1397 DC Drive

1.5 - 150HP @230VAC
7 - 265ADC @380/415VAC
3 - 600HP @460VAC

Firmware Rev. 2.xx

User Manual
Solid state equipment has operational characteristics differing from those of electromechanical equipment. “Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls” (Publication SGI-1.1 available from your local Allen-Bradley Sales Office or online at http://www.ab.com/manuals/gi) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will the Allen-Bradley Company be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, the Allen-Bradley Company cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Allen-Bradley Company with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual we use notes to make you aware of safety considerations.

<table>
<thead>
<tr>
<th><strong>ATTENTION:</strong></th>
<th>Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.</th>
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</table>

Attentions help you:

- identify a hazard
- avoid the hazard
- recognize the consequences

<table>
<thead>
<tr>
<th><strong>Important:</strong></th>
<th>Identifies information that is especially important for successful application and understanding of the product.</th>
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<thead>
<tr>
<th><strong>Shock Hazard</strong></th>
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Introduction

Manual Objectives

The purpose of this manual is to provide you with the necessary information to install, program, start up and maintain the 1397 DC Drive. This manual should be read in its entirety before operating, servicing or initializing the 1397 Drive. This manual must be consulted first, as it will reference other 1397 manuals for option initialization.

This manual is intended for qualified service personnel responsible for setting up and servicing the 1397 DC Drive. You must have previous experience with and a basic understanding of electrical terminology, programming procedures, required equipment and safety precautions, as typical applications will consist of a properly rated DC motor, with or without feedback based on performance requirements, and the 1397.

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

ATTENTION: An incorrectly installed or applied drive can result in component damage or a reduction in product life. Wiring or application errors such as undersizing the motor, incorrect or inadequate AC supply or excessive ambient temperatures may result in damage to the Drive or motor.

ATTENTION: This drive contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference Allen–Bradley Publication 8000 – 4.5.2, Guarding against Electrostatic Damage or any other applicable ESD protection handbook.
### Chapter Objective

Chapter 1 in addition to detailing drive features and specifications, also supplies the information needed to unpack, properly inspect and if necessary, store the 1397 Drive. A complete explanation of the catalog numbering system is also included in this chapter.

### Storage Conditions

After receipt inspection, repack the Drive in its original shipping container until ready for installation. To ensure satisfactory operation at startup and to maintain warranty coverage, store the Drive as follows:
- In its original shipping container in a clean, dry, safe place.
- In an ambient temperature that does not exceed 65°C (149°F) or go below -30°C (-22°F).
- Within a relative humidity range of 5 to 95% without condensation.
- At an altitude of less than 3,000 meters (10,000 ft.) above sea level.

### Drive Identification

The 1397 DC Drive has a nameplate on the side of the chassis (Fig. 1.1) that identifies the specific model number design, applicable AC input power and DC output power data. All communication concerning this product should refer to the appropriate model number information.

#### Figure 1.1

**Bulletin 1397 Nameplate**

![Bulletin 1397 Nameplate](image)

**BULLETION 1397**

M/N 1397-BO10R                   5/10HP
INPUT 230/460VAC 19A 3PH 50/60HZ
OUTPUT 240/500VDC  20A
DC FIELD 150/300VDC   10A
SHORT CIRCUIT RATING   5000A
I/M 1397-5.0             W/D 30371–23

FOR 230V OPERATION, SEE I/M
SERIAL NO. 1397-B010R V 001    WY
MADE IN USA

The technical power information on the nameplate should be referenced to verify proper power application.

### Firmware Version

The manual covers firmware versions through 2.xx.
### Catalog Numbering Convention

Drive specific data, such as horsepower (or output current), regenerative or non-regenerative type, line voltage etc. can be determined by the Drive model number. The model number structure is shown below.

#### 1397–B005–OPTIONS

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<th>Third Position Rating</th>
<th>Fourth Position Type</th>
<th>Fifth Position</th>
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<td></td>
<td><strong>002</strong></td>
<td>2 (1.5)</td>
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<td></td>
<td><strong>003</strong></td>
<td>3 (2.2)</td>
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<td>5 (3.7)</td>
<td><strong>–</strong></td>
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<td></td>
<td></td>
<td><strong>007</strong></td>
<td>7.5 (5.8)</td>
<td><strong>–</strong></td>
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<td><strong>010</strong></td>
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<td>125 (93)</td>
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<td><strong>150</strong></td>
<td>150 (111)</td>
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<td><strong>U</strong></td>
<td>380/415V AC ADC</td>
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<td>120 (89.5)/138 (102.9)</td>
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<td><strong>B</strong></td>
<td>460V AC</td>
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<td>500 (373)</td>
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<td></td>
<td><strong>600</strong></td>
<td>600 (448)</td>
<td><strong>–</strong></td>
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</tbody>
</table>

1 Regen (R) required for reversing applications

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NOTE: Refer to page 1–4 for additional option information.
1397 – OPTIONS

CONTROL OPTIONS
- DS  AC Line Disconnect
- MB  Blower Motor Starter
- L10  Control Interface – 115VAC
- L11  I/O Expansion Cord
- DB  Dynamic Braking
- FS3  Enhanced Field Supply
- FS2  Field Current Regulator
- PE  Pulse Encoder Kit
- AC  AC Tachometer Kit
- IFB  (400 – 600 HP only)

COMMUNICATION OPTIONS (Loose Kits)
- 1203-GD1  Single Point Remote I/O (RIO) – 115V AC
- 1203-GK1  Single Point Remote I/O (RIO) – 24 VDC
- 1203-GK2  RS-232 Interface Brd
- 1203-GK5  DeviceNet – 24 VDC

OPTION CROSS REFERENCE

HUMAN INTERFACE OPTIONS
- HAB  Blank – No Functionality
- HAP  Programmer Only
- HA1  Programmer / Controller with Analog Pot
- HA2  Programmer / Controller with Digital Pot

Specifications

Input Voltage and Frequency Ratings
Nominal Voltage
- 207 to 253 V AC or 414 to 506 V AC (Horsepower-rated drives)
- 342 to 437 V AC or 374 V AC to 477 V AC (Current-rated drives)
Nominal Line Frequency
- 50 or 60 cycles per second
Frequency Variation
- ± 2 cycles of nominal

AC Line Fault Capacity
Allowable AC Line Symmetrical (See Power Ratings and Supply Capacity)

AC Line kVA
AC Line Distribution Capacity
- Maximum 3 drives per transformer
Minimum Source kVA (See Power Ratings and Supply Capacity)

DC Voltage Ratings
230 V AC Line
- Armature Voltage
- 240 V DC
Field Voltage (w/basic fld supply)
- 150 V DC
380/415 V AC Line
- Armature Voltage
- 400/460 V DC
Field Voltage (w/basic fld supply)
- 250/270 V DC
460 V AC Line
- Armature Voltage
- 500 V DC
Field Voltage (w/basic fld supply)
- 300 V DC

Service Factor Ratings
Service Factor
- 1.0 Continuous
Overload Capacity (drive only)
- 150% of full load rating for one minute
- 200% of full load rating for 13 seconds
Minimum Load
- 5% of rated load
**Service Conditions**

**Ambient Temperature**
- Chassis: 55°C (131°F) maximum
- Cabinet: 40°C (104°F) maximum

**Altitude**
- Chassis and Cabinet: 3300 feet above sea level
- Above 3300 feet: Derate 3% for every 1000 ft above 3300 ft up to 10000 ft.

**Humidity**
- Chassis and Cabinet: 5 to 95% non-condensing

**Environment**
The drive should be located in an area that is free of dust, dirt, acidic or caustic vapors, vibration and shock, temperature extremes, and electrical or electromagnetic noise interference.

**Regulation**

**Tachometer Speed Regulation**

<table>
<thead>
<tr>
<th>Regulation Arrangement</th>
<th>Speed Change with 95% Load Change</th>
<th>Speed Change from All other Variables</th>
<th>Kit Model Number</th>
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<tbody>
<tr>
<td>Armature voltage regulation w/IR Compensation</td>
<td>2-3 %</td>
<td>15%</td>
<td>Standard</td>
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<tr>
<td>Closed Loop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(DC Tach Feedback)</td>
<td>1%</td>
<td>2%</td>
<td>Standard</td>
</tr>
<tr>
<td>(Pulse Encoder Feedback)</td>
<td></td>
<td></td>
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<tr>
<td>(RD-120 Pulse Encoder FDBK)</td>
<td>0.01%</td>
<td>0.01%</td>
<td>1397 – PE</td>
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</table>

1 Optional pulse encoder feedback kit required.

**Speed Change**
- Operator’s Speed Adjustment: 0 to rated speed
- Specification Speed Range: 100:1 based on top speed and tachometer

**Drive Efficiency**
- Drive Only: 98.6% (rated load and speed)
- Drive and Motor: 85% typical

Note: Typical percent shown depends on motor operating speed and frame size.

**Power Ratings**
- Displacement Power Factor: 88% typical (rated load and speed)

Note: Typical percent shown depends on motor operating speed and frame size.
### Power Ratings and Supply Capacity (230/460VAC)

<table>
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<th>HP</th>
<th>230 V AC</th>
<th>460 V AC</th>
<th>240 V DC</th>
<th>500 V DC</th>
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<th>460 V AC</th>
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<tr>
<td></td>
<td>Full Load Rated RMS AC Line Current (Amperes)</td>
<td>Full Load Rated DC Armature Current (Amperes)</td>
<td>Rated Field Current (Amperes)</td>
<td>Power Source Capacity 1 (Amperes)</td>
<td>Minimum Source kVA</td>
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<td>35</td>
<td>15</td>
<td>10</td>
<td>10000</td>
<td>5000</td>
</tr>
<tr>
<td>25</td>
<td>80</td>
<td>39</td>
<td>93</td>
<td>45</td>
<td>15</td>
<td>10</td>
<td>10000</td>
<td>5000</td>
</tr>
<tr>
<td>30</td>
<td>94</td>
<td>45</td>
<td>110</td>
<td>52</td>
<td>15</td>
<td>10</td>
<td>10000</td>
<td>5000</td>
</tr>
<tr>
<td>40</td>
<td>125</td>
<td>63</td>
<td>146</td>
<td>73</td>
<td>15</td>
<td>15</td>
<td>25000</td>
<td>10000</td>
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<tr>
<td>50</td>
<td>154</td>
<td>74</td>
<td>180</td>
<td>86</td>
<td>15</td>
<td>15</td>
<td>25000</td>
<td>10000</td>
</tr>
<tr>
<td>60</td>
<td>186</td>
<td>86</td>
<td>218</td>
<td>100</td>
<td>15</td>
<td>15</td>
<td>25000</td>
<td>10000</td>
</tr>
<tr>
<td>75</td>
<td>226</td>
<td>110</td>
<td>265</td>
<td>129</td>
<td>15</td>
<td>15</td>
<td>25000</td>
<td>25000</td>
</tr>
<tr>
<td>100</td>
<td>307</td>
<td>143</td>
<td>360</td>
<td>167</td>
<td>15</td>
<td>25000</td>
<td>118</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>370</td>
<td>177</td>
<td>434</td>
<td>207</td>
<td>15</td>
<td>25000</td>
<td>145</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>443</td>
<td>213</td>
<td>521</td>
<td>250</td>
<td>15</td>
<td>25000</td>
<td>175</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>281</td>
<td>330</td>
<td>412</td>
<td>250</td>
<td>15</td>
<td>30000</td>
<td>220</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>351</td>
<td>412</td>
<td>495</td>
<td>15</td>
<td>30000</td>
<td>275</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>421</td>
<td>495</td>
<td>667</td>
<td>15</td>
<td>30000</td>
<td>330</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>567</td>
<td>667</td>
<td>940</td>
<td>15</td>
<td>75000</td>
<td>440</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>680</td>
<td>800</td>
<td>960</td>
<td>15</td>
<td>75000</td>
<td>550</td>
<td></td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>816</td>
<td>960</td>
<td>15</td>
<td>75000</td>
<td>660</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ATTENTION: When applying 1397 Drives to a power distribution system with KVA capacity in excess of five times the smallest drive rating the use of an isolation transformer or line reactors of similar impedance is required. Also, the Drives are designed for a maximum of three units per transformer.

1 Maximum permissible available symmetrical RMS fault current.

### Power Ratings and Supply Capacity (380/415VAC)

<table>
<thead>
<tr>
<th>380 VAC KW/HP</th>
<th>415 VAC KW/HP</th>
</tr>
</thead>
<tbody>
<tr>
<td>380/415 Full Load Rated RMS AC Line Current Amperes</td>
<td>380/415 Full Load Rated DC Armature Current Amperes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HP</th>
<th>380/415 Full Load Rated RMS AC Line Current Amperes</th>
<th>380/415 Full Load Rated DC Armature Current Amperes</th>
<th>Rated Field Current</th>
<th>Power Source Capacity 1 (Amperes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8/2.4</td>
<td>10</td>
<td>7</td>
<td>10</td>
<td>5000</td>
</tr>
<tr>
<td>9/12</td>
<td>26</td>
<td>29</td>
<td>10</td>
<td>5000</td>
</tr>
<tr>
<td>17.9/24</td>
<td>48</td>
<td>55</td>
<td>10</td>
<td>5000</td>
</tr>
<tr>
<td>35.8/48</td>
<td>94</td>
<td>110</td>
<td>15</td>
<td>11,500</td>
</tr>
<tr>
<td>89.5/120</td>
<td>226</td>
<td>265</td>
<td>15</td>
<td>25,000</td>
</tr>
</tbody>
</table>
The following sections describe drive inputs and outputs. Refer to Chapter 3 for terminal strip connections and wiring diagrams.

**Logic Inputs**

ATTENTION: Connecting an external power source to any of the +24 volt connections (terminals 1, 7, 11, and 14) on the regulator board terminal strip will damage the drive. Do not connect the external power source to the +24 volt connections on the regulator board terminal strip. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

The logic input circuits can be powered either from the internal +24 VDC power supply or from an external +24 VDC power source. The internal +24 VDC power supply is available at the regulator board terminal strip (see Fig. 2.15). If an external power source is used, only its common must be connected to 24VCOM on the regulator board (terminal 15).

**Electrical Specifications**

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>+24 VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn On Voltage</td>
<td>+8 VDC</td>
</tr>
<tr>
<td>Turn Off Current</td>
<td>0.5 mA</td>
</tr>
<tr>
<td>Common</td>
<td>All input circuits have the same common</td>
</tr>
</tbody>
</table>

**Logic Outputs**

The logic output circuits are normally open (when de-energized) relay contacts. When energized (contacts closed), the three circuits indicate the following drive conditions. Terminals are on the terminal strip on the regulator board.

<table>
<thead>
<tr>
<th>Running</th>
<th>Terminal 27 to 28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm</td>
<td>Terminal 29 to 30</td>
</tr>
<tr>
<td>No Fault</td>
<td>Terminal 31 to 32</td>
</tr>
</tbody>
</table>

**Electrical Specifications**

<table>
<thead>
<tr>
<th>Operating Voltage</th>
<th>250 VAC maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 VDC maximum</td>
</tr>
<tr>
<td>Switching Current</td>
<td>2 Amps maximum resistive</td>
</tr>
<tr>
<td></td>
<td>1 Amp maximum inductive</td>
</tr>
</tbody>
</table>
The three customer analog inputs are Analog Reference 1, Analog Reference 2 and Analog Tachometer Feedback. These inputs are converted within the Drive to 12 bits plus sign at their full range. The electrical specifications for each of these are listed below.

### Analog Reference 1 (Terminals 19,20)
(see page 4.25 for J10 & J12 jumper settings)
- Voltage Reference: $\pm 10 \text{ VDC}$
- Milliamp Reference: 4-20 mA or 10-50 mA

### Analog Reference 2 (Terminals 16, 17, 18)
(see page 4.24 for J19 jumper settings)
- Potentiometer: $5k\Omega$ minimum
- External Voltage Source: $+10 \text{ VDC}$

### Analog Tachometer Feedback
(see page 4.20 for J11 and J14 jumper settings)
- Tach Voltage at Top speed: 10 to 250 VDC

### Analog Outputs

The two metering analog outputs are available at regulator board terminals 24, 25 and 26. Terminal 25 is the common connection for both output signals. The selected signals for both meter outputs are averaged (filtered) over 100 ms to reduce meter fluctuations.

**NOTE:** Refer to the Start-Up chapter for information on programming Analog Outputs.

### Electrical Specifications
- Output Voltage: $\pm 10 \text{ VDC}, \ 4 \text{ mA}$
Drive Description

The Drive is a 3 phase full-wave power converter without flyback rectifier, complete with a digital current regulator and a digital speed regulator for armature voltage or speed regulation by tachometer feedback. Shown in Figure 1.2 is a block diagram of the 1397 Drive.

The Drive employs wireless regulator construction and uses a keypad for Drive setup, including parameter adjustments and unit selection, monitoring, and diagnostics. Reference, feedback, and metering signals can be interfaced to the Drive. The Drive can be controlled locally by the control device (HIM, GPT, DriveTools etc.) keypad or remotely by using the terminals at the regulator board terminal strip.

Figure 1.2
1397 Block Diagram
## Options

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>I/M Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>115 V AC Control Interface</td>
<td>Converts customer-supplied 115 V AC signals to 24 V DC for operating a 1397. Mounts separately on the panel or can be mounted in the bottom of a NEMA Type 1 enclosed drive.</td>
<td>1397-5.18</td>
</tr>
<tr>
<td>All Horsepowers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>230 V AC Conversion</td>
<td>Allows conversion of the 460 V AC 1397 to a 230 V AC 1397 at one-half the 460 V AC horsepower rating.</td>
<td>1397-5.16</td>
</tr>
<tr>
<td>A-C Line Disconnect</td>
<td>Provides instructions for properly attaching and lifting Dynamic Braking drive.</td>
<td></td>
</tr>
<tr>
<td>3 – 60 HP @ 460V</td>
<td>Allows the three-phase line to be disconnected at the drive. Molded case switch that mounts on the chassis of the drive or NEMA Type 1 enclosure.</td>
<td>1397-5.11</td>
</tr>
<tr>
<td>1 – 30HP @ 230V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 – 100A @ 380/415VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic Braking</td>
<td>Provides the hardware, including braking grids, needed to provide dynamic braking on stop. Supplied in a NEMA Type 1 enclosure. The 1397–DB–A and 1397–DB–B series allow the kit to be panel mounted. These kits include the resistor grid assembly and contactor. The customer must supply fused 115 V AC.</td>
<td>1397-5.15</td>
</tr>
<tr>
<td>Enhanced Field Supply</td>
<td>Provides electronic field trim, field economy, and the ability to supply 240V field voltage and other special voltages. This kit replaces the standard field supply.</td>
<td>1397-5.24</td>
</tr>
<tr>
<td>Regulated Field Supply</td>
<td>Provides field economy, as well as pre-weakening of the field using a fixed reference or field weakening for above base speed operation. Tachometer feedback is required with this kit. This kit replaces the standard field supply.</td>
<td>1397-5.17</td>
</tr>
<tr>
<td>Supplied as standard on:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400 – 600HP @ 460V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150HP @ 460V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 HP @ 230V and up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>265 &amp; 521 ADC @ 380/415 VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blower Motor Starter</td>
<td>Provides a fused A-C starter with adjustable overload and interlocking for control of three phase blower motor used to cool the DC motor.</td>
<td>1397-5.20</td>
</tr>
<tr>
<td>Expansion I/O Module</td>
<td>Mounts on the 1397 chassis and gives the drive additional analog, frequency, and digital I/O capability.</td>
<td>1397-5.19</td>
</tr>
<tr>
<td>Pulse Encoder Interface Card</td>
<td>Allows for digital pulse encoder speed feedback.</td>
<td>1397-5.13</td>
</tr>
<tr>
<td>All Horsepowers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC Tachometer Interface Card</td>
<td>Allows for AC tachometer speed feedback.</td>
<td>1397-5.22</td>
</tr>
<tr>
<td>All Horsepowers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC Line Disconnect</td>
<td>Allows the three-phase line to be disconnected at the drive.</td>
<td>1397-5.21</td>
</tr>
<tr>
<td>75 – 150 HP @ 460V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 – 75 HP @ 230V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC Line Disconnect</td>
<td>Allows the three-phase line to be disconnected at the drive.</td>
<td>1397-5.27</td>
</tr>
<tr>
<td>200 – 300 HP @ 460V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 – 150 HP @ 230V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>521 ADC @ 380/415 VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inverting Fault Circuit Breaker</td>
<td>Allows high inertia loads on regenerative 1397 drives.</td>
<td>1397-5.29</td>
</tr>
<tr>
<td>400–600 HP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC Line Disconnect</td>
<td>Allows the three-phase line to be disconnected at the drive.</td>
<td>1397-5.30</td>
</tr>
<tr>
<td>400 – 600 HP @ 460V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC Line Filter Kit</td>
<td>Allows power transformer greater than 2300V RMS to be applied to the drive.</td>
<td>1397-5.31</td>
</tr>
<tr>
<td>600 HP @ 460V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic Braking Resistor Assembly Lifting Instructions 250–600HP</td>
<td>Provides instructions for properly attaching and lifting Dynamic Braking Kits.</td>
<td>1397-5.32</td>
</tr>
</tbody>
</table>
Chapter 2

Installation

Chapter Objectives

The following data will guide you in planning the installation of the 1397 Drive. Since most start-up difficulties are the result of incorrect wiring, every precaution must be taken to assure that the wiring is done as instructed.

IMPORTANT: You are responsible for completing the installation, wiring and grounding of the 1397 Drive and for complying with all National and Local Electrical Codes.

ATTENTION: The following information is merely a guide for proper installation. The National Electrical Code and any other governing regional or local code will overrule this information. The Allen-Bradley Company cannot assume responsibility for the compliance or noncompliance to any code, national, local or otherwise for the proper installation of this Drive or associated equipment. A hazard of personal injury and/or equipment damage exists if codes are ignored during installation.

Environment

The Drive must be mounted in a clean, dry location. Contaminants such as oils, corrosive vapors and abrasive debris must be kept out of the enclosure. Temperatures around the Drive must be kept between 0° and 55°C (32°F and 131°F). Humidity must remain between 5% to 95% non-condensing. The Drive can be applied at elevation of 3300 feet (1,000 meters) without derating. The Drive current rating must be derated by 3% for each additional 1,000 feet (300 meters). Above 10,000 feet (3,000 meters), consult the local Allen-Bradley Sales Office.

Mounting

The 1397 Drive is of the open chassis type construction and is designed to allow you to install it in a suitable enclosure. The selection of enclosure type is the responsibility of the user. Dimensions and clearances for the 1397 are detailed in the figures on the following pages.

ATTENTION: Plan Drive installation so that all cutting, drilling, tapping and welding can be done with the Drive removed from the enclosure. The Drive is of the open type construction and any metal debris must be kept from falling into the Drive. Metal debris or other foreign matter may become lodged in the circuitry resulting in component damage.
Cooling Airflow

In order to maintain proper cooling, the Drive must be mounted in a vertical position. Refer to Figure 2.1 for the recommended minimum clearance of each Drive.

The Drive design produces up to a 10°C or 18°F air temperature rise when the Drive is operated at full capacity. Precautions should be taken not to exceed the maximum inlet ambient air temperature of 55°C (131°F). If the Drive is in an enclosed cabinet, air circulation fans or a closed circuit heat exchanger may be required.

Line Filters (CE Only)

For information on installing, wiring and grounding Line Filters used in CE compliant applications, refer to Appendix B.

AC Line Inductors (CE Only)

For installation information on AC Line Inductors used in CE compliant applications, refer to Appendix B.
Figure 2.1
Enclosure Mounting Minimum Clearances

<table>
<thead>
<tr>
<th></th>
<th>1.5 – 30 HP @ 230VAC</th>
<th>3 – 60 HP @ 460VAC</th>
<th>7 – 110A @ 380 / 415 VAC</th>
<th>40 – 150 HP @ 230VAC</th>
<th>75 – 600 HP @ 460VAC</th>
<th>265A @ 380 / 415 VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Leftside Clearance</td>
<td>76 mm (3 in.)</td>
<td>76 mm (3 in.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B Rightside Clearance</td>
<td>51 mm (2 in.)</td>
<td>51 mm (2 in.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C Drive to Drive Side Clearance</td>
<td>101 mm (4 in.)</td>
<td>101 mm (4 in.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D Bottom Clearance</td>
<td>127 mm (5 in.)</td>
<td>305 mm (12 in.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E Top Clearance</td>
<td>127 mm (5 in.)</td>
<td>305 mm (12 in.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Do Not Mount Drive Horizontally on Side or Back.
Enclosure Mounting Dimensions

Figure 2.2
Drive Mounting Dimensions –
1.5 to 30 HP at 230 VAC
7 to 110A @ 380/415 VAC
3 to 60 HP at 460 VAC

All Dimensions Millimeters and (Inches)
Approximate Shipping Weight 30.8 kg (68 lbs.)
Figure 2.3
Drive Mounting Dimensions –
40 to 75 HP at 230 VAC
265A @ 380/415 VAC
75 to 150 HP at 460 VAC

All Dimensions Millimeters and (Inches)
Approximate Shipping Weight 55.0 kg (122 lbs.)
Figure 2.4
Drive Mounting Dimensions – 150 HP at 230 VAC; 200 – 300 HP at 460 VAC

All Dimensions Millimeters and (Inches)

Approximate Shipping Weight 100 kg (220.5 lbs.)

Mounting Hardware
6 x M10 or 3/8"

All Dimensions Millimeters and (Inches)

Approximate Shipping Weight 100 kg (220.5 lbs.)
Figure 2.5
Drive Mounting Dimensions –
400 to 600 HP at 460 V AC

[Diagram showing dimensions for drive mounting, with specific measurements and notes.]
Grounding Procedures

The purpose of grounding is to:

- Limit dangerous voltages to ground potential on exposed parts in the event of an electrical fault.
- To facilitate proper operation of overcurrent device when ground fault conditions are incurred.
- To provide suppression of electrical interference.

The general grounding concept for the 1397 is shown in Figure 2.6 and explained below. Specific Drive ground point locations are detailed in Figures 2.7, 2.8 and 2.9.

Safety Ground – Is the safety ground required by code. The ground bus can be connected to adjacent building steel (girder, joist) or a floor ground grid, provided grounding points comply with NEC regulations. Multiple connections are permitted, but Do Not ground at the same point as a Signal Ground. The minimum distance between Signal and Safety Ground is 10 feet (3 meters). The ground bus is limited to a maximum of 1 ohm resistance to ground.

Power Feeder – Each power feeder from the substation transformer to the Drive must be provided with properly sized ground cables. Simply utilizing the conduit or cable armor as a ground is not adequate. The conduit or cable armor and ground wires should be bonded to substation ground at both ends. Each transformer enclosure and/or frame must be bonded to ground at a minimum of two locations.

Motor Connection – Each DC motor frame must be bonded to grounded building steel within 20 feet (6 meters) of its location and tied to the drives Safety Ground via ground wires within the power cables and/or conduit. Bond the conduit or cable armor to ground at both ends. The ground wire size and installation must be per NEC Article 250.

Encoder Connections – If used, must be routed in grounded steel conduit. The conduit must be grounded at both ends. Ground the cable shield at the motor only (See Figure 2.6).

Tachometer Connections – If used, must be routed in grounded steel conduit. The conduit must be grounded at both ends. Ground the cable shield at the Drive end Only (See Figure 2.6).

(CE) Line Filter Connections – For grounding requirements in CE compliant applications, refer to page B.8 in this manual.

(CE) AC Line Inductor Connections – For grounding requirements in CE compliant applications, refer to page B.8 in this manual.
Figure 2.6
1397 Grounding Practices

IMPORTANT: For CE requirements refer to Appendix B
Figure 2.7
Drive Ground Point Locations – 1.5-30 HP at 230 V AC
7–100 A @ 380/415 V AC
3-60 HP at 460 V AC
Figure 2.8
Drive Ground Point Locations – 40-75 HP at 230 VAC
265A @ 380/415 VAC
75-150 HP at 460 VAC, 265 Amp Rated Output
Figure 2.9
Drive Ground Point Locations – 150 HP at 230 VAC; 300 HP at 460 VAC

10mm DIA GROUND STUD
Located at back of chassis

6mm DIA CONTROL GROUND STUD

10mm DIA GROUND STUDS
Located at back of chassis

10mm DIA GROUND STUD
Located at back of chassis

10mm DIA GROUND STUD
(With Lug)
Figure 2.10
Drive Ground Point Locations –
400-600 HP at 460 VAC

![Diagram showing drive ground point locations](image-url)
Table 2.A
Chassis Ground Connections

<table>
<thead>
<tr>
<th>Hardware Size</th>
<th>Tightening</th>
</tr>
</thead>
<tbody>
<tr>
<td>M5</td>
<td>18 lb/in (2Nm)</td>
</tr>
<tr>
<td>M6</td>
<td>33 lb/in (3.7 Nm)</td>
</tr>
<tr>
<td>M8</td>
<td>100 lb/in (11.3 Nm)</td>
</tr>
<tr>
<td>M10</td>
<td>200 lb/in (23 Nm)</td>
</tr>
<tr>
<td>Lug with 14–10 AWG</td>
<td>35 lb/in (4 Nm)</td>
</tr>
<tr>
<td>Lug with 8 AWG</td>
<td>40 lb/in (4.5 Nm)</td>
</tr>
<tr>
<td>Lug with 6–4 AWG</td>
<td>45 lb/in (5.1 Nm)</td>
</tr>
</tbody>
</table>

Wiring Clearance

Although the minimum clearance should be maintained for proper cooling, this space may not always provide proper wiring clearance. The minimum allowable wire bending radius may necessitate that extra space be provided to accommodate power wiring. Consult the governing code for the proper wiring method.

Disconnect

NOTE: You are responsible for completing the installation of the Drive system and to comply with all National and Local Electrical Codes. The following information is to be used as a reference only.

ATTENTION: Hazard of electric shock or equipment damage exist if the Drive is not installed correctly. The National Electrical Code (NEC) and local codes outline provisions for safely installing electrical equipment. Installation must comply with specifications regarding wire types, conductor sizes, branch circuit protection and disconnect devices. Failure to do so may result in personal injury and/or equipment damage.

You must provide a main disconnect and lockout device with cabinet interlocks. This device must be wired in the isolation transformer or reactor primary circuit. The device must be sized to handle 115% of the full load primary current plus any additional loads that are connected to the control system. Proper branch circuit protection for the Drive and additional devices must be provided according to NEC and local codes.

NOTE: Refer to Table on Page 1-6 for Drive current ratings to aid in properly sizing wire.

24V Power Supply

The 1397 is equipped with a 250mA 24V power supply to power additional peripheral devices. For example, up to two of the following 24V DC Scanport modules can be used:

- 1203-GK1 Single Point Remote I/O
- 1203-GK2 DFI (RS–232 / 422 / 485) or DH–485
If more than two SCANport modules are used with the 1397 Drive, an additional 24V DC power supply must be installed, or 115V SCANport modules must be used. Refer to the SCANport user manual for information on installing additional SCANport modules.

The 24V DC power supply can be accessed at terminals #14 (24V DC) and #15 (24VDC common) of the regulator board terminal strip.

Wire sizes must be selected individually, observing all applicable safety and NEC regulations. The minimum permissible wire size does not necessarily result in the best operating economy. Due to the Drive overload capacity, the conductors for the transformer primary and secondary must be sized (at a minimum) for 125% of the full load Drive line current. The motor armature conductors must also be rated for 125% (at a minimum) of the full load motor current.

Shielded type wire is recommended in control circuits for protection against interference. A shielded wire is required for all signal wires. The recommended conductor size must be a minimum of 24 AWG. The best interference suppression is obtained with a wire having an individual shield for every pair. Table 2.B provides a listing and description of cable types and wiring recommendations. Figure 2.9 shows recommended cable shielding. Note that wiring classes are for reference only, and are not associated with any code or standard.
### Table 2.B
Cable and Wiring Recommendations

<table>
<thead>
<tr>
<th>Category</th>
<th>Wiring Class</th>
<th>Signal Definition</th>
<th>Signal Examples</th>
<th>Cable Type</th>
<th>Minimum Spacing in Inches between Classes – Steel Conduit/Tray</th>
<th>Spacing Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2/3/4</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>1</td>
<td>AC Power (600V or greater)</td>
<td>2.3kV 3/Ph AC Lines</td>
<td>per NEC &amp; Local Codes</td>
<td>0</td>
<td>3/9</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>AC Power (less than 600V)</td>
<td>460V 3/Ph AC Lines</td>
<td>per NEC &amp; Local Codes</td>
<td>3/9</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>DC Power</td>
<td>DC Motor Armature</td>
<td>per NEC &amp; Local Codes</td>
<td>3/9</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>DC Power</td>
<td>DC Motor Field</td>
<td>per NEC &amp; Local Codes</td>
<td>3/9</td>
<td>0</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td>5</td>
<td>115V AC/DC Logic</td>
<td>Relay Logic/PLC I/O Motor Thermostat</td>
<td>per NEC &amp; Local Codes</td>
<td>3/9</td>
<td>3/6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>115V AC Power</td>
<td>Power Supplies, Instruments</td>
<td>per NEC &amp; Local Codes</td>
<td>3/9</td>
<td>3/6</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>24V AC/DC Logic</td>
<td>PLC I/O</td>
<td>per NEC &amp; Local Codes</td>
<td>3/9</td>
<td>3/6</td>
</tr>
<tr>
<td><strong>Signal (Process)</strong></td>
<td>7</td>
<td>Analog Signals, DC Supplies</td>
<td>Reference/Feedback Signal, 5 to 24V DC</td>
<td>Shielded Cable – Belden 8735, 8737, 8404</td>
<td>3/18</td>
<td>3/12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Digital (low speed)</td>
<td>TTL</td>
<td></td>
<td>3/9</td>
<td>3/9</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Digital (high speed)</td>
<td>I/O, Encoder, Count Pulse Tach</td>
<td>Shielded Cable – Belden 9728, 9730</td>
<td>3/9</td>
<td>3/9</td>
</tr>
<tr>
<td><strong>Signal (Comm)</strong></td>
<td>9</td>
<td>Serial Communication</td>
<td>RS-232, 422 to Terminals/Printers</td>
<td>Shielded Cable – Belden RS-232 – 8735, RS-422 – 9729, 9730</td>
<td>3/18</td>
<td>3/12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(greater than 20k baud)</td>
<td>PLC Remote I/O, PLC Data Highway</td>
<td>Twinaxial Cable – Belden 9463, A-B 1770-CD</td>
<td>Note 6</td>
<td>1/3</td>
</tr>
</tbody>
</table>

**Example:** Spacing relationship between 480V AC incoming power leads and 24V DC logic leads.
- 480V AC leads are Class 2 ; 24V DC leads are Class 6
- For separate steel conduits, the conduits must be 3 inches (76 mm) apart
- In a cable tray, the two groups of leads are to be 6 inches (152 mm) apart

**Spacing Notes:**

1. Both outgoing and return current carrying conductors are to be pulled in same conduit or laid adjacent in tray.
2. Cables of the following classes can be grouped together.
   A. Class 1; Equal to or above 601 volts
   B. Classes 2, 3, and 4 may have their respective circuits pulled in the same conduit or layered in the same tray.
   C. Classes 5 and 6 may have their respective circuits pulled in the same conduit or layered in the same tray.
   Note: Bundle may not exceed conditions of NEC 310
   D. Classes 7 and 8 may have their respective circuits pulled in the same conduit or layered in the same tray.
   Note: Encoder cables run in a bundle may experience some amount of EMI coupling. The circuit application may dictate separate spacing.
   E. Classes 9, 10 and 11 may have their respective circuits pulled in the same conduit or layered in the same tray.
   Communication cables run in a bundle may experience some amount of EMI coupling and corresponding communication faults. The application may dictate separate spacing.
3. All wires of class 7 thru 11 MUST be shielded per the recommendations
4. In cable trays, steel separators are advisable between the class groupings.
5. If conduit is used, it must be continuous and composed of magnetic steel.

**LEGEND**

<table>
<thead>
<tr>
<th>Spacing Notes</th>
<th>Class Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/3/4</td>
<td>Class Spacing</td>
</tr>
<tr>
<td>3/9</td>
<td>Steel Conduit/Tray</td>
</tr>
</tbody>
</table>

6. Spacing of communication cables classes 2 thru 6 is:
   - CONDUIT SPACING
   - 115 Volts – 1 inch
   - 230 Volts – 1.5 inches
   - 380/575 Volts – 3 inches
   - 575 volts – proportional to 6” per 1000 volts.

<table>
<thead>
<tr>
<th>General Notes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Steel conduit is recommended for all wiring classes. (Classes 7-11).</td>
<td></td>
</tr>
<tr>
<td>2. Spacing shown between classes is the minimum required for parallel runs less than 400 feet. Greater spacing should be used where possible.</td>
<td></td>
</tr>
<tr>
<td>3. Shields for shielded cables must be connected at one end only. The other end should be cut back and insulated. Shields for cables from a cabinet to an external device must be connected at cabinet end. Shields for cables from one cabinet to another must be connected at the source end cabinet. Splicing of shielded cables, if absolutely necessary, should be done so that shields remain continuous and insulated from ground.</td>
<td></td>
</tr>
<tr>
<td>4. Power wire is selected by load. 16AWG is the minimum recommended size for control wiring.</td>
<td></td>
</tr>
</tbody>
</table>
Motor Installation

The following procedure provides the steps needed to properly install a DC motor for use with a 1397 Drive.

1. Verify that the motor you intend to install is the appropriate rating for use with your model 1397 Drive.
2. Install the DC motor in accordance with the motor manufacturer’s installation instructions.
3. Ensure that coupled applications have proper shaft alignment with the driven machine or that belted applications have proper sheave/belt alignment to minimize unnecessary motor loading.
4. If the motor is accessible while it is running, make certain all guards necessary to satisfy local and national codes are installed.
5. Size the motor armature circuit conductors for the specific Drive rating and according to applicable codes.
6. Locate and connect the DC motor armature leads and the shunt field supply leads on the Drive (Figures 2.13 through 2.16).

ATTENTION: 400 to 600 HP @ 460VAC
Regenerative Drives require an externally mounted Inverting Fault Protection device connected in the armature circuit. Refer to the instruction manual provided with the Inverting Fault Protection device you have selected for your drive for connection information. Failure to provide Inverting Fault Protection could result in severe bodily injury or loss of life.

Power Wiring Procedure

The following procedure provides the steps needed to properly perform the power wiring connections to the 1397 Drive.

Using Table 2.C, verify that the motor field is compatible with the DC field voltage output of the Drive.

Table 2.C
Standard Field Voltage Output

<table>
<thead>
<tr>
<th>AC Incoming Voltage to Drive</th>
<th>DC Supply Output Voltage to Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>230V AC</td>
<td>150V DC</td>
</tr>
<tr>
<td>380V AC</td>
<td>250V DC</td>
</tr>
<tr>
<td>415V AC</td>
<td>270V DC</td>
</tr>
<tr>
<td>460V AC</td>
<td>300V DC</td>
</tr>
</tbody>
</table>
1. Connect the motor armature and field leads to produce proper direction of motor rotation. Figure 2.12 shows the connections required to produce counterclockwise rotation of the motor when viewed from the commutator end with a positive speed reference input to the Drive.

**Figure 2.12**
Typical DC Motor Connections (CCW) Rotation

1.5 to 150HP @ 230VAC, 3 to 300HP @ 460VAC

(1) In cases where full regenerative torque capability is required for braking or slow down operation or where the drive will be applied for bi-directional operation, you should specify straight shunt DC motors (wound without a series field winding) to assure symmetrical motor operation in both forward and reverse directions, full torque capability, and motor stability under any mode of operation.

(2) If this connection of the motor armature leads results in motor rotation opposite of what is required, reverse the A1 and A2 lead connections at the motor.

(3) Connect Drive Terminal A2/S1 or S2 to motor terminal A2.

2. The 1397 is supplied with semiconductor fuses for line protection. An isolation transformer can also be used. In general, the 1397 is suitable for direct connection to a correct voltage AC line that has minimum impedance of 3%. If the
line is lower impedance, a line reactor or isolation transformer must be added upline from the Drive to increase line impedance. If the line impedance is too low, transient voltage spikes or interruptions can create excessive current spikes that will cause nuisance input fuse blowing, and may cause damage to the Drive power structure. Refer to Figures 2.13 through 2.16 for AC input wiring at the main fuses and the following ATTENTION note when determining if a line reactor or isolation transformer is required for your installation.

**AC Line Connection** – Connect incoming three-phase AC line power to the AC Line Terminals as shown in Figures 2.13 through 2.16. Note that the incoming AC power is wired to separate terminals on the 1.5-30HP/3-60HP, 7–110A Drives, but is wired directly to AC line fuses on 40-75HP/75-150HP, 100-150/200-300HP, 265A and higher and 400 to 600 HP Drives. The fuses supplied are designed to provide protection against short circuits for the Drive semiconductors and associated output wiring. They are not to be considered a substitute for the user supplied motor branch circuit protective devices that are required by the National Electrical Code. Refer to Table 2.E for proper sizing of the AC power and branch fuses.

**ATTENTION:** If the AC input power system does not have a neutral or one phase referenced to ground, an isolation transformer with the neutral of the secondary grounded is **highly recommended.** If the line-to-line voltages on any phase can exceed 125% of the nominal line-to-line voltage, an isolation transformer with the neutral of the secondary grounded, is **always required.** Failure to observe these precautions could result in bodily injury or damage to equipment.
Figure 2.13
AC Line Connection Location
1.5-30 HP at 230 VAC; 3-60 HP at 460 VAC
7-110A @ 380/415 VAC
Figure 2.14
AC Line Connection Location
40-75 HP at 230 VAC; 75-150 HP at 460 VAC
265A @ 380/415 VAC
Figure 2.15
A-C Line Connection Locations
100-150 HP at 230 VAC; 200-300 HP at 460 VAC

SHOWN WITHOUT AC LINE DISCONNECT

DANGER
CIRCUIT BREAKER DOES NOT DISCONNECT INCOMING A0 LINE POWER IT ONLY PROVIDES DC FAULT PROTECTION.

RISK OF ELECTRICAL SHOCK. DISCONNECT INPUT POWER BEFORE SERVICING EQUIPMENT.
Figure 2.16
A-C Line Connection Locations
400-600 HP at 460 V AC

Without AC Line Disconnect

With AC Line Disconnect
## Table 2.D
### AC Line Connectors

<table>
<thead>
<tr>
<th>HP</th>
<th>230 V AC</th>
<th>380 VAC</th>
<th>415 VAC</th>
<th>460 V AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>6.2 Nm (55 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>—</td>
</tr>
<tr>
<td>2</td>
<td>6.2 Nm (55 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>—</td>
</tr>
<tr>
<td>3</td>
<td>6.2 Nm (55 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>—</td>
</tr>
<tr>
<td>5</td>
<td>6.2 Nm (55 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>—</td>
</tr>
<tr>
<td>7.5</td>
<td>6.2 Nm (55 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>—</td>
</tr>
<tr>
<td>10</td>
<td>6.2 Nm (55 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>—</td>
</tr>
<tr>
<td>15</td>
<td>13.6 Nm (120 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>—</td>
</tr>
<tr>
<td>20</td>
<td>13.6 Nm (120 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
<td>—</td>
</tr>
<tr>
<td>25</td>
<td>13.6 Nm (120 lb-in)</td>
<td>13.6 Nm (120 lb-in)</td>
<td>13.6 Nm (120 lb-in)</td>
<td>6.2 Nm (55 lb-in)</td>
</tr>
<tr>
<td>30</td>
<td>13.6 Nm (120 lb-in)</td>
<td>13.6 Nm (120 lb-in)</td>
<td>13.6 Nm (120 lb-in)</td>
<td>13.6 Nm (120 lb-in)</td>
</tr>
<tr>
<td>40</td>
<td>22 Nm (200 lb-in)</td>
<td>13.6 Nm (120 lb-in)</td>
<td>13.6 Nm (120 lb-in)</td>
<td>13.6 Nm (120 lb-in)</td>
</tr>
<tr>
<td>50</td>
<td>22 Nm (200 lb-in)</td>
<td>13.6 Nm (120 lb-in)</td>
<td>13.6 Nm (120 lb-in)</td>
<td>13.6 Nm (120 lb-in)</td>
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<tr>
<td>60</td>
<td>22 Nm (200 lb-in)</td>
<td>22 Nm (200 lb-in)</td>
<td>22 Nm (200 lb-in)</td>
<td>22 Nm (200 lb-in)</td>
</tr>
<tr>
<td>75</td>
<td>22 Nm (200 lb-in)</td>
<td>22 Nm (200 lb-in)</td>
<td>22 Nm (200 lb-in)</td>
<td>22 Nm (200 lb-in)</td>
</tr>
<tr>
<td>100</td>
<td>22 Nm (200 lb-in)</td>
<td>22 Nm (200 lb-in)</td>
<td>22 Nm (200 lb-in)</td>
<td>22 Nm (200 lb-in)</td>
</tr>
<tr>
<td>125</td>
<td>40 Nm (350 lb-in)</td>
<td>22 Nm (200 lb-in)</td>
<td>22 Nm (200 lb-in)</td>
<td>22 Nm (200 lb-in)</td>
</tr>
<tr>
<td>150</td>
<td>40 Nm (350 lb-in)</td>
<td>22 Nm (200 lb-in)</td>
<td>22 Nm (200 lb-in)</td>
<td>22 Nm (200 lb-in)</td>
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<td>—</td>
<td>—</td>
<td>34 Nm (300 lb-in)</td>
</tr>
<tr>
<td>250</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>34 Nm (300 lb-in)</td>
</tr>
<tr>
<td>300</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>34 Nm (300 lb-in)</td>
</tr>
<tr>
<td>400</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>34 Nm (300 lb-in)</td>
</tr>
<tr>
<td>500</td>
<td>—</td>
<td>—</td>
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</tr>
<tr>
<td>600</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>34 Nm (300 lb-in)</td>
</tr>
</tbody>
</table>

Note: The tightening torque in the table applies to the wiring device (stud or terminal board) provided. When an input or an output device (breaker or lug kit) is added, refer to the kit instructions for tightening specifications.
The following tables list the recommended AC line and DC armature fuses for the Drive. The armature fuse is required only for regenerative Drives.

Standard models are shipped with the appropriate fuses.

You must select the correct replacement fuse type from Tables 2.E and 2.F.

### Table 2.E
**AC Line Fuses**

<table>
<thead>
<tr>
<th>HP at 230 V AC</th>
<th>HP at 380 V AC</th>
<th>HP at 415 V AC</th>
<th>HP at 460 V AC</th>
<th>Fuse Rating (500 V)</th>
<th>Fuse Class</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5-5</td>
<td>2.4</td>
<td>2.8</td>
<td>3-10</td>
<td>40A</td>
<td>XL50F</td>
<td>Bussman</td>
</tr>
<tr>
<td>7.5-10</td>
<td>12</td>
<td>13.8</td>
<td>15-20</td>
<td>80A</td>
<td>XL50F</td>
<td>Bussman</td>
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<tr>
<td>15</td>
<td>24</td>
<td>27.6</td>
<td>30</td>
<td>90A</td>
<td>XL50F</td>
<td>Bussman</td>
</tr>
<tr>
<td>20-30</td>
<td>48</td>
<td>55.2</td>
<td>40-60</td>
<td>150A</td>
<td>XL50F</td>
<td>Bussman</td>
</tr>
<tr>
<td>40-60</td>
<td>120</td>
<td>138</td>
<td>75-125</td>
<td>300A</td>
<td>XL50F</td>
<td>Bussman</td>
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<tr>
<td>75</td>
<td></td>
<td></td>
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<td>100</td>
<td></td>
<td></td>
<td>200</td>
<td>600A</td>
<td>XL50F</td>
<td>Bussman</td>
</tr>
<tr>
<td>125-150</td>
<td></td>
<td></td>
<td>250-300</td>
<td>800A</td>
<td>XL50F</td>
<td>Bussman</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>400-600</td>
<td>600A (700V)</td>
<td>XL50F</td>
<td>Bussman</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 in parallel</td>
<td>A70QS600–4K</td>
<td>Gould</td>
</tr>
</tbody>
</table>

### Table 2.F
**DC Armature Fuses (Regenerative Drives Only)**

<table>
<thead>
<tr>
<th>DC Line Fuse (11FU)</th>
<th>HP at 230 V AC</th>
<th>A @ 380/415 V AC</th>
<th>HP at 460 V AC</th>
<th>Fuse Rating (700 V)</th>
<th>Fuse Class</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>7</td>
<td>3</td>
<td>15A</td>
<td>XL70F</td>
<td>Bussman</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>4</td>
<td>20A</td>
<td>XL70F</td>
<td>Bussman</td>
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</tr>
<tr>
<td>3</td>
<td>7</td>
<td>6</td>
<td>25A</td>
<td>XL70F</td>
<td>Bussman</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>10</td>
<td>35A</td>
<td>XL70F</td>
<td>Bussman</td>
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<tr>
<td>7.5</td>
<td>29</td>
<td>15</td>
<td>40A</td>
<td>XL70F</td>
<td>Bussman</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>29</td>
<td>20</td>
<td>50A</td>
<td>XL70F</td>
<td>Bussman</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>55</td>
<td>30</td>
<td>70A</td>
<td>XL70F</td>
<td>Bussman</td>
<td></td>
</tr>
<tr>
<td>20-25</td>
<td>55</td>
<td>40-50</td>
<td>125A</td>
<td>XL70F</td>
<td>Bussman</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>110</td>
<td>60</td>
<td>150A</td>
<td>XL70F</td>
<td>Bussman</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>110</td>
<td>75</td>
<td>200A</td>
<td>XL70F</td>
<td>Bussman</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>110</td>
<td>100</td>
<td>250A</td>
<td>XL70F</td>
<td>Bussman</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>110</td>
<td>125</td>
<td>300A</td>
<td>XL70F</td>
<td>Bussman</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>205</td>
<td>150</td>
<td>350A</td>
<td>XL70F</td>
<td>Bussman</td>
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</tr>
</tbody>
</table>
Figure 2.17
DC Drive Motor Field and Armature Connection Locations
1.5-30 HP at 230 VAC
7-110A @ 380/415 VAC
3-60 HP at 460 VAC
Figure 2.18
DC Motor Field and Armature Connection Locations
40-75 HP at 230 VAC
265A @ 380/415 VAC
75-150 HP at 460 VAC

[Diagram of DC Motor Field and Armature Connection Locations]
Figure 2.19
DC Motor Field and Armature Connection Locations
100-150 HP at 230 VAC,
200-300 HP at 460 VAC
Figure 2.20
DC Motor Field and Armature Connection Locations
400-600 HP at 460 VAC

REMovable Link
Control Connections

The Bulletin 1397 is supplied with the following standard I/O compliment:

- **10 Digital Inputs**
  - 24V DC internally or externally supplied
  - 8V DC turn–on voltage
  - 0.5 mA turn–off current

- **3 Contact Outputs**
  - 250V AC maximum
  - 30V DC maximum
  - 2A maximum resistive load
  - 1A maximum inductive load

- **2 Speed Reference Inputs**
  - Analog Reference 1
    - ±10V DC
    - 4 – 20 mA
    - 10 – 50 mA
    - Converted within Drive to 12 bit plus sign
  - Analog Reference 2
    - External potentiometer (5kΩ min.)
    - ±10V DC
    - Converted within Drive to 12 bit plus sign

- **DC Tachometer Input**
  - 10 – 250V DC
  - Converted within Drive to 12 bit plus sign

- **2 Analog Outputs**
  - ±10V DC
  - 4A maximum load

In order to maintain simplicity, the functions of the analog and digital inputs are fixed. The analog and digital outputs, however, may be reconfigured. See Chapter 5 for information on parameters that must be manipulated to reconfigure the outputs.

**ATTENTION:** The 1397 Drive control circuitry includes solid–state components. If hazards due to accidental contact with moving machinery or unintentional flow of liquid, gas or solids exist, an additional hardwired stop circuit may be required to remove AC line power to the Drive. When AC input power is removed, there will be a loss of inherent regenerative braking effect and the motor will coast to a stop. An auxiliary braking method may be required.
Control Wiring Procedure

Most control connections on the 1397 Drive are made at the Regulator Board Terminal Strip which is located at the bottom of the Drive as shown in Figure 2.21.

Figure 2.21
Regulator Board Terminal Strip Location

Regulator Board Input Signal Definitions

The 1397 Drive will recognize a change in the state of a digital input (e.g. 0-24VDC) if it is applied longer than 20 ms. Power (24VDC) signals are available on regulator terminal block pins TB-01, TB-07, TB-11 and TB-14. The associated common connection is present on TB-15. The Digital inputs shown Figure 2.18 are defined as follows:

- **TB–01** POWER – A 24VDC supply is available at this pin.
- **TB–02** RUN – Edge sensitive signal that initiates a Run command (0 \(\rightarrow\) 1 = Run). If the Drive is Run, voltage may be applied to the armature causing the motor to reach the desired speed. The Run input is latched and therefore does not have to be maintained to keep the drive Running. This input can be masked through the [Run Mask] (P. 201) or [Logic Mask] (P.207) parameters.
TB-03 STOP – This is a level sensitive signal that initiates a Stop command (0 = Stop, 1 = Not Stop). The stopping mode is determined by the [Stop Mode Type] (P. 115) parameter. This input CANNOT be masked. Both the customer interlock AND Coast to Stop must be made for the Drive to be READY.

Figure 2.22
Terminal Strip Inputs

2> All customer interlock contacts must be closed for drive operation.
3> The circuit breaker is supplied with 200-300 HP regenerative drives. Note that if any other interlocks are required for your application, they must be connected in series with the circuit breaker contact to the customer interlock input.

* = Required for initial startup and operational checks. Voltage must be present at these points during operation.
JOG – This is a edge sensitive signal that initiates a Jog command (0 = Jog, 0 = Not Jog). If the Drive is READY and not already RUNNING, voltage will be applied causing the motor to reach the value of Jog Reference. The Drive will Jog for only as long as this input is asserted. This input can be masked through the Jog Mask (P. 203) or Logic Mask (P. 207) parameter. When released, the Drive will ramp to zero speed based on the Jog/Acc/Dec Time (P. 092). The contactor will open based on Jog Off Dly Time (P. 094).

REVERSE/FORWARD – This is a Level sensitive signal that selects the commanded direction, Forward = 0 or Reverse = 1. This input can be masked through the Direction Mask (P. 202) or Logic Mask (P. 207) parameter. If it is not masked, it will assume control of the drive reference.

REFERENCE SELECT – This is a edge sensitive signal that selects between REF 1 Source (= 1) and REF2 Source (= 0) parameters to be used as a reference to the Drive. The input can be masked through the Reference Mask (P. 204) or Logic Mask (P. 207) parameters. If it is not masked, it will assume control of the Drive reference. If an I/O Expansion board is installed, the Preset Speed selection bits will override the reference selected by this input.

POWER – A 24VDC supply is available at this pin.

COAST-TO-STOP – Level sensitive input that causes a Coast Stop command (Open = Stop, Closed = NOT Stop). The contactor is forced to open by hardware intervention (i.e. hardware only), making the motor coast to rest (if Running). This input is not maskable and is always active. When the Coast-to-Stop input is open, the Drive will be Not Ready. If an optional Dynamic Braking (DB) kit is present, the braking resistor is automatically applied when the contactor breaks the armature circuit.

CUSTOMER INTERLOCK – Level sensitive input that causes a Coast Stop command (0 = Stop, 1 = NOT Stop). The contactor is forced to open through firmware, making the motor coast to rest (if Running). The input allows external user interlock signals to be part of the Drive ready logic. This input CANNOT be masked.

FAULT/ALARM Clear – Edge sensitive input that clears fault and/or alarm indicator(s) (0 = Clear). The fault and alarm log entries are not affected. This input can be masked through the Fault Reset Mask (P. 205) or Logic Mask (P. 207) parameters.
TB–11  POWER – A 24VDC supply is available at this pin.

TB–12  MOTOR BRUSH WEAR – Level sensitive input that causes a motor brush wear alarm (0 = ALARM). The Drive can still operate under this condition. This input CANNOT be masked.

TB–13  MOTOR THERMOSTAT – Level sensitive input that causes a motor thermostat fault (0 = FAULT). The Drive will be faulted while this input is true. This input CANNOT be masked.

TB–14  POWER – A 24VDC supply is available at this pin.

TB–15  COMMON – A 24VDC common supply is available at this pin.

TB–16,17,18  ANALOG REFERENCE 2 – Fixed ± 10VDC analog reference.

TB–19,20  ANALOG REFERENCE 1 – Signal type selected by Anlg In 1 Type (P.128) parameter (0–10 VDC, ±10 VDC, 4-20mA, 10–50mA) and hardware jumpers on the regulator board (J10 and J12).

TB–21,22,23  ANALOG TACHOMETER IN – Use of #21 or #22 is determined by J14 hardware jumper on the regulator.

ATTENTION: If motor rotation is changed by reversing either the motor armature lead connections or the field connections, the Pulse Encoder feedback polarity on the B and NOT B leads must be reversed. If a DC Tach is used, feedback polarity must also be reversed. Failure to observe this precaution could result in personal injury or damage to equipment.

1. Wiring the Coast Stop Circuit

The 1397 Drive has the capability to accept an input from either a 24VDC or 115VAC contact (if the 115 VAC Control Option Board is installed). The contact must be normally closed and will typically be a Stop pushbutton. Refer to the following paragraphs for connection information. This input cannot be masked and is always active.

ATTENTION: The Run/Stop and customer interlock circuitry in this Drive is composed of solid-state components. A hardwired Coast to Stop circuit must be used with this Drive. For 115VAC control, this circuitry may be added on the optional 115VAC Control Board.
ATTENTION: If Dynamic Braking is used as an alternative stopping method, DO NOT use a hardwired Stop device that removes AC line power. This will de-energize the shunt field, causing a loss of the DB effect and the motor will coast to a stop. Hazards to personnel may exist if the machine is allowed to coast to a stop.

24V DC INPUT – If 24VDC COAST TO STOP is desired, the contacts of the ECOAST device must be wired to terminals 7 and 8 of the regulator board terminal strip as shown in Figure 2.23.

![Figure 2.23](image)

Regulator Board Terminal Strip 24VDC Inputs

ATTENTION: Applying improper input voltage could damage the regulator board. Make certain that only 24VDC is being applied to the Regulator board terminal strip. If 115VAC inputs are desired, an optional 115VAC Control Option Board is required!

115V AC INPUT – If you are using 115VAC inputs for control, a 115 VAC Control Option Board must be installed and wired to your regulator board. If the 115VAC Control Board is not installed on your 1397, follow the instructions provided with the 115V Control Board option kit to install the board before proceeding with control wiring.

ATTENTION: The Drive and 115 VAC Control Option Board are at Line Voltages when connected to sources of incoming AC power. Disconnect, Tag and Lockout all sources of AC power to the Drive and the 115VAC Option Board before performing the following procedure. Failure to observe these precautions could result in personal injury or loss of life.

115V AC COAST TO STOP inputs are installed at terminals 7 and 8 of the CON2 connector on the 115VAC option board as shown in Figure 2.24.
2. Wiring Customer Interlocks

Wire the Customer Interlock as shown in Figure 2.25. Both the 24V Regulator Board Terminal Strip and the 115V CON2 Terminal Strip utilize terminal #9 and #11 as the connection point for a Customer Interlock. All customer interlocks must be closed for Drive operation and CANNOT be masked.

3. Wiring the Motor Thermostat/Brush Wear Circuits

Either a 24VDC or 115VAC input can be used to receive an external voltage for a normally closed contact used in a motor thermostat circuit. As shown in Figure 2.26, Terminal 13 is used for the motor thermostat circuit on both 24VDC and 115VAC configurations. If the motor thermostat circuit is open, the Drive will display a fault and coast to a stop.

Terminal 12 is used for a level sensitive input that triggers a motor brush wear alarm. The Drive will continue to operate under this condition. Both the MOTOR BRUSH WEAR and MOTOR THERMOSTAT inputs are always active and CANNOT be masked.
The contacts of the motor thermostat and Brush Wear must be N.C. The Drive interprets a voltage at Terminals 12 & 13 as a normal expected condition. This input CANNOT be masked.

4. Wiring the Fault/Alarm Reset Circuit

This input clears fault and/or alarm indicators and resets the circuit. As shown in Figure 2.27 the Fault/Alarm Reset circuit requires a N.O. operator device that closes to cause a reset. This input can be masked using the [Fault Reset Mask] (P. 205) or [Logic Mask] (P. 207).
5. Wiring the Control I/O Circuits

Both the 24VDC and 115VAC control circuits use the #1 thru #6 terminals on their respective terminal strips for control functions as shown in Figure 2.28.

**Figure 2.28**
Control I/O Wiring

The RUN connection is made at terminal 2 on both 24VDC and 115VAC terminal strips. The Run input is latched and therefore does not have to be maintained to keep the Drive Running. This input can be masked through the [Run Mask] (P. 201) or [Logic Mask] (P. 207) parameter.

The STOP connection is made at terminal 3 on both 24VDC and 115VAC terminal strips. The stopping mode is determined by the [Stop Mode Type] (P. 115). This input CANNOT BE MASKED.

**ATTENTION:** If Dynamic Braking is used as an alternative stopping method, DO NOT use a hardwired Stop device that removes AC line power. This will de-energize the shunt field, causing a loss of the DB effect and the motor will coast to a stop. Hazards to personnel may exist if the machine is allowed to coast to a stop.

**ATTENTION:** You have the ultimate responsibility to determine which stopping method is best suited to the application and will meet applicable standards for operator safety.
The JOG connection is made at terminal 4 on both 24VDC and 115VAC terminal strips. The Drive will jog when this input is asserted, if the Drive is Ready and not already Running. This input can be masked through the [Jog Mask] (P. 203) or [Logic Mask] (P. 207).

The DIRECTION connection is made at terminal 5 on both 24VDC and 115VAC terminal strips. This level sensitive input selects between Forward (= 0) and Reverse (= 1). This parameter can be masked through the [Direction Mask] (P. 202) or [Logic Mask] (P. 207) parameters.

The REFERENCE SELECT connection is made at terminal 6 on both 24VDC and 115VAC terminal strips. This level sensitive input selects between ANALOG REFERENCE 1 (= 1) and ANALOG REFERENCE 2 (= 0) parameters to be used as the reference to the Drive. This parameter can be masked through the [Reference Mask] (P.204) or [Logic Mask] (P. 207) parameters. NOTE: If an I/O expansion board is installed, the Preset Speed selection bits will override the reference selected by this input.

6. Wiring the Analog Input Circuits

Terminals TB16 thru TB23, as shown in Figure 2.29 are used for reference and feedback signals.

ANALOG REFERENCE 2 is a fixed ± 10 VDC reference which is connected at terminals 16, 17 and 18.

ANALOG REFERENCE 1 which is connected at Terminals TB19 and TB20 is a selectable signal type reference determined by [Anlg In 1 Type] (P. 128) and regulator board jumpers J10 and J12.

ANALOG REFERENCE 1 can be set for 0-10 VDC, ±10 VDC, 4-20mA or 10-50 mA.

Figure 2.29
Regulator Board Terminal Strip
Analog Input Connections
7. Wiring the Output Circuits

The 1397 Drive contains 2 Analog Outputs and 3 Digital Outputs as illustrated in Figure 2.30.

The Analog Outputs are fixed +/– 10 VDC outputs that are updated every 20 ms by the Drive and are sent thru a 100 ms running averaging filter within the drive.

ANALOG OUTPUT 1 is connected at terminals 24 and 25 and [Anlg Out 1 Src] (P 145) determines which Drive testpoint is the source selected.

ANALOG OUTPUT 2 is connected at terminals 25 and 26 and [Analog Out 2 Src] (P. 148) determines which Drive testpoint is the source selected.

The Digital Outputs indicate the present operating state of the Drive and are connected as follows:

Terminals 27–28 – 1 = Running 0 = Not Running
Terminals 29–30 – 1 = Alarm active 0 = No alarms active
Terminals 31–32 – 0 = Fault active 1 = No faults active

Figure 2.30
Regulator Board Terminal Strip
Output Connections
Programming Terminal

General

Chapter 3 describes the various controls and indicators found on the optional Human Interface Module (HIM). The material presented in this chapter must be understood to perform the start-up procedure in Chapter 4.

HIM Description

When the Drive mounted HIM is supplied, it will be accessible from the front of the Drive as shown in Figure 3.1. The HIM has two main functions:

- To provide a means of programming the Drive and viewing operating parameters.
- To allow different Drive functions to be controlled.

The HIM is divided into two sections; Display & Programming Panel and Control Panel. The Display Panel provides a means of programming the Drive and viewing the various operating parameters. The Control Panel allows you to control different drive functions.

IMPORTANT: The operation of some HIM functions will depend upon parameter settings.

Figure 3.1
Human Interface Module Sections

![Diagram of HIM sections with labels for Display Panel and Control Panel.]

Display Panel

Control Panel
Key Descriptions

Descriptions of the keys used with the 1397 Drive are presented in the following paragraphs.

Escape
When pressed, the ESCape key will cause the programming system to go back one level in the menu tree.

Select
Pressing the SELect key alternately causes the top or bottom line of the display to become active. The flashing first character indicates which line is active.

Increment/Decrement
These keys are used to increment and decrement a value or scroll through different groups or parameters.

Enter
When pressed, a group or parameter will be selected or a parameter value will be entered into memory. After a parameter has been entered into memory, the top line of the display will automatically become active, allowing another parameter (or group) to be chosen.
**Run**

By default, this key will initiate Drive operation if hardware is enabled, (ie. Drive is ready and no other control devices are sending a Stop command. To change this function, the [Start Mask] (P. 201) or [Logic Mask] (P 207) parameter must be reconfigured. Refer to Chapter 5. If the Drive is jogging or already running, the key has no effect.

**Stop**

When pressed, a stop sequence will be initiated, causing a controlled stop to occur, as determined by [Stop Mode Type] (P. 115). The HIM also sends a “Fault Clear” which can be masked.

**Jog**

By default, when this key is pressed the motor will jog at a speed determined by the [Jog Reference] (P. 093) parameter. Releasing the key will cause the motor to ramp to zero and the contactor will open based on Jog Off Dly Time (P. 094).

**Change Direction** [Key Active Only on Regen Drives with [Reverse Disable] set to off and [Encoder Quad] to ON.]

Pressing this key will cause the motor to change direction. The appropriate Direction Indicator will light to indicate direction.

**Direction LEDs (Indicators)**

These LEDs will illuminate to indicate the direction of motor rotation. [Direction Mask] (P. 202) and [Logic Mask] (P. 207) must be set to allow HIM control of direction change. If both of these LED’s are lit, the one that is steadily lit indicates the commanded direction, while the flashing LED indicates the actual direction.

NOTE: All Run, Jog and Direction keys can also be affected by the [Logic Mask] (P. 207). It may be necessary to set or disable parameter 207 when configuring keys.
Up/Down Arrows (only available with digital speed control)

Pressing these keys will increase or decrease the HIM reference command. An indication of this command will be shown on the visual Speed Indicator. The Drive will use this reference if the HIM is the selected reference source.

Pressing both keys simultaneously stores the current HIM reference command in HIM memory. Cycling power or removing the HIM from the Drive will set the reference command to the value stored in HIM memory.

If the Analog Speed Potentiometer option has been ordered, the Up/Down keys and Speed Indicator will be replaced by the pot.

Speed Indicator

Illuminates in steps to give an approximate visual indication of the commanded speed.

If the Analog Speed Potentiometer option has been ordered, the Up/Down keys and Speed Indicator will be replaced by the pot.
When power is first applied to the Drive, the HIM will cycle through a series of displays. These displays will show Drive name, HIM ID number and communication status. Upon completion, the Status Display will be shown.

**Figure 3.3**
**Status Display**

![Status Display](image)

This display shows the current status of the Drive (i.e. “Ready,” “Running,” etc.) or any faults that may be present. The Status Display can be replaced by the Process Display or Password Login menu. See appropriate sections on the following pages for more information.

From this display, pressing any key will cause “Choose Mode” to be displayed. Pressing the Increment or Decrement keys will allow different modes to be selected as described on the pages that follow.

**Display**
When selected, the Display mode allows any of the parameters to be viewed. However, parameter modifications are not allowed.

**Program**
Program mode provides access to the complete listing of parameters available for programming.

**Process**
The Process mode displays two user-selected parameters with text and scaling programmed by the user.

**Search** (Available on Series B HIM only)
This mode will search for parameters that are not at their default values.

**Control Status** (Available on Series B HIM only)
Permits the drive logic mask to be disabled/enabled allowing HIM removal while Drive power is applied. This menu also provides access to a fault queue and a warning queue which will list the last ten faults or alarms, respectively that have occurred. “Trip” displayed with a fault indicates the actual fault that tripped the Drive. A clear function clears the queue – it will also clear an active fault/alarm condition.

**Password**
The Password mode protects the Drive parameters against programming changes by unauthorized personnel. When a password has been assigned, access to the Program/EEProm modes and the Control Logic/Clear Fault Queue menus can only be gained when the correct password has been entered. The password can be any five digit number between 00000 and 65535.
FIGURE 3.4
1397 HIM Programming Steps

OPERATOR LEVEL

Power-Up Mode & Status Display

```
ESC or SEL or ▲ or ▼ or ←
```

"Choose Mode"

MODE LEVEL

DISPLAY → PROCESS → PROGRAM → EEPROM → SEARCH → CONTROL STATUS → PASSWORD

```
▲ ← ▼
```

GROUP LEVEL

Process Display

Reset Defaults
Upload Parameters
Download Parameters
Recall Values
Save Values

Control Logic
Fault Queue
Warning Queue

Login, Logout
Modify

PARAMETER LEVEL

SEE CHAPTER 5 FOR SPECIFIC PARAMETER DESCRIPTIONS

* Series B HIM (or later) only
Program and Display Modes

1. The Display and Program modes allow access to the parameters for viewing or programming.

   A. From the Status Display, press Enter (or any key). “Choose Mode” will be shown.

   B. Press the Increment (or Decrement) key to show “Program” (or “Display”).

   C. Press Enter.

   D. Press the Increment (or Decrement) key until the desired group is displayed.

   E. Press Enter.

   F. Press the Increment (or Decrement) key to scroll to the desired parameter.

Bit ENUMs

Bit ENUMS (16 character text strings) will be displayed to aid interpretation of bit parameters.

   G. Select a bit parameter with the Increment (or Decrement) keys.

   H. Press the SELECT key to view the ENUM of the first bit. Pressing this key again will move the cursor to the left one bit.

   A blinking underline cursor will indicate that you are in the Display mode or that a Read Only parameter has been accessed. A flashing character will indicate that the value can be changed.

   Individual bits of a Read/Write parameter can be changed in the same manner. Pressing the SELECT key will move the cursor (flashing character) one bit to the left. That bit can then be changed by pressing the Increment/Decrement keys.
### Process Mode

<table>
<thead>
<tr>
<th>Process Mode</th>
<th>1. When selected, the Process mode will show a custom display consisting of information programmed with the Process Display group of parameters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Follow steps A-C on the preceding page to access the Program mode.</td>
<td></td>
</tr>
<tr>
<td>B. Press the Increment/Decrement key until “Process Display” is shown. Press Enter.</td>
<td></td>
</tr>
<tr>
<td>C. Using the Increment/Decrement keys, select [Process 1 Par] and enter the number of the parameter you wish to monitor. Press Enter.</td>
<td></td>
</tr>
<tr>
<td>D. Select [Process 1 Scale] using the Increment/Decrement keys. Enter the desired scaling factor. Press Enter.</td>
<td></td>
</tr>
<tr>
<td>E. Select [Process 1 Txt 1] using the Increment/Decrement keys. Enter the desired text character. Press Enter and repeat for the remaining characters.</td>
<td></td>
</tr>
<tr>
<td>F. If desired, a second display line can also be programmed by repeating steps A-E for [Process 2 xxx] parameters.</td>
<td></td>
</tr>
<tr>
<td>G. When process programming is complete, press ESCape until “Choose Mode” is displayed. Press Increment/Decrement until “Process” is displayed.</td>
<td></td>
</tr>
<tr>
<td>H. Press Enter. This selects which custom display will be on line 1 and line 2. Use the Increment/Decrement keys to select process 1 or 2 parameters for line 1.</td>
<td></td>
</tr>
<tr>
<td>I. Press SELEct to move to line 2. Select the desired process parameters. A zero can be entered to disable line 2. In addition, the Process Display can be set to appear when Drive power is applied by simultaneously pressing the Increment and Decrement keys while the Process Display active.</td>
<td></td>
</tr>
</tbody>
</table>
The EEPROM mode is used to restore all settings to factory default values or upload/download parameters between the HIM and Drive.

1. To restore factory defaults:

A. From the Status Display, press Enter (or any key). “Choose Mode” will be displayed.

B. Press the Increment (or Decrement) key until “EEProm” is displayed. If EEPROM is not in the menu, programming is password protected. Refer to Password Mode later in this section.

C. Press Enter.

D. Press the Increment (or Decrement) key until “Reset Defaults” is displayed.

E. Press Enter to restore all parameters to their original factory settings.

F. Press the Stop key to reset the fault, if one occurs.

2. To upload a parameter profile from the Drive to the HIM:

A. From the EEPROM menu (see steps A-C above), press the Increment/Decrement keys until “Drive -> HIM” is displayed.

B. Press Enter. A profile name (up to 14 characters) will be displayed on line 2 of the HIM. This name can be changed or a new name entered. Use the SEL key to move the cursor left. The Increment/Decrement keys will change the character.
### Drive → HIM (continued)

<p>| | |</p>
<table>
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<tr>
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<tbody>
<tr>
<td><img src="left" alt="Arrow" /></td>
<td>C. Press Enter. An informational display will be shown, indicating the Drive type and firmware version.</td>
</tr>
<tr>
<td><img src="left" alt="Arrow" /></td>
<td>D. Press Enter to start the upload. The parameter number currently being uploaded will be displayed on line 1 of the HIM. Line 2 will indicate total progress. Press ESC to stop the upload.</td>
</tr>
<tr>
<td><img src="left" alt="Arrow" /></td>
<td>E. “Completed” displayed on line 2 will indicate a successful upload. Press Enter. If “ERROR” is displayed, see Chapter 6.</td>
</tr>
</tbody>
</table>

### HIM → Drive

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<table>
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<tbody>
<tr>
<td><img src="up" alt="Arrow" /> or <img src="down" alt="Arrow" /></td>
<td>3. To download a parameter profile from the HIM to a Drive:</td>
</tr>
<tr>
<td><img src="left" alt="Arrow" /></td>
<td><strong>Important:</strong> The download function will only be available when there is a valid profile stored in the HIM.</td>
</tr>
<tr>
<td><img src="left" alt="Arrow" /></td>
<td>A. From the EEPROM menu (see steps 1A-1C), press the Increment/Decrement keys until “HIM → Drive” is displayed.</td>
</tr>
<tr>
<td><img src="left" alt="Arrow" /></td>
<td>B. Press the Enter key. A profile name will be displayed on line 2 of the HIM. Pressing the Increment/Decrement keys will scroll the display to a second profile (if available).</td>
</tr>
<tr>
<td><img src="left" alt="Arrow" /></td>
<td>C. Once the desired profile name is displayed, press the Enter key. An informational display will be shown, indicating the version numbers of the profile and drive.</td>
</tr>
<tr>
<td><img src="left" alt="Arrow" /></td>
<td>D. Press Enter to start the download. The parameter number currently being downloaded will be displayed on line 1 of the HIM. Line 2 will indicate total progress. Press ESC to stop the download.</td>
</tr>
<tr>
<td><img src="left" alt="Arrow" /></td>
<td>E. A successful download will be indicated by “Completed” displayed on line 2 of the HIM. Press Enter. If “ERROR” is displayed, see Chapter 6.</td>
</tr>
</tbody>
</table>

**NOTE:** After downloading the parameter profile, the data is NOT automatically saved. Perform a “Save” to save parameters to non-volatile memory.
### Save Values

<table>
<thead>
<tr>
<th>ESC</th>
</tr>
</thead>
<tbody>
<tr>
<td>▲ or ▼</td>
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</tbody>
</table>

1. To save values in the EEPROM Mode:
   
   A. Use the ESCape key if necessary to reach the “Choose Mode” display.
   
   B. Press the Increment (or Decrement) key until “EEProm” is displayed.
   
   C. Press Enter.
   
   D. Press the Increment (or Decrement) key until “Save Values” displayed.
   
   E. Press Enter to save values.
Search Mode

1. This mode allows you to search through the parameter list and display all parameters that are not at the factory default values.

A. From the Status Display, press Enter (or any key). “Choose Mode” will be shown.

B. Press the Increment (or Decrement) key until “Search” is displayed.

C. Press Enter. The HIM will search through all parameters and display any parameters that are not at their factory default values.

D. Press the Increment (or Decrement) key to scroll through the list.

Control Status Mode

1. This mode allows the Drive logic mask to be disabled, thus preventing a Serial Fault when the HIM is removed with Drive power applied.

A. From the Status Display, press Enter (or any key). “Choose Mode” will be shown.

B. Press the Increment (or Decrement) key until “Control Status” is displayed. Press Enter.

C. Select “Control Logic” using the Increment/Decrement keys. Press Enter.

D. Press the SELEct key, then use the Increment (or Decrement) key to select “Disabled” (or “Enable”).

E. Press Enter. The logic mask is now disabled (or enabled).
Control Status Mode (continued)

Fault Queue/Clear Faults

2. This menu provides a means to view the fault queue and clear it when desired.

F. From the Control Status menu, press the Increment (or Decrement) key until “Fault Queue” is displayed.

G. Press Enter.

H. Press the Increment (or Decrement) key until “View Faults” is displayed.

I. Press Enter. The fault queue will be displayed. “Trip” displayed with a fault will indicate the fault that tripped the drive.

J. Use the Increment (or Decrement) key to scroll through the list.

K. To clear the fault queue, press ESCape. Then use the Increment/Decrement keys to select “Clear Queue.” Press Enter. Please note that “Clear Queue” will also clear active fault conditions.

Warning Queue/Clear Warning

3. This menu provides a means to view the Warning queue and clear it when desired.

L. From the Control Status menu, press the Increment (or Decrement) key until “Warning Queue” is displayed.

M. Press Enter.

N. Press the Increment (or Decrement) key until “View Warnings” is displayed.

O. Press Enter. The Warning queue will be displayed. “Trip” displayed with a fault will indicate the fault that tripped the drive.

P. Use the Increment (or Decrement) key to scroll through the list.

Q. To clear the Warning queue, press ESCape. Then use the Inc/Dec keys to select “Clear Queue.” Press Enter. Please note that “Clear Queue” will also clear active warning conditions.
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Chapter 4

Start-Up and Adjustment

Introduction

This chapter is a detailed step-by-step procedure for the proper start up and tuning of the 1397 drive. Among the procedures to be performed in this chapter are the following:

- Verify Wiring
- Verify proper supply voltages.
- Calibrate drive set-up parameters.
- Set jumper switches
- Execute drive tuning procedures.

The Start Up checklist should be used to record all data.

**ATTENTION:** Servicing energized industrial control equipment can be hazardous. Severe injury or death can result from electrical shock, burn, or unintended actuation of controlled equipment. Hazardous voltages may exist in the cabinet even with the circuit breaker in the off position. Recommended practice is to disconnect and lock out control equipment from power sources, and discharge stored energy in capacitors, if present. If it is necessary to work in the vicinity of energized equipment, the Safety Related Practices of NFPA 70E, “ELECTRICAL SAFETY FOR EMPLOYEE WORKPLACES” must be followed. DO NOT work alone on energized equipment!

**ATTENTION:** Potentially fatal voltages may result from improper usage of an oscilloscope and other test equipment. The oscilloscope chassis may be at potentially fatal voltage if not properly grounded. If an oscilloscope is used to measure high voltage waveforms, use only a dual channel oscilloscope in the differential mode with X-100 probes. It is recommended that the oscilloscope be used in the A minus B Quasi-differential mode with the oscilloscope chassis grounded to an earth ground. Refer to equipment safety instructions for all test equipment before using with the 1397.
ATTENTION: Only qualified personnel familiar with the 1397 DC Drive and its associated machinery should plan and implement the installation, startup and subsequent maintenance of the Drive. Failure to comply may result in personal injury and/or equipment damage.

Required Tools & Equipment

The following equipment is required for start-up and tuning.

- Multimeter capable of 1000V DC/750V AC, with input resistance of at least 1 megohm.
- Test leads for multimeter
- Assorted screwdrivers (Phillips and blade) and a set of open end wrenches.
- Clamp on Ammeter (AC and DC with current ratings to match Drive ratings)
- Programming Terminal (HIM or GPT)

Recommended Tools & Equipment

The following equipment is recommended for start-up and tuning.

- Dual trace oscilloscope with A minus B quasi differential capability
- X100 probes for oscilloscope

ATTENTION: Do Not use a megohmmeter for continuity checks in the Drive. The high voltage of the megohmmeter can damage the Drive’s electronic circuits. Failure to observe this precaution could result in damage to, or destruction of equipment.

General

Only qualified electrical technicians and/or electrical engineers familiar with solid state controls and circuitry should attempt a 1397 start-up. It is imperative that personnel familiarize themselves with the functional description portion of this manual.

The Drive employs regulator construction and uses a keypad for Drive setup, including parameter adjustments and unit selection, monitoring, and diagnostics. Reference, feedback, and metering signals can be interfaced to the Drive. The Drive can be controlled locally by the Human Interface Module (HIM) keypad or remotely by using the terminals at the regulator board terminal strip.
Drive Hardware Adjustments

Control Transformer Settings

Figure 4.1
Control Transformer Tap Settings
100-150 HP @ 230 VAC
200-300 HP @ 460 VAC

BOTTOM VIEW

TAP SETTINGS FOR 460 VAC INPUT POWER

TAP SETTINGS FOR 230 VAC INPUT POWER
Converting a 300 HP 1397 Drive from 460 to 230 VAC Line Input

Unlike lower horsepower units, 200-300 HP 1397 Drives can be converted from 460VAC input to 230 VAC input without the use of a conversion kit. To convert a 300 HP Drive perform the following steps:

- Disconnect and lock out all incoming power to the Drive.
- Disconnect the jumpers between H2 and H3 on the control transformer as shown in Figure 4.3.
- Use the jumpers that were removed to connect H1 to H3 and H4 to H2, as shown in Figure 4.3.
- Reconnect power to the Drive.
- Access parameter 51 [Nominal AC Volt], Set the value to 230.

Converting a 600 HP 1397 Drive from 460 to 230 VAC Line Input

Converting a 600 HP Drive from 460 to 230V AC input is NOT recommended.

A 600 HP 1397 Drive operating off a 230VAC line input may not have sufficient voltage for the field supply.
Figure 4.3
Control Transformer Settings — 230/380/415/460 VAC Drives
for HP Rated Drives

Control Transformer
Set for
460V AC Input Line

Control Transformer
Set for
380V AC Input Line

Control Transformer
Set for
415V AC Input Line

Control Transformer
Set for
230V AC Input Line

for Current Rated Drives
Motor Ground Check

ATTENTION: A megohmeter can be used for this ground check, but all conductors between the motor and the Drive must be disconnected. The megohmeter’s high voltage can damage the Drive’s electronic circuits. Disconnect all conductors between the motor and Drive before using a megohmeter for this motor ground check. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

The DC motor frame and conduit box should be connected to a good earth ground per the motor instruction.

Verify that there is no path to ground in either the DC motor armature circuit, the shunt field circuit or the thermostat circuit. Connect one lead of an ohmmeter to the motor frame and the other lead to the two armature leads, then to the two field leads and to the two thermostat leads. If a reading of less than 100,000 ohms is observed, a ground condition exists and MUST be corrected before power is applied.

Pre–Power Checks

Verify that the Drive has been installed and wired per the installation instructions listed in Chapter 2, Installation. Of particular importance are the following:

- Drive Mounting
- Safety Grounds
- General Wiring
- Secure mounting of all connections and components

ATTENTION: Failure to follow wiring guidelines set forth in Chapter 2 Installation, may result in machine malfunction or personal injury.

Record Data

To assist with Start-Up, the information listed in the Pre-Power Checklist Table must be recorded. This information includes:

- Drive Nameplate Data.
- Motor Nameplate Data.
- Tach/Encoder Data (if applicable).
- Field Supply Type.
- Installed drive options such as AC line disconnects, dynamic braking, etc.

IMPORTANT: Record all Regulator Board & Option jumper settings for future reference when replacing parts.
### Table 4.A
#### Pre-Power Checklist

**DRIVE NAMEPLATE DATA:**

Catalog Number: ________________________________

M/N: __________________________

Ser: __________________________

AC Input: __________ Volts __________ Amps

DC Output: __________ Volts __________ Amps

DC Field: __________ Volts __________ Amps

Short Circuit Rating: __________ Amps

HP: __________

**MOTOR NAMEPLATE DATA:**

Manufacturer: ________________________________

Model Number: ________________________________

Serial Number: ________________________________

Type: __________________________

HP: __________

RPM: __________

Arm Volts __________ Volts __________ Amps

Field Volts __________ Amps

Wound Type: __________________________

Frame: __________________________

**TACHOMETER/ENCODER NAMEPLATE DATA:**

Manufacturer: ________________________________

Model Number: ________________________________

Serial Number: ________________________________

Type: __________________________

Rated Supply Voltage (encoder only): __________ Volts

Rated Output Voltage

Encoder __________ Volts square wave

Encoder Pulse per Revolution (PPR) __________

DC Tach __________ Volts at ________ RPM

**OPTION NAMEPLATE DATA:**

Manufacturer: ________________________________

Model Number: ________________________________

Serial Number: ________________________________

Type: __________________________

**FIELD SUPPLY DATA:**

Volts: __________

Type: __________
Field Supply Configuration

Verify which shunt field supply has shipped with your Drive. Configuration procedures will vary depending on field supply type.

ATTENTION: Field Supply configuration must be checked while making the Pre-Power Checks. If your Drive uses either the optional Enhanced Field Supply or the Regulated Field Supply, different configuration procedures are required than with the Standard Field Supply. Power should not be applied to the motor field windings prior to adjusting these parameters, as outlined in the respective field supply’s installation manual. Failure to properly configure your field supply could cause the motor to run at excessive speed or damage the motor which could result in personal injury or destruction of equipment.

Standard Field Supply (See Note Below)

If the Standard Field Supply (Fig. 4.4) is installed, adjustment is not necessary.

Figure 4.4
Standard Field Supply Terminations

Note: Regulated Field Supply is provided as standard on:
230V Drives with ratings above 45 kW (60 Hp)
460V Drives with ratings above 112 kW (150 Hp)
380/415V Drives with ratings above 35.8 kW (48 Hp)
Enhanced Field Supply
The Enhanced Field Supply (Fig. 4.5) allows adjustment of the field voltage through hardware jumper settings and parameter adjustment. Prior to applying the Enhanced Field Supply output to the DC motor’s field windings, the output voltage must be adjusted so that it doesn’t exceed the rated motor field voltage. This procedure is described in the Enhanced Field Supply Kit Installation manual, Publication 1397-5.12.

Figure 4.5
Enhanced Field Supply

---

ATTENTION: It is imperative that the Drive NOT BE STARTED with the field windings in the un-powered condition. Failure to follow these procedures may result in a machine malfunction and/or personal injury. The output voltage and current of both the enhanced field supply and the regulated field supply are determined by the values contained in set-up parameters.
Regulated Field Supply

The Regulated Field Supply (Fig. 4.6) allows the motor to run above base speed (i.e. to operate in the constant horsepower range) by weakening the motor field current. Prior to applying the regulated field supply output to the DC motor’s field windings, the output current must be adjusted so that it does not exceed the rated motor field current. This procedure is described in the Regulated Field Supply Kit Installation manual, Publication 1397-5.17.

Figure 4.6
Regulated Field Supply Terminations
Pre-Power Verification

ATTENTION: Prior to energizing the Drive, it is imperative that the installation instructions in Chapter 2 and the Pre-Power checks listed in the previous section be completely accomplished. No attempt to apply power should be made if the installation is in question. Failure to properly install and configure the Drive or options could result in personal injury and/or equipment damage.

Additionally, you must verify that all Drive options are properly configured for their intended application. These options include, but are not limited to:

<table>
<thead>
<tr>
<th>OPTION</th>
<th>INSTALLATION MANUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhanced Field Supply</td>
<td>1397 – 5.24</td>
</tr>
<tr>
<td>Regulated Field Supply</td>
<td>1397 – 5.17</td>
</tr>
<tr>
<td>60 HP AC Line Disconnect</td>
<td>1397 – 5.11</td>
</tr>
<tr>
<td>Dynamic Braking</td>
<td>1397 – 5.14</td>
</tr>
<tr>
<td>Pulse Encoder Interface</td>
<td>1397 – 5.13</td>
</tr>
<tr>
<td>Expansion I/O</td>
<td>1397 – 5.19</td>
</tr>
<tr>
<td>AC Tach Interface</td>
<td>1397 – 5.22</td>
</tr>
<tr>
<td>460/230V Fuse Kit</td>
<td>1397 – 5.16</td>
</tr>
<tr>
<td>Blower Motor Starter</td>
<td>1397 – 5.20</td>
</tr>
<tr>
<td>150 HP AC Line Disconnect</td>
<td>1397 – 5.21</td>
</tr>
<tr>
<td>115VAC Control Int Bd</td>
<td>1397 – 5.18</td>
</tr>
<tr>
<td>Inverting Fault C.B. Kit</td>
<td>1397 – 5.29</td>
</tr>
<tr>
<td>AC Line Disconnect Kit</td>
<td>1397 – 5.30</td>
</tr>
<tr>
<td>AC Line Filter Kit</td>
<td>1397 – 5.31</td>
</tr>
</tbody>
</table>

Ensure that the Coast/Stop input between terminals TB-7 and TB-8 of the Regulator Board is locked in the open state.

If the Drive is equipped with an optional AC disconnect, verify that the disconnect is in the open position.

Record the motor field polarity in Table 4.B, as terminated at terminals F1 and F2 of the field terminal strip (Figures 4.7 & 4.8).
Figure 4.7
DC Motor Field Connection Location
1.5-30 HP at 230 VAC
7-110A @ 380/415 VAC
3-60 HP at 460 VAC
Figure 4.8
DC Motor Field Connection Location

TOP VIEW

40 – 75 HP at 230 VAC
265A @ 380/415 VAC
75 – 150 HP at 460 VAC

100 – 150 HP at 230 VAC
200 – 300 HP at 460 VAC

400 – 600 HP at 460 VAC
Table 4.B
Motor Field Connections

<table>
<thead>
<tr>
<th>Drive Terminal</th>
<th>Wire No</th>
<th>Motor Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 (+)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F2 (−)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Power-On Checks

Power Application

⚠️ **ATTENTION**: The following start-up procedure must be performed with power applied to the Drive. Some of the voltages present are at incoming line potential. To avoid electric shock hazard or damage to equipment, only qualified service personnel should perform the following procedure. Thoroughly read and understand the procedure before beginning. If an event does not occur while performing this procedure, DO NOT PROCEED. REMOVE POWER by opening the branch circuit disconnect device and correct the malfunction before continuing.

Apply power to the Drive. If you are using a HIM programming device, the Drive will display the following screen for several seconds during power-up.

Connecting . . .

**IMPORTANT**: If the Drive detects a fault, a statement relating to the fault will be shown on the display. Record this information, remove all power and correct the fault source before proceeding.

**Drives without AC Line Disconnect**

Apply the main power source feeding the Drive, and measure the voltage present between terminals.

L1 and L2 (181 – 182)
L1 and L3 (181 – 183)
L2 and L3 (182 – 183)

Record the measurements in Table 4.C:
Table 4.C
Rated Drive Voltage (No Disconnect Option)

<table>
<thead>
<tr>
<th>Test Points</th>
<th>Expected Value</th>
<th>Measured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 to L2</td>
<td>Rated AC Voltage (230/380/415/460V)</td>
<td></td>
</tr>
<tr>
<td>L1 to L3</td>
<td>Rated AC Voltage (230/380/415/460V)</td>
<td></td>
</tr>
<tr>
<td>L2 to L3</td>
<td>Rated AC Voltage (230/380/415/460V)</td>
<td></td>
</tr>
</tbody>
</table>

Drives with AC Line Disconnect

Apply the main power source feeding the Drive, and energize the Drive by closing the Drive’s AC line disconnect. Measure the voltage present between the terminals on the load side of the disconnect:
81 and 82
81 and 83
82 and 83

Record the measurements in the following table:

Table 4.D
Rated Drive Voltage (With Disconnect Option)

<table>
<thead>
<tr>
<th>Test Points</th>
<th>Expected Value</th>
<th>Measured Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>81 to 82</td>
<td>Rated AC Voltage (230/380/415/460V)</td>
<td></td>
</tr>
<tr>
<td>81 to 83</td>
<td>Rated AC Voltage (230/380/415/460V)</td>
<td></td>
</tr>
<tr>
<td>82 to 83</td>
<td>Rated AC Voltage (230/380/415/460V)</td>
<td></td>
</tr>
</tbody>
</table>

In all cases, the three-phase input voltage should be equal to the rated Drive AC input voltage +/-10%. If the voltage is not within tolerance, verify that the Drive rating is correct or perform the necessary adjustments to the incoming line voltage so that it complies with the Drive rating.

Parameter Set-Up

All Drives are shipped with factory default parameter settings. Before making any parameter changes, review Chapter 5, Programming Parameters. Parameter values are changed using the Human Interface Module (HIM). Before beginning any changes become thoroughly familiar with the HIM.

ATTENTION: Before starting this procedure, make certain that the Coast-to-Stop input is locked in the open state. The Drive’s AC contactor must remain open while the parameter set-up is being performed. Failure to maintain the input and contactor in the open state could lead to unintended motor or process equipment operation and subsequent damage.
ATTENTION: Only qualified electrical personnel familiar with the construction and operation of electrical equipment and the hazards involved should install, adjust, operate, and/or service this equipment. Read and understand this section entirely before proceeding. Failure to observe this precaution could result in bodily injury or loss of life.

Table 4.E provides a description of the parameters which must be properly configured prior to operating the Drive. Unless otherwise noted, these parameters are located in the Set-Up group. Scroll through the Set-Up group and set the parameters based on the application. For additional information, refer to Chapter 5, Programming Parameters. For information on operation of the Human Interface Module, see Chapter 3, Programming.

ATTENTION: The 1397 control circuitry includes solid-state components. If hazards due to accidental contact with moving machinery or unintentional flow of liquid, gas or solids exist, an additional hardwired stop circuit may be required (in addition to the required hard wired Coast-to-Stop circuit) to remove AC line power to the Drive. When AC input power is removed, there will be a loss of inherent regenerative braking effect and the motor will coast to a stop. An auxiliary braking method may be required.

IMPORTANT: Use the EEPROM mode in the programming terminal to save all parameter changes to EEPROM or they will be lost when power is removed from the Drive.

ATTENTION: The incorrect setting of Setup parameters can cause an overspeed condition. These parameters must be set by a qualified person who understands the significance of setting them. Verify that the value of these parameters are set accurately for your application requirements. Failure to observe this precaution could result in personal injury or equipment damage.
Table 4.E

Parameter Modification Sequence

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Par. No.</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Stop Mode Type]</td>
<td>P.115</td>
<td>Coast</td>
<td>P.115 Selects stopping mode of the Drive in response to a normal Stop command. P.116 sets the threshold speed below which the main contactor will automatically open after a ramp stop or current limit stop is asserted. This value should be less than or equal to [Min Process Speed].</td>
</tr>
<tr>
<td>[Stop Speed Level]</td>
<td>P.116</td>
<td></td>
<td>[Stop Mode] default is Coast. If you wish to change modes, exit the Set Up menu and select Stop Mode. Change the default to Ramp or Limit and then set the [Stop Speed Level] in parameter 116.</td>
</tr>
<tr>
<td>[Max Motor Speed]</td>
<td>P.041</td>
<td>500 RPM</td>
<td>[Max Motor Speed] is the highest normal running speed of the motor. This parameter scales the feedback device. [Max Motor Speed] depends on several factors: ● If there is no field weakening, the top speed is typically the same as the 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.</td>
</tr>
<tr>
<td>[Motor Arm Amps]</td>
<td>P.045</td>
<td>8.0 Amps</td>
<td>ATTENTION: The Drive will not operate properly if this parameter value is wrong. This parameter must be equal to the rated armature amps on the motor nameplate. Failure to observe this precaution could result in damage to or destruction of the equipment.</td>
</tr>
<tr>
<td>[Motor Field Amps]</td>
<td>P.044</td>
<td>0.01 Amps</td>
<td>It only needs to be set if a regulated field supply is installed. Sets the motor rated hot field amps from the motor nameplate. Scales the field current feedback.</td>
</tr>
<tr>
<td>[Motor Arm Volts]</td>
<td>P.046</td>
<td>240 Volts(^1)</td>
<td>The rated armature voltage from the motor nameplate.</td>
</tr>
<tr>
<td>[Feedback Type]</td>
<td>P.039</td>
<td>Arm Volt(^1)</td>
<td>[Feedback Type] selects the type of feedback signal that is used for the speed/voltage loop. [Encoder] can be selected only if a pulse tachometer kit is installed. [Feedback Type] causes the [Neg Current Lim] (step 16) to be set to 0 and [Reverse Disable] (step 4) to be set to On if: ● AC Tach is selected. ● Pulse Tach is selected and [Encoder Quad] is set Off.</td>
</tr>
<tr>
<td>[Anlg Tach V/1000] Setup</td>
<td>P.047</td>
<td>18 V/1000 RPM(^1)</td>
<td>This parameter only needs to be set if [Feedback Type] was set to AC Tach or DC Tach. [Anlg Tach V/1000] is the 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. This parameter might be limited to less than 200.0 volts/1000 so that voltage from the tachometer will not be more than 250 V. ATTENTION: Failure to set the Analog Tach Voltage range correctly can cause an overspeed condition.</td>
</tr>
</tbody>
</table>

\(^1\) Units are volts DC for DC tachometers or volts AC RMS for AC tachometers.
## Parameter Modification Sequence (cont)

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Par No.</th>
<th>Default</th>
<th>Description</th>
<th>User Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Encoder PPR]</td>
<td>P.048</td>
<td>18 PPR</td>
<td>This parameter only needs to be set if [Feedback Type] was set to Encoder.</td>
<td></td>
</tr>
<tr>
<td><strong>Setup Group</strong></td>
<td></td>
<td></td>
<td>[Encoder PPR] sets the pulse tachometer pulses per revolution (PPR) from the</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>pulse tachometer nameplate.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>ATTENTION:</strong> The incorrect setting of the Encoder PPR parameter can cause</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>an overspeed condition. This parameter must be set by a qualified person who</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>understands the significance of setting it. Set the value of this parameter</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>accurately per your application requirements. Failure to observe this</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>precaution could result in bodily injury.</td>
<td></td>
</tr>
<tr>
<td>[Encoder Quad]</td>
<td>P.049</td>
<td>On</td>
<td>This parameter only needs to be set if [Feedback Type] was set to Pulse Tach.</td>
<td></td>
</tr>
<tr>
<td><strong>Setup Group</strong></td>
<td></td>
<td></td>
<td>[Encoder Quad] enables or disables pulse tachometer quadrature.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Set On for a bidirectional pulse tachometer.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Set Off for a unidirectional pulse tachometer.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If [Encoder Quad] is set to Off while Pulse Tach is the selected</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[Feedback Type], [Neg Current Lim] will be set to 0 and [Reverse Disable]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>set to On (preventing reverse direction).</td>
<td></td>
</tr>
<tr>
<td>[Accel Time]</td>
<td>P.037</td>
<td>5.0</td>
<td>The time it takes to accelerate from 0 to [Max Motor Speed] (P.041).</td>
<td></td>
</tr>
<tr>
<td><strong>Setup Group</strong></td>
<td></td>
<td>Seconds</td>
<td>Smaller changes in speed take proportionately less time.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If [Trim Mode Type] (P. 117) is set to Proportional, this time value is</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>modified by [Draw Percent Out] (P.009).</td>
<td></td>
</tr>
<tr>
<td>[Decel Time]</td>
<td>P.038</td>
<td>5.0</td>
<td><strong>Decel Time</strong> selects the time it takes to decelerate from [Top Speed] to</td>
<td></td>
</tr>
<tr>
<td><strong>Setup Group</strong></td>
<td></td>
<td>Seconds</td>
<td>0. Smaller changes in speed take proportionately less time.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If [Trim Mode Select] is set to Proportional, this time value is modified by</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[Draw Percent Out]. Selects the minimum speed of the Drive without being</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>stopped. It is typically greater than zero. If it is less than 10% of [Max</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Maximum Speed], an alarm is generated.</td>
<td></td>
</tr>
<tr>
<td>[Max Process Spd]</td>
<td>P.042</td>
<td>500 RPM</td>
<td><strong>ATTENTION:</strong> When performing this adjustment, do not allow the motor to</td>
<td></td>
</tr>
<tr>
<td><strong>Setup Group</strong></td>
<td></td>
<td></td>
<td>exceed the maximum safe speed of the driven equipment as determined by the</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>equipment manufacturer. Failure to observe this precaution could result in</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bodily injury.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The maximum speed of the Drive that can be supported by the application or</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>process. [Max Process Speed] can be less than or equal to [Max Motor Speed].</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If raising this value causes [Min Process Spd] to become less than 10% of</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[Max Process Spd], an alarm is generated.</td>
<td></td>
</tr>
</tbody>
</table>
**ATTENTION:** This Drive can operate at and maintain zero speed when this parameter is set to zero. The user is 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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Process Spd</td>
<td>P.043</td>
<td>250 RPM</td>
</tr>
<tr>
<td>Nominal AC Freq</td>
<td>P.050</td>
<td>60 Hz</td>
</tr>
<tr>
<td>Nominal AC Volts</td>
<td>P.051</td>
<td>230 VAC</td>
</tr>
<tr>
<td>CT Turns Ratio</td>
<td>P.036</td>
<td>NA*</td>
</tr>
<tr>
<td>Jog Acc/Dec Time</td>
<td>P.092</td>
<td>3.0 Seconds</td>
</tr>
<tr>
<td>Jog Reference</td>
<td>P.093</td>
<td>250 RPM</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Default levels may change based on incoming Voltage levels.
Jumper Settings

The jumper settings for the 1397 Drive determine the regulator type, program protection, field settings, references for automatic and manual modes, tachometer voltage range, and armature feedback scaling.

IMPORTANT: The Diagnostic Parameter group in the 1397 will display the proper jumper configuration you should use for J11, J14 and J18, based on the parameters you have previously entered.

- Through the HIM, check the proper jumper settings for [J11 Tach VScale] (P.180), [J14 Tach V Range] (P.181), and [J18 Arm Fdbk Res] (P.183) in the Diagnostics Menu. Write down the as displayed settings in the Calculated Setting column of Table 4.G and in Table 4.F below. Make sure the actual settings match.

Table 4.F
Regulator Board Hardware Jumper Settings

<table>
<thead>
<tr>
<th>Hardware Jumper</th>
<th>Location of Recommended Value</th>
<th>Actual Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>J11</td>
<td>Tach V Scale (P 180)</td>
<td></td>
</tr>
<tr>
<td>J14</td>
<td>Tach V Range (P. 181)</td>
<td></td>
</tr>
<tr>
<td>J18</td>
<td>Arm Fdbk Res (P. 183)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: If [Feedback Type] (P.039) is not set to DC Tach or AC Tach, the position of J11 and J14 is ignored.

- Through the HIM, check the current settings for [J15 Reg Type] (P.182), [J20 Fld Loss] (P. 184), and [J21 Field Supply] (P.185) in the Diagnostics menu. If these settings are correct for your system, you do not need to change them. Record the settings in Table 4.G.

Note: Only check these parameters after entering the correct values for the parameters in the setup menu. J11, J14 and J18 are calculated from the setup menu parameters. When all parameter values and jumper settings are completed perform an EEPROM save.

Setting the Jumpers

![ATTENTION: This equipment is at line voltage when AC power is connected to the Drive. Disconnect and lock out incoming power to the Drive before proceeding. After power is removed, verify with a voltmeter at power terminals 181, 182 and 183 that no voltage exists before touching any internal parts of the Drive. Failure to observe these precautions could result in severe bodily injury or loss of life.]

![ATTENTION: Unless explicitly stated otherwise, power must be removed before changing any jumper connection. Failure to observe this precaution could result in damage to, or destruction of, the equipment.]
IMPORTANT: Jumper settings are read only on powerup, so power must be cycled for a change to a jumper setting to be recognized by the Drive.

To set the jumpers:

1. Remove power from the Drive. Remove the cover. Refer to Chapter 3 for cover removal. You do need to remove the HIM bracket.
2. The jumpers are located on the regulator board as shown in Figure 4.9.
3. Change the jumper settings as described in the following description and record them in the Final Setting column of Table 4.G.

### Table 4.G
Jumper and Adjustment Settings

<table>
<thead>
<tr>
<th>Jumper/Adjustment</th>
<th>Default Setting</th>
<th>Calculated Setting</th>
<th>Final Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>J15 (Regulator Type)</td>
<td>Speed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J16 (Program Protection)</td>
<td>Not Currently Used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J20 (Field Loss Detect)</td>
<td>Enable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J21 (Field Supply Jumper)</td>
<td>N/A 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J19 (Analog Ref 2)</td>
<td>Pot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J14 (Tach V Range)</td>
<td>62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J11 (Tach V Scale)</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J10 (Analog Ref 1)</td>
<td>Volts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J12 (Analog Ref 1)</td>
<td>Volts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J18 (ARM I FB RB)</td>
<td>Position 4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Only applicable when the optional Enhanced Field Supply kit is installed.

### Setting the Regulator Type (Jumper J15)

J15 determines whether the Drive uses speed/voltage or torque/current regulation mode. This jumper is read only when the regulator is powered up.

When Current is selected, all speed references become torque references. For example: Analog Ref 1 and Ref 2 are now Torque References.

Also note that speed/voltage parameters must be set to provide overspeed protection for the Drive.

**ATTENTION:** Failure to correctly set speed/voltage parameters could result in dangerously high motor speeds. Failure to provide overspeed protection could result in bodily injury or equipment damage.
Setting Field Loss Detection (Jumper J20)

The Field Loss Detect jumper (J20) determines whether or not a fault is generated when a field loss occurs.

**IMPORTANT:** Jumper J20 is ignored if the Field Current Regulator kit is installed. Therefore, placing J20 in the Disable position will not disable field loss detection. See the instructions supplied with the kit for more information on the Field Current Regulator.

**NOTE:** Jumper J20 has no effect if the drive is equipped with an enhanced or regulated field supply.
ATTENTION: The user must provide external field current loss detection and inhibit Drive operation via one of the Drive interlocks when Jumper J20 is positioned to disable. Misapplication of this jumper can cause the motor to run at dangerously high speeds. Failure to observe this precaution could result in bodily injury and/or equipment damage.

To detect complete loss of field current, place the jumper on pins 1 and 2 (Enable). When a complete loss is sensed, a fault is generated and the Drive is coast stopped.

To ignore field loss, place the jumper on pins 2 and 3 (Disable). Any loss of field current is ignored. Use the Disable option only when no field exists, such as with a permanent magnet motor or when a separate field supply is used.

IMPORTANT: Jumper J20 has no effect if a Regulated Field Supply is installed. No fault is generated with a Regulated Field Supply.

Setting the Drive for the Enhanced Field Supply (Jumper J21)

IMPORTANT: This jumper has no effect on the standard field supply or the optional Field Current Regulator kit.

The Field Supply Jumper (J21) determines the voltage range that the Drive expects to see from the optional Enhanced Field Supply kit. Refer to the instructions supplied with the kit for more information on the Enhanced Field Supply.

The DC voltage range can be either from 45 to 90% or from 90 to 112.5%.

To set the Drive for a voltage range of 45 to 90%, place the jumper on pins 1 and 2.

To set the Drive for a voltage range of 90 to 112.5%, place the jumper on pins 2 and 3.
Setting the Source for the Anlg Reference 2 (Jumper J19, Manual Ref on board)

**ATTENTION:** The Drive will not operate at the correct speed if Jumper J19 is not set to the correct position. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

The Manual Ref jumper (J19) determines whether the internal +10 V isolated power supply or an external +10 V source is used for Analog Reference 2.

To use the +10V power supply for the Analog Reference 2 potentiometer, place the jumper on pins 2 and 3 (Pot). The supply at terminal 16 of the regulator board terminal strip is used.

To use an external +10 V source, place the jumper on pins 1 and 2 (Ext). The external reference is connected at terminals 17 and 18 of the regulator board terminal strip.

**NOTE:** This input can be used as a trim on the auto mode speed reference by setting the jumper on pins 1 and 2 (EXT). In this case a ±10 V range can be used.

Setting the Voltage Range and Scale of an Analog Tachometer (Jumpers J14 and J11)

The Tach V Range (J14) and Tach V Scale (J11) jumpers set the voltage range and scale of the analog tachometer.

**NOTE:** These jumpers are ignored if an analog tach is not used and if [Feedback Type] (P. 039) is not set to DC Tach or AC Tach.

Note: Jumper J14 determines which terminal is used for tach connection. Refer to Figure 4.15 for a tach installation illustration. Table 4.H details tach terminations for Lo or Hi speed operation.

**ATTENTION:** The Drive can overspeed if jumper J14 is set incorrectly, or the tach is wired incorrectly. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

**Table 4.H**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hi – Range</td>
<td>21</td>
</tr>
<tr>
<td>Lo – Range</td>
<td>22</td>
</tr>
</tbody>
</table>

During quick start, the Drive calculates the value of the tachometer voltage range based on the values of **[Max Process Speed]** (P. 042) and **[Anlg Tach v/1000]** (P. 047) and the setting of Feedback Select. The correct values are displayed under the Diagnostics menu on the HIM. Verify these jumper settings before performing the auto-tuning procedure.
ATTENTION: The Drive will not operate at the correct speed if jumpers J11 and J14 are not set to the correct positions. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

The expected analog tachometer voltage range can be set to a maximum of 250 or 62V DC. Jumper J11 selects the hardware circuitry to maximize the resolution over the entire speed range.

Table 4.I
Regulator Board Jumpers

<table>
<thead>
<tr>
<th>Top Speed</th>
<th>Jumper J14</th>
<th>Jumper J11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tach Volts ≤ 16 Volts</td>
<td>Low</td>
<td>16</td>
</tr>
<tr>
<td>Tach Volts ≤ 31 Volts</td>
<td>Low</td>
<td>31/125</td>
</tr>
<tr>
<td>Tach Volts ≤ 62 Volts</td>
<td>Low</td>
<td>62/250</td>
</tr>
<tr>
<td>Tach Volts ≤ 125 Volts</td>
<td>High</td>
<td>31/125</td>
</tr>
<tr>
<td>Tach Volts ≤ 250 Volts</td>
<td>High</td>
<td>62/250</td>
</tr>
</tbody>
</table>

Note: The output voltage of the tachometer must not exceed 250 V for DC tachometers or 275 RMS for AC tachometers when the motor is rotating at [Max Motor Speed]. To calculate the output voltage at top speed, multiply the two parameter values:

\[
\text{Tach Voltage at [Max Motor Speed]} = \frac{\text{[Max Motor Speed] × [Analog Tach v per thousand]}}{1000}
\]

Analog Reference 1 Set-up (Jumpers J12, Autoref and J10, Autoref)

The Anlg In 1 jumpers (J12 and J10 Fig. 4.10) select the type of analog reference to be used. J12 selects the type of signal (voltage or milliamps). J10 selects the range.

Figure 4.10
Anlg In 1 Jumper Selection

Scaling the Armature Current Feedback (Jumper 18)

The Arm I FB RB jumper (J18) scales the armature current feedback signal. The Drive calculates the value of the burden resistor needed to scale the armature current feedback signal. The calculations are based on the values of [Motor Arm Amps] (P.045) and Maximum Current (P. 040).

ATTENTION: The Drive will not operate at the correct speed if jumpers J10, J12 and J18 are not set to the correct positions for your application. Failure to observe this precaution could result in damage to, or destruction of, the equipment.
The HIM displays the correct position of the jumper under the Diagnostics menu [J18 Arm Fdbk Res] (P.183). Verify this jumper setting before performing the self-tuning procedure.

Verify the Correct Operation of 24V I/O Inputs

Table 4.J lists the standard 1397 I/O input points indicating those hardware inputs which are required for Drive operation. Some of these signals may be generated by the terminal strip or a SCANport device or HIM or both. These signals are identified in the table by the column labeled “Alternate Control Source”.

NOTE: Required signals MUST be correctly wired to the terminal strip for proper Drive operation, and cannot be masked. Signals that are not required may be “masked off” for exclusive control by a SCANport device or HIM. Masking parameters are described in detail in Chapter 5: Programming Parameters.

IMPORTANT: Regulator Board terminal Strip Inputs 3, 8, 9, 12 and 13 must be closed for the Drive to be ready.

Table 4.J
Standard I/O Functions

<table>
<thead>
<tr>
<th>I/O Point</th>
<th>Required</th>
<th>Alternate Control Source</th>
<th>Contact Sense</th>
<th>Active Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run</td>
<td>No</td>
<td>SCANport/HIM</td>
<td>NO</td>
<td>Start when CLOSED</td>
</tr>
<tr>
<td>STOP</td>
<td>YES</td>
<td>SCANport/HIM</td>
<td>NC</td>
<td>Stop when OPEN</td>
</tr>
<tr>
<td>Jog</td>
<td>No</td>
<td>SCANport/HIM</td>
<td>NO</td>
<td>Jog when closed</td>
</tr>
<tr>
<td>Rev/Fwd</td>
<td>No</td>
<td>SCANport/HIM</td>
<td>NO</td>
<td>Forward = Open Rev = Closed</td>
</tr>
<tr>
<td>Reference Select</td>
<td>No</td>
<td>SCANport/HIM</td>
<td>NO</td>
<td>Selects Analog Ref 2 when Open</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Selects Analog Ref 1 when Closed</td>
</tr>
<tr>
<td>Coast to Stop</td>
<td>YES</td>
<td>None</td>
<td>NC</td>
<td>Opens AC or DB Contactor (if installed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>when OPEN Motor Coasts to Stop</td>
</tr>
<tr>
<td>Customer Interlock</td>
<td>YES</td>
<td>None</td>
<td>NC</td>
<td>Opens AC contactor when OPEN – motor coasts to stop</td>
</tr>
<tr>
<td>Fault/Alarm Reset</td>
<td>No</td>
<td>SCANport/HIM</td>
<td>NO</td>
<td>Resets fault / acknowledges alarm when CLOSED</td>
</tr>
<tr>
<td>Brush Wear</td>
<td>Yes</td>
<td>None</td>
<td>NC</td>
<td>When OPEN activates warning Motor will still run.</td>
</tr>
<tr>
<td>Motor Thermostat</td>
<td>Yes</td>
<td>None</td>
<td>NC</td>
<td>Opens AC contactor when OPEN – motor coasts to stop</td>
</tr>
<tr>
<td>Analog Ref 1</td>
<td>No</td>
<td>Scanport/HIM</td>
<td>Analog</td>
<td>External speed reference selected when REF SELECT CLOSED</td>
</tr>
<tr>
<td>Analog Ref 2</td>
<td>No</td>
<td>Scanport/HIM</td>
<td>Analog</td>
<td>External speed reference selected when REF SELECT OPEN</td>
</tr>
<tr>
<td>Analog Tachometer</td>
<td>No</td>
<td>None</td>
<td>Analog</td>
<td>Input for DC (analog) tachometer</td>
</tr>
</tbody>
</table>
Verify that the standard inputs connected to the Drive are properly terminated and produce the desired operation. If an input does not produce the desired result, remove power from the Drive and verify the installation.

1. Apply power to the Drive.
2. **Coast-to-Stop Input** – With the Coast Stop input in its CLOSED position (i.e. not in a coast stop condition) measure the voltage present between terminals 7 and 8 of the regulator board terminal strip. The measured voltage should be approximately 0V DC.

   Repeat this procedure with the Coast-to-Stop input OPEN (i.e. Drive in a Coast Stop condition). The measured voltage should be 24V.

   After proper operation is verified leave the Coast-to-Stop input in its OPEN position (i.e. Coast-to-Stop the Drive).

   **ATTENTION:** Failure to put the Drive in the Coast-to-Stop condition could allow the Drive to restart when performing the following checks. Failure to observe this precaution could lead to personal injury and/or equipment damage.

3. **Stop Input** – Repeat step 2, measuring the voltage present between terminals 1 and 3 of the regulator terminal board. The voltage across the stop input should be 0VDC with the Stop input CLOSED (Stop Not initiated), and 24VDC with the stop input OPEN (stop initiated).

4. **Customer Interlock Input** – The customer interlock input is a permissive required to operate the Drive. It allows the Drive to be interlocked with the driven equipment for personnel or equipment safety purposes. If the Drive is stopped, it is prevented from running until this input is CLOSED. If the interlock input OPENS when the Drive is running, the AC contactor will be forced open, and the motor will coast to a stop.

   **NOTE:** If the application does not require a customer interlock, verify the terminals 11 and 9 of the regulator board terminal strip are jumpered, and proceed to Step 5.

   Verify that the Customer interlock is operating properly by repeating Step 2, measuring the voltage present between terminals 11 and 9 of the regulator board terminal strip. The voltage across the stop input should be 0V DC with the Customer Interlock input CLOSED (permissive OK, and 24V DC with the stop input OPEN (permissive lost).
5. **Motor Thermostat Input** – If your DC Motor is equipped with a thermostat verify that it is correctly wired. Remove power from the Drive and verify that no voltage exists between either motor thermostat input terminal and ground by measuring between both terminal 13 and 14 and the Drive chassis. If voltage exists, verify motor thermostat wiring at the motor.

NOTE: If the DC motor used for this application doesn’t possess a motor thermostat, verify that terminals 13 and 14 of the regulator board terminal strip are jumpered (Figure 4.11) and proceed to Step 6.

![Figure 4.11](image-url)  
**No-Thermostat Option**

- **ATTENTION:** It is strongly recommended that a motor thermostat be used to protect the motor from overheating. Failure to use a thermostat or wire it properly could result in motor failure if the motor is run at excessive load for prolonged periods.

Temporarily remove the wire terminated at thermostat input terminal 14 of the regulator board terminal strip. With an ohm meter, measure the resistance between terminal 13 and the lead removed from terminal 14. If the measured resistance isn’t between 0 and 2 ohms, verify the motor thermostat wiring at the motor.

At the motor, temporarily remove one of the motor thermostat connections and perform the resistance measurement performed above. If a very high resistance is not measured (i.e. infinