   | A6-D20                                 |
| Sp Bmp St2       | 1336 | 2.2.16   | A6-D20                                 |
| Sp Bmp Sw        | 0    | 2.7.39   | A6-E20                                 |
| Sp Cmp1 Eq       | 1152 | 1.2.29   | A6-L10                                 |
| Sp Cmp1 In       | 0    | 2.8.48   | A6-L14                                 |
| Sp Cmp1 Out      | 1153 | 1.2.30   | A6-K10                                 |

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| Sp Cmp1 Thres | 0    | 2.8.49 | A6-K14         |
| Sp Cmp1_Hyst  | 1345 | 2.2.25 | A6-J13         |
| Sp Cmp1_Stpt  | 1346 | 2.2.26 | A6-K14, A6-K14 |
| Sp Cmp2 Eq    | 1154 | 1.2.31 | A6-J11         |
| Sp Cmp2 In    | 0    | 2.8.50 | A6-H14         |
| Sp Cmp2 Out   | 1155 | 1.2.32 | A6-H10         |
| Sp Cmp2 Thres | 0    | 2.8.51 | A6-H14         |
| Sp Cmp2_Hyst  | 1347 | 2.2.27 | A6-G13         |
| Sp Cmp2_Stpt  | 1348 | 2.2.28 | A6-H14, A6-H14 |
| Sp Dly1 In    | 0    | 2.7.42 | A6-F13         |
| Sp Dly1 Out   | 1156 | 1.2.33 | A6-F11         |
| Sp Dly1 TOFF  | 1349 | 2.3.15 | A6-E13         |
| Sp Dly1 TON   | 1350 | 2.3.16 | A6-E13         |
| Sp Dly2 In    | 0    | 2.7.43 | A6-D13         |
| Sp Dly2 Out   | 1157 | 1.2.34 | A6-D11         |
| Sp Dly2 TOFF  | 1351 | 2.3.17 | A6-C13         |
| Sp Dly2 TON   | 1352 | 2.3.18 | A6-C13         |
| Sp HL High    | 1341 | 2.2.21 | A6-P14         |
| Sp HL Hyst    | 1342 | 2.2.22 | A6-M13         |
| Sp HL Inp     | 0    | 2.8.46 | A6-N14         |
| Sp HL Low     | 1343 | 2.2.23 | A6-N14         |
| Sp HL Max     | 1563 | 1.2.27 | A6-P10         |
| Sp HL Min     | 1564 | 1.2.28 | A6-N10         |
| Sp HL Setpt   | 0    | 2.8.47 | A6-M13         |
| Sp HL Stpt    | 1344 | 2.2.24 | A6-M13         |
| Sp Inv1 In    | 0    | 2.7.53 | A6-M6          |
| Sp Inv1 Out   | 1161 | 1.2.38 | A6-M4          |
| Sp Inv2 In    | 0    | 2.7.54 | A6-M6          |
| Sp Inv2 Out   | 1162 | 1.2.39 | A6-M4          |
| Sp Inv3 In    | 0    | 2.7.55 | A6-L6          |
| Sp Inv3 Out   | 1163 | 1.2.40 | A6-L4          |
| Sp LH Decimal | 0    | 2.6.13 | A6-L13         |
| Sp Lim Inp    | 0    | 2.8.52 | A6-M20         |
| Sp Lim Max    | 1353 | 2.5.20 | A6-M20         |
| Sp Lim Min    | 1354 | 2.5.21 | A6-L20         |
| Sp Lim Out    | 1574 | 1.3.38 | A6-M17         |
| Sp LP Fil In  | 0    | 2.8.35 | A6-K20         |
| Sp LP Fil Out | 1557 | 1.3.32 | A6-K17         |
| Sp LP Fil TC  | 1329 | 2.3.12 | A6-K20         |
| Sp Ltch1 H1   | 0    | 2.7.44 | A6-S6          |
| Sp Ltch1 H2   | 0    | 2.7.45 | A6-S6          |
| Sp Ltch1 L    | 0    | 2.7.46 | A6-T6          |
| Sp Ltch1 Out  | 1158 | 1.2.35 | A6-S4          |
| Sp Ltch2 H1   | 0    | 2.7.47 | A6-R6          |
| Sp Ltch2 H2   | 0    | 2.7.48 | A6-P6          |
| Sp Ltch2 L    | 0    | 2.7.49 | A6-R6          |
| Sp Ltch2 Out  | 1159 | 1.2.36 | A6-R4          |
| Sp Ltch3 H1   | 0    | 2.7.50 | A6-N6          |
| Sp Ltch3 H2   | 0    | 2.7.51 | A6-N6          |
| Sp Ltch3 L    | 0    | 2.7.52 | A6-P6          |
| Sp Ltch3 Out  | 1160 | 1.2.37 | A6-N4          |
| Sp MD1 Div    | 0    | 2.8.27 | A6-K27         |
| Sp MD1 Dv     | 1323 | 2.6.7  | A6-J27         |
| Sp MD1 Mlt    | 1324 | 2.6.8  | A6-K27         |
| Sp MD1 Mul    | 0    | 2.8.28 | A6-K27         |
| Sp MD1 Out    | 1553 | 1.3.28 | A6-K24         |
| Sp MD1 Val    | 0    | 2.8.25 | A6-L27         |
| Sp MD2 Div    | 0    | 2.8.29 | A6-H27         |
| Sp MD2 Dv     | 1325 | 2.6.9  | A6-H27         |
| Sp MD2 Mlt    | 1326 | 2.6.10 | A6-H27         |
| Sp MD2 Mul    | 0    | 2.8.30 | A6-H27         |
| Sp MD2 Out    | 1554 | 1.3.29 | A6-J24         |
| Sp MD2 Val    | 0    | 2.8.26 | A6-J27         |
| Sp Or1 In1    | 0    | 2.7.65 | A6-L6          |

