FlexPak® 3000 Drive Operator Interface Module (OIM) User's Guide

Instruction Manual D2-3344

Rockwell Automation

Reliance Electric

The information in this manual is subject to change without notice.

Throughout this manual, the following notes are used to alert you to safety considerations:

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

Important: Identifies information that is critical for successful application and understanding of the product.

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this section in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: Pressing RUN or JOG on the OIM immediately starts the motor if the control source is set to KEYPAD. Make sure the motor and driven machinery are safe to start before pressing either of these keys. Failure to observe this precaution could result in severe bodily injury or loss of life.

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CHAPTER 1

Introduction to the FlexPak OIM

The FlexPak® Operator Interface Module (OIM) is a keypad and display that connects to FlexPak 3000 DC drives. It communicates serially to the drive Regulator board and allows you to change drive parameters, operate the drive, and monitor drive operation.

Changing Drive Parameters

Drive parameters set critical information about the drive, such as the motor rated amps and top speed. You can also use parameters to fine-tune the drive for your application, scale inputs and outputs, view the values of output signals, and configure remote interfaces. For detail on accessing parameters, see chapter 4.

To view and set the most critical parameters quickly, you can use the OIM's Quick Start option, described in chapter 5.

Operating the Drive

After the parameters are configured, you can operate the drive through the OIM. Operation includes setting the source for control (such as the terminal strip, serial port, or OIM) and starting and stopping the drive. For detail on these functions, see chapter 6.

Monitoring Drive Operation

During normal drive operation, the OIM displays the values of two or four drive outputs, such as motor speed and motor load. For information on determining which outputs are displayed, see chapter 6.

If a fault or alarm occurs, the output display is replaced by an alarm or fault message. For information on resolving, clearing, and resetting fault and alarm messages, see chapter 7.

1.1 Related Publications

This manual describes how to use the OIM with the FlexPak 3000 drive. For information on drive installation and drive startup, see the hardware manual shipped with your drive. For parameter descriptions and troubleshooting procedures, see the software manual shipped with your drive.

1.2 Getting Assistance from Reliance Electric

If you have any questions or problems with the products described in this instruction manual, contact your local Reliance Electric sales office. For technical assistance, call 1-800-726-8112.

CHAPTER 2

Description of the OIM Keypad, Display, and Indicators

This chapter describes how to use the keypad, display, and indicators on the OIM to configure, monitor, and control the drive.

Figure 2.1 shows the OIM in program mode with keys, indicators, and screen information identified.

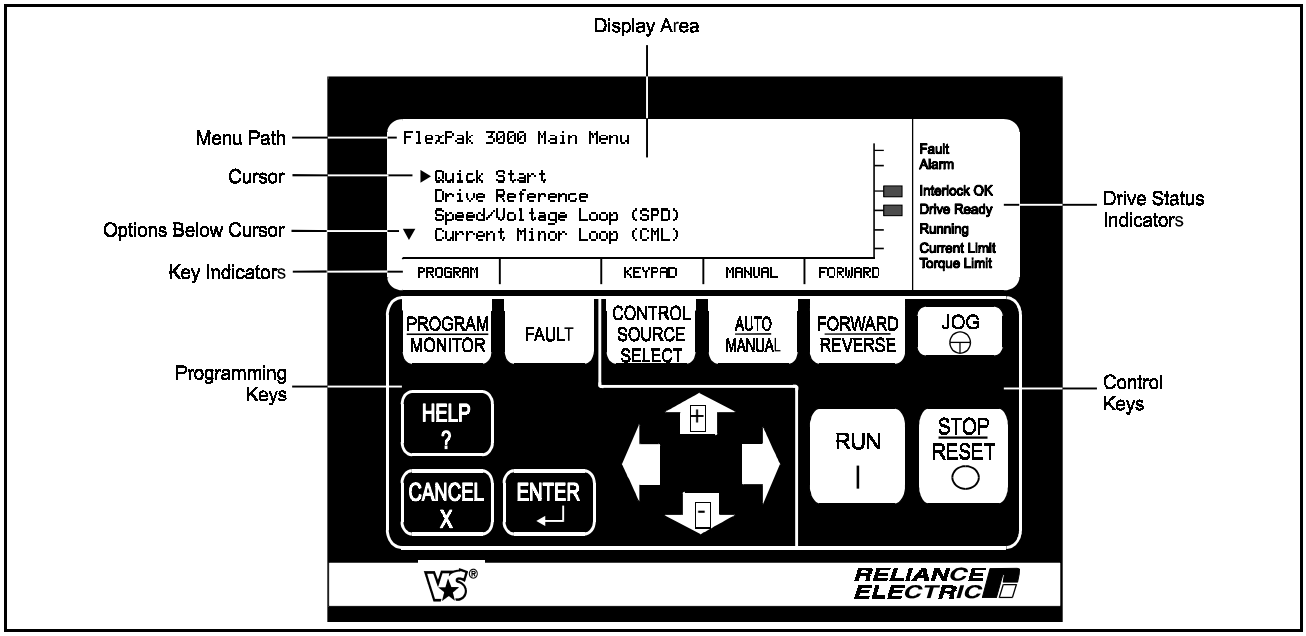


Figure 2.1 – OIM Keypad, Display, and Indicators

2.1 Keypad

The OIM keys are grouped by programming and control functions, as shown in figure 2.1. Programming keys are described in table 2.1. Control keys are described in table 2.2.

Important: STOP RESET is always active when the OIM is communicating with the drive.

Table 2.1 – Programming Key Descriptions

Key	Mode	Function
PROGRAM / MONITOR	Program or Monitor	Switches between program mode and the two monitor mode screens. In fault, alarm, or diagnostics menus, PROGRAM / MONITOR returns you to the program or monitor screen you were in previously. See chapter 7 for information.
FAULT	Program or Monitor	Cycles through the Fault, Alarm, and Diagnostics menus. Use these menus to review, reset, and clear faults and alarms. You can also display diagnostic information for troubleshooting the drive. See chapter 7 for information.
HELP ?	Program	Provides help for menus or parameters. In the Main Menu, provides information about using the menus. In other menus, HELP ? gives a brief overview of the menu options. In a parameter entry screen, HELP ? displays the parameter name, number, type (input or output, retentive or non-retentive), and units of measure. To exit a help screen and return to program mode, press CANCEL X.
	Monitor	Displays the status indicators in the selected language. Press CANCEL X to return to the monitor mode display.
CANCEL X	Program or Monitor	If a fault, alarm, or programming error message is displayed, clears the message and goes to the previous screen. In a fault, alarm, or diagnostics menu, goes to previous screen. In a help screen, exits help and goes to the previous screen.
	Program	In menus, goes to the previous menu until it reaches the Main Menu. At the Main Menu, it has no effect. In parameter entry screens: • If you have started making a change to a value, restores the original value. • If you have not made any changes or pressed ENTER ↵ to accept the change, CANCEL X returns you to the menu.
	Monitor	Goes to program mode from either of the monitor mode screens.

Table 2.1 – Programming Key Descriptions

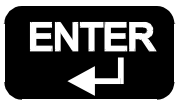
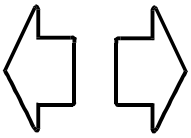
Key	Mode	Function
	Program	In a menu, ENTER selects the option at the cursor. In a parameter entry screen, ENTER allows you to change input parameter values. If a list is available for the parameter, ENTER selects the value at the cursor. When the parameter value has been changed, ENTER saves the new value.
	Monitor	Saves the keypad reference. See section 6.3 for information on the reference.
 	Program	These keys move the cursor between menu items or between the parameters and options in the menus. After you select a parameter to change, these keys increase or decrease the digit at the cursor, or move between items in a list. See chapter 4 for information on changing values. In help screens and fault messages, these keys display more text if it is available.
	Monitor	These keys increase or decrease the keypad reference. See section 6.3 for information on changing the reference.
	Program or Monitor	In menus and the monitor mode screen, ⇦ accesses the Language Selection screen. See section 3.3. In menus and the monitor mode screen, ⇨ displays the Contrast Adjustment screen. See section 3.2. In parameter entry screens, ⇦ and ⇨ move the cursor left and right.

Table 2.2 – Control Key Descriptions

Key	Mode	Function
CONTROL SOURCE SELECT	Program or Monitor	Allows you to select from a list of possible sources for drive control signals. CONTROL SOURCE SELECT is not active when the drive is running or jogging, and during Quick Start and self-tuning. See section 6.2 for information on selecting a control source.
AUTO MANUAL	Program or Monitor	Determines which reference the drive uses. See section 6.3 for information on selecting the reference. This key is only active when CONTROL SOURCE SELECT is set to KEYPAD.
		**ATTENTION:** When switching from auto to manual or from manual to auto, the drive ramps to the reference from the new source at the rate specified by ACCELERATION TIME (P.001) or DECELERATION TIME (P.002). An abrupt speed change might occur, depending on the new reference and the rate specified in these parameters. Make sure personnel are clear of the drive and motor when switching from AUTO to MANUAL or from MANUAL to AUTO. Failure to observe this precaution can result in bodily injury and damage to the equipment.
FORWARD REVERSE	Program or Monitor	Toggles direction of motor rotation when CONTROL SOURCE SELECT is set to KEYPAD. The direction is fixed to FORWARD: • for non-regenerative drives • if REVERSE DISABLE (P.015) is set ON • when an AC tachometer is used • when a pulse encoder with quadrature disabled is used
JOG	Program or Monitor	When CONTROL SOURCE SELECT is set to KEYPAD and the drive is ready, holding JOG down jogs the motor. The motor stops when JOG is released. When jogging, the motor ramps up to JOG SPEED (P.012) or JOG SPEED 2 (P.017) at the speed set by JOG ACCEL/DECEL TIME (P.013). When JOG is released, the drive reference ramps down to zero at the same rate. JOG SPEED 2 (P.017) is only available if DIG IN 0 SELECT (P.428) is set to JOG SPEED SELECT and digital input 0 (terminal 12 on the Regulator board) is on. See your software manual for information.
RUN |	Program or Monitor	When CONTROL SOURCE SELECT is set to KEYPAD and the drive is ready, RUN | applies power to the motor and allows it to accelerate to the reference.

Table 2.2 – Control Key Descriptions

Key	Mode	Function
STOP RESET	Program or Monitor	If the drive is running, STOP RESET stops the drive as selected by STOP MODE SELECT (P.114). When the OIM is connected and communicating with the drive, STOP RESET is always active, regardless of the setting of CONTROL SOURCE SELECT. If the drive is not running and CONTROL SOURCE SELECT is set to KEYPAD, STOP RESET resets any active faults and alarms. It does not clear the fault and alarm logs. See chapter 7 for information on resetting faults and alarms.
		ATTENTION: The user must provide an external, operator-accessible coast/stop pushbutton at terminals 7 and 8 on the Regulator board to disable the machine in case of improper operation. Uncontrolled machine operation can result if this procedure is not followed. Failure to observe this precaution could result in severe bodily injury or loss of life.

2.2 The Display

The OIM screens help you configure and monitor the drive. Figure 2.2 shows the OIM screen at the Main Menu in program mode.

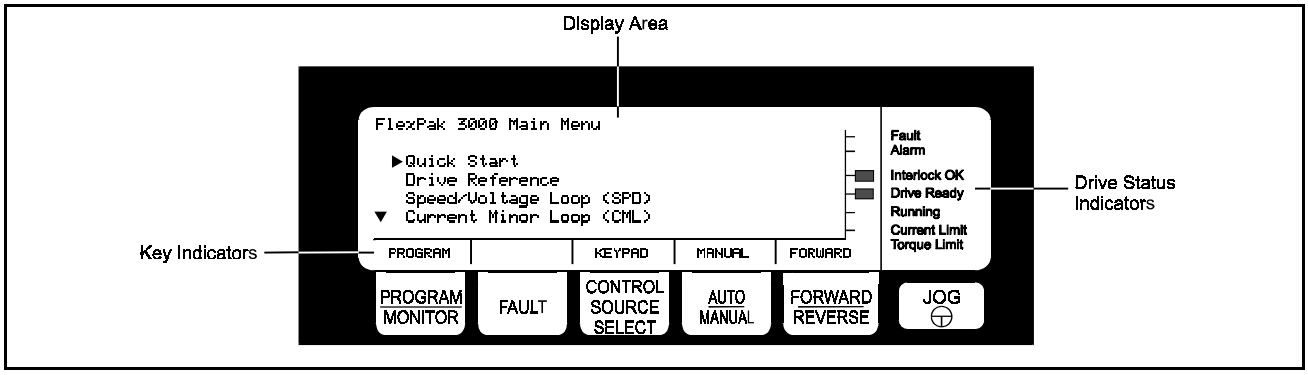


Figure 2.2 – OIM Display in Program Mode

The display contains three main areas:

- The drive status indicator area.
- The display area, where the program or monitor mode information is displayed. See chapter 4 for information on program mode. See chapter 6 for information on monitor mode.
- The key indicator area.

2.2.1 Drive Status Indicators

The indicators on the right of the display allow you to check the status of the drive. In figure 2.2, the Interlock OK and Drive Ready indicators are shown on. The indicators are described in table 2.3.

Table 2.3 – Drive Status Indicators

Indicator	State	Description
Fault	On	At least one fault has occurred. See chapter 7 for fault information.
	Off	There are no faults.
Alarm	On	At least one alarm has occurred. See chapter 7 for alarm information.
	Off	There are no alarms.
Interlock OK	On	The coast/DB contact and all customer interlocks (Regulator board terminal 9) are closed. See the hardware manual for more information.
	Off	One or more customer interlocks or the coast/DB contact is open.
Drive Ready	On	Drive is ready to run or jog. All customer interlocks are closed, the coast/DB contact is closed, and there are no faults.
	Off	Drive is not ready. See chapter 7 for diagnostics information.
Running	On	The contactor is closed and the motor armature is energized in either run or jog mode. The drive is running.
	Off	The contactor is open and the drive is not running.
Current Limit Torque Limit	On	Drive is operating at the maximum allowable current or torque.
	Off	Drive is not at the maximum allowable current or torque.

2.2.2 Key Indicators

There are five indicators at the bottom of the screen above the keys. When CONTROL SOURCE SELECT is set to KEYPAD, these indicators tell you which setting is selected by the key. If one of the other control sources is selected, these indicators tell you the setting selected by that control source.

In figure 2.2, the keys are set to PROGRAM, KEYPAD, MANUAL, and FORWARD. Indicators are described in table 2.4.

Table 2.4 – Key Indicators

Key Indicator Above	Possible Indications	Description
PROGRAM/MONITOR	PROGRAM	OIM is in program mode.
	MONITOR	OIM is in monitor mode.
	(blank)	OIM is in a fault, alarm, or diagnostic menu.
FAULT	FAULT	Fault Menu is displayed.
	ALARM	Alarm Menu is displayed.
	DIAGS	Diagnostics Menu is displayed.
CONTROL SOURCE SELECT	TERMBLK	Signals at the Regulator board terminal strip control the drive.
	NETWORK	A network is controlling drive operation. Blinks when network communication is not active.
	SERIAL	Drive is controlled through its serial port, typically by the CS3000 software.
	KEYPAD	OIM keys control drive operation.
AUTO/MANUAL	AUTO or MANUAL	Depends on the setting of CONTROL SOURCE SELECT. See section 6.2.
FORWARD/REVERSE	FORWARD	The drive is configured to run the motor in the forward direction.
	REVERSE	The drive is configured to run the motor in the reverse direction.

2.2.3 Special Display Characters

There are several special characters you might see on the display. They are described in table 2.5.

Table 2.5 – Special Display Characters

► or ▮	The cursor. Indicates the currently selected options. Use + and – to move the ► cursor. Use ⇦ and ⇨ to move the ▮ cursor.
▲	Displayed if more text or options are available above the top selection. Press + to view the information.
▼	Displayed if more text or options are available below the top selection. Press – to view the information.
	Locked cursor. Displayed instead of ► if a menu or parameter option is not available.

CHAPTER 3

Powering Up and Adjusting the OIM

This chapter tells you what to expect on power-up and power-down and how to make adjustments for your application.

3.1 Powering Up the OIM

The OIM is powered when the drive is powered. During power up, the OIM establishes communication with the drive and reads drive information from the Regulator board. The OIM indicators are off and the display goes through the power-up sequence shown in figure 3.1.

Important: See the hardware manual for instructions on powering up the drive.

First Screen on Power-Up

```
WELCOME TO THE FLEXPAK 3000
DIGITAL DC DRIVE
      (c) Copyright Reliance Electric
 Industrial Company 1994
      Keypad Version: xxxx
Running keypad/display diagnostics
Please wait.
```

Second Screen on Power-Up

```
Link initialization in progress.



Reading Regulator data.
Please wait.
```

Figure 3.1 – OIM Power-Up Sequence

When the power-up sequence is complete, the OIM enters program or monitor mode, depending on the mode when it was powered down. Any faults or alarms detected during power-up are displayed before you see the normal displays. See chapter 7 for information on alarms and faults.

Important: The OIM is powered down with the drive. Make sure changes are saved before powering down the drive. If parameter changes are not saved, they will be lost. See section 4.4, “Saving and Restoring Parameter Values”.

3.2 Adjusting the Screen Contrast

If the display is difficult to read, you can adjust the contrast. You can do this at any time except when you are in a parameter value entry screen or during self-tuning. You might need to change the display contrast periodically because of ambient temperature changes.

To adjust the screen contrast:

Step 1. Press ⇨. The contrast adjustment screen is displayed, as shown in figure 3.2.

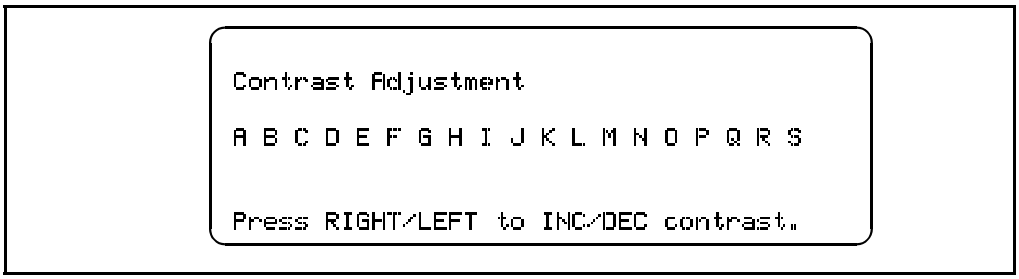


Figure 3.2 – Contrast Adjustment Screen

Step 2. Use ⇨ to increase the contrast (make the screen darker) or ⇦ to decrease the contrast (make the screen lighter).

Step 3. Press ENTER to accept the new contrast. The previous screen is displayed.

To save the new configuration through a power cycle, you must use Memory Save. See section 4.4, “Saving and Restoring Parameter Values”.

3.3 Changing the Language Displayed on the OIM

The OIM can display text in English, German, French, Spanish, or Italian. In addition, you can select CODE, which displays the parameter code numbers instead of names, with all other text in English. (Parameter code numbers are provided in the software manual.) The default language setting is English. You can change the language at any time except when you are in a parameter value entry screen or during self-tuning.