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| Sp Or1 In2     | 0    | 2.7.66 | A6-K6          |
| Sp Or1 NIn3    | 0    | 2.7.67 | A6-K6          |
| Sp Or1 Out     | 1167 | 1.2.44 | A6-K3          |
| Sp Or2 In1     | 0    | 2.7.68 | A6-J6          |
| Sp Or2 In2     | 0    | 2.7.69 | A6-J6          |
| Sp Or2 NIn3    | 0    | 2.7.70 | A6-H6          |
| Sp Or2 Out     | 1168 | 1.2.45 | A6-J3          |
| Sp Or3 In1     | 0    | 2.7.71 | A6-H6          |
| Sp Or3 In2     | 0    | 2.7.72 | A6-G6          |
| Sp Or3 NIn3    | 0    | 2.7.73 | A6-G6          |
| Sp Or3 Out     | 1169 | 1.2.46 | A6-G3          |
| Sp Sel1 En1    | 0    | 2.7.40 | A6-T20         |
| Sp Sel1 In0    | 0    | 2.8.42 | A6-S20         |
| Sp Sel1 In1    | 0    | 2.8.43 | A6-R20         |
| Sp Sel1 Out    | 1561 | 1.3.36 | A6-R17         |
| Sp Sel1 ST0    | 1337 | 2.2.17 | A6-S20         |
| Sp Sel1 ST1    | 1338 | 2.2.18 | A6-R20         |
| Sp Sel2 En1    | 0    | 2.7.41 | A6-R20         |
| Sp Sel2 In0    | 0    | 2.8.44 | A6-P20         |
| Sp Sel2 In1    | 0    | 2.8.45 | A6-N20         |
| Sp Sel2 Out    | 1562 | 1.3.37 | A6-P17         |
| Sp Sel2 ST0    | 1339 | 2.2.19 | A6-P20         |
| Sp Sel2 ST1    | 1340 | 2.2.20 | A6-N20         |
| Sp Sub Val     | 1328 | 2.6.12 | A6-E27, A6-E27 |
| Sp Sub1 In1    | 0    | 2.8.33 | A6-F27         |
| Sp Sub1 In2    | 0    | 2.8.34 | A6-E27         |
| Sp Sub1 Out    | 1565 | 1.3.31 | A6-E24         |
| Sp Sum1 EnA    | 0    | 2.7.35 | A6-H20         |
| Sp Sum1 EnB    | 0    | 2.7.36 | A6-J20         |
| Sp Sum1 EnC    | 0    | 2.7.37 | A6-J20         |
| Sp Sum1 InA    | 0    | 2.8.37 | A6-H20         |
| Sp Sum1 InB    | 0    | 2.8.38 | A6-G20         |
| Sp Sum1 InC    | 0    | 2.8.39 | A6-F20         |
| Sp Sum1 Out    | 1559 | 1.3.34 | A6-G17         |
| Sp Sum1 StA    | 1330 | 2.2.12 | A6-G20         |
| Sp Sum1 StB    | 1331 | 2.2.13 | A6-G20         |
| Sp Sum1 StC    | 1332 | 2.2.14 | A6-F20         |
| Sp Tbl0 Gn     | 1320 | 2.6.4  | A6-R27         |
| Sp Tbl0 Inp    | 0    | 2.8.19 | A6-S27         |
| Sp Tbl0 Out    | 1550 | 1.3.25 | A6-S23         |
| Sp Tbl0 Xin    | 0    | 2.8.20 | A6-S27         |
| Sp Tbl1 Gn     | 1321 | 2.6.5  | A6-N27         |
| Sp Tbl1 Inp    | 0    | 2.8.21 | A6-P27         |
| Sp Tbl1 Out    | 1551 | 1.3.26 | A6-P23         |
| Sp Tbl1 Xin    | 0    | 2.8.22 | A6-P27         |
| Sp Tbl2 Gn     | 1322 | 2.6.6  | A6-L27         |
| Sp Tbl2 Inp    | 0    | 2.8.23 | A6-M27         |
| Sp Tbl2 Out    | 1552 | 1.3.27 | A6-M23         |
| Sp Tbl2 Xin    | 0    | 2.8.24 | A6-M27         |
| Sp WPVal ID    | 0    | 2.8.73 | A6-S10         |
| Sp WPVal Inp   | 0    | 2.8.75 | A6-S13         |
| Sp WPVal2 ID   | 0    | 2.8.74 | A6-R10         |
| Sp WPVal2 Inp  | 0    | 2.8.76 | A6-R13         |
| Spd B Rate2    | 1285 | 2.3.10 | A3-H12         |
| Spd Bump Sw    | 0    | 2.7.30 | A3-K12         |
| Spd Cmp Fil TC | 0    | 2.3.19 | A8-E27         |
| Spd Decimal    | 0    | 2.5.8  | A8-D24         |
| Spd Fdbk       | 0    | 2.8.10 | A8-F27         |
| Spd Hyst       | 0    | 2.5.7  | A8-E24         |
| Spd Ramp       | 1583 | 1.3.54 | A2-F21         |
| Spd Slk Out    | 1274 | 2.2.7  | A2-P25         |
| Spd Slk Up     | 1273 | 2.2.6  | A2-R25         |
| SPI Flt Resp   | 734  | 2.1.14 | A8-K16         |
| Sref Dia Scl   | 0    | 2.8.61 | A1-L9, A2-N14  |

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| Start Dia       | 1370 | 2.2.29    | A9-L25, A9-N11 |
| Start Input     | 1089 | 1.2.5     | A5-S20, A5-L16 |
| Step Ref        | 1520 | 1.3.11    | A2-R15         |
| Step Reverse    | 0    | 2.7.15    | A2-S17         |
| Stop by Ft      | 0    | 2.7.91    | A9-K9, A9-J9   |
| Stop Cmd        | 1064 | 1.2.52    | A4-D17, A9-K3  |
| Stop Dia Stpt   | 1241 | 2.2.34    | A9-F8          |
| Stop Ft Inp     | 0    | 2.8.78    | A9-C25         |
| Stop Ft Stpt    | 1239 | 2.2.35    | A9-C25         |
| Stop Input      | 0    | 2.7.6     | A5-H19, A5-F20 |
| Stop RS Dia Inp | 0    | 2.8.80    | A9-F8          |
| Stp Ft Mlt      | 1240 | 2.6.30    | A9-D25, A9-G6  |
| Sup Enable      | 0    | 2.7.16    | A2-S25         |
| Sup Sout        | 1518 | 1.3.12    | A2-R20         |
| Sup Sout Rp     | 1519 | 1.3.13    | A2-R18         |
| T0_X0           | 1700 | 2.11.1.1  | A10-P24        |
| T0_X1           | 1701 | 2.11.1.2  | A10-N24        |
| T0_X10          | 1710 | 2.11.1.11 | A10-K24        |
| T0_X11          | 1711 | 2.11.1.12 | A10-K24        |
| T0_X12          | 1712 | 2.11.1.13 | A10-J24        |
| T0_X13          | 1713 | 2.11.1.14 | A10-J24        |
| T0_X14          | 1714 | 2.11.1.15 | A10-J24        |
| T0_X15          | 1715 | 2.11.1.16 | A10-H24        |
| T0_X2           | 1702 | 2.11.1.3  | A10-N24        |
| T0_X3           | 1703 | 2.11.1.4  | A10-N24        |
| T0_X4           | 1704 | 2.11.1.5  | A10-M24        |
| T0_X5           | 1705 | 2.11.1.6  | A10-M24        |
| T0_X6           | 1706 | 2.11.1.7  | A10-M24        |
| T0_X7           | 1707 | 2.11.1.8  | A10-L24        |
| T0_X8           | 1708 | 2.11.1.9  | A10-L24        |
| T0_X9           | 1709 | 2.11.1.10 | A10-K24        |
| T0_Y0           | 1716 | 2.11.1.17 | A10-P22        |
| T0_Y1           | 1717 | 2.11.1.18 | A10-N22        |
| T0_Y10          | 1726 | 2.11.1.27 | A10-K22        |
| T0_Y11          | 1727 | 2.11.1.28 | A10-K22        |
| T0_Y12          | 1728 | 2.11.1.29 | A10-J22        |
| T0_Y13          | 1729 | 2.11.1.30 | A10-J22        |
| T0_Y14          | 1730 | 2.11.1.31 | A10-J22        |
| T0_Y15          | 1731 | 2.11.1.32 | A10-H22        |
| T0_Y2           | 1718 | 2.11.1.19 | A10-N22        |
| T0_Y3           | 1719 | 2.11.1.20 | A10-N22        |
| T0_Y4           | 1720 | 2.11.1.21 | A10-M22        |
| T0_Y5           | 1721 | 2.11.1.22 | A10-M22        |
| T0_Y6           | 1722 | 2.11.1.23 | A10-L22        |
| T0_Y7           | 1723 | 2.11.1.24 | A10-L22        |
| T0_Y8           | 1724 | 2.11.1.25 | A10-L22        |
| T0_Y9           | 1725 | 2.11.1.26 | A10-K22        |
| T1_X0           | 1732 | 2.11.2.1  | A10-P19        |
| T1_X1           | 1733 | 2.11.2.2  | A10-N19        |
| T1_X10          | 1742 | 2.11.2.11 | A10-K19        |
| T1_X11          | 1743 | 2.11.2.12 |                |
| T1_X12          | 1744 | 2.11.2.13 | A10-J19        |
| T1_X13          | 1745 | 2.11.2.14 | A10-J19        |
| T1_X14          | 1746 | 2.11.2.15 | A10-J19        |
| T1_X15          | 1747 | 2.11.2.16 | A10-H19        |
| T1_X2           | 1734 | 2.11.2.3  | A10-N19        |
| T1_X3           | 1735 | 2.11.2.4  | A10-N19        |
| T1_X4           | 1736 | 2.11.2.5  | A10-M19        |
| T1_X5           | 1737 | 2.11.2.6  | A10-M19        |
| T1_X6           | 1738 | 2.11.2.7  | A10-L19        |
| T1_X7           | 1739 | 2.11.2.8  | A10-L19        |
| T1_X8           | 1740 | 2.11.2.9  | A10-L19        |
| T1_X9           | 1741 | 2.11.2.10 | A10-K19        |
| T1_Y0           | 1748 | 2.11.2.17 | A10-P16        |

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| T1_Y1  | 1749 | 2.11.2.18 | A10-N16          |
| T1_Y10 | 1758 | 2.11.2.27 | A10-K16          |
| T1_Y11 | 1759 | 2.11.2.28 | A10-K16          |
| T1_Y12 | 1760 | 2.11.2.29 | A10-J16          |
| T1_Y13 | 1761 | 2.11.2.30 | A10-J16          |
| T1_Y14 | 1762 | 2.11.2.31 | A10-J16          |
| T1_Y15 | 1763 | 2.11.2.32 | A10-H16          |
| T1_Y2  | 1750 | 2.11.2.19 | A10-N16          |
| T1_Y3  | 1751 | 2.11.2.20 | A10-N16          |
| T1_Y4  | 1752 | 2.11.2.21 | A10-M16          |
| T1_Y5  | 1753 | 2.11.2.22 | A10-M16          |
| T1_Y6  | 1754 | 2.11.2.23 | A10-L16          |
| T1_Y7  | 1755 | 2.11.2.24 | A10-L16          |
| T1_Y8  | 1756 | 2.11.2.25 | A10-L16          |
| T1_Y9  | 1757 | 2.11.2.26 | A10-K16          |
| T2_X0  | 1764 | 2.11.3.1  | A10-P13          |
| T2_X1  | 1765 | 2.11.3.2  | A10-N13          |
| T2_X10 | 1774 | 2.11.3.11 | A10-K13          |
| T2_X11 | 1775 | 2.11.3.12 | A10-K19, A10-K13 |
| T2_X12 | 1776 | 2.11.3.13 | A10-J13          |
| T2_X13 | 1777 | 2.11.3.14 | A10-J8           |
| T2_X14 | 1778 | 2.11.3.15 | A10-J13          |
| T2_X15 | 1779 | 2.11.3.16 |                  |
| T2_X2  | 1766 | 2.11.3.3  | A10-N13          |
| T2_X3  | 1767 | 2.11.3.4  | A10-N13          |
| T2_X4  | 1768 | 2.11.3.5  | A10-M13          |
| T2_X5  | 1769 | 2.11.3.6  | A10-M13          |
| T2_X6  | 1770 | 2.11.3.7  | A10-M13          |
| T2_X7  | 1771 | 2.11.3.8  | A10-L13          |
| T2_X8  | 1772 | 2.11.3.9  | A10-L13          |
| T2_X9  | 1773 | 2.11.3.10 | A10-K13          |
| T2_Y0  | 1780 | 2.11.3.17 | A10-P11          |
| T2_Y1  | 1781 | 2.11.3.18 | A10-N11          |
| T2_Y10 | 1790 | 2.11.3.27 | A10-K11          |
| T2_Y11 | 1791 | 2.11.3.28 | A10-K11          |
| T2_Y12 | 1792 | 2.11.3.29 | A10-J11          |
| T2_Y13 | 1793 | 2.11.3.30 | A10-J11          |
| T2_Y14 | 1794 | 2.11.3.31 | A10-J11          |
| T2_Y15 | 1795 | 2.11.3.32 | A10-H11          |
| T2_Y2  | 1782 | 2.11.3.19 | A10-N11          |
| T2_Y3  | 1783 | 2.11.3.20 | A10-N11          |
| T2_Y4  | 1784 | 2.11.3.21 | A10-M11          |
| T2_Y5  | 1785 | 2.11.3.22 | A10-M11          |
| T2_Y6  | 1786 | 2.11.3.23 | A10-L11          |
| T2_Y7  | 1787 | 2.11.3.24 | A10-L11          |
| T2_Y8  | 1788 | 2.11.3.25 | A10-L11          |
| T2_Y9  | 1789 | 2.11.3.26 | A10-K11          |
| T3_X0  | 1796 | 2.11.4.1  | A10-P8           |
| T3_X1  | 1797 | 2.11.4.2  | A10-N8           |
| T3_X10 | 1806 | 2.11.4.11 | A10-K8           |
| T3_X11 | 1807 | 2.11.4.12 | A10-K8           |
| T3_X12 | 1808 | 2.11.4.13 | A10-J8           |
| T3_X13 | 1809 | 2.11.4.14 | A10-J13          |
| T3_X14 | 1810 | 2.11.4.15 | A10-J8           |
| T3_X15 | 1811 | 2.11.4.16 | A10-H13, A10-H8  |
| T3_X2  | 1798 | 2.11.4.3  | A10-N8           |
| T3_X3  | 1799 | 2.11.4.4  | A10-N8           |
| T3_X4  | 1800 | 2.11.4.5  | A10-M8           |
| T3_X5  | 1801 | 2.11.4.6  | A10-M8           |
| T3_X6  | 1802 | 2.11.4.7  | A10-M8           |
| T3_X7  | 1803 | 2.11.4.8  | A10-L8           |
| T3_X8  | 1804 | 2.11.4.9  | A10-L8           |
| T3_X9  | 1805 | 2.11.4.10 | A10-K8           |
| T3_Y0  | 1812 | 2.11.4.17 | A10-P5           |

| NAME            | ID   | MENU      | COORDINATES   |
|-----------------|------|-----------|---------------|
| T3_Y1           | 1813 | 2.11.4.18 | A10-N5        |
| T3_Y10          | 1822 | 2.11.4.27 | A10-K5        |
| T3_Y11          | 1823 | 2.11.4.28 | A10-K5        |
| T3_Y12          | 1824 | 2.11.4.29 | A10-J5        |
| T3_Y13          | 1825 | 2.11.4.30 | A10-J5        |
| T3_Y14          | 1826 | 2.11.4.31 | A10-J5        |
| T3_Y15          | 1827 | 2.11.4.32 | A10-H5        |
| T3_Y2           | 1814 | 2.11.4.19 | A10-N5        |
| T3_Y3           | 1815 | 2.11.4.20 | A10-N5        |
| T3_Y4           | 1816 | 2.11.4.21 | A10-M5        |
| T3_Y5           | 1817 | 2.11.4.22 | A10-M5        |
| T3_Y6           | 1818 | 2.11.4.23 | A10-M5        |
| T3_Y7           | 1819 | 2.11.4.24 | A10-L5        |
| T3_Y8           | 1820 | 2.11.4.25 | A10-L5        |
| T3_Y9           | 1821 | 2.11.4.26 | A10-K5        |
| Ten At Max      | 1105 | 1.2.23    | A3-E3         |
| Ten At Min      | 1106 | 1.2.22    | A3-D3         |
| Ten B Rate      | 1272 | 2.3.8     | A3-P7         |
| Ten B Sw        | 0    | 2.7.24    | A3-S6         |
| Ten Bal Dif     | 0    | 1.3.16    | A3-R15        |
| Ten Bal out     | 1513 | 1.3.17    | A3-R15        |
| Ten Bal Ret     | 0    | 2.9.5     | A3-S17        |
| Ten Bal Set     | 0    | 2.7.19    | A3-S18        |
| Ten Cmp Stp     | 0    | 2.8.18    | A3-C6         |
| Ten Dec Rate    | 1263 | 2.3.5     | A3-N15        |
| Ten HL Decimal  | 0    | 2.5.17    | A3-B6         |
| Ten I Gain      | 1279 | 2.4.2     | A3-G26        |
| Ten I Inp       | 0    | 2.8.16    | A3-G26        |
| Ten I Res 1     | 0    | 2.7.25    | A3-L25        |
| Ten I Res 2     | 0    | 2.7.26    | A3-L25        |
| Ten I Res 3     | 0    | 2.7.27    | A3-K25        |
| Ten I Res 4     | 0    | 2.7.28    | A3-K25        |
| Ten I Stl Gn    | 0    | 2.4.4     | A3-F26        |
| Ten Inc Rate    | 1264 | 2.3.6     | A3-P15        |
| Ten Inp Stall   | 1512 | 1.3.15    | A3-R18        |
| Ten Max Lmt     | 1280 | 2.5.12    | A3-G20        |
| Ten Min Lmt     | 1281 | 2.5.13    | A3-F20        |
| Ten P Gain      | 1278 | 2.4.1     | A3-H26        |
| Ten P Inp       | 0    | 2.8.17    | A3-H26        |
| Ten P Stl Gn    | 0    | 2.4.5     | A3-H26        |
| Ten PI Gn Scale | 1282 | 2.4.3     | A3-G21        |
| Ten PI Hold     | 0    | 2.7.29    | A3-K21        |
| Ten PI Max      | 1109 | 1.2.20    | A3-L18        |
| Ten PI Min      | 1108 | 1.2.21    | A3-L18        |
| Ten PI Out      | 1522 | 1.3.22    | A3-J16        |
| Ten Preload     | 0    | 2.8.15    | A3-G21        |
| Ten Ramp Rate   | 1271 | 2.3.7     | A3-P10        |
| Ten Ramped      | 1516 | 1.3.20    | A3-R7         |
| Ten Ref         | 1262 | 2.2.11    | A3-S27        |
| Ten Res Bit     | 1107 | 1.2.19    | A3-L22        |
| Ten Rev Pol     | 0    | 2.7.31    | A3-K9         |
| Ten Rmp Res     | 0    | 2.7.23    | A3-S10        |
| Ten Spd Err     | 1524 | 1.3.24    | A3-J7, A3-B22 |
| Ten Stall       | 1261 | 2.2.10    | A3-R21        |
| Ten Stall En    | 0    | 2.7.18    | A3-S21        |
| Ten Stall Inp   | 0    | 2.8.13    | A3-R21        |
| Ten Stpt        | 1514 | 1.3.18    | A3-R11        |
| Ten Stpt Dec    | 0    | 2.7.20    | A3-P15        |
| Ten Stpt Dif    | 1515 | 1.3.19    | A3-P11        |
| Ten Stpt Inc    | 0    | 2.7.21    | A3-P15        |
| Ten Stpt Max    | 1265 | 2.5.10    | A3-N14        |
| Ten Stpt Max    | 1102 | 1.2.17    | A3-S12        |
| Ten Stpt Min    | 1103 | 1.2.18    | A3-S11        |
| Ten Stpt Min    | 1266 | 2.5.11    | A3-M14        |

| NAME             | ID   | MENU     | COORDINATES                    |
|------------------|------|----------|--------------------------------|
| Ten Stpt Res     | 0    | 2.7.22   | A3-S14                         |
| Ten Stpt Up      | 0    | 2.9.6    | A3-S14                         |
| Ten SUP          | 1523 | 1.3.23   | A3-J12                         |
| Tens Fdbk        | 0    | 2.8.14   | A3-P19, A3-R7, A3-J22, A3-D7   |
| Tension Inp      | 0    | 2.8.12   | A3-R21                         |
| Tension Ref      | 1517 | 1.3.21   | A3-R4, A3-J22                  |
| Thread Enable    | 1095 | 1.2.9    | A5-E28, A5-F16, A5-D19, A5-R13 |
| Thread Input     | 0    | 2.7.2    | A5-K28, A5-F28                 |
| Thread Ref       | 0    | 2.8.2    | A1-N17                         |
| Thread Speed     | 1255 | 2.2.2    | A1-N17                         |
| Torque Reference | 18   | 1.3.39   | A2-F3, A7-D6                   |
| Trq Dir          | 0    | 2.7.33   | A2-J11                         |
| Trq No Ramp      | 0    | 2.7.34   | A2-E8                          |
| Trq Ref          | 0    | 2.8.53   | A2-G15                         |
| Trq Ref C        | 0    | 2.8.56   | A2-E16                         |
| Trq Ref En       | 0    | 2.7.32   | A2-H7                          |
| Trq Ref Max      | 642  | 2.5.18   | A2-E6                          |
| Trq Ref StA      | 1302 | 2.2.8    | A2-G15                         |
| Trq Ref StB      | 1303 | 2.2.9    | A2-F16, A2-E16                 |
| Trq RefB         | 0    | 2.8.54   | A2-G16                         |
| Trq RefB Div     | 0    | 2.6.15   | A2-E16                         |
| Trq RefB Mlt     | 0    | 2.8.55   | A2-F16                         |
| Trq RefB MSt     | 1304 | 2.6.14   | A2-F16                         |
| Trq Rmp Rate     | 1290 | 2.3.11   | A2-F8                          |
| Trq_Ref_Min      | 643  | 2.5.19   | A2-D6                          |
| Undir Cdiam      | 1576 | 1.3.42   | A9-N20                         |
| Uni Dia          | 1580 | 1.3.47   | A9-P11                         |
| Uni Dia Div      | 1275 | 2.6.21   | A9-N15                         |
| Uni Dia Gn       | 1276 | 2.6.22   | A9-P15                         |
| Uni Type         | 0    | 2.9.12   |                                |
| Unipulser Inp    | 0    | 2.10.1.3 | A9-S17                         |
| Unipulser Inp2   | 0    | 2.10.1.4 | A9-S17                         |
| Up Dwn           | 0    | 2.7.83   | A9-S24                         |
| User Flt 1       | 0    | 2.1.2    | A8-H18                         |
| User Flt 2       | 0    | 2.1.3    | A8-H18                         |
| User Flt 3       | 0    | 2.1.4    | A8-G18                         |
| User Flt 4       | 0    | 2.1.5    | A8-F18                         |
| User Flt1 Resp   | 0    | 2.1.6    | A8-J16                         |
| User Flt2 Resp   | 0    | 2.1.7    | A8-H16                         |
| User Flt3 Resp   | 0    | 2.1.8    | A8-G16                         |
| User Flt4 Resp   | 0    | 2.1.9    | A8-G16                         |
| UW1 Trq          | 1584 | 1.3.55   | A3-C10                         |
| UW2 Trq          | 1585 | 1.3.56   | A3-C10                         |
| Var WK Inp       | 0    | 2.8.71   | A2-J27                         |
| Var WK Stpt      | 1379 | 2.4.8    | A2-J27                         |
| Watchdog In      | 0    | 2.7.74   | A7-B22                         |
| Watchdog Out     | 1003 | 1.2.49   | A7-D18                         |
| WD Com Dly       | 0    | 2.3.20   | A7-B21                         |
| WD Flt Response  | 0    | 2.1.15   | A8-J16                         |
| WD Init Dly Tim  | 0    | 2.3.21   | A7-C19                         |
| WD Trip          | 0    | 1.2.48   | A7-C15                         |
| Width Inp        | 0    | 2.8.72   | A2-J27                         |
| Width Stpt       | 1380 | 2.6.19   | A2-J27                         |
| Win Aux En       | 0    | 2.7.86   | A3-E22                         |
| Win Aux Ref      | 0    | 2.8.67   | A3-B22                         |
| Win Boost        | 0    | 2.2.31   | A3-C22                         |
| Win Boost En     | 0    | 2.7.85   | A3-E22                         |
| Win Fd Fwd       | 1578 | 1.3.44   | A3-C13                         |
| Win Fd Gain      | 1376 | 2.6.18   | A3-B25                         |
| Win Fd Gn I      | 0    | 2.8.66   | A3-B25                         |
| Win Fdk Tch      | 0    | 2.8.59   | A9-N27                         |
| Win Ffd Dia      | 0    | 2.8.65   | A3-C27                         |
| Win Ffd En       | 0    | 2.7.84   | A3-D22                         |
| Win Ffd Inp      | 0    | 2.8.64   | A3-C27                         |

| NAME            | ID   | MENU   | COORDINATES  |
|-----------------|------|--------|--|
| Win Ffd Rev     | 0    | 2.7.87 | A3-E16   |
| Win Gn Dia En   | 0    | 2.9.7  | A3-K15   |
| Win Gn Not D En | 0    | 2.9.8  | A3-K15   |
| Win Gn Out      | 1579 | 1.3.45 | A3-C22   |
| Win Input       | 0    | 2.8.62 | A3-S27   |
| Win Ref Tch     | 0    | 2.8.58 | A2-F28, A9-P27   |
| Win Ref Xin     | 0    | 2.8.63 | A3-R27   |
| Win Stl Gn Sel  | 0    | 2.7.88 | A3-J26, A3-G26   |
| Win Tbl Div     | 0    | 2.6.17 | A3-S27   |
| Win Tbl Out     | 1577 | 1.3.43 | A3-R21, A3-S24   |
| Win WK          | 1582 | 1.3.53 | A2-J20, A3-C18   |
| Zero Analog     | 1200 | 2.13.3 | A3-P19, A3-P7, A3-J22, A3-G21, A3-D7, A4-L9, A4-J10, A5-C12, A6-R27, A6-P27, A6-M27, A6-K27, A6-J27, A6-M20, A6-K20, A6-D27, A6-S13, A6-R13, A6-N14, A7-D6, A7-C6, A7-K7, A7-J7, A7-H7, A7-H7, A7-G7, A7-G7, A7-F7   |
| Zero Bit        | 1002 | 2.13.2 | A1-N27, A1-M27, A1-L18, A2-R25, A2-S25, A2-S17, A2-H14, A2-H14, A2-H14, A2-J11, A3-S21, A3-P15, A3-N15, A3-S10, A3-K25, A3-K25, A3-K21, A3-K12, A3-K9, A3-S14, A3-J26, A3-G26, A3-E22, A3-E22, A3-E16, A3-D13, A4-R19, A4-P19, A4-K19, A4-K19, A4-C17, A4-E11, A4-D11, A4-C11, A5-M28, A5-K28, A5-F28, A5-C8, A6-S20, A6-R20, A6-H20, A6-H20, A6-J20, A6-E20, A6-F20, A6-F13, A6-D13, A6-S6, A6-R6, A6-P6, A6-M6, A6-M6, A6-L6, A6-L6, A6-K6, A6-K6, A6-J6, A6-J6, A6-H6, A6-H6, A6-G6, A6-G6, A6-F6, A6-F6, A6-E6, A6-C6, A6-E6, A6-D6, A6-D6, A6-C6, A6-B6, A7-R17, A7-P17, A7-P17, A7-N17, A7-N17, A7-M17, A7-M17, A7-L17, A7-L17, A7-K17, A7-K17, A7-J17, A7-J17, A7-H17, A7-H17, A7-G17, A7-B22, A8-L19, A8-H18, A8-H18, A8-G18, A8-F18, A8-M17, A9-R28, A9-P28, A9-S24, A9-K11, A9-T16 |
| Zero Detect     | 1259 | 2.5.6  | A8-F24   |



## APPENDIX D

### PARAMETER ID NUMBER CROSS-REFERENCE

| ID   | NAME              | MENU     |
|------|-------------------|----------|
| 18   | Torque Reference  | 1.3.39   |
| 25   | FreqReference     | 1.3.8    |
| 37   | Active Flt Last   | 1.3.40   |
| 101  | Min Frequency     | 2.5.2    |
| 102  | Freq Max          | 2.5.1    |
| 104  | Decel Time 1      | 2.3.23   |
| 123  | Keypad Spd Dir    | 3.1      |
| 500  | Smooth Ratio      | 2.3.24   |
| 503  | Fast Stop Tim     | 2.3.1    |
| 642  | Trq Ref Max       | 2.5.18   |
| 643  | Trq_Ref_Min       | 2.5.19   |
| 701  | Ext Flt Resp      | 2.1.11   |
| 733  | FBCComm.FaultResp | 2.1.13   |
| 734  | SPI Flt Resp      | 2.1.14   |
| 1001 | One Bit           | 2.13.1   |
| 1002 | Zero Bit          | 2.13.2   |
| 1003 | Watchdog Out      | 1.2.49   |
| 1011 | DIN 1             | 1.4.1    |
| 1012 | DIN 2             | 1.4.2    |
| 1013 | DIN 3             | 1.4.3    |
| 1014 | DIN 4             | 1.4.4    |
| 1015 | DIN 5             | 1.4.5    |
| 1016 | DIN 6             | 1.4.6    |
| 1017 | DIN 7             | 1.4.7    |
| 1018 | DIN 8             | 1.4.8    |
| 1021 | Not DIN 1         | 1.4.9    |
| 1022 | Not DIN 2         | 1.4.10   |
| 1023 | Not DIN 3         | 1.4.11   |
| 1024 | Not DIN 4         | 1.4.12   |
| 1025 | Not DIN 5         | 1.4.13   |
| 1026 | Not DIN 6         | 1.4.14   |
| 1027 | Not DIN 7         | 1.4.15   |
| 1028 | Not DIN 8         | 1.4.16   |
| 1040 | FB Bit00          | 1.6.1.1  |
| 1041 | FB Bit01          | 1.6.1.2  |
| 1042 | FB Bit02          | 1.6.1.3  |
| 1043 | FB Bit03          | 1.6.1.4  |
| 1044 | FB Bit04          | 1.6.1.5  |
| 1045 | FB Bit05          | 1.6.1.6  |
| 1046 | FB Bit06          | 1.6.1.7  |
| 1047 | FB Bit07          | 1.6.1.8  |
| 1048 | FB Bit08          | 1.6.1.9  |
| 1049 | FB Bit09          | 1.6.1.10 |
| 1050 | FB Bit10          | 1.6.1.11 |
| 1051 | FB Bit11          | 1.6.1.12 |
| 1052 | FB Bit12          | 1.6.1.13 |

| ID   | NAME          | MENU     |
|------|---------------|----------|
| 1053 | FB Bit13      | 1.6.1.14 |
| 1054 | FB Bit14      | 1.6.1.15 |
| 1055 | FB Bit15      | 1.6.1.16 |
| 1060 | MD Run Enable | 1.7.10   |
| 1061 | MD Watchdog   | 1.7.3    |
| 1062 | Ft Stop Set   | 1.2.50   |
| 1063 | Dia Stop Set  | 1.2.51   |
| 1064 | Stop Cmd      | 1.2.52   |
| 1087 | Jog FR Input  | 1.2.11   |
| 1089 | Start Input   | 1.2.5    |
| 1090 | RunRequest    | 1.2.12   |
| 1091 | Run OK        | 1.2.4    |
| 1094 | Jog enable    | 1.2.10   |
| 1095 | Thread Enable | 1.2.9    |
| 1096 | Run Enable    | 1.2.7    |
| 1097 | RJT Enable    | 1.2.8    |
| 1099 | Cntrl Inhib   | 1.2.1    |
| 1100 | Run In Max    | 1.2.14   |
| 1101 | Run In Min    | 1.2.15   |
| 1102 | Ten Stpt Max  | 1.2.17   |
| 1103 | Ten Stpt Min  | 1.2.18   |
| 1105 | Ten At Max    | 1.2.23   |
| 1106 | Ten At Min    | 1.2.22   |
| 1107 | Ten Res Bit   | 1.2.19   |
| 1108 | Ten PI Min    | 1.2.21   |
| 1109 | Ten PI Max    | 1.2.20   |
| 1116 | MC Fault      | 1.2.2    |
| 1117 | MC Warning    | 1.2.3    |
| 1118 | DDT Lim       | 2.5.27   |
| 1121 | PC Control    | 1.2.13   |
| 1127 | At Zero Spd   | 1.2.47   |
| 1128 | Reverse       | 1.2.6    |
| 1129 | Neg Spd Ref   | 1.2.16   |
| 1150 | Sp Bmp Dn1    | 1.2.25   |
| 1151 | Sp Bmp Dn2    | 1.2.26   |
| 1152 | Sp Cmp1 Eq    | 1.2.29   |
| 1153 | Sp Cmp1 Out   | 1.2.30   |
| 1154 | Sp Cmp2 Eq    | 1.2.31   |
| 1155 | Sp Cmp2 Out   | 1.2.32   |
| 1156 | Sp Dly1 Out   | 1.2.33   |
| 1157 | Sp Dly2 Out   | 1.2.34   |
| 1158 | Sp Litch1 Out | 1.2.35   |
| 1159 | Sp Litch2 Out | 1.2.36   |
| 1160 | Sp Litch3 Out | 1.2.37   |
| 1161 | Sp Inv1 Out   | 1.2.38   |
| 1162 | Sp Inv2 Out   | 1.2.39   |

| ID   | NAME            | MENU   |
|------|-----------------|--------|
| 1163 | Sp Inv3 Out     | 1.2.40 |
| 1164 | Sp And1 Out     | 1.2.41 |
| 1165 | Sp And2 Out     | 1.2.42 |
| 1166 | Sp And3 Out     | 1.2.43 |
| 1167 | Sp Or1 Out      | 1.2.44 |
| 1168 | Sp Or2 Out      | 1.2.45 |
| 1169 | Sp Or3 Out      | 1.2.46 |
| 1172 | MD WD OK        | 1.7.2  |
| 1200 | Zero Analog     | 2.13.3 |
| 1201 | One Analog      | 2.13.4 |
| 1202 | Int Ten         | 2.13.5 |
| 1203 | Int Hundred     | 2.13.6 |
| 1204 | Int Thousand    | 2.13.7 |
| 1236 | DDT Mult        | 2.6.32 |
| 1237 | DDT Div         | 2.6.31 |
| 1238 | Caliper Stpt    | 2.2.36 |
| 1239 | Stop Ft Stpt    | 2.2.35 |
| 1240 | Stp Ft Mlt      | 2.6.30 |
| 1241 | Stop Dia Stpt   | 2.2.34 |
| 1242 | Init RSDia      | 2.2.33 |
| 1243 | Caliper Min     | 2.5.26 |
| 1244 | Caliper Max     | 2.5.25 |
| 1245 | RSDia Div       | 2.6.28 |
| 1246 | RSDia Mult      | 2.6.27 |
| 1247 | Drum Gap        | 2.6.24 |
| 1248 | RR Dia Mlt      | 2.6.26 |
| 1249 | RR Dia Div      | 2.6.25 |
| 1250 | RD Dia          | 2.6.23 |
| 1251 | Draw Stpt       | 2.2.5  |
| 1254 | Run Speed       | 2.2.1  |
| 1255 | Thread Speed    | 2.2.2  |
| 1256 | Jog F Speed     | 2.2.3  |
| 1257 | Jog R Speed     | 2.2.4  |
| 1258 | Ovr Spd Stp     | 2.5.5  |
| 1259 | Zero Detect     | 2.5.6  |
| 1260 | Slv Rate Lim    | 2.3.4  |
| 1261 | Ten Stall       | 2.2.10 |
| 1262 | Ten Ref         | 2.2.11 |
| 1263 | Ten Dec Rate    | 2.3.5  |
| 1264 | Ten Inc Rate    | 2.3.6  |
| 1265 | Ten Stpt Max    | 2.5.10 |
| 1266 | Ten Stpt Min    | 2.5.11 |
| 1267 | Max Run Stpt    | 2.5.3  |
| 1268 | Min Run Stpt    | 2.5.4  |
| 1269 | Run Dec Rate    | 2.3.2  |
| 1270 | Run Inc Rate    | 2.3.3  |
| 1271 | Ten Ramp Rate   | 2.3.7  |
| 1272 | Ten B Rate      | 2.3.8  |
| 1273 | Spd Slk Up      | 2.2.6  |
| 1274 | Spd Slk Out     | 2.2.7  |
| 1275 | Uni Dia Div     | 2.6.21 |
| 1276 | Uni Dia Gn      | 2.6.22 |
| 1278 | Ten P Gain      | 2.4.1  |
| 1279 | Ten I Gain      | 2.4.2  |
| 1280 | Ten Max Lmt     | 2.5.12 |
| 1281 | Ten Min Lmt     | 2.5.13 |
| 1282 | Ten PI Gn Scale | 2.4.3  |
| 1285 | Spd B Rate2     | 2.3.10 |
| 1286 | Max Tension     | 2.5.9  |

| ID   | NAME          | MENU      |
|------|---------------|-----------|
| 1287 | Max Ten Hys   | 2.5.16    |
| 1288 | Min Ten Set   | 2.5.15    |
| 1289 | Max Ten Set   | 2.5.14    |
| 1290 | Trq Rmp Rate  | 2.3.11    |
| 1294 | Counter1 Dec  | 2.10.5.10 |
| 1295 | Counter1 Mult | 2.10.5.11 |
| 1296 | Counter2 Dec  | 2.10.5.15 |
| 1297 | Counter2 Mult | 2.10.5.16 |
| 1302 | Trq Ref StA   | 2.2.8     |
| 1303 | Trq Ref StB   | 2.2.9     |
| 1304 | Trq RefB MSt  | 2.6.14    |
| 1310 | Slack Rate    | 2.3.9     |
| 1320 | Sp Tbl0 Gn    | 2.6.4     |
| 1321 | Sp Tbl1 Gn    | 2.6.5     |
| 1322 | Sp Tbl2 Gn    | 2.6.6     |
| 1323 | Sp MD1 Dv     | 2.6.7     |
| 1324 | Sp MD1 Mlt    | 2.6.8     |
| 1325 | Sp MD2 Dv     | 2.6.9     |
| 1326 | Sp MD2 Mlt    | 2.6.10    |
| 1327 | Sp Add Val    | 2.6.11    |
| 1328 | Sp Sub Val    | 2.6.12    |
| 1329 | Sp LP Fil TC  | 2.3.12    |
| 1330 | Sp Sum1 StA   | 2.2.12    |
| 1331 | Sp Sum1 StB   | 2.2.13    |
| 1332 | Sp Sum1 StC   | 2.2.14    |
| 1333 | Sp Bmp Rate1  | 2.3.13    |
| 1334 | Sp Bmp Rate2  | 2.3.14    |
| 1335 | Sp Bmp St1    | 2.2.15    |
| 1336 | Sp Bmp St2    | 2.2.16    |
| 1337 | Sp Sel1 ST0   | 2.2.17    |
| 1338 | Sp Sel1 ST1   | 2.2.18    |
| 1339 | Sp Sel2 ST0   | 2.2.19    |
| 1340 | Sp Sel2 ST1   | 2.2.20    |
| 1341 | Sp HL High    | 2.2.21    |
| 1342 | Sp HL Hyst    | 2.2.22    |
| 1343 | Sp HL Low     | 2.2.23    |
| 1344 | Sp HL Stpt    | 2.2.24    |
| 1345 | Sp Cmp1_Hyst  | 2.2.25    |
| 1346 | Sp Cmp1_Stpt  | 2.2.26    |
| 1347 | Sp Cmp2_Hyst  | 2.2.27    |
| 1348 | Sp Cmp2_Stpt  | 2.2.28    |
| 1349 | Sp Dly1 TOFF  | 2.3.15    |
| 1350 | Sp Dly1 TON   | 2.3.16    |
| 1351 | Sp Dly2 TOFF  | 2.3.17    |
| 1352 | Sp Dly2 TON   | 2.3.18    |
| 1353 | Sp Lim Max    | 2.5.20    |
| 1354 | Sp Lim Min    | 2.5.21    |
| 1370 | Start Dia     | 2.2.29    |
| 1371 | Dia Gn St     | 2.6.16    |
| 1372 | Max Dia       | 2.5.22    |
| 1373 | Min Dia       | 2.5.23    |
| 1374 | Dia Rate Lm   | 2.3.22    |
| 1375 | Opn Lp Stpt   | 2.2.30    |
| 1376 | Win Fd Gain   | 2.6.18    |
| 1377 | Gn With Dia   | 2.4.6     |
| 1378 | Fix WK Stpt   | 2.4.7     |
| 1379 | Var WK Stpt   | 2.4.8     |
| 1380 | Width Stpt    | 2.6.19    |
| 1501 | Run Stpt Dif  | 1.3.3     |

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| 1502 | Draw Ref         | 1.3.4  |
| 1503 | Run Stpt         | 1.3.5  |
| 1504 | RJT Ref          | 1.3.6  |
| 1505 | Control Place    | 1.3.1  |
| 1506 | Cntrl Mode       | 1.3.2  |
| 1507 | Freq Reference   | 1.3.7  |
| 1512 | Ten Inp Stall    | 1.3.15 |
| 1513 | Ten Bal out      | 1.3.17 |
| 1514 | Ten Stpt         | 1.3.18 |
| 1515 | Ten Stpt Dif     | 1.3.19 |
| 1516 | Ten Ramped       | 1.3.20 |
| 1517 | Tension Ref      | 1.3.21 |
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| 1519 | Sup Sout Rp      | 1.3.13 |
| 1520 | Step Ref         | 1.3.11 |
| 1521 | ProcessPITrimRef | 1.3.14 |
| 1522 | Ten PI Out       | 1.3.22 |
| 1523 | Ten SUP          | 1.3.23 |
| 1524 | Ten Spd Err      | 1.3.24 |
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| 1529 | Counter2         | 1.5.20 |
| 1530 | SB In Cntl Word  | 1.7.4  |
| 1531 | SB In Freq Ref   | 1.7.5  |
| 1532 | SB In Int1       | 1.7.6  |
| 1533 | SB In Int2       | 1.7.7  |
| 1534 | SB Out Cntl Word | 1.7.9  |
| 1535 | SB In Trq Ref    | 1.7.8  |
| 1537 | RS Dia           | 1.3.49 |
| 1550 | Sp Tbl0 Out      | 1.3.25 |
| 1551 | Sp Tbl1 Out      | 1.3.26 |
| 1552 | Sp Tbl2 Out      | 1.3.27 |
| 1553 | Sp MD1 Out       | 1.3.28 |
| 1554 | Sp MD2 Out       | 1.3.29 |
| 1555 | Sp Add1 Out      | 1.3.30 |
| 1557 | Sp LP Fil Out    | 1.3.32 |
| 1558 | Sp ABS Out       | 1.3.33 |
| 1559 | Sp Sum1 Out      | 1.3.34 |
| 1560 | Sp Bmp Out       | 1.3.35 |
| 1561 | Sp Sel1 Out      | 1.3.36 |
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| 1563 | Sp HL Max        | 1.2.27 |
| 1564 | Sp HL Min        | 1.2.28 |
| 1565 | Sp Sub1 Out      | 1.3.31 |
| 1569 | Accel TC         | 1.3.46 |
| 1570 | ABS RJT Ref      | 1.3.9  |
| 1574 | Sp Lim Out       | 1.3.38 |
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| 1578 | Win Fd Fwd       | 1.3.44 |
| 1579 | Win Gn Out       | 1.3.45 |
| 1580 | Uni Dia          | 1.3.47 |
| 1581 | Caliper          | 1.3.51 |
| 1582 | Win WK           | 1.3.53 |
| 1583 | Spd Ramp         | 1.3.54 |
| 1584 | UW1 Trq          | 1.3.55 |
| 1585 | UW2 Trq          | 1.3.56 |
| 1586 | Fil Uni Dia      | 1.3.48 |
| 1590 | AOUT1 Val        | 1.5.13 |

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| 1591 | AOUT2 Val         | 1.5.14    |
| 1592 | AOUT3 Val         | 1.5.15    |
| 1593 | AOUT4 Val         | 1.5.16    |
| 1601 | AIN1              | 1.5.5     |
| 1602 | AIN2              | 1.5.6     |
| 1603 | AIN3              | 1.5.7     |
| 1604 | AIN4              | 1.5.8     |
| 1609 | Enc1_Out          | 1.5.17    |
| 1610 | Enc2_Out          | 1.5.18    |
| 1611 | FB Word In 1      | 1.6.2.1   |
| 1612 | FB Word In 2      | 1.6.2.2   |
| 1613 | FB Word In 3      | 1.6.2.3   |
| 1614 | FB Word In 4      | 1.6.2.4   |
| 1615 | FB Word In 5      | 1.6.2.5   |
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| 1617 | FB Word In 7      | 1.6.2.7   |
| 1618 | FB Word In 8      | 1.6.2.8   |
| 1619 | FB Word In 9      | 1.6.2.9   |
| 1620 | FB Word In 10     | 1.6.2.10  |
| 1621 | FB Fix Cntrl Wrld | 1.6.1.17  |
| 1622 | FB Word Out 1     | 1.6.3.1   |
| 1623 | FB Word Out 2     | 1.6.3.2   |
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| 1625 | FB Word Out 4     | 1.6.3.4   |
| 1626 | FB Word Out 5     | 1.6.3.5   |
| 1627 | FB Word Out 6     | 1.6.3.6   |
| 1628 | FB Word Out 7     | 1.6.3.7   |
| 1629 | FB Word Out 8     | 1.6.3.8   |
| 1630 | FB Gen Cntrl Wrld | 1.6.1.18  |
| 1631 | FB Gen Sts Word   | 1.6.1.19  |
| 1632 | FB Spd Ref        | 1.6.2.11  |
| 1633 | Ft to Stop        | 1.3.50    |
| 1634 | Ft to Dia         | 1.3.52    |
| 1700 | T0_X0             | 2.11.1.1  |
| 1701 | T0_X1             | 2.11.1.2  |
| 1702 | T0_X2             | 2.11.1.3  |
| 1703 | T0_X3             | 2.11.1.4  |
| 1704 | T0_X4             | 2.11.1.5  |
| 1705 | T0_X5             | 2.11.1.6  |
| 1706 | T0_X6             | 2.11.1.7  |
| 1707 | T0_X7             | 2.11.1.8  |
| 1708 | T0_X8             | 2.11.1.9  |
| 1709 | T0_X9             | 2.11.1.10 |
| 1710 | T0_X10            | 2.11.1.11 |
| 1711 | T0_X11            | 2.11.1.12 |
| 1712 | T0_X12            | 2.11.1.13 |
| 1713 | T0_X13            | 2.11.1.14 |
| 1714 | T0_X14            | 2.11.1.15 |
| 1715 | T0_X15            | 2.11.1.16 |
| 1716 | T0_Y0             | 2.11.1.17 |
| 1717 | T0_Y1             | 2.11.1.18 |
| 1718 | T0_Y2             | 2.11.1.19 |
| 1719 | T0_Y3             | 2.11.1.20 |
| 1720 | T0_Y4             | 2.11.1.21 |
| 1721 | T0_Y5             | 2.11.1.22 |
| 1722 | T0_Y6             | 2.11.1.23 |
| 1723 | T0_Y7             | 2.11.1.24 |
| 1724 | T0_Y8             | 2.11.1.25 |
| 1725 | T0_Y9             | 2.11.1.26 |

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| 1726 | T0_Y10 | 2.11.1.27 |
| 1727 | T0_Y11 | 2.11.1.28 |
| 1728 | T0_Y12 | 2.11.1.29 |
| 1729 | T0_Y13 | 2.11.1.30 |
| 1730 | T0_Y14 | 2.11.1.31 |
| 1731 | T0_Y15 | 2.11.1.32 |
| 1732 | T1_X0  | 2.11.2.1  |
| 1733 | T1_X1  | 2.11.2.2  |
| 1734 | T1_X2  | 2.11.2.3  |
| 1735 | T1_X3  | 2.11.2.4  |
| 1736 | T1_X4  | 2.11.2.5  |
| 1737 | T1_X5  | 2.11.2.6  |
| 1738 | T1_X6  | 2.11.2.7  |
| 1739 | T1_X7  | 2.11.2.8  |
| 1740 | T1_X8  | 2.11.2.9  |
| 1741 | T1_X9  | 2.11.2.10 |
| 1742 | T1_X10 | 2.11.2.11 |
| 1743 | T1_X11 | 2.11.2.12 |
| 1744 | T1_X12 | 2.11.2.13 |
| 1745 | T1_X13 | 2.11.2.14 |
| 1746 | T1_X14 | 2.11.2.15 |
| 1747 | T1_X15 | 2.11.2.16 |
| 1748 | T1_Y0  | 2.11.2.17 |
| 1749 | T1_Y1  | 2.11.2.18 |
| 1750 | T1_Y2  | 2.11.2.19 |
| 1751 | T1_Y3  | 2.11.2.20 |
| 1752 | T1_Y4  | 2.11.2.21 |
| 1753 | T1_Y5  | 2.11.2.22 |
| 1754 | T1_Y6  | 2.11.2.23 |
| 1755 | T1_Y7  | 2.11.2.24 |
| 1756 | T1_Y8  | 2.11.2.25 |
| 1757 | T1_Y9  | 2.11.2.26 |
| 1758 | T1_Y10 | 2.11.2.27 |
| 1759 | T1_Y11 | 2.11.2.28 |
| 1760 | T1_Y12 | 2.11.2.29 |
| 1761 | T1_Y13 | 2.11.2.30 |
| 1762 | T1_Y14 | 2.11.2.31 |
| 1763 | T1_Y15 | 2.11.2.32 |
| 1764 | T2_X0  | 2.11.3.1  |
| 1765 | T2_X1  | 2.11.3.2  |
| 1766 | T2_X2  | 2.11.3.3  |
| 1767 | T2_X3  | 2.11.3.4  |
| 1768 | T2_X4  | 2.11.3.5  |
| 1769 | T2_X5  | 2.11.3.6  |
| 1770 | T2_X6  | 2.11.3.7  |
| 1771 | T2_X7  | 2.11.3.8  |
| 1772 | T2_X8  | 2.11.3.9  |
| 1773 | T2_X9  | 2.11.3.10 |
| 1774 | T2_X10 | 2.11.3.11 |
| 1775 | T2_X11 | 2.11.3.12 |
| 1776 | T2_X12 | 2.11.3.13 |
| 1777 | T2_X13 | 2.11.3.14 |
| 1778 | T2_X14 | 2.11.3.15 |
| 1779 | T2_X15 | 2.11.3.16 |
| 1780 | T2_Y0  | 2.11.3.17 |
| 1781 | T2_Y1  | 2.11.3.18 |
| 1782 | T2_Y2  | 2.11.3.19 |
| 1783 | T2_Y3  | 2.11.3.20 |
| 1784 | T2_Y4  | 2.11.3.21 |

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| 1785 | T2_Y5  | 2.11.3.22 |
| 1786 | T2_Y6  | 2.11.3.23 |
| 1787 | T2_Y7  | 2.11.3.24 |
| 1788 | T2_Y8  | 2.11.3.25 |
| 1789 | T2_Y9  | 2.11.3.26 |
| 1790 | T2_Y10 | 2.11.3.27 |
| 1791 | T2_Y11 | 2.11.3.28 |
| 1792 | T2_Y12 | 2.11.3.29 |
| 1793 | T2_Y13 | 2.11.3.30 |
| 1794 | T2_Y14 | 2.11.3.31 |
| 1795 | T2_Y15 | 2.11.3.32 |
| 1796 | T3_X0  | 2.11.4.1  |
| 1797 | T3_X1  | 2.11.4.2  |
| 1798 | T3_X2  | 2.11.4.3  |
| 1799 | T3_X3  | 2.11.4.4  |
| 1800 | T3_X4  | 2.11.4.5  |
| 1801 | T3_X5  | 2.11.4.6  |
| 1802 | T3_X6  | 2.11.4.7  |
| 1803 | T3_X7  | 2.11.4.8  |
| 1804 | T3_X8  | 2.11.4.9  |
| 1805 | T3_X9  | 2.11.4.10 |
| 1806 | T3_X10 | 2.11.4.11 |
| 1807 | T3_X11 | 2.11.4.12 |
| 1808 | T3_X12 | 2.11.4.13 |
| 1809 | T3_X13 | 2.11.4.14 |
| 1810 | T3_X14 | 2.11.4.15 |
| 1811 | T3_X15 | 2.11.4.16 |
| 1812 | T3_Y0  | 2.11.4.17 |
| 1813 | T3_Y1  | 2.11.4.18 |
| 1814 | T3_Y2  | 2.11.4.19 |
| 1815 | T3_Y3  | 2.11.4.20 |
| 1816 | T3_Y4  | 2.11.4.21 |
| 1817 | T3_Y5  | 2.11.4.22 |
| 1818 | T3_Y6  | 2.11.4.23 |
| 1819 | T3_Y7  | 2.11.4.24 |
| 1820 | T3_Y8  | 2.11.4.25 |
| 1821 | T3_Y9  | 2.11.4.26 |
| 1822 | T3_Y10 | 2.11.4.27 |
| 1823 | T3_Y11 | 2.11.4.28 |
| 1824 | T3_Y12 | 2.11.4.29 |
| 1825 | T3_Y13 | 2.11.4.30 |
| 1826 | T3_Y14 | 2.11.4.31 |
| 1827 | T3_Y15 | 2.11.4.32 |