To change the language:

Step 1. Press ⇦. The language select screen is displayed, as shown in figure 3.3. The currently selected option is displayed in the upper right.

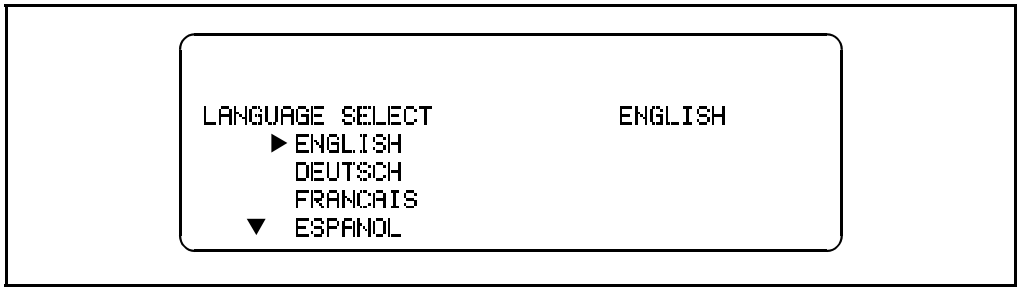


Figure 3.3 – Language Selection Screen

Step 2. Press ⇧ or ⇩ until the cursor (►) is pointing to the language you want.

Step 3. Press ENTER to accept the new language.

The message “Please Wait” in the new language is displayed for a few seconds. The display then returns to the previous screen, with text shown in the new language.

To save the new setting through a power cycle, you must use Memory Save. See section 4.4, “Saving and Restoring Parameter Values”.

3.4 Scaling Values Displayed on the OIM

If needed, you can scale speed, load, and outer control loop units to match your application requirements. You can select from pre-defined units, or configure your own units through the OTHER option. (OTHER is available only for speed and outer control loop units.) Scaling these units affects only the OIM display.

If you do not change these values, they are set to the defaults of:

- RPM for speed units
- %FLA for load units
- % for outer control loop units

The scaling options are:

- Speed units: RPM, %, or OTHER
- Load units: %FLA or AMPS
- Outer control loop units: AMPS, %, or OTHER

User units affect the monitor mode displays, including display of the serial and keypad references and the parameters listed in table 3.1.

Table 3.1 – Parameter Displays That are Affected by Scaled Units

Parameter Displays Affected by Speed Units	
ANALOG AUTO REFERENCE (P.188)	PRESET SPEED 2 (P.118)
ANALOG MAN REFERENCE (P.192)	PRESET SPEED 3 (P.119)
ANALOG MAN TRIM REF (P.194)	PULSE TACH FEEDBACK (P.292)
ANALOG TACH FEEDBACK (P.291)	SPD LOOP ERROR (P.297)
CURRENT COMPOUND TP (P.293)	SPD LOOP FEEDBACK (P.296)
JOG RAMP OUTPUT (P.294)	SPD LOOP LAG OUTPUT (P.298)
JOG SPEED (P.012)	SPD LOOP REFERENCE (P.295)
MAXIMUM SPEED (P.004)	SPD SOURCE SELECT OUT (P.193)
MINIMUM SPEED (P.003)	SPEED RAMP INPUT TP (P.198)
MOP OUTPUT (P.191)	SPEED RAMP OUTPUT (P.199)
OCL OUTPUT (P.848)	STOP SPEED THRESHOLD (P.113)
PRESET SPEED 1 (P.117)	TRIM OUTPUT (P.197)
Parameters Affected by Outer Control Loop Units	
OCL FEEDBACK (P.847)	OCL REFERENCE (P.845)
OCL RAMP OUTPUT (P.846)	OCL REF REGISTER (P.801)
Parameter Displays Affected by Load Units	
CML ERROR (P.398)	SPD LOOP OUTPUT (P.299)
CML FEEDBACK (P.397)	TORQUE REFERENCE (P.189)
CML REFERENCE (P.396)	

3.4.1 Changing the Scaling of Speed, Load, and Outer Control Loop Units

Examples in this procedure are for speed unit scaling. The same basic steps are used to configure load and outer control loop units.

To scale units:

Step 1. Press PROGRAM MONITOR until the key indicator reads PROGRAM. Press CANCEL X until "FlexPak 3000 Main Menu" is displayed at the top of the screen.

Step 2. Press ↓ to point the cursor (►) to Operator Interface. Press ENTER.

Step 3. Press ↓ to point the cursor to Define User Units. Press ENTER to display the menu shown in figure 3.4.

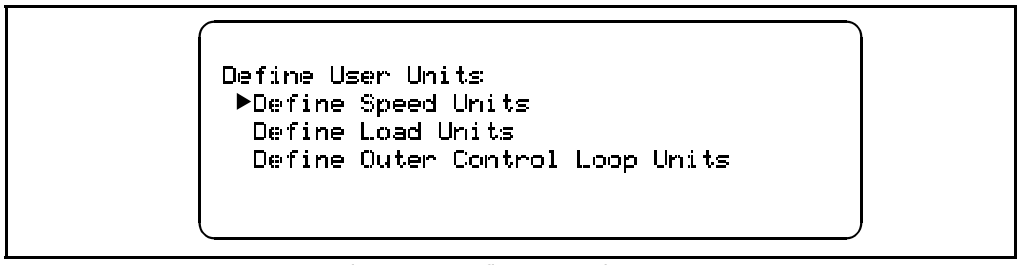


Figure 3.4 – Define User Units Menu

Step 4. Press ↓ until the cursor is pointing to the option you want. Press ENTER. After a few seconds, the Define Units screen is displayed, shown in figure 3.5. The currently selected units shown on the right side of the screen.

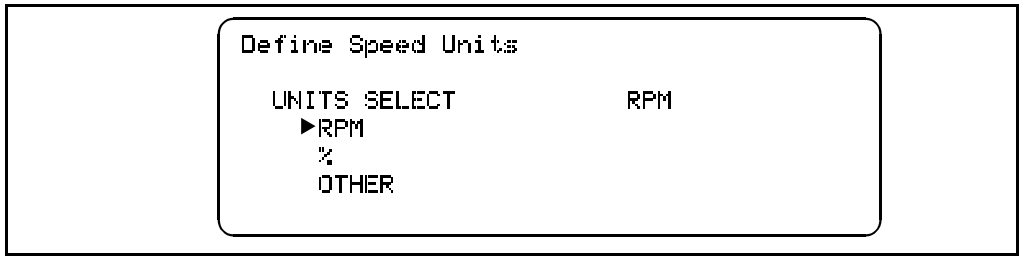


Figure 3.5 – Define Speed Units Screen

Step 5. Move the cursor to the units of measure that you want. Press ENTER

- If you selected RPM, %, %FLA, or AMPS: The units are changed and you are returned to the Define User Units screen. To save the new units through a power cycle, you must use Memory Save. See section 4.4.
- If you selected OTHER: See the next section.

3.4.2 Scaling Speed or Outer Control Loop Units to Custom Settings

Complete the procedure in “Changing the Scaling of Speed, Load, and Outer Control Loop Units” on page 3-5 before proceeding.

If you selected OTHER for the speed or outer control loop units, screens are displayed that allow you to customize your scaling units. The first screen for the speed units is shown in figure 3.6.

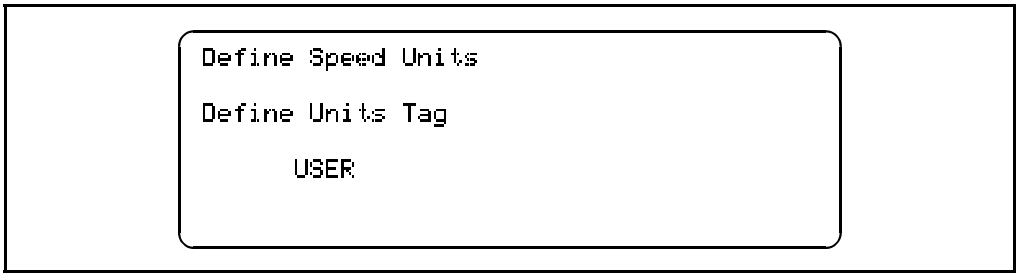


Figure 3.6 – Define Custom Speed Units — Tag Screen

ATTENTION: If you exit from the procedure for configuring OTHER speed units before completing it, incorrect values might be displayed for the parameters and displays affected by scaling. If you exit before completion, repeat the Define Speed Units procedure above to reset the scaling to RPM, HERTZ, or %, as appropriate for your application. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

To define OTHER units:

Step 1. In the screen shown in figure 3.6, name the units of measure. The name can be up to six characters long. To create the name:

- You are at the first character. Press + or – to scroll to the character you want.
- Press → to move to the next character. Scroll to the character you want.
- Repeat this procedure for each character until the tag is complete.

Step 2. Press ENTER when the tag is correct. After a few seconds, the full scale value screen is displayed, as shown in figure 3.7.

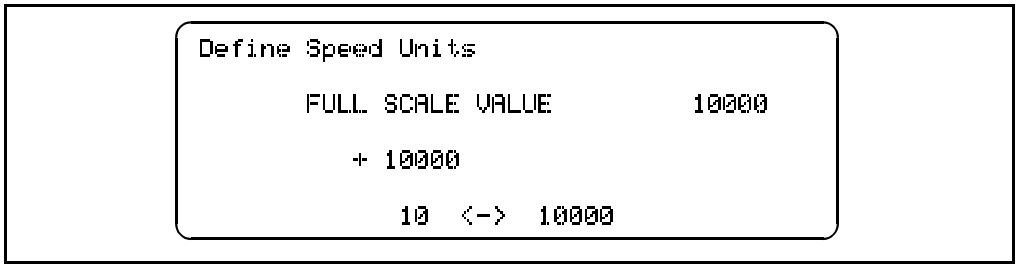


Figure 3.7 – Define Speed Units — Full Scale Value Screen

Step 3. Determine the full scale value for your display units. This is the value that will be displayed for the maximum value of the units. For example, if TOP SPEED (P.011) is set at 1750 RPM and you want to display 100 inches/second when the speed is at 1750 RPM, you will enter a full scale value of 100.

The full scale value can be from 1 to 10,000.

Step 1. To configure the full scale value, press ⇦ or ⇨ to move the cursor (▮) to the number or the sign that needs to change. Press ⇧ or ⇩ to change the number or sign. When the value is correct, press ENTER.

Step 2. If your value is relatively low, you can set one or two decimal points. (If your value is high, you cannot set decimal points. Go to step 4.)

The decimal place screen is displayed after a few seconds, as shown in figure 3.8. Continue this procedure.

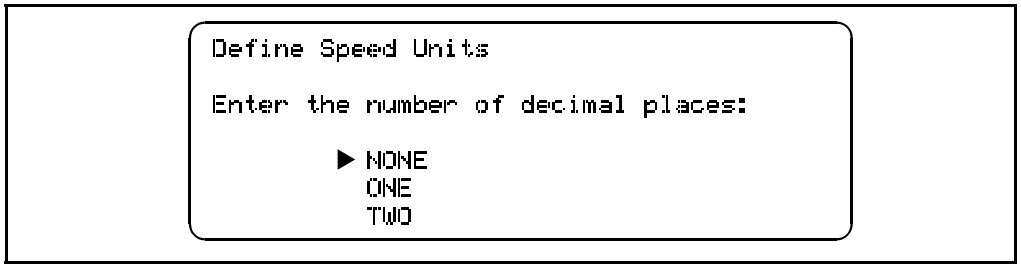


Figure 3.8 – Define Speed Units — Decimal Place Screen

Step 3. Press ⇧ to move the cursor to the decimal places you want. Press ENTER.

Step 4. Custom unit configuration is complete and you are returned to the menu.

To save the new units through a power cycle, you must use Memory Save. See section 4.4.

CHAPTER 4

Basics of Configuring the Drive Using the OIM

Configuring the drive customizes it for your application. You can use the OIM, CS3000 software, or network to configure the drive. This chapter describes how to use the OIM to configure the drive, including:

- access parameters and make changes to them
- restore factory default values for the parameters
- self-tune the drive (which lets the drive configure some parameters for you)
- use a password to protect your configuration
- save changes to parameters

Appendix A of this manual lists full menu paths for accessing parameters. For parameter descriptions, see the software manual.

4.1 Types of Parameters

Parameters can be inputs or outputs, tunable or configurable, and retentive or non-retentive.

- Input: You can change the value of the parameter through the OIM.
- Output: Provides output information. Value cannot be changed through the OIM.
- Tunable: Parameter value can be changed when the drive is running.
- Configurable: Parameter value cannot be changed when the drive is running.
- Retentive: Parameter value is stored in the drive even when power is off. To save changes to the values, a Memory Save must be performed before removing power.
- Non-retentive: Changes to the parameter value are not saved when power is removed.

4.2 Accessing OIM Menus and Parameters

OIM menus and parameters are accessed in program mode. To select program mode, press PROGRAM MONITOR until the key indicator reads PROGRAM.

If you exit from a menu or parameter list using PROGRAM MONITOR, you return to monitor mode. When you return to program mode, the last menu or parameter that was displayed is displayed again. To go to the Main Menu, press CANCEL X until "FlexPak 3000 Main Menu" is displayed at the top of the screen.

4.2.1 Accessing the Menus

When you enter program mode for the first time after power-up, the Main Menu is displayed, as shown in figure 4.1. All menus are accessed from the Main Menu.

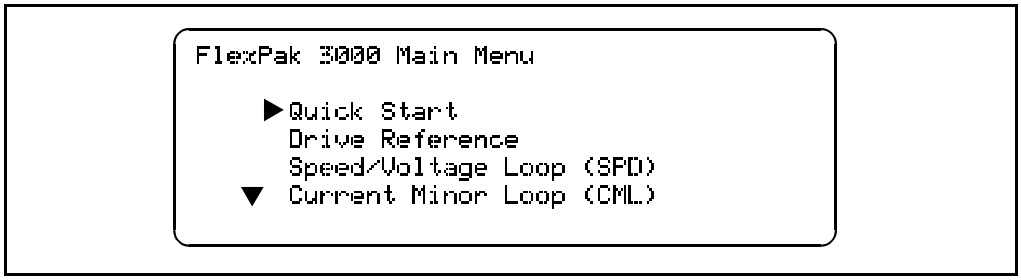


Figure 4.1 – Main Menu Screen

To view the rest of the menu, press ↓. The full Main Menu includes:

- Quick Start
- Drive Reference
- Speed/Voltage Loop (SPD)
- Current Minor Loop (CML)
- Outer Control Loop (OCL)
- Input/Output
- Network Communications
- Field
- Drive Information
- Operator Interface
- Additional Parameters

Menus contain other menus and parameters.

To select an item in a menu, press ↑ or ↓ until the cursor (►) is pointing at the item. Press ENTER. The menu or parameters in that menu item are displayed.

4.2.2 Using Help in Program Mode

In program mode, you can access help for menus and parameter entry screens. To get help, press HELP ? when the menu or parameter entry screen is displayed. When you have read the help screen, press CANCEL X to return to the previous screen.

If you see ▲ or ▼ on the help screen, there is more text. Press + or – to display the additional text.

The Main Menu help screen is shown in figure 4.2.

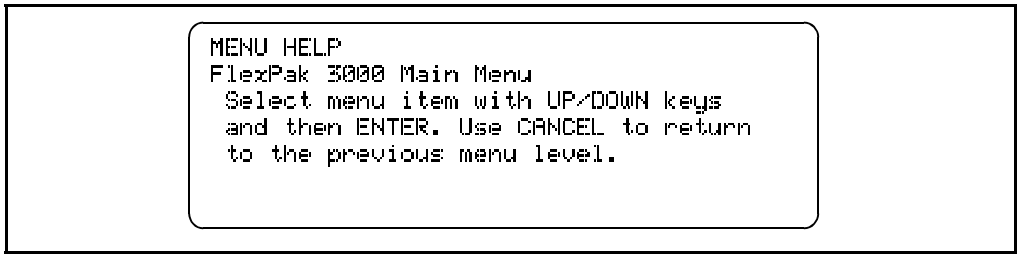


Figure 4.2 – Main Menu Help Screen

In a menu, help gives an overview of the menu options. The Drive Reference menu help is shown in figure 4.3.

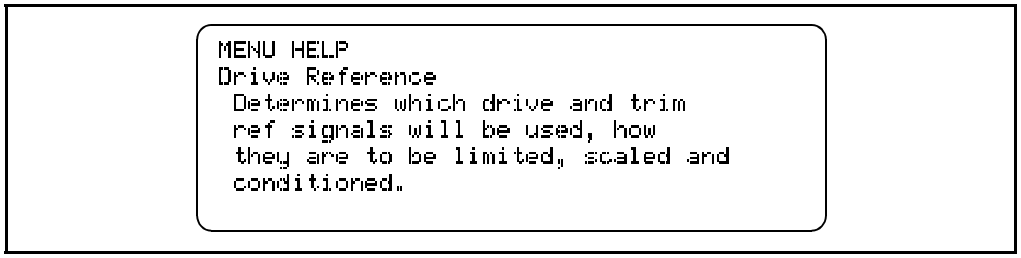


Figure 4.3 – Example of the Drive Reference Menu Help Screen

In a parameter entry screen, the help screen gives you the parameter name, number, type, and units of measure. A typical parameter help screen is shown in figure 4.4.

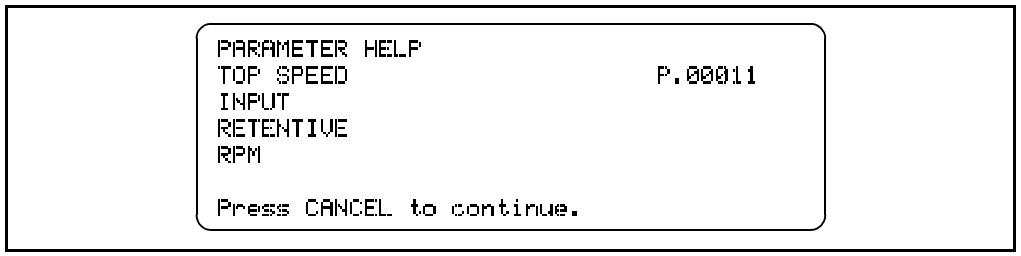


Figure 4.4 – Example of a Parameter Help Screen

In the help screen shown in figure 4.4:

- The name of the parameter is TOP SPEED.
- The parameter number (code) is P.00011.
- The parameter type is INPUT. The parameter type can also be OUTPUT.
- The save type is RETENTIVE. The save type can also be NON-RETENTIVE.
- The units of measure are RPM. If units of measure do not apply, this line is blank.

For full descriptions of parameters, see the software manual.

4.2.3 Accessing the Parameters

Parameters are accessed through the menus. The menu paths to get to parameters are provided:

- In appendix A of this manual.
- As part of the parameter descriptions in the software manual.

Some parameters and parameter options are only available if the appropriate option is installed. For example, the ANALOG IN 1 option for TRIM REFERENCE SELECT (P.108) is only displayed if an I/O Expansion kit is installed. The cursor changes to a lock ( ) for parameters or options that are not available.

If you exit program mode from a parameter entry screen, you are returned to that screen when you come back to program mode.

Basics of Accessing a Parameter

Step 1. Select the menu that contains the parameter.

Step 2. Press ENTER. The next menu or parameter list is displayed. Repeat steps 1 and 2 for each menu until the parameter list you want is displayed.

Step 3. Move the cursor to the parameter you want to change. Press ENTER.

The parameter value entry screen is displayed. It allows you to look at or change parameter values.

Example of Accessing the METER OUT 1 SELECT Parameter

Step 1. At the Main Menu, press ⇩ to move the cursor (►) to Input/Output as shown in figure 4.5.

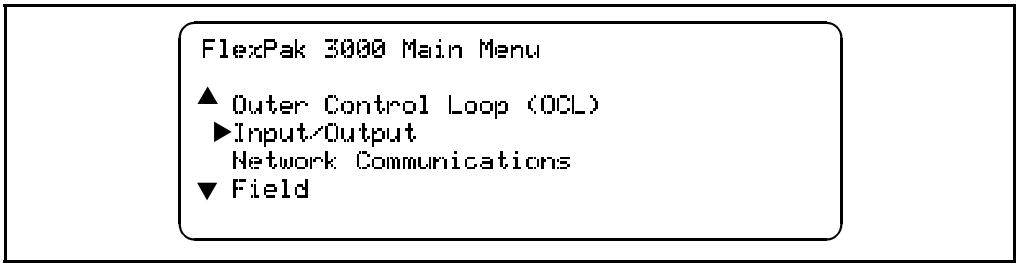


Figure 4.5 – Selecting the Input/Output Menu

Step 2. Press ENTER. The Input/Output menu is displayed, as shown in figure 4.6.

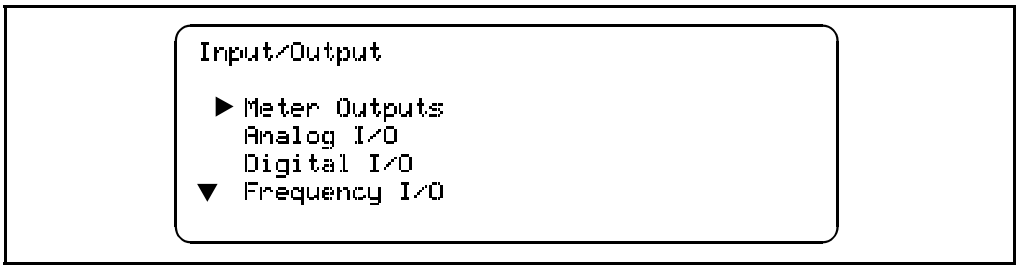


Figure 4.6 – Input/Output Menu

Step 3. Make sure the cursor is pointing at Meter Outputs. Press ENTER. The Meter Outputs menu is displayed, as shown in figure 4.7.

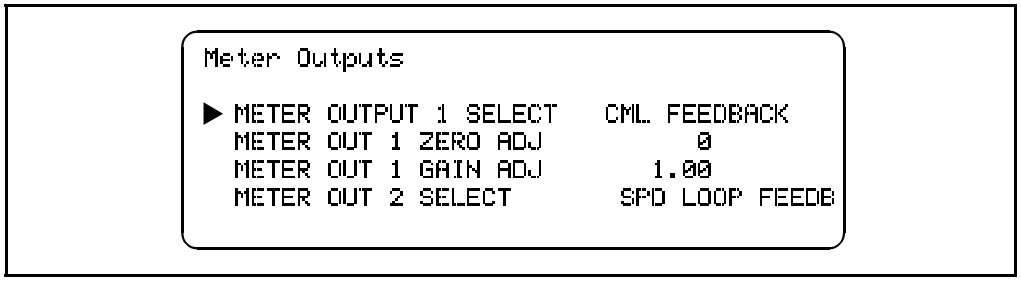


Figure 4.7 – Meter Outputs Menu

At this point, you can view or change parameter values. See the next sections.

4.2.4 Viewing Parameter Values

In the parameter lists, parameter values are shown to the right of the parameter name, as shown in figure 4.7. After looking at the parameter values, press CANCEL to return to the previous menu.

Output parameters are updated from the drive approximately twice per second.

4.2.5 Changing Parameter Values

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this section in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

You can change the values of input parameters in parameter value entry screens. You cannot change the value of output parameters. Figure 4.8 shows an example of the parameter entry screen for ACCELERATION TIME (P.001).

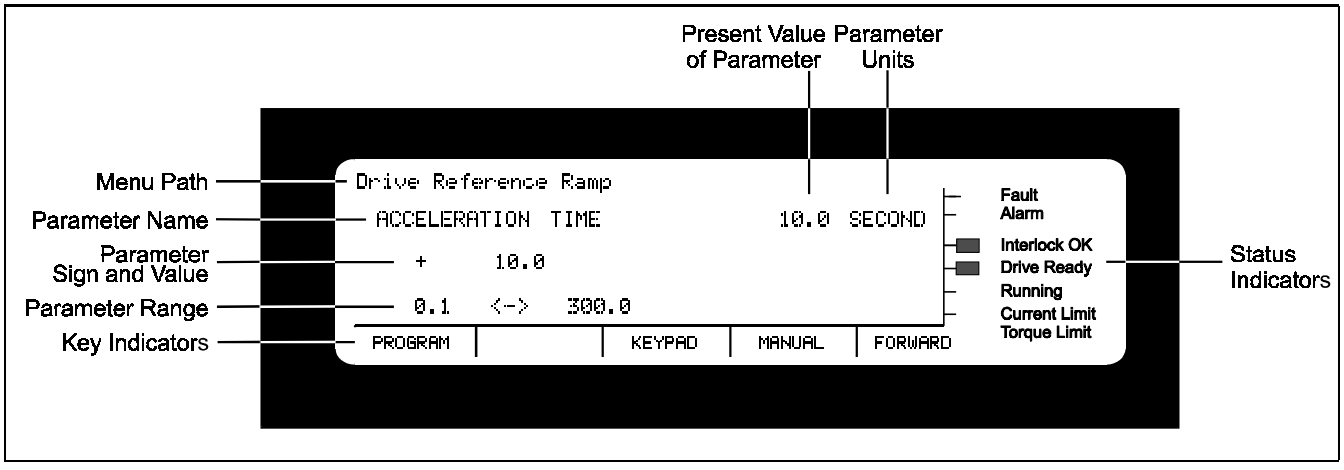


Figure 4.8 – Example of a Parameter Entry Screen

Important: To exit a parameter entry screen without making changes, press CANCEL X.

To change a parameter value:

Step 1. Go to the menu that contains the parameter you want to change by using the procedure in section 4.2.3, “Accessing the Parameters”.

Step 2. Press ↓ to move the cursor until it points to the parameter. Press ENTER.

Step 3. You will see either:

- the existing value with the cursor blinking at the far right digit, like the screen shown in figure 4.8.
- a list of options, like the screen shown in figure 4.9.

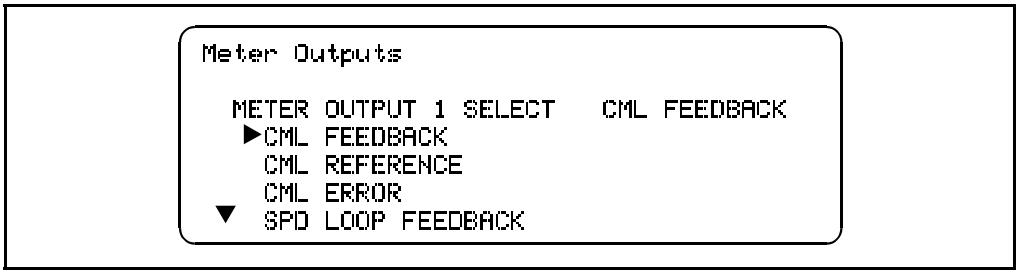


Figure 4.9 – Parameter Entry Screen with a List of Options

Step 4. If the existing value is shown, go to step 5. If you see a list of options:

a. Move the cursor to the option you want to select.

b. Press ENTER to accept the option.

c. Go to step 7.

Step 5. If you see the existing value:

a. Use ← and → to move the cursor to the number or sign you want to change.

b. Press + or ↓ to change the number or sign. When changing:

- If the right-most digit is increased past 9, the digit to the left is increased by one. Incrementing any other digit does not increase the digit to the left. For example, if 19**9** is displayed, press + to change the value to 200. If 1**9**9 is displayed, + changes the value to 109.
- If the field is blank and you fill in the left-most digit, the digits to the right are automatically filled in with zeros.
- You cannot enter a number out of the parameter’s range. The drive clamps values to a minimum and maximum.
- Press CANCEL X to restore the previous value. You can then either change the value or press CANCEL X again to exit the parameter entry screen without accepting any changes.

Step 6. Press ENTER to accept the changed value and go to step 7.

Step 7. Press CANCEL to return to the list of parameters.

Step 8. To save the changes to the parameters, you must perform a memory save. See section 4.4, “Saving and Restoring Parameter Values”.

Step 9. Record changes to parameter values in the software manual.

4.2.6 Parameter Values That Cannot Be Changed

In some cases, you cannot change parameter values. If this is the case, an error message is displayed when you try to select the parameter. The situations in which you cannot change parameter values are:

- When the drive is running and the parameter you are changing is configurable. Configurable parameters cannot be changed while the drive is running or jogging. Stop the drive to change the parameter.
- When password or hardware program protection is enabled. See section 4.3, “Using a Password to Protect Configuration”, for information on password program protection. See the hardware manual for hardware program protection.
- If the parameter is an output. Output parameters can only be displayed.

4.3 Using a Password to Protect Configuration

To prevent changes to parameters from the OIM, you can use software or hardware program protection. Program protection does not affect keypad control (including the manual reference), the contrast and language configuration, the fault and alarm options, or monitor mode. It has no effect on changes made through the serial port.

Hardware-based program protection is enabled by a jumper setting and is described in the hardware manual. Software-based program protection is enabled through the PASSWORD parameter and is described later in this section.

Important: Hardware program protection takes precedence over software program protection. If hardware program protection is set to DISABLE, the PASSWORD parameter is ignored.

ATTENTION: It is the user’s responsibility to distribute the security password. Reliance is not responsible for unauthorized access violations within the user’s organization. Failure to observe this precaution could result in bodily injury.

When password program protection is enabled and you select a parameter, the message “Do you wish to enter the password to DISABLE program protection” is displayed. You must enter the password to change the parameter. This disables software program protection. To re-enable software program protection, repeat the following procedure.

If you do not enter the correct password when you try to change a parameter, the message “PROGRAM ERROR! PASSWORD PROTECTION IS ENABLED” is displayed.

The PASSWORD parameter toggles the program protection setting. If program protection is enabled, this procedure disables it. If disabled, the procedure enables it.

To enable or disable software program protection:

Step 1. Press CANCEL until the PROGRAM MONITOR indicator reads PROGRAM and “FlexPak 3000 Main Menu” is displayed at the top of the screen.

Step 2. Select the Operator Interface menu.

Step 3. Select the PASSWORD parameter.

- If program protection is currently disabled: The message “Do you wish to enter the password to ENABLE program protection?” is displayed.
- If program protection is currently enabled: The message “Do you wish to enter the password to DISABLE program protection?” is displayed.

Step 4. Select YES or NO. Press ENTER.

- YES: Changes the setting. The screen shown in figure 4.10 is displayed. Go to step 5.
- NO: Keeps the current setting. You are returned to the Operator Interface menu and no change is made.

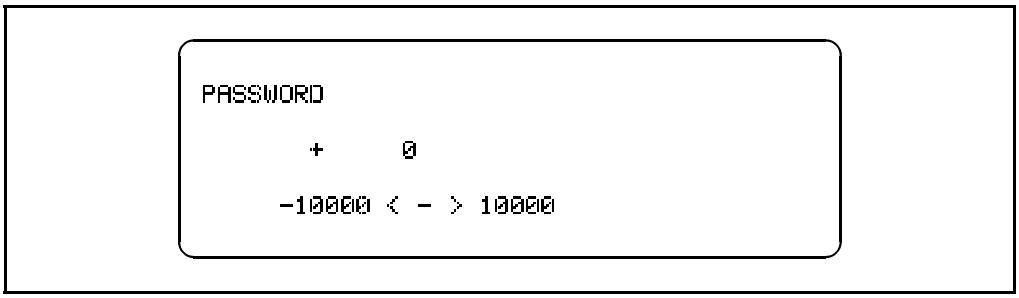


Figure 4.10 – PASSWORD Parameter Entry Screen

Step 5. Press + to change the value to 55. (You cannot set a different password.) Press ENTER. You are returned to the Operator Interface menu and the PASSWORD setting is changed.

Step 6. To save changes to the PASSWORD parameter through a power cycle, the configuration must be saved using the CS3000 software. See the CS3000 software manual for information.

4.4 Saving and Restoring Parameter Values

Through the OIM, you can save parameter values, restore parameter values from a previous save, or restore default parameter values.

Memory Save

You must use Memory Save to save changes to parameter values and the language setting through a power cycle. Any values that are not saved revert to the previous value on power cycle.

Important: Memory Save does not save the PASSWORD parameter setting. To save the PASSWORD, you must use the CS3000 software.

Memory Restore

Restores the parameter values and monitor mode configuration from the last Memory Save. Use Memory Restore if changes were made to the OIM that you do not want to keep. If a Memory Save has never been performed, the factory defaults are restored.

Restore Defaults

Restores parameter values and monitor mode to the configuration set by the factory.

Important: After performing Restore Defaults, you should configure the parameters in the Quick Start menu and perform the self-tuning procedure, described in chapter 5.

4.4.1 Using Memory Operations to Save and Restore Parameter Values

To save, restore, or restore defaults:

Step 1. Press CANCEL X until the PROGRAM MONITOR indicator reads PROGRAM and “FlexPak 3000 Main Menu” is displayed at the top of the screen.

Step 2. Select Operator Interface. Press ENTER.

Step 3. Select Memory Operations. Press ENTER. The menu shown in figure 4.11 is displayed.

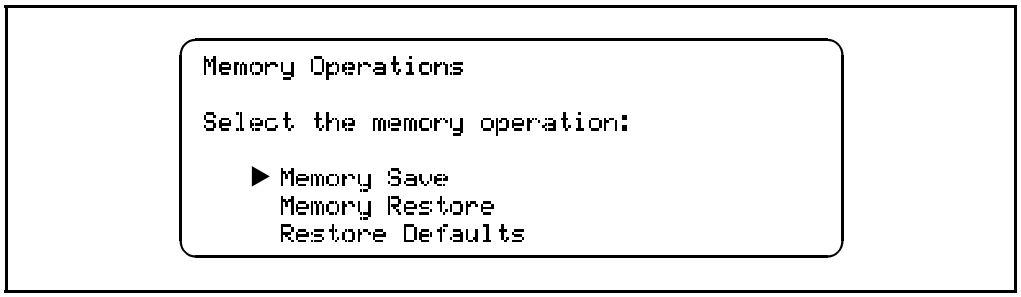


Figure 4.11 – Memory Operations Screen

Step 4. Select the action you want to perform. Press ENTER. Depending on the action you select, you will see:

- Memory Save: "The current parameter values will be saved to memory. Continue?"
- Memory Restore: "The last saved values will be restored. Continue?"
- Restore Defaults: "The factory default values will be restored. Continue?"

An example of the Memory Save message is shown in figure 4.12.

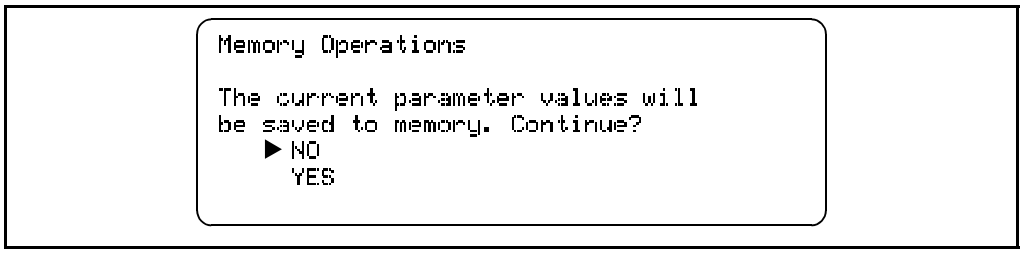


Figure 4.12 – Memory Save Screen

Step 5. To select YES, press ⇩.

Step 6. Press ENTER. You are returned to the Memory Operations menu. Memory Save, Memory Restore, or Restore Defaults is complete.

4.4.2 Saving Parameter Values When Exiting Program Mode

In program mode, if you press PROGRAM MONITOR when you are in a menu or parameter entry screen and have not yet saved parameter changes, you are prompted to save them. The prompt is shown in figure 4.13.

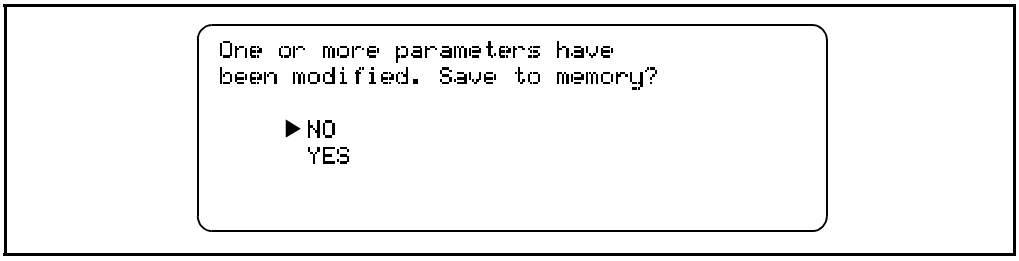


Figure 4.13 – Parameters Have Been Modified Screen

Select YES and press ENTER. The message shown in figure 4.14 is displayed.

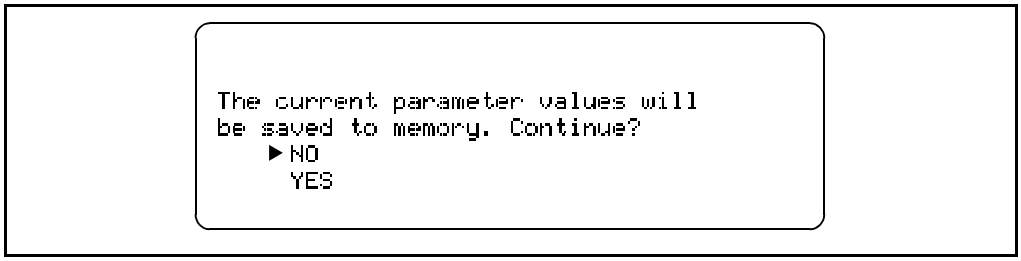


Figure 4.14 – Save Current Parameter Values Screen

To save the changes and go to monitor mode, select YES and press ENTER.

(To go to monitor mode without saving changes, select NO and press ENTER on either of these screens.)

CHAPTER 5

Using Quick Start

Quick Start lets you configure the most commonly used parameters through one menu. This helps you set up the drive as quickly as possible.

Brief descriptions of Quick Start parameters are provided in section 5.5 in the order they are displayed as you go through Quick Start. For full parameter descriptions, see the software manual. Record your parameter configuration in the software manual.

5.1 Preparing for Quick Start

Before performing Quick Start, you must:

- be qualified to configure the drive and be familiar with operation of DC drives.
- be familiar with operation of the OIM. Refer to chapter 2.
- have completed all hardware installation as described in the hardware manual.
- record this motor data from each motor nameplate for use during Quick Start:
  - motor rated amps: _____
  - motor rated volts: _____
  - motor base speed: _____
  - if field weakening is used: field weakened speed: _____
  - encoder or tachometer: _____
  - motor hot field amps: _____
- properly connect the drive to the motor.

5.2 Using the Quick Start Exit Menu

Quick Start automates the process of entering values for selected parameters by taking you to the next Quick Start parameter after you accept a parameter value. If you want to return to a parameter or exit Quick Start before the process is complete, press CANCEL X. The Quick Start Exit Menu is displayed, as shown in figure 5.1.

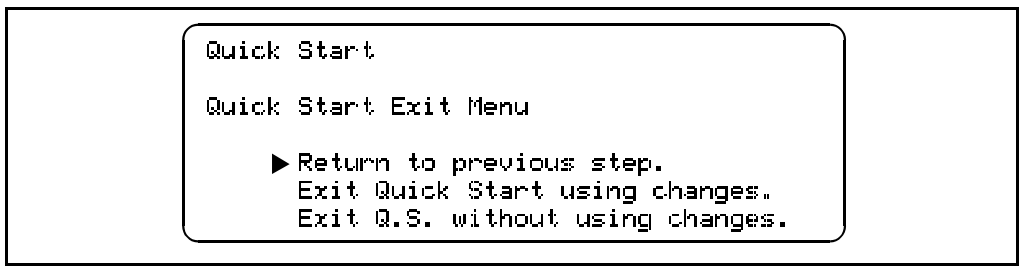


Figure 5.1 – Quick Start Exit Menu

Use + or – to move the cursor to the option you want. Press ENTER.

The exit options are:

- Return to previous step: Returns to the previous parameter. After you accept that parameter value, Quick Start resumes from that parameter. To go back several parameters, you can press CANCEL X and select “Return to previous step” as many times as needed.
- Exit Quick Start using changes: Exits Quick Start and accepts any changes. You must use Memory Save to save the changes through a power cycle. See section 4.4, “Saving and Restoring Parameter Values”, for more information.
- Exit Q.S. without using changes: Exits Quick Start. Changes are ignored.
- To leave the exit menu without selecting any of the options: Press CANCEL X. You return to the Quick Start parameter entry screen.

5.3 Configuring the Drive Using Quick Start

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this section in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: Incorrect values for some of the parameters in Quick Start can cause the drive to operate improperly. Verify that the values of these parameters are appropriate for your application. Failure to observe these precautions could result in bodily injury.

Important: If program protection is enabled, you cannot change Quick Start parameters. See section 4.3, “Using a Password to Protect Configuration”, to disable password program protection, or the hardware manual for removing hardware program protection.

Before performing Quick Start, you might need to configure the AC line parameters, AC LINE PERIOD (P.393) or AC LINE VOLTAGE (P.392), for your application. Generally, you only need to configure these parameters if the default values for these parameters are incorrect for your application (typically indicated by the alarm AC LINE VOLTAGE HIGH or AC LINE VOLTAGE LOW). If you need to adjust these parameters, you should change them before performing Quick Start. See the software manual for descriptions of these alarms and parameters.

To use Quick Start:

Step 1. Make sure the drive is stopped (the Running status indicator is off).

Step 2. Press CONTROL SOURCE SELECT and select KEYPAD. Press ENTER. (See section 6.2 for more detail on selecting a control source.)

Step 3. Press PROGRAM MONITOR until its key indicator reads PROGRAM.

Step 4. Move the cursor (►) to the Quick Start menu. Press ENTER.

Quick Start begins. The first parameter is displayed, as shown in figure 5.2.

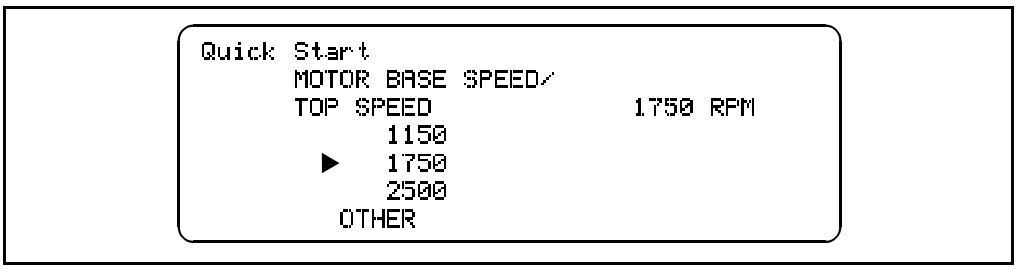


Figure 5.2 – First Quick Start Parameter Entry Screen

Step 5. Use the procedure described in section 4.2.5 to change the value. Press ENTER. Quick Start automatically takes you to the next parameter entry screen.

Step 6. Continue going through the Quick Start parameters, changing values as needed. Press ENTER to accept values and move to the next parameter.

Step 7. After the final parameter entry screen (IR COMPENSATION (P.206) or MOTOR HOT FLD AMPS (P.510), depending on the installed options), the Correct Scaling Jumper Positions screen is displayed. This shows the correct settings for three of the jumpers on the Regulator board. See the hardware manual for information on setting the jumpers. Press ENTER after checking the jumpers.

ATTENTION: The drive will not operate at the correct speed if hardware jumpers J11, J14, and J18 are not set as indicated on the OIM during Quick Start. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

Step 8. The Quick Start Complete screen is displayed, as shown in figure 5.3.

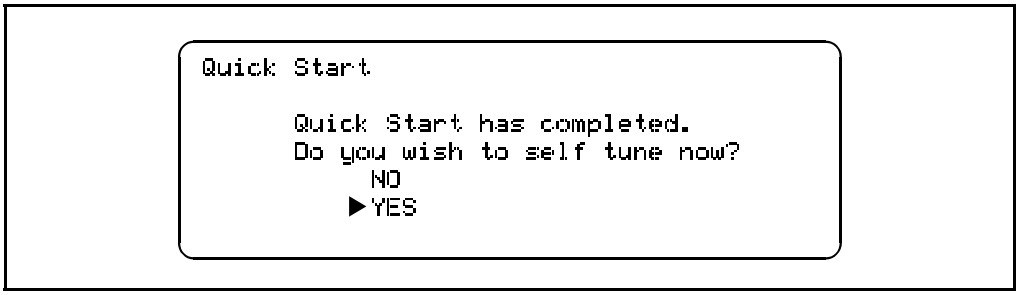


Figure 5.3 – Quick Start Complete Screen

Step 9. You can either start self-tuning or exit Quick Start.

- To start self-tuning: Select YES. See section 5.4, “Self-Tuning the Current Minor and Speed Loops”, for information on self-tuning. When self-tuning is complete, you are returned to the Main Menu.
- To exit Quick Start without self-tuning: Select NO. The Main Menu is displayed.

Step 10. To save the changes made to parameters during Quick Start, you must do a Memory Save. See section 4.4, “Saving and Restoring Parameter Values”.

5.4 Self-Tuning the Current Minor and Speed Loops

ATTENTION: Before self-tuning, verify that no overhauling or hanging loads are on the motor. Self-tuning will not operate properly if these types of loads exist. Failure to observe this precaution could result in bodily injury.

ATTENTION: The motor will rotate during self-tuning. Stay clear of rotating machinery. Failure to observe this precaution could result in bodily injury.

ATTENTION: Self-tuning will not operate properly if the setup and adjustment of the drive is incomplete. See the hardware manual for information. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

ATTENTION: Do not perform self-tuning on drives that are mechanically coupled to one another through the process material. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

Self-tuning automatically tunes the current minor and speed loops. It can be performed as part of Quick Start, or as a separate procedure. You can choose either one or both of the loops. The drive can be tuned with load connected if the load is not mechanically connected to another drive. For example, you could not tune the drive successfully if the load is a web between two sections of a paper machine.

Self-tune can only be started if CONTROL SOURCE SELECT is set to KEYPAD or TERMBLK. It cannot be started if the control is NETWORK or SERIAL.

Self-tuning configures the parameters listed in table 5.1. For descriptions of these parameters, see the software manual. It also sets normalized inductance for the CML.

For information on the control loops, see the software manual.

Table 5.1 – Parameters Configured by CML and Speed Loop Self-Tuning

CML Tuning	Speed Loop Tuning
CML PI LEAD FREQUENCY (P.302)	SPD LOOP PI LEAD FREQ (P.212)
CML PI PROP GAIN (P.301)	SPD LOOP PI PROP GAIN (P.211)
CML REF RATE LIMIT (P.303)	NORMALIZED INERTIA (P.222)

5.4.1 Setting Up the OIM for Self-Tuning

Speed loop self-tuning can only be performed on drives with tachometer or encoder feedback. In drives configured for armature voltage regulation (no feedback), you can only tune the current minor loop (CML).

To prepare for self-tuning:

Step 1. Configure all of the parameters for your application. For information on changing parameters, see section 4.2.5, “Changing Parameter Values”, in this manual. For parameter descriptions, see the software manual.

Step 2. Perform drive setup as described in the hardware manual. Self-tune will not operate properly if these settings and adjustments are not completed.

Step 3. Stop the drive if it is running.

Step 4. Set CONTROL SOURCE SELECT to KEYPAD or TERMBLK. See section 6.2 for instructions.

Step 5. Clear any faults from the fault log. See chapter 7 for information.

If you do not do these steps, you will get an error message when you try to start self-tuning.

5.4.2 Performing the Self-Tuning Procedure

Before self-tuning, complete the steps in section 5.4.1.

To perform self-tuning:

Step 1. Configure the self-tune parameters listed here. For descriptions of these parameters, see section 5.4.5, or see the software manual.

- SELF TUNE BRIDGE (P.220)
- SELF TUNE FIELD RANGE (P.218)
- SELF TUNE STABILITY (P.219)

Step 2. Access the Self Tuning menu from either the menus or from Quick Start.

From the menus:

a. Select Speed/Voltage Loop (SPD). Press ENTER.

b. Select Speed/Voltage Loop (SPD) Tuning. Press ENTER.

c. Select Self Tuning.

or

a. Select Current Minor Loop (CML). Press ENTER.

b. Select CML Tuning. Press ENTER.

c. Select Self Tuning.

From Quick Start:

The self-tuning menu is displayed after you configure the other Quick Start parameters.

Step 3. If FEEDBACK SELECT (P.200) is set to ARMATURE VOLT, go to step 4. If FEEDBACK SELECT (P.200) is not set to ARMATURE VOLT, select one of these types of self-tuning. Press ENTER.

- CML and SPEED Loop: Self-tunes the current minor loop and then the speed loop.
- CML only: Self-tunes only the current minor loop.
- SPEED only: Self-tunes only the speed control loop. The current minor loop should have been tuned before tuning only the speed loop.

Step 4. The message in figure 5.4 is displayed. To start self-tuning, press RUN.

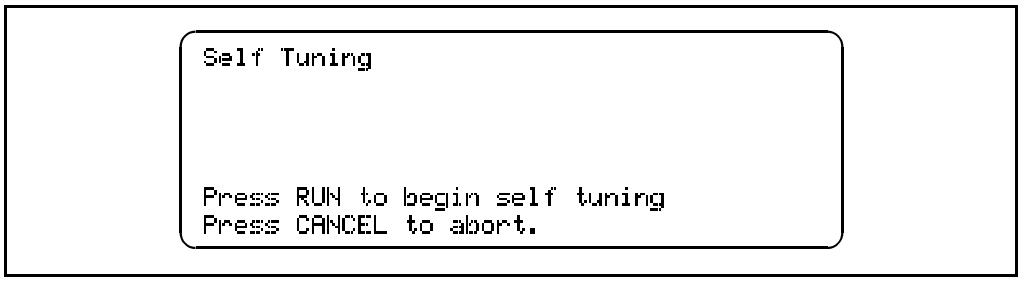


Figure 5.4 – Self-Tuning Screen

Step 5. The message “Self Tuning is active” blinks on the screen during self-tuning. The current minor loop takes a few seconds to self-tune. The speed loop takes about two minutes. During self-tuning, you can go to monitor mode without disrupting self-tuning.

Important: If you go into monitor mode during self-tuning, you must return to program mode at completion of self-tuning to see the following screen. Self-tuning is complete when the drive stops running.

When self-tuning is complete, the screen shown in figure 5.5 is displayed. If you selected only one of the loops, only the information for that loop is displayed.

The two parameters shown here (NORMALIZED INDUCTANCE and NORMALIZED INERTIA) are configured by self-tuning. NORMALIZED INDUCTANCE is the normalized armature inductance as measured by CML self-tuning. NORMALIZED INERTIA (P.222) is the time required to accelerate the motor and load inertia from zero to base speed (see the software manual for more information on this parameter).

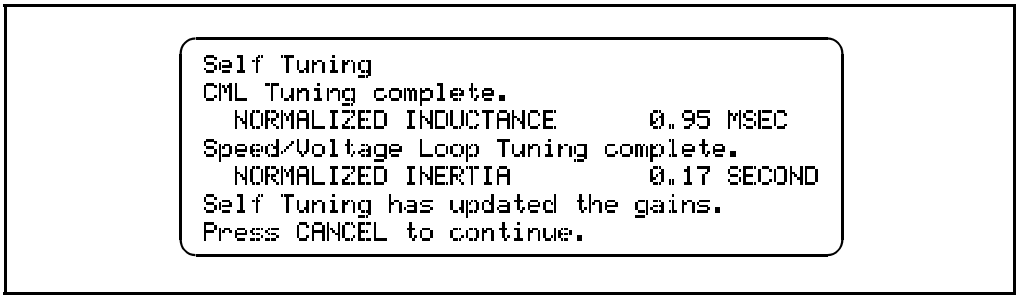


Figure 5.5 – Self-Tuning Complete Screen

Step 6. Press CANCEL X to clear the message. The display returns to the menu you started from.

Step 7. To save the changes through a power cycle, you must use Memory Save, described in section 4.4.

See the hardware manual for final adjustments to the drive before beginning normal operation.

5.4.3 Exiting Before Self-Tuning is Complete

If you have not yet pressed RUN to start self-tuning, you can stop self-tuning (and Quick Start) by pressing CANCEL X. The Main Menu is displayed if you enabled self-tuning in Quick Start, or the Self Tune Parameters menu.

If you have already pressed RUN to start self-tuning, press STOP RESET or assert the stop input to stop self-tuning. This causes a self-tuning drive fault. See the next section for information on these faults.

5.4.4 What To Do if a Fault Occurs During Self-Tuning

If a fault occurs during self-tuning:

- the motor coasts-to-rest, regardless of the setting of STOP MODE SELECT (P.114).
- the drive logs a self-tuning fault, which must be reset and cleared. See chapter 7 for information on clearing and resetting faults.

When the problem that caused the fault is corrected, repeat the self-tuning procedure.

5.4.5 Self-Tune Parameter Descriptions

Configure these parameters before starting the process described in section 5.4, “Self-Tuning the Current Minor and Speed Loops”.

SELF TUNE BRIDGE (P.220)

Determines the direction the motor shaft will rotate during the self-tune process by selecting the SCR bridge.

Parameter Range:	FORWARD REVERSE
Default Setting:	FORWARD
Parameter Type:	Tunable

If the reverse bridge will be predominant in the application, select REVERSE.

For non-regenerative (S6) drives, this is fixed to FORWARD.

SELF TUNE FIELD RANGE (P.218)

Ratio of motor top speed to base speed. Typical value is 1.00, where TOP SPEED (P.011) is equal to base speed. Applies to speed loop tuning only.

Parameter Range:	0.90 to 5.00
Default Setting:	1.00
Parameter Type:	Tunable

SELF TUNE STABILITY (P.219)

Determines the self-tune stability, which configures the performance of the speed loop.

Parameter Range:	10 to 100
Default Setting:	25
Parameter Type:	Tunable

Low values increase the speed loop response. High values decrease the speed response, but result in more stability. The typical value is 25. Applies to speed loop tuning only.

5.5 Quick Start Parameter Descriptions

Brief descriptions of the Quick Start parameters are provided here for your reference. Full descriptions of the parameters are provided in the software manual. These descriptions are listed in the order in which they are displayed during the Quick Start procedure.

ATTENTION: The incorrect configuration of Quick Start parameters can cause an overspeed condition. These parameters must be configured by a qualified person who understands the significance of configuring them accurately. Verify that the values of these parameters are configured accurately for your application. Failure to observe this precaution could result in bodily injury.

MOTOR BASE SPEED/TOP SPEED (P.011)

The highest running speed of the motor. This input is the basis of speed loop scaling.

Parameter Range:	5 to 5000 RPM
Default Setting:	500 RPM
Parameter Type:	Configurable

TOP SPEED depends on several factors:

- If there is no field weakening, the top speed is typically the same as the motor nameplate base speed.
- If there is field weakening, the top speed is the same as the field weakened speed. Top speed is typically more than the base speed when field weakening is applied.

ATTENTION: Before starting the drive, this parameter must be set to base speed or, if the Field Current Regulator kit is installed, the field weakened speed. You are responsible for assuring safe conditions for operating personnel by setting this parameter properly. Failure to observe this precaution could result in bodily injury.

ATTENTION: Do not allow the motor to exceed the maximum safe speed of the motor or driven equipment as determined by the equipment manufacturer. Failure to observe this precaution can result in bodily injury.

MOTOR RATED ARM AMPS (P.008)

The rated armature current from the motor nameplate.

Parameter Range:	0 to 3000.0 amps
Default Setting:	8.0 amps
Parameter Type:	Configurable

ATTENTION: This parameter must be less than the motor rated armature amps or drive current rating listed on the motor nameplate. If this is configured incorrectly, overcurrent or excess heating of the motor could result. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

MOTOR RATED ARM VOLTS (P.009)

The rated armature voltage as it is listed on the motor nameplate.

Parameter Range:	160 to 675 volts
Default Setting:	240 volts
Parameter Type:	Configurable

REVERSE DISABLE (P.015)

Applies only to regenerative drives. If you have a non-regenerative drive, Quick Start automatically skips this parameter.

Parameter Range:	OFF ON
Default Setting:*	OFF
Parameter Type:	Configurable

When ON, REVERSE DISABLE does not allow the speed reference to drop below zero.

When OFF, the speed reference can drop below zero and the drive can operate in the reverse direction.

REVERSE DISABLE is forced to ON when:

- The drive has a non-regenerative (S6) power unit.
- FEEDBACK SELECT is set to AC TACH.
- FEEDBACK SELECT is set to PULSE TACH and PULSE TACH QUADRATURE (P.208) is set to OFF.

FEEDBACK SELECT (P.200)

Selects the type of feedback signal that is used for the speed/voltage loop.

Parameter Range:	ARMATURE VOLT DC TACH PULSE TACH AC TACH
Default Setting:	ARMATURE VOLT
Parameter Type:	Configurable

PULSE TACH and AC TACH can only be selected if the appropriate kit is installed (Pulse Encoder (Tachometer) kit or AC Tachometer Feedback kit).

NEGATIVE CURRENT LIM (P.006) is set to 0 and REVERSE DISABLE (P.015) is set ON if:

- AC TACH is selected.
- PULSE TACH is selected and PULSE TACH QUADRATURE (P.208) is set to OFF.

ANLG TACH VOLTS/1000 (P.203)

This parameter is only available if FEEDBACK SELECT (P.200) is set to AC TACH or DC TACH.

Parameter Range:*	18.0 to 200.0 VOLTS/1000 RPM
Default Setting:	18.0 VOLTS/1000 RPM
Parameter Type:	Configurable

Analog tachometer scaling from the tachometer nameplate in volts per 1000 RPM. Units are volts DC for DC tachometers or volts AC RMS for AC tachometers.

Use of an AC tachometer requires the AC Tachometer Feedback kit.

*Depending on the setting of TOP SPEED (P.011), the high limit might be less than 200.0 to prevent the tachometer voltage from exceeding 250V.

PULSE TACH PPR (P.207)

Only available if FEEDBACK SELECT is set to PULSE TACH.

Parameter Range:	18 to 2500 PPR
Default Setting:	18 PPR
Parameter Type:	Configurable

Pulse encoder pulses per revolution (PPR) from the pulse encoder nameplate.

PULSE TACH QUADRATURE (P.208)

Only available if FEEDBACK SELECT is set to PULSE TACH.

Parameter Range:	ON OFF
Default Setting:	ON
Parameter Type:	Configurable

Enables or disables pulse encoder quadrature.

A quadrature pulse encoder must be used on regenerative drives that use a pulse encoder.

Set ON for a bidirectional pulse encoder.

Set OFF for a unidirectional pulse encoder.

If PULSE TACH QUADRATURE is set to OFF and PULSE TACH is the selected FEEDBACK SELECT type, NEGATIVE CURRENT LIM (P.006) will be set to 0 and REVERSE DISABLE (P.015) set to ON (preventing reverse direction).

ACCELERATION TIME (P.001)

Sets the minimum time that the selected speed reference can changed from zero to TOP SPEED (P.011).

Parameter Range:	0.1 to 300.0 seconds
Default Setting:	5.0 seconds
Parameter Type:	Tunable

If TRIM MODE SELECT (P.110) is set to PROPORTIONAL, the actual time to accelerate might be modified by DRAW PERCENTAGE OUT (P.196). See the software manual for information on trim.

DECELERATION TIME (P.002)

Sets the minimum time in which the selected speed reference can change from TOP SPEED (P.011) to 0.

Parameter Range:	0.1 to 300.0 seconds
Default Setting:	5.0 seconds
Parameter Type:	Tunable

If TRIM MODE SELECT (P.110) is set to PROPORTIONAL, the actual time to decelerate might be modified by DRAW PERCENTAGE OUT (P.196). See the software manual for information on trim.

MINIMUM SPEED (P.003)

Selects the minimum speed of the drive without being stopped. It is typically greater than zero.

Parameter Range:	0 to MAXIMUM SPEED (RPM or user-defined units)
Default Setting:	250 RPM
Parameter Type:	Tunable

If it is less than 10% of MAXIMUM SPEED, an alarm is generated.

ATTENTION: This drive can operate at and maintain zero speed when this parameter is set to zero. You are responsible for assuring safe conditions for operating personnel by providing suitable guards, audible or visual alarms, or other devices to indicate that the drive is operating at or near zero speed. Failure to observe this precaution could result in severe bodily injury or loss of life.

MAXIMUM SPEED (P.004)

The maximum speed of the drive that can be supported by the application or process.

Parameter Range:	1 to TOP SPEED (RPM or user-defined units)
Default Setting:	500 RPM
Parameter Type:	Tunable

If raising this value causes MINIMUM SPEED to become less than 10% of MAXIMUM SPEED, an alarm is generated.

This is typically set to base speed from the motor nameplate.

ATTENTION: Do not allow the motor to exceed the maximum safe speed, as determined by the equipment manufacturer, of the motor or the driven equipment. Failure to observe this precaution could result in bodily injury.

JOG ACCEL/DECEL TIME (P.013)

Sets the minimum time that the jog reference can change from zero to TOP SPEED (P.011) and from TOP SPEED to zero.

Parameter Range:	0.1 to 300.0 seconds
Default Setting:	3.0 seconds
Parameter Type:	Tunable

The S-CURVE ROUNDING (P.014) parameter does not affect the setting of this parameter.

JOG SPEED (P.012)

The operating speed while the drive is jogging if DIG IN 0 SELECT (P.428) is set to JOG SPEED SELECT and digital input 0 (terminal 12 on the Regulator board) is off.

Parameter Range:	0 to MAXIMUM SPEED (RPM or user-defined units)
Default Setting:	250 RPM
Parameter Type:	Tunable

ATTENTION: This drive can operate at and maintain zero speed when this parameter is set to zero. A voltage-regulated drive can produce zero speed at low minimum speed values. You are responsible for assuring safe conditions for operating personnel by providing suitable guards, audible or visual alarms, or other devices to indicate that the drive is operating at or near zero speed. Failure to observe this precaution could result in severe bodily injury or loss of life.

POSITIVE CURRENT LIM (P.005)

Sets the highest amount of current (% full load amps) for the forward bridge.

Parameter Range:	0 to MAXIMUM CURRENT (%FLA)*
Default Setting:	150 %FLA
Parameter Type:	Tunable

Used as a high limit for the speed loop PI block when POS CURRENT LIM SEL (P.223) is set to REGISTER.

NEGATIVE CURRENT LIM (P.006)

This parameter only needs to be set for regenerative drives.

Selects the highest amount of current (% full load amps) for the reverse bridge.

Parameter Range:* †	When NEG CUR LIM INV EN (P.226) = ENABLED: 0 to MAXIMUM CURRENT (%FLA) When NEG CUR LIM INV EN (P.226) = DISABLED: –MAXIMUM CURRENT to 0 (%FLA)
Default Setting:	±150 %FLA
Parameter Type:	Tunable

Used as a low limit for the speed loop PI block when NEG CURRENT LIM SEL (P.224) is set to REGISTER.

*The range is clamped to zero:

- For non-regenerative drives.
- If FEEDBACK SELECT is set to AC TACH.
- If FEEDBACK SELECT is set to PULSE TACH and PULSE TACH QUADRATURE (P.208) is set to OFF.

† The range depends on the setting of NEG CUR LIM INV EN (P.226).

IR COMPENSATION (P.206)

Sets the armature voltage loss compensation value used when the drive is configured as a voltage regulator.

Parameter Range:	0 to 50%
Default Setting:	0%
Parameter Type:	Tunable

This parameter is also used by the Field Current Regulator kit to set the field-weakened threshold.

IR COMPENSATION is normally determined from the motor data sheet. It should be set to the percent IR drop of the motor.

If this data is not available on the motor data sheet, you can set this empirically so that the no-load and full-load speeds are as close as possible when operating as a voltage regulator.

This parameter is not available for current/torque regulated drives.

MOTOR HOT FLD AMPS (P.510)

This parameter only needs to be set if the Field Current Regulator kit is installed.

Parameter Range:	0.11 to installed supply rating (4.00, 10.00, or 20.00 amps)
Default Setting:	0.01 amps
Parameter Type:	Configurable

Motor nameplate value of the rated hot field amps. This input is the basis of field current scaling.

If the factory defaults are restored, or if a valid value has not yet been entered for this parameter, the DC field voltage is fixed at 150V on a 230VAC line, or at 300V on a 460VAC line.

ATTENTION: You must configure this to the motor nameplate value. The incorrect configuration of this parameter can cause a motor overvoltage condition. Configure MOTOR HOT FLD AMPS to the motor's nameplate value. Failure to observe this precaution can result in bodily injury and damage to the equipment.

CHAPTER 6

Using the OIM to Monitor and Control the Drive

The OIM allows you to monitor the speed, armature voltage, load, and current keypad reference outputs to the motor. You can choose between two viewing options.

The OIM also allows you to control the drive. Motor control options available through the OIM include starting, stopping, jogging, and setting the manual reference and control source.

6.1 Using the OIM to Monitor Drive Outputs

You can monitor two or four drive outputs when the OIM is in monitor mode. A sample of the four-output monitor mode screen is shown in figure 6.1.

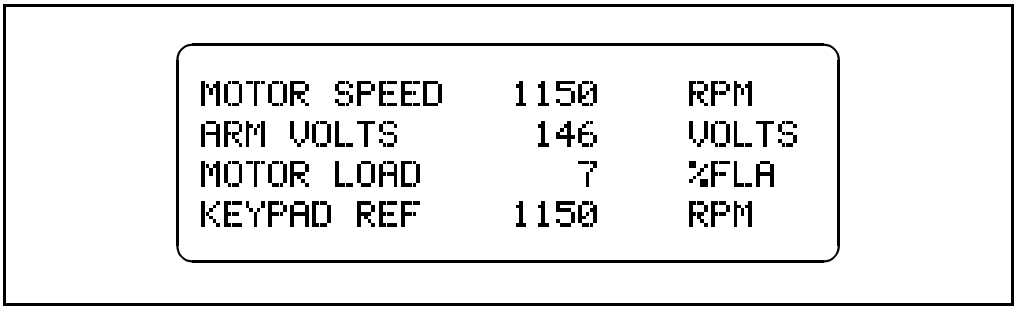


Figure 6.1 – First Monitor Mode Screen

6.1.1 Description of the Monitor Mode Outputs

You can monitor:

- MOTOR SPEED: The actual motor speed as measured by a speed feedback device. Displayed as a percentage, RPM, or user-scaled units.
- ARM VOLTS: The actual armature voltage.
- MOTOR LOAD: The actual motor load (armature current) in percent full load amps (%FLA) or amps. The resolution of this output depends on the setting of MOTOR RATED ARM AMPS (P.008). For values of less than 1000.0 amps, motor load is displayed with 0.1 amps resolution. For values more than or equal to 1000.0 amps, motor load is displayed with 1 amp resolution.
- REF: The reference. This is the speed or torque the drive attempts to reach when the drive is running. The control source is indicated in the label. For example, in figure 6.1, the reference is from the keypad.

6.1.2 Selecting the Outputs to Monitor

You can view one of two monitor mode screens. The first monitor mode screen shows all four monitored outputs. The second monitor mode screen shows the motor speed and motor load without labels, but in larger text so the values can be read from a distance. You can switch between the monitor mode screens at any time.

To select monitor mode:

Step 1. Press PROGRAM MONITOR until the key indicator switches from PROGRAM to MONITOR. The monitor mode screen with four outputs is displayed, as shown in figure 6.1.

Step 2. To display the two-output monitor mode screen, press PROGRAM MONITOR again. The screen shown in figure 6.2 is displayed. You cannot change the value of the reference in this screen.

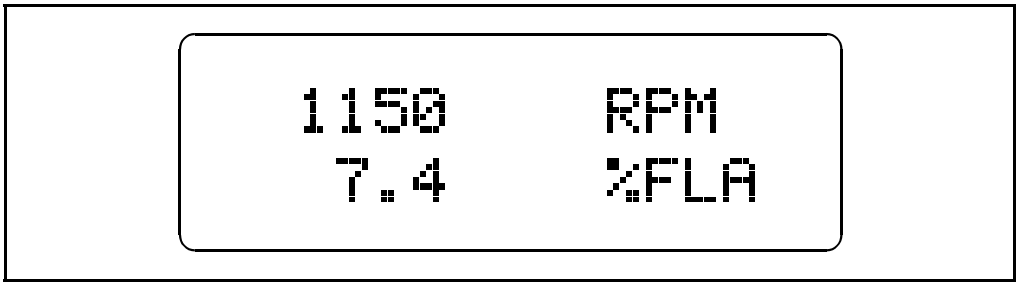


Figure 6.2 – Second Monitor Mode Screen

Step 3. To go to program mode, press PROGRAM MONITOR again. As you press PROGRAM MONITOR, you cycle between program mode, the four-output monitor mode screen, and the two-output monitor screen.

6.1.3 Using Help in Monitor Mode

Pressing HELP ? in monitor mode displays the labels for the drive status indicators in the selected language. To return to monitor mode, press CANCEL X.

6.2 Control Source

The control source selects the source of the drive control signals. Control signals include drive operating signals, such as run and jog, and the drive reference. The control source is selected using CONTROL SOURCE SELECT.

6.2.1 About the Control Source

The possible control sources are:

- KEYPAD: Control is through the keypad.
- TERMBLK: Control is through Regulator board terminals 16 through 20. See the hardware manual for terminal descriptions and wiring instructions.
- SERIAL: Control is through a personal computer running the CS3000 software.
- NETWORK: Control is through a network such as the AutoMax Network Communication kit or DeviceNet Interface kit.

If the drive is configured as a current (torque) regulator (jumper J15 is set to CURRENT), the control source can only be set to TERMBLK or NETWORK. See the software manual for information.

When the control source is a device other than the OIM, you can change the settings only through the selected control source. However, the OIM keypad/display reflects the settings made by that control source. For example, if the drive is commanded to run from another control source, the Running indicator will be on.

Table 6.1 shows the possible control source and reference source settings. It also shows the display for the key indicator under AUTO MANUAL.

Table 6.1 – Effect of Control Source and Reference Settings on the AUTO/MANUAL Indicator and OIM Displays

Control Source	Reference Set Through	AUTO MANUAL Key Indicator	Reference Display (Monitor Mode)	Units
KEYPAD	Automatic reference from the terminal strip as set by AUTO REFERENCE SELECT (P.103)	AUTO	TERMBLK REF	RPM, percentage, or user-scaled units
	OIM	MANUAL	KEYPAD REF	
TERMBLK (Regulator type is speed/voltage)	Automatic reference from the terminal strip as set by AUTO REFERENCE SELECT (P.103)	AUTO	TERMBLK REF	
	Manual reference from the terminal strip as set by MANUAL REF SELECT (P.106)	MANUAL		
SERIAL	Automatic reference from the terminal strip as set by AUTO REFERENCE SELECT (P.103)	AUTO		
	Serial device (PC)	MANUAL	SERIAL REF	
NETWORK	Network	AUTO (Manual not available)	NETWORK REF	From network
TERMBLK (Regulator type is current/torque)	Automatic reference from the terminal strip as set by AUTO REFERENCE SELECT (P.103)	AUTO (Manual not available)	TORQUE REF	MOTOR LOAD units

6.2.2 Setting the Control Source

Important: The control source selection you make might change the setting of AUTO MANUAL. See table 6.1.

To select the control source:

Step 1. Stop the drive if it is running.

Step 2. Press CONTROL SOURCE SELECT. The screen shown in figure 6.3 is displayed.

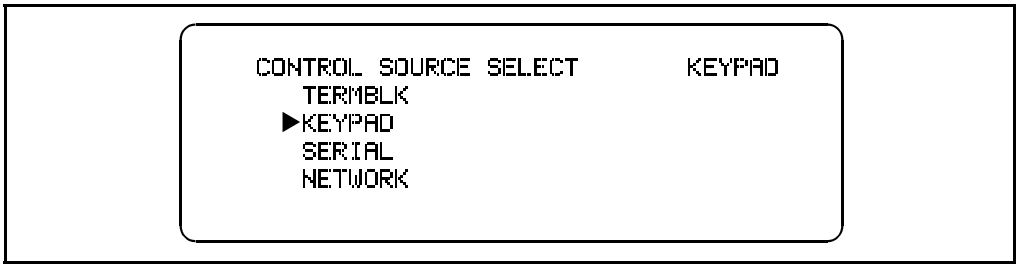


Figure 6.3 – CONTROL SOURCE SELECT Screen

Step 3. Press + or – to move the cursor to the control source you want.

Step 4. Press ENTER to accept the option and return to the previous screen. The option you accepted is displayed in the key indicator.

6.3 Changing the Manual Reference Using the OIM

The reference is the speed or torque the drive attempts to reach. The reference can be either automatic or manual, as determined by the control source.

The “reference” is also referred to as the “setpoint.”

ATTENTION: When switching from auto to manual or from manual to auto, the drive ramps to the reference level provided by the new source at the rate specified by ACCELERATION TIME (P.001) or DECELERATION TIME (P.002). Be aware that an abrupt speed change might occur, depending on the new reference and the rate specified in these parameters. Failure to observe this precaution could result in bodily injury.

When CONTROL SOURCE SELECT is set to KEYPAD, you can change the reference through the OIM. To change the reference:

Step 1. Set CONTROL SOURCE SELECT to KEYPAD. See section 6.2.2 for instruction.

Step 2. Go to the four-output monitor mode screen.

Step 3. Press AUTO MANUAL until the key indicator reads MANUAL.

Step 4. Press + to increase the manual reference or – to decrease it. The change is displayed as you enter it. Hold down + or – to change the value more quickly.

Step 5. Press ENTER to save the new reference.

6.4 Using the OIM to Control the Drive

When [CONTROL SOURCE SELECT] is set to KEYPAD, you can use the OIM to control the drive. This includes running, jogging, changing the direction of, and stopping the drive.

ATTENTION: If the drive is ready and [CONTROL SOURCE SELECT] is set to KEYPAD, pressing [RUN] or [JOG] on the OIM immediately starts the motor. Make sure the motor and driven machinery are safe to start before pressing either of these keys. Failure to observe this precaution could result in severe bodily injury or loss of life.

6.4.1 Starting the Drive

From the OIM, you can run or jog the motor when [CONTROL SOURCE SELECT] is set to KEYPAD and the Drive Ready indicator is on.

To Run the Drive:

Press [RUN] to start the motor and allow it to accelerate to the drive reference.

To Jog the Drive:

Press [JOG] to jog the motor. The drive ramps up to the reference in the time set by JOG ACCEL/DECEL TIME (P.013). The motor runs as long as [JOG] is held down.

When [JOG] is released, the motor ramps to stop in the time set by JOG ACCEL/DECEL TIME (P.013).

6.4.2 Stopping the Drive

When the drive is running, pressing [STOP RESET] stops the drive in the manner selected by STOP MODE SELECT. When the OIM is connected and communicating with the drive, [STOP RESET] is always active, regardless of the setting of [CONTROL SOURCE SELECT].

ATTENTION: You must provide an external, hardwired emergency stop circuit outside of the drive circuitry. This circuit must disable the system in case of improper operation. Uncontrolled machine operation can result if this procedure is not followed. Failure to observe this precaution could result in bodily injury.

6.4.3 Changing Drive Direction

When CONTROL SOURCE SELECT is set to KEYPAD, you can change the direction of the motor by pressing FORWARD REVERSE. The direction can be changed when the drive is running or stopped.

The direction is fixed to FORWARD:

- for non-regenerative drives
- if the REVERSE DISABLE parameter is set to ON
- when an AC tachometer is used (FEEDBACK SELECT is set to AC TACH)
- when a pulse encoder with quadrature disabled is used (FEEDBACK SELECT is set to PULSE TACH and PULSE TACH QUADRATURE is set to OFF)

CHAPTER 7

Troubleshooting the Drive Using the OIM

Using the OIM, you can troubleshoot drive problems using one of these methods:

- If a fault or alarm message is displayed, you can use the message and the Fault or Alarm Menu to identify the problem.
- If the drive is not ready or has stopped, you can use the Diagnostics Menu to identify the problem.
- If a program error message is displayed, you can use the message to identify the problem.

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this section in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

7.1 Identifying Problems Indicated by Faults or Alarms

The OIM identifies problems as faults or alarms. A fault is a condition that stops the drive or prevents it from running. An alarm is a condition that could cause a fault, but does not stop the drive or prevent it from running.

When a fault or alarm occurs:

- the fault or alarm indicator turns on.
- it is logged (if the log is not full).
- a message is displayed on the OIM screen. Examples are shown in figures 7.1 and 7.2. If a fault and alarm occur at the same time, the fault message is displayed.

When a fault occurs, the drive coasts to a stop, regardless of the setting of STOP MODE SELECT (P.114). Alarms do not stop the drive.

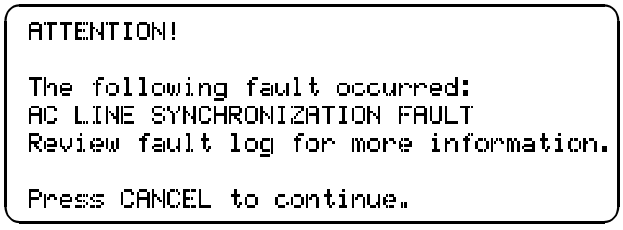


Figure 7.1 – Example of a Fault Screen

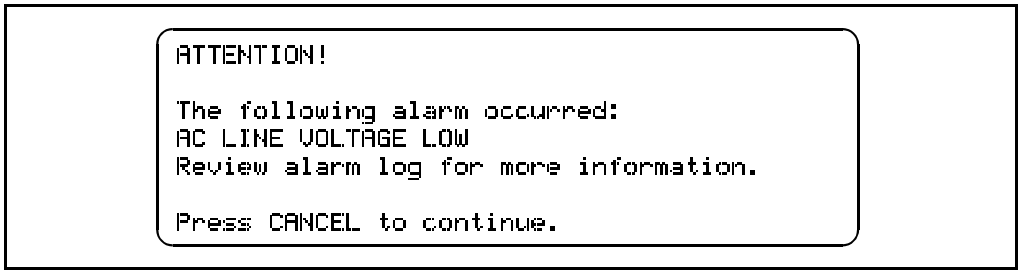


Figure 7.2 – Example of an Alarm Screen

Press CANCEL X to clear the fault or alarm message. If multiple faults or alarms occurred, they are displayed after you press CANCEL X.

If the fault or alarm log is full, a message is displayed. To log future faults and alarms, you must clear the log (section 7.2.2). Each log holds up to ten entries.

To identify the problem when a fault or alarm occurs, use the Fault or Alarm Menu or the tables in the software manual. They give the probable cause and corrective action to take when a fault or alarm occurs.

When a fault is corrected, you must reset the faults before restarting the drive. When an alarm is corrected, the alarm is automatically reset, but the indicator does not turn off until you reset the alarm indicator.

7.2 Reviewing and Resetting Faults and Alarms

Use the Fault or Alarm Menu to review and reset faults and alarms and clear the logs.

To access the Fault Menu, press FAULT. The key indicator displays FAULT and the Fault Menu in figure 7.3 is displayed.

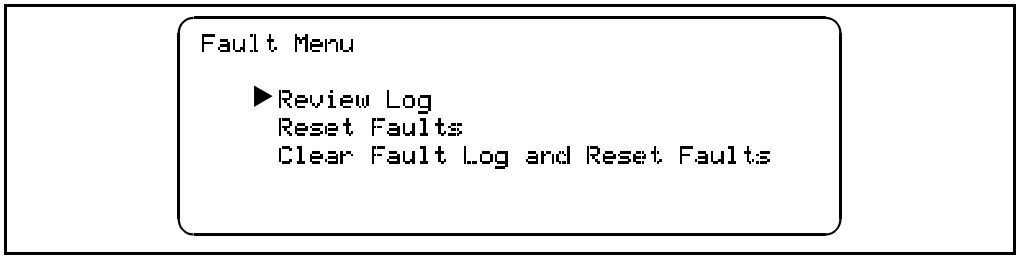


Figure 7.3 – Fault Menu

To access the Alarm Menu, press FAULT until the key indicator displays ALARM. The Alarm Menu is displayed, as shown in figure 7.4.

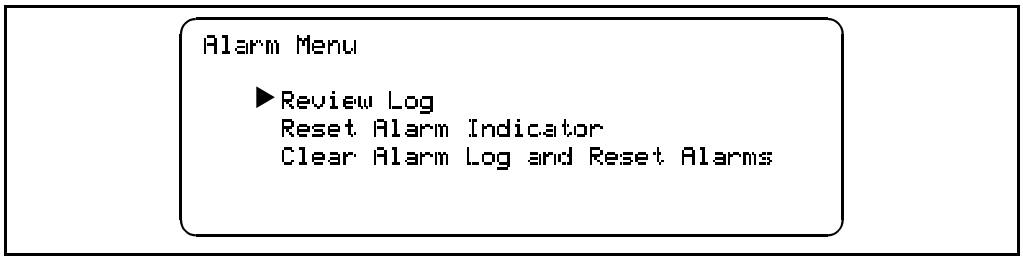


Figure 7.4 – Alarm Menu

7.2.1 Reviewing the Fault and Alarm Logs

You can review the fault and alarm logs to help identify the problem and determine when it occurred.

Step 1. Select Review Log from the Fault or Alarm Menu. The screen shown in figure 7.5 is displayed. If the log is empty, “Log is Empty” is displayed.

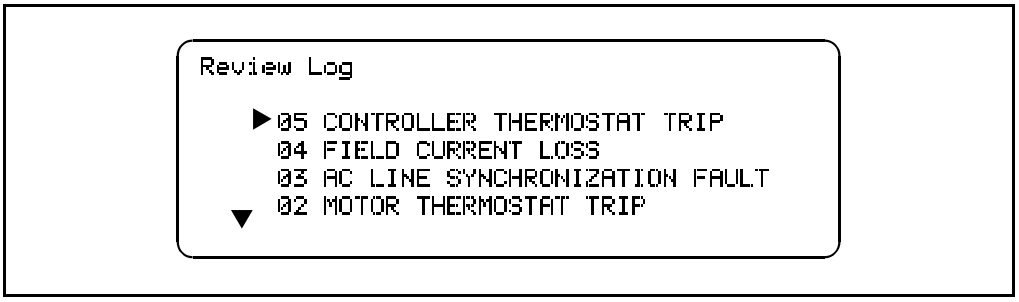


Figure 7.5 – Example of a Fault Log Screen

The first line in the Review Log is the most recent fault or alarm. If a fault or alarm is detected while you are in the log, the display is updated to show the new entry.

Step 2. To view more information about a particular fault or alarm, move the cursor to that fault or alarm and press ENTER. A detail screen is displayed, similar to the examples shown in figures 7.6 and 7.7.

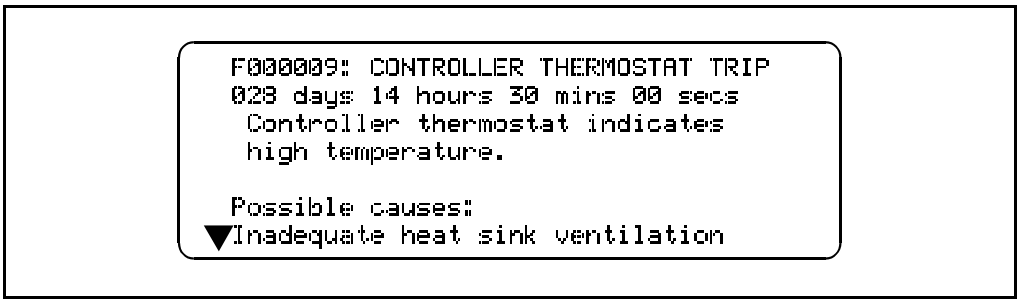


Figure 7.6 – Example of a Fault Detail Screen

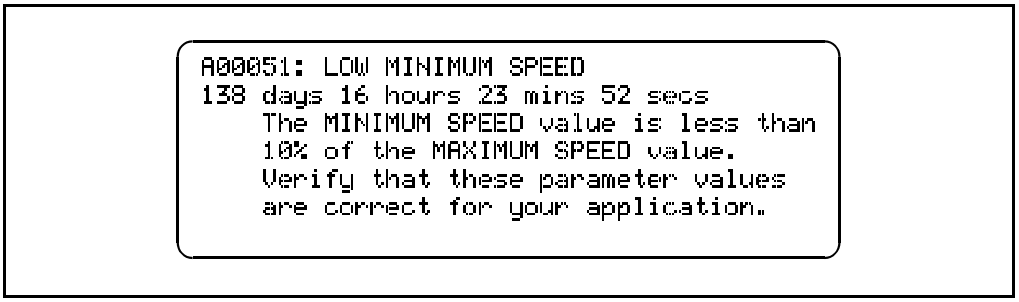


Figure 7.7 – Example of an Alarm Detail Screen

These screens show:

- The fault or alarm number (on the first line). You can use this number to look up information about the fault or alarm in the software manual.
- A one-line description of the fault or alarm.
- The date and time when the fault or alarm occurred. This time is based on an internal 248-day counter. The counter is restarted when drive power is cycled, or when the clock is reset (see section 7.7, “Resetting the Clock”).
- A description of the problem that caused the fault or alarm and possible solutions. If B is displayed, more information is available. Press ⇩ to read the rest of the screen.

Press CANCEL X to exit this screen and return to the Review Log.

Step 3. Repeat step 2 for any other faults or alarms that you want to view in detail. Press CANCEL X to return to the Fault or Alarm Menu.

7.2.2 Resetting Faults and Alarms and Clearing the Logs

You can reset faults and alarms without clearing the logs, or reset them and clear the logs.

Important: Alarm logs are automatically cleared when power is cycled. Fault logs are saved through a power cycle.

To reset faults or alarms without clearing the log

Step 1. Select Reset Faults or Reset Alarm Indicator from the menu. Press ENTER.

The first line in the Review Log is the most recent fault or alarm. If a fault or alarm is detected while you are in the log, the display is updated to show the new entry.

Step 2. If you select:

- Reset Faults: You will see the message “ATTENTION! DRIVE FAULTS HAVE BEEN RESET.” If the fault condition has been cleared, the FAULT indicator is turned off and the faults are reset.
- Reset Alarm Indicator: You will see the message “ATTENTION! DRIVE ALARMS HAVE BEEN RESET.” The ALARM indicator is turned off.

Step 3. Press CANCEL X to clear the message and return to the Fault or Alarm Menu.

Step 4. Press CANCEL X again to return to program or monitor mode.

Other methods of resetting faults and alarms without clearing the logs are:

- If the drive is stopped and CONTROL SOURCE SELECT is set to KEYPAD, press STOP RESET.
- If available through the selected control source, assert fault reset.

To reset the faults or alarms and clear the log

Important: You cannot clear individual faults or alarms. This procedure clears the entire log.

Step 1. Depending on whether you are clearing faults or alarms, do one of the following:

- From the Fault Menu: Select “Clear Fault Log and Reset Faults.”
- From the Alarm Menu: Select “Clear Alarm Log and Reset Alarms.”

Step 2. Press ENTER. A message is displayed that states that the alarms or faults were reset and the log was cleared. For alarms, the ALARM indicator is turned off and the alarm log is cleared. For fault conditions that have been conditioned, the FAULT indicator is turned off, the faults are reset, and the fault log is cleared.

Step 3. Press CANCEL to clear the message and return to the Fault or Alarm Menu.

Step 4. Press CANCEL again to return to program or monitor mode.

7.3 Using Diagnostics to Solve Drive Problems

The diagnostics menu provides information about why the drive is not ready and why it stopped. The diagnostics screens are continually updated with the status of the drive.

To use diagnostics:

Step 1. Press FAULT until the key indicator reads DIAGS. The screen shown in figure 7.8 is displayed.

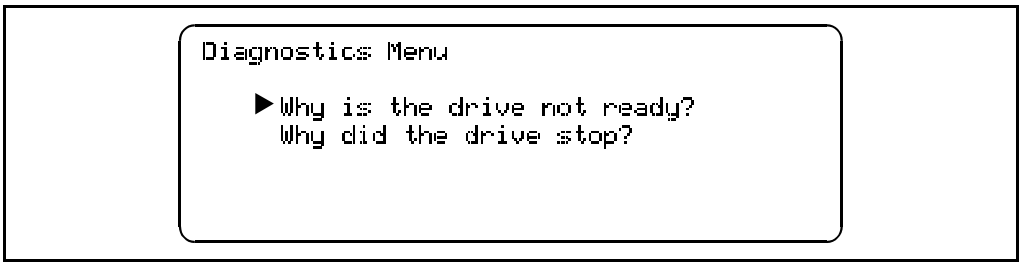


Figure 7.8 – Diagnostics Menu

Step 2. Choose the option appropriate to your problem:

- If the DRIVE READY indicator is off: Select “Why is the drive not ready?”
- If the drive has stopped: Select “Why did the drive stop?”

Step 3. Press ENTER. The screen shows possible explanations of why the drive is not ready or has stopped. If B is displayed, more information is available. Press ↓ to read the rest of the screen.

Step 4. Press CANCEL to exit the screen.

Step 5. Press CANCEL at the Diagnostics Menu to return to program or monitor mode.

7.4 Clearing a Programming Error Message

Programming errors occur if you select an option that is not valid, such as attempting to set a read-only parameter. These errors do not affect drive operation and are not logged. To remove a programming error message, press CANCEL X.

7.5 Determining Why the OIM is Not Communicating with the Drive

The OIM can stop communicating with the drive if the communication link is faulty, if a fatal OIM error occurs, or if a fatal regulator error occurs. If one of these conditions is present, the OIM displays a message indicating the problem.

Unless CONTROL SOURCE SELECT is set to OIM, an OIM failure does not affect drive operation. If the OIM is the control source, an OIM failure causes the drive to stop.

ATTENTION: STOP RESET is not active if a communication between the drive and OIM has stopped. Use another control source to stop the drive. Failure to this precaution could result in severe bodily injury or loss of life.

Possible causes and solutions are shown in table 7.1.

Table 7.1 – OIM Failure Causes and Solutions

Error	Cause	Solution
Link Failure	Communication between the OIM and Regulator board is lost. This can occur if the cable between them is disconnected.	Check the cable between the OIM and the Regulator board. The OIM attempts to re-establish communication. If it succeeds, the message "Press CANCEL to continue" is displayed. Press CANCEL X to return to program or monitor mode. If this does not correct the problem, contact Reliance for assistance.
Fatal OIM Error (FATAL KEYPAD ERROR might be displayed.)	The OIM did not pass self-diagnostics.	Cycle drive power. If this does not correct the problem, contact Reliance for assistance.
Fatal Regulator Failure	There is a problem with the drive.	Cycle drive power. If this does not correct the problem, contact Reliance for assistance.

7.6 Replacing the OIM

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this section in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: Do not install or remove the OIM with power applied to the drive. Disconnect and lockout incoming power before attempting installation or removal. Failure to observe this precaution could result in severe bodily injury or loss of life.

If necessary, the entire OIM (M/N 317C160D) or the OIM circuit board (M/N 58772) can be replaced using this procedure.

7.6.1 Preparing to Replace the OIM

Before replacing the OIM, disconnect power from the drive.

You will need the following equipment:

- New OIM display assembly or OIM circuit board
- #1 Phillips screwdriver
- #2 Phillips screwdriver
- M7 Hex wrench or socket wrench

7.6.2 Accessing the OIM and Disconnecting It from the Regulator Board

These steps are required for both OIM circuit board and complete OIM replacement.

Important: Unless otherwise indicated, keep all hardware for the replacement procedure.

Step 1. Loosen the screws that secure the front cover to the drive.

Step 2. Remove the front cover.

Step 3. Disconnect the communication cable from J9 on the Regulator board by pressing down the locking clip and pulling the cable out.

Step 4. Remove the four screws holding the OIM assembly to the drive enclosure.

Step 5. Pull the OIM assembly away from the drive so you can access the ground wire on the upper right corner of the OIM mounting plate. Slide the ground wire off its connection.

Important: Ground wires on older versions of the OIM are fastened by a nut. If you are replacing an older version, keep the hardware so you can re-attach the ground wire.

7.6.3 Replacing the OIM Circuit Board Only

Follow this procedure if you are replacing only the circuit board. If you are replacing the entire OIM assembly, see section 7.6.4, “Replacing the Entire OIM Assembly”.

You must remove the OIM assembly from the drive to replace the circuit board. See section 7.6.1, “Preparing to Replace the OIM”, and section 7.6.2, “Accessing the OIM and Disconnecting It from the Regulator Board”, for instructions.

To replace the circuit board:

Step 1. Place the OIM assembly face down on a surface that will not scratch the OIM front panel.

Step 2. Remove the four screws holding the circuit board to the mounting plate.

Step 3. Lift the circuit board from the standoffs. Remove the washers if they detach from the screws.

Step 4. Place the new circuit board on the standoffs. Make sure the 20-pin connector is properly aligned with the matching header on the Regulator board (J3).

Step 5. Tighten the four screws holding the board to the mounting plate.

Step 6. Connect the ground wire from the drive to the ground terminal on the OIM mounting plate.

Step 7. Replace the four screws securing the OIM assembly to the drive.

Step 8. Connect the communication cable from the OIM assembly to J9 on the Regulator board.

Step 9. Replace the drive front cover and tighten the screws, securing it to the drive enclosure.

7.6.4 Replacing the Entire OIM Assembly

Follow this procedure if you are replacing the entire OIM assembly. If you are replacing the circuit board, see section 7.6.3, “Replacing the OIM Circuit Board Only”.

You must remove the old OIM assembly from the drive before replacing it. See section 7.6.1, “Preparing to Replace the OIM”, and section 7.6.2, “Accessing the OIM and Disconnecting It from the Regulator Board”, for instructions.

To replace the OIM:

Step 1. Connect the ground wire from the drive to the ground terminal on the OIM mounting plate. If you are replacing an older version of the OIM, you might need to use the hardware from the old unit.

Step 2. Replace the four screws securing the OIM assembly to the drive.

Step 3. Connect the communication cable from the OIM assembly to J9 on the Regulator board, making sure that it locks into place.

Step 4. Replace the drive front cover and tighten the screws, securing it to the drive enclosure.

7.7 Resetting the Clock

The elapsed time clock on the drive displays the day and time since the last power cycle or clock reset. The time is based on an internal 248-day counter.

The clock is primarily used to show when a fault or alarm occurred. It is reset by cycling power or by using the procedure described here.

To reset the clock:

Step 1. Press PROGRAM MONITOR until the key indicator reads PROGRAM.

Step 2. Press ↑ or ↓ until the cursor (►) is pointing to Operator Interface. Press ENTER.

Step 3. Press ↑ or ↓ until the cursor is pointing to Reset Clock. Press ENTER.

Step 4. The OIM resets the elapsed time clock to 000 days 00 hours 00 mins 00 secs and displays the message shown in figure 7.9. Press CANCEL to return to the menu.

Figure 7.9 – Reset Clock Message Screen

GLOSSARY

Altitude. The atmospheric altitude (height above sea level) at which the motor or drive will be operating.

Armature. The portion of the DC motor that rotates.

Armature Resistance. Measured in ohms at 25 degrees Celsius (cold).

Base Speed. The speed that a DC motor develops at rated armature voltage and rated field current with rated load applied. Typically nameplate data.

Configurable. Input parameter whose values can only be modified while the drive is stopped (not running or jogging).

Constant Speed. Used to describe a motor that changes speed only slightly from a no-load to a full-load condition.

DC Motor. A motor using either generated or rectified DC power. A DC motor is usually used when variable speed operation is required.

DB. Dynamic Braking.

Default Value. Parameter values that are stored in the drive's read-only memory (ROM).

Drive. Power converting equipment supplying electrical power to a motor.

Efficiency. The ratio of mechanical output to electrical input. It represents the effectiveness with which the motor converts electrical energy to mechanical energy.

Field. A term commonly used to describe the stationary (stator) member of a DC motor. The field provides the magnetic field with which the mechanically rotating (armature or rotor) member interacts.

Horsepower. The measure of the rate of work. One horsepower is equivalent to lifting 33,000 pounds to a height of one foot in one minute. The horsepower of a motor is expressed as a function of torque and RPM. For motors, you can approximate horsepower using this formula:

$$HP = T \times \frac{RPM}{5250}$$

where:

- HP = horsepower
- T = Torque (in lb-ft)
- RPM = revolutions per minute

Inertial Load. A load (such as flywheel or fan) that tends to cause the motor shaft to continue to rotate after power has been removed (stored kinetic energy). If this continued rotation cannot be tolerated, some mechanical or electrical braking means must be applied. This application might require a special motor due to the energy required to accelerate the inertia. Inertia is measured in either lb-ft^2 or oz-in^2.

$$\text{Inertia Reflected to the Shaft of the Motor} = \text{Load Inertia} \times \left(\frac{\text{Load RPM}}{\text{Motor RPM}}\right)^2$$

Input Parameter. You can change the value of the parameter through the OIM.

LCD. Liquid Crystal Display.

LED. Light Emitting Diode.

Motor. A device that converts electrical energy to mechanical energy to turn a shaft.

Motor Electrical Time Constant. The ratio of electrical inductance (L_a) to armature resistance (R_a).

Motor Identification:

- Frame designation (actual frame size in which the motor is built)
- Horsepower, speed, design and enclosure
- Voltage, frequency and number of phases of power supply
- Class of insulation and time rating
- Application

Motor Nameplate. The plate on the outside of a motor that describes the motor, HP, voltage, RPM, efficiency, design, enclosure, etc.

Motor Thermostat. Unit applied directly to the motor's windings that senses winding temperature and might automatically break the circuit in an overheating situation.

Non-Retentive. Changes to the parameter value are not saved when power is removed.

Output Parameter: Provides output information. Value cannot be changed through the OIM.

Power (P) in kW. The measure of the rate of work. One kilowatt (kW) is equivalent to lifting 98 kg to a height of one meter in one second. The kW rating of a motor is expressed as a function of torque and RPM. For motors, you can use this approximate formula:

$$P = T \times \frac{RPM}{9550}$$

where:

- P = horsepower
- T= Torque (in Nm)
- RPM = revolutions per minute

Rated Full Load Current. Armature current in amperes.

Retentive. Parameter value is stored in the drive even when power is off. To save changes to the values, a Memory Save must be performed before removing power.

RPM. Revolutions per Minute. The number of times per minute the shaft of the motor (machine) rotates.

Service Factor (SF). When used on a motor nameplate, a number that indicates how much above the nameplate rating a motor can be loaded without causing serious degradation. For example, a 1.15 SF can produce 15% greater torque than a 1.0 SF rating of the same motor.

Tachometer. Normally used as a rotation sensing device. Tachometers are typically attached to the output shaft of a motor requiring close speed regulation. The tachometer feeds its signal to a control loop, which adjusts its input to the motor accordingly.

Top Speed. The highest speed a drive can achieve. Top speed equals base speed when there is no field weakening.

Torque. Turning force delivered by a motor or gearmotor shaft, usually expressed in pounds-feet or newton-meters:

$$\text{lb-ft} = \text{HP} \times \frac{5250}{\text{RPM}} = \text{Full Load Torque}$$

$$\text{Nm} = \text{P(kW)} \times \frac{9550}{\text{RPM}} = \text{Full Load Torque}$$

Tunable. Input parameter whose value can be modified at any time (when the drive is stopped, running, or jogging).

APPENDIX A

OIM Menu Structure

This appendix shows the OIM menu structure and the parameters in the menus.

In these lists, parameter names are shown in upper case and menus are shown in lower case.

A.1 FlexPak 3000 Main Menu

To access the Main Menu, press CANCEL X until FlexPak 3000 Main Menu is displayed at the top of the screen. The main menu consists of:

- Quick Start
- Drive Reference
- Speed/Voltage Loop (SPD)
- Current Minor Loop (CML)
- Outer Control Loop (OCL)
- Input/Output
- Network Communications
- Field
- Drive Information
- Operator Interface
- Additional Parameters

A.2 Complete OIM Menu Structure

FlexPak 3000 Main Menu

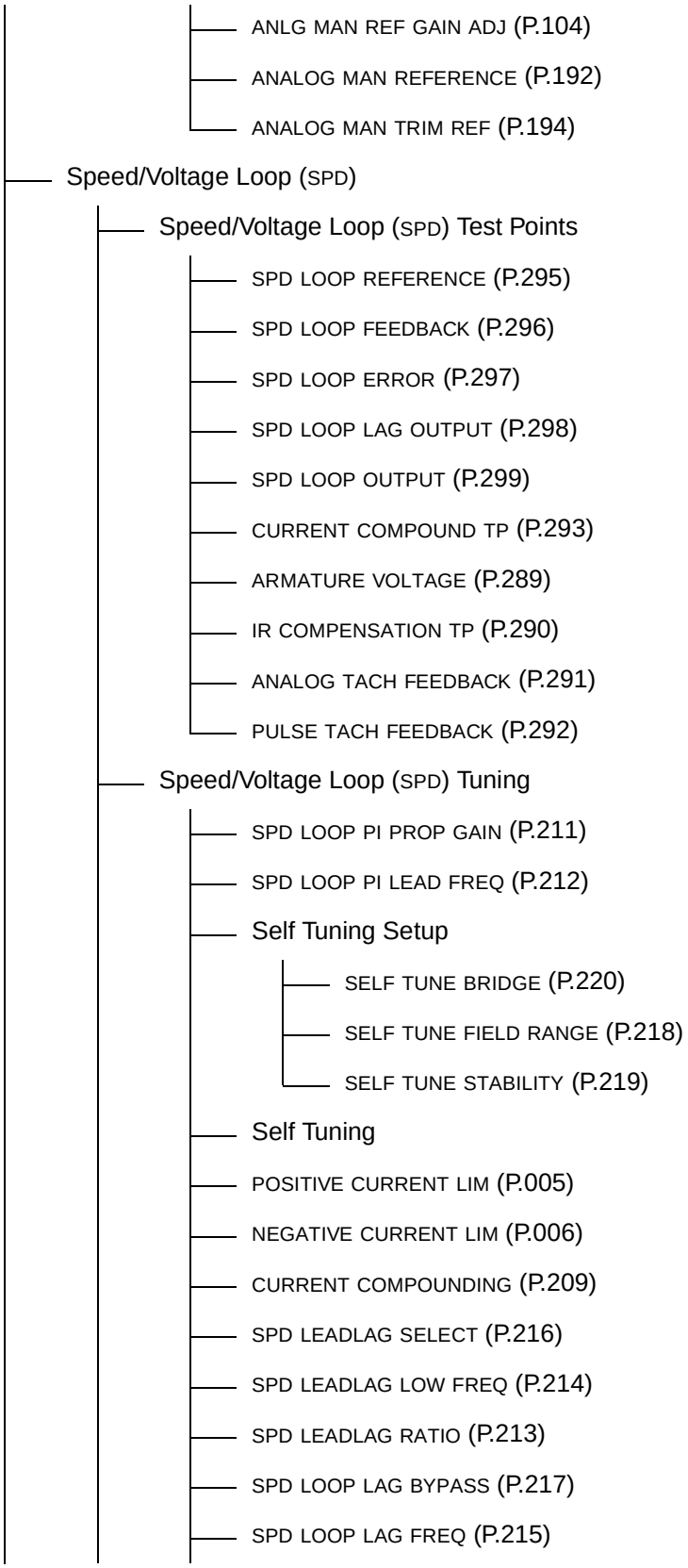
- Quick Start
  - MOTOR BASE SPEED/TOP SPEED (P.011)
  - MOTOR RATED ARM AMPS (P.008)
  - MOTOR RATED ARM VOLTS (P.009)
  - REVERSE DISABLE (P.015)
  - FEEDBACK SELECT (P.200)
  - ACCELERATION TIME (P.001)

- DECELERATION TIME (P.002)
- MINIMUM SPEED (P.003)
- MAXIMUM SPEED (P.004)
- JOG ACCEL/DECEL TIME (P.013)
- JOG SPEED (P.012)
- POSITIVE CURRENT LIM (P.005)
- NEGATIVE CURRENT LIM (P.006)
- IR COMPENSATION (P.206)
- J11 ANLG TACH VLT SCL (P.792)
- J14 ANLG TACH VLT RNG (P.793)
- J18 ARM I FB RESISTOR (P.395)
- Self Tune

Drive Reference

- Drive Reference Test Points
  - ANALOG AUTO REFERENCE (P.188)
  - ANALOG MAN REFERENCE (P.192)
  - ANALOG MAN TRIM REF (P.194)
  - SPD SOURCE SELECT OUT (P.193)
  - DRAW PERCENTAGE OUT (P.196)
  - TRIM OUTPUT (P.197)
  - SPEED RAMP INPUT TP (P.198)
  - SPEED RAMP OUTPUT (P.199)
  - JOG RAMP OUTPUT (P.294)
  - SPD LOOP REFERENCE (P.295)
  - MOP OUTPUT (P.191)
- Drive Reference Trim
  - TRIM REF REGISTER (P.107)
  - TRIM REFERENCE SELECT (P.108)
  - TRIM RANGE (P.109)
  - TRIM MODE SELECT (P.110)

- Drive Reference Limits
  - TOP SPEED (P.011)
  - MAXIMUM SPEED (P.004)
  - MINIMUM SPEED (P.003)
  - REVERSE DISABLE (P.015)
  - AUTO MODE MIN BYPASS (P.111)
- Drive Reference Ramp
  - ACCELERATION TIME (P.001)
  - DECELERATION TIME (P.002)
  - S-CURVE ROUNDING (P.014)
  - JOG ACCEL/DECEL TIME (P.013)
  - AUTO MODE RAMP BYPASS (P.112)
  - MOP ACCEL TIME (P.115)
  - MOP DECEL TIME (P.120)
- Drive Reference Configure
  - JOG SPEED (P.012)
  - ANLG AUTO SIGNAL TYPE (P.100)
  - STOP MODE SELECT (P.114)
  - STOP SPEED THRESHOLD (P.113)
  - AUTO REFERENCE SELECT (P.103)
  - MANUAL REF SELECT (P.106)
  - JOG OFF DELAY TIME (P.121)
  - PRESET SPEED 1 (P.117)
  - PRESET SPEED 2 (P.118)
  - PRESET SPEED 3 (P.119)
  - MOP RESET ENABLE (P.116)
- Drive Reference Scaling
  - ANLG AUTO ZERO ADJ (P.102)
  - ANLG AUTO GAIN ADJ (P.101)
  - ANALOG AUTO REFERENCE (P.188)
  - ANLG MAN REF ZERO ADJ (P.105)


ANLG MAN REF GAIN ADJ (P.104)
ANALOG MAN REFERENCE (P.192)
ANALOG MAN TRIM REF (P.194)
Speed/Voltage Loop (SPD)
Speed/Voltage Loop (SPD) Test Points
SPD LOOP REFERENCE (P.295)
SPD LOOP FEEDBACK (P.296)
SPD LOOP ERROR (P.297)
SPD LOOP LAG OUTPUT (P.298)
SPD LOOP OUTPUT (P.299)
CURRENT COMPOUND TP (P.293)
ARMATURE VOLTAGE (P.289)
IR COMPENSATION TP (P.290)
ANALOG TACH FEEDBACK (P.291)
PULSE TACH FEEDBACK (P.292)
Speed/Voltage Loop (SPD) Tuning
SPD LOOP PI PROP GAIN (P.211)
SPD LOOP PI LEAD FREQ (P.212)
Self Tuning Setup
SELF TUNE BRIDGE (P.220)
SELF TUNE FIELD RANGE (P.218)
SELF TUNE STABILITY (P.219)
Self Tuning
POSITIVE CURRENT LIM (P.005)
NEGATIVE CURRENT LIM (P.006)
CURRENT COMPOUNDING (P.209)
SPD LEADLAG SELECT (P.216)
SPD LEADLAG LOW FREQ (P.214)
SPD LEADLAG RATIO (P.213)
SPD LOOP LAG BYPASS (P.217)
SPD LOOP LAG FREQ (P.215)

- IR COMPENSATION (P.206)
- INERTIA COMP SELECT (P.221)
- NORMALIZED INERTIA (P.222)
- POS CURRENT LIM SEL (P.223)
- NEG CURRENT LIM SEL (P.224)

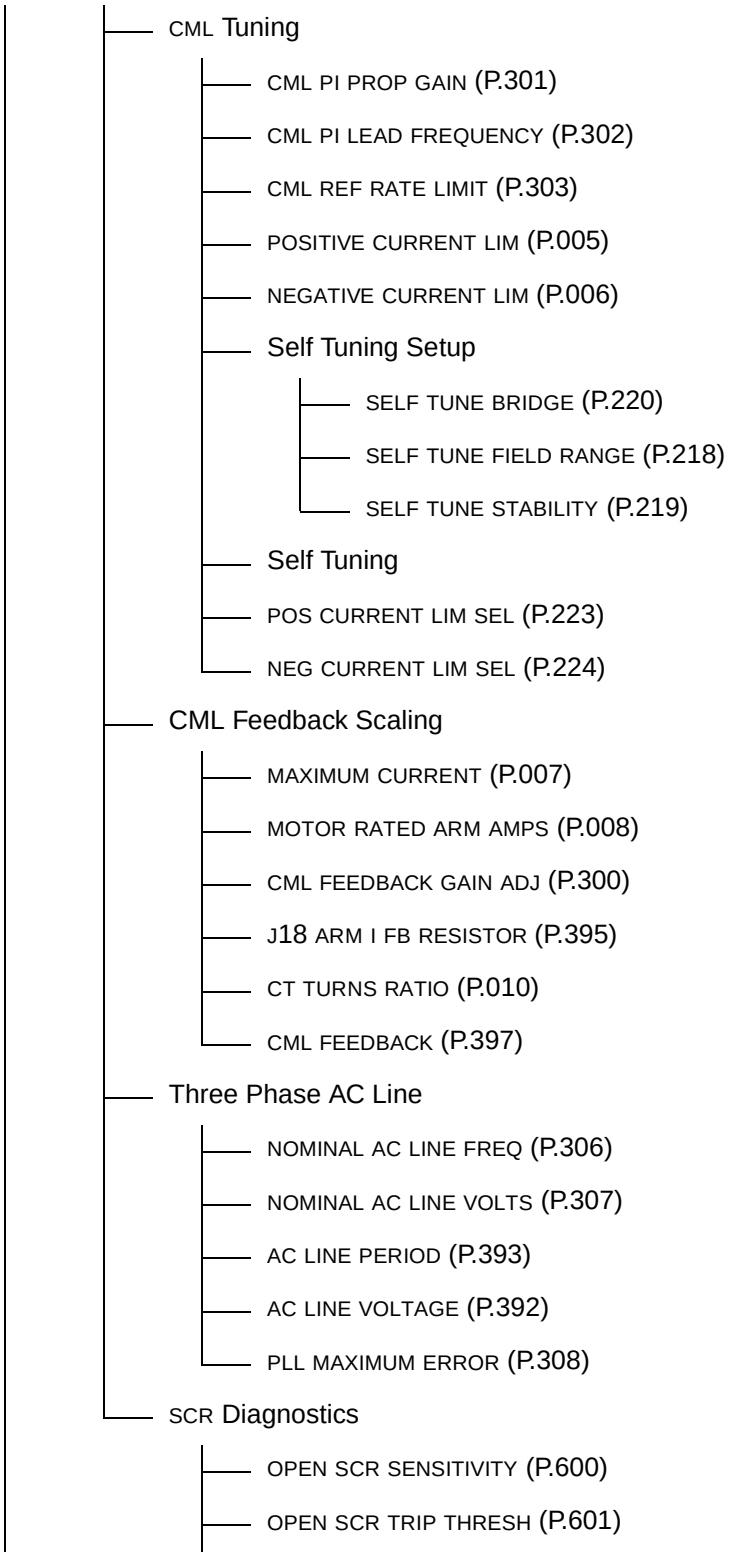
Speed/Voltage Loop (SPD) Feedback

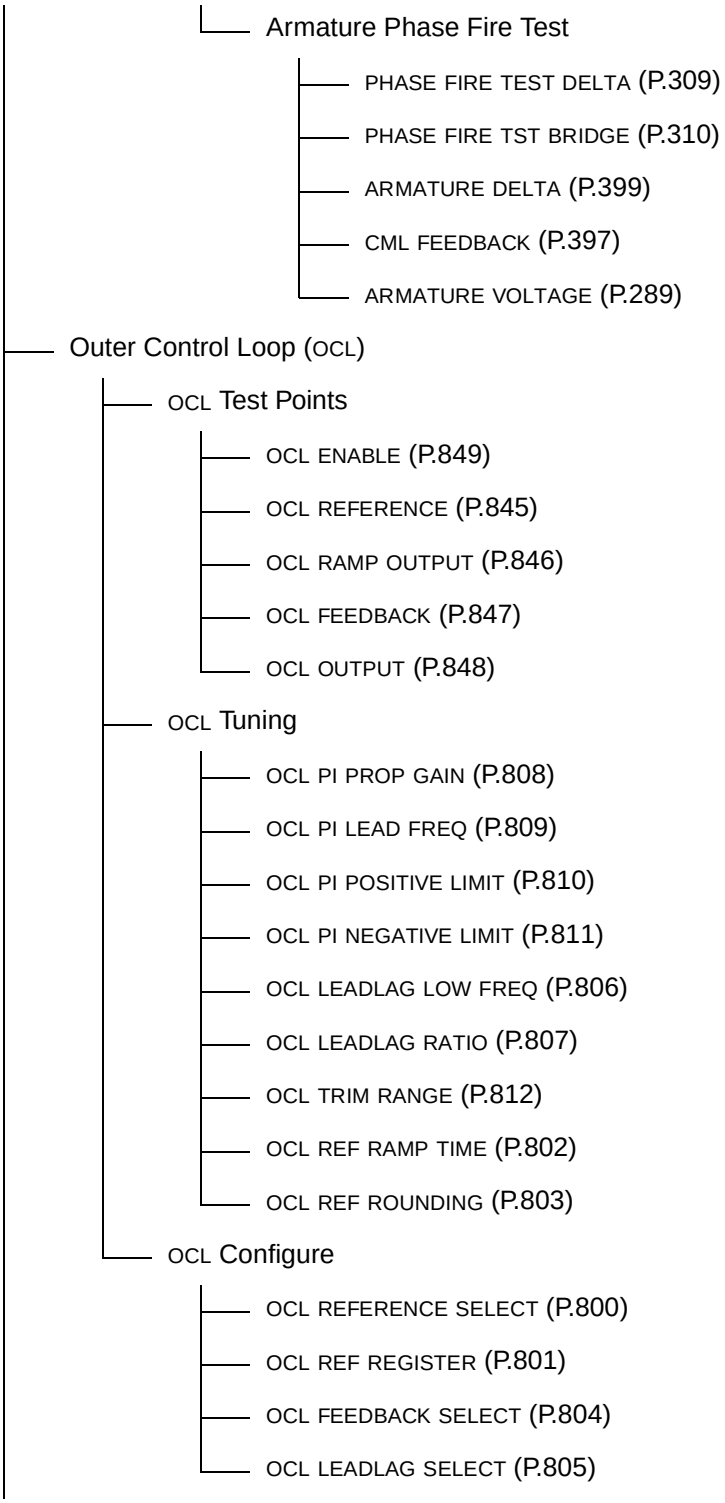
- FEEDBACK SELECT (P.200)
- MOTOR RATED ARM VOLTS (P.009)
- ARM VOLTAGE ZERO ADJ (P.205)
- ARM VOLTAGE GAIN ADJ (P.204)
- ARMATURE VOLTAGE (P.289)
- ANALOG TACH ZERO ADJ (P.202)
- ANALOG TACH GAIN ADJ (P.201)
- ANALOG TACH FEEDBACK (P.291)
- ANLG TACH VOLTS/1000 (P.203)
- J11 ANLG TACH VLT SCL (P.792)
- J14 ANLG TACH VLT RNG (P.793)
- PULSE TACH PPR (P.207)
- PULSE TACH QUADRATURE (P.208)

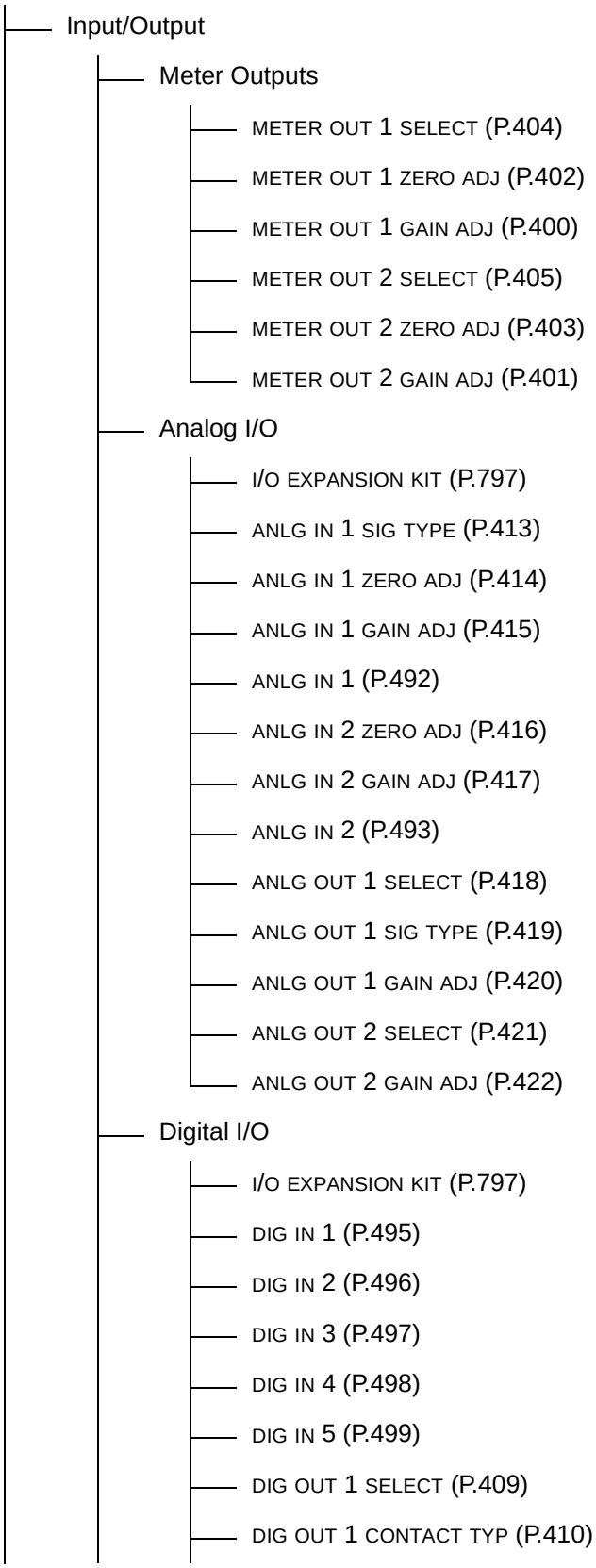
Current Minor Loop (CML)

CML Test Points

- CML REFERENCE (P.396)
- CML FEEDBACK (P.397)
- CML ERROR (P.398)
- SPD LOOP OUTPUT (P.299)
- ARMATURE BRIDGE POL (P.394)
- ARMATURE DELTA (P.399)
- TORQUE REFERENCE (P.189)
- J15 REGULATOR TYPE (P.799)


CML Tuning
CML PI PROP GAIN (P.301)
CML PI LEAD FREQUENCY (P.302)
CML REF RATE LIMIT (P.303)
POSITIVE CURRENT LIM (P.005)
NEGATIVE CURRENT LIM (P.006)
Self Tuning Setup
SELF TUNE BRIDGE (P.220)
SELF TUNE FIELD RANGE (P.218)
SELF TUNE STABILITY (P.219)
Self Tuning
POS CURRENT LIM SEL (P.223)
NEG CURRENT LIM SEL (P.224)
CML Feedback Scaling
MAXIMUM CURRENT (P.007)
MOTOR RATED ARM AMPS (P.008)
CML FEEDBACK GAIN ADJ (P.300)
J18 ARM I FB RESISTOR (P.395)
CT TURNS RATIO (P.010)
CML FEEDBACK (P.397)
Three Phase AC Line
NOMINAL AC LINE FREQ (P.306)
NOMINAL AC LINE VOLTS (P.307)
AC LINE PERIOD (P.393)
AC LINE VOLTAGE (P.392)
PLL MAXIMUM ERROR (P.308)
SCR Diagnostics
OPEN SCR SENSITIVITY (P.600)
OPEN SCR TRIP THRESH (P.601)


Armature Phase Fire Test
PHASE FIRE TEST DELTA (P.309)
PHASE FIRE TST BRIDGE (P.310)
ARMATURE DELTA (P.399)
CML FEEDBACK (P.397)
ARMATURE VOLTAGE (P.289)
Outer Control Loop (OCL)
OCL Test Points
OCL ENABLE (P.849)
OCL REFERENCE (P.845)
OCL RAMP OUTPUT (P.846)
OCL FEEDBACK (P.847)
OCL OUTPUT (P.848)
OCL Tuning
OCL PI PROP GAIN (P.808)
OCL PI LEAD FREQ (P.809)
OCL PI POSITIVE LIMIT (P.810)
OCL PI NEGATIVE LIMIT (P.811)
OCL LEADLAG LOW FREQ (P.806)
OCL LEADLAG RATIO (P.807)
OCL TRIM RANGE (P.812)
OCL REF RAMP TIME (P.802)
OCL REF ROUNDING (P.803)
OCL Configure
OCL REFERENCE SELECT (P.800)
OCL REF REGISTER (P.801)
OCL FEEDBACK SELECT (P.804)
OCL LEADLAG SELECT (P.805)

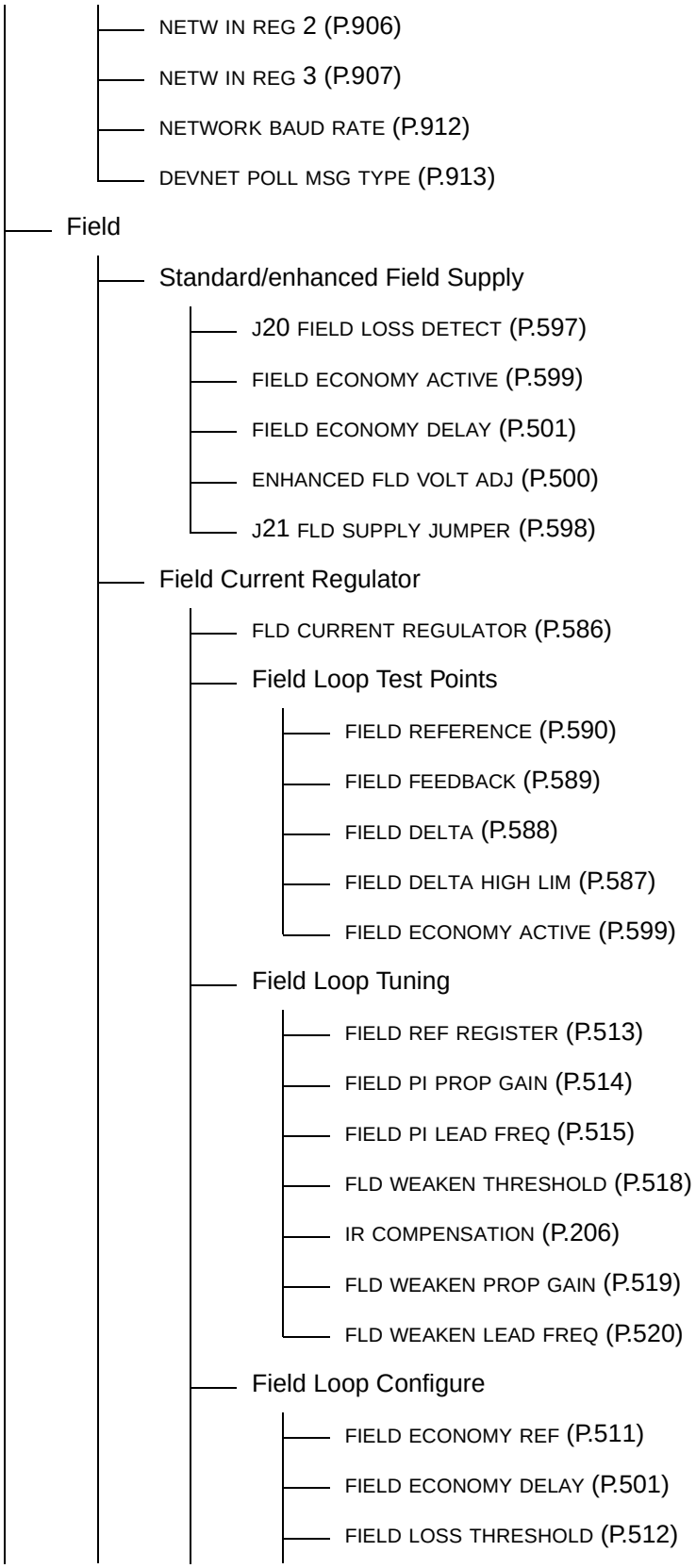

Input/Output
Meter Outputs
METER OUT 1 SELECT (P.404)
METER OUT 1 ZERO ADJ (P.402)
METER OUT 1 GAIN ADJ (P.400)
METER OUT 2 SELECT (P.405)
METER OUT 2 ZERO ADJ (P.403)
METER OUT 2 GAIN ADJ (P.401)
Analog I/O
I/O EXPANSION KIT (P.797)
ANLG IN 1 SIG TYPE (P.413)
ANLG IN 1 ZERO ADJ (P.414)
ANLG IN 1 GAIN ADJ (P.415)
ANLG IN 1 (P.492)
ANLG IN 2 ZERO ADJ (P.416)
ANLG IN 2 GAIN ADJ (P.417)
ANLG IN 2 (P.493)
ANLG OUT 1 SELECT (P.418)
ANLG OUT 1 SIG TYPE (P.419)
ANLG OUT 1 GAIN ADJ (P.420)
ANLG OUT 2 SELECT (P.421)
ANLG OUT 2 GAIN ADJ (P.422)
Digital I/O
I/O EXPANSION KIT (P.797)
DIG IN 1 (P.495)
DIG IN 2 (P.496)
DIG IN 3 (P.497)
DIG IN 4 (P.498)
DIG IN 5 (P.499)
DIG OUT 1 SELECT (P.409)
DIG OUT 1 CONTACT TYP (P.410)

- DIG OUT 2 SELECT (P.411)
- DIG OUT 2 CONTACT TYP (P.412)

- Frequency I/O
  - I/O EXPANSION KIT (P.797)
  - FREQ IN ZERO (P.423)
  - FREQ IN FULL SCALE (P.424)
  - FREQ IN (P.491)
  - FREQ OUT SELECT (P.425)
  - FREQ OUT ZERO (P.426)
  - FREQ OUT FULL SCALE (P.427)

- Level Detectors
  - LEVEL DETECT 1 SELECT (P.602)
  - LEVEL DETECT 1 THRESH (P.603)
  - LEVEL DETECT 1 DELAY (P.604)
  - LEVEL DETECT 1 OUTPUT (P.648)
  - LEVEL DETECT 2 SELECT (P.605)
  - LEVEL DETECT 2 THRESH (P.606)
  - LEVEL DETECT 2 DELAY (P.607)
  - LEVEL DETECT 2 OUTPUT (P.649)

- Network Communications
  - NETWORK KIT (P.796)
  - NETW TYPE & VERSION (P.909)
  - NETW COMM STATUS (P.908)
  - NETW DROP NUMBER (P.900)
  - NETW COMM LOSS SELECT (P.901)
  - NETW CONNECT TYPE (P.910)
  - AMX NETW REF SELECT (P.911)
  - NETW OUT REG 1 SELECT (P.902)
  - NETW OUT REG 2 SELECT (P.903)
  - NETW OUT REG 3 SELECT (P.904)
  - NETW IN REG 1 (P.905)


NETW IN REG 2 (P.906)
NETW IN REG 3 (P.907)
NETWORK BAUD RATE (P.912)
DEVNET POLL MSG TYPE (P.913)
Field
Standard/enhanced Field Supply
J20 FIELD LOSS DETECT (P.597)
FIELD ECONOMY ACTIVE (P.599)
FIELD ECONOMY DELAY (P.501)
ENHANCED FLD VOLT ADJ (P.500)
J21 FLD SUPPLY JUMPER (P.598)
Field Current Regulator
FLD CURRENT REGULATOR (P.586)
Field Loop Test Points
FIELD REFERENCE (P.590)
FIELD FEEDBACK (P.589)
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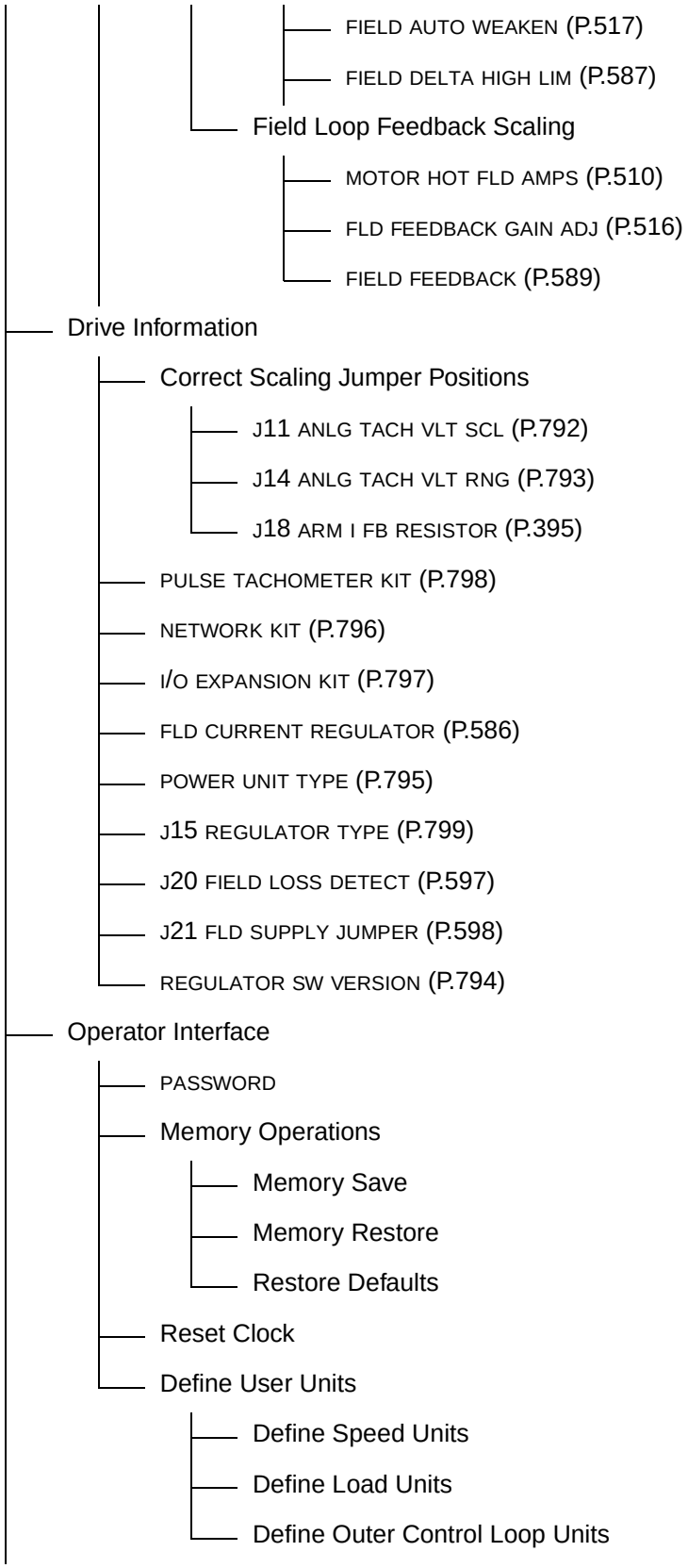
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U.S. Drives Technical Support
Tel: (1) 262.512.8176, Fax: (1) 262.512.2222, Email: support@drives.ra.rockwell.com, Online: www.ab.com/support/abdrives

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation, Vorstlaan/Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

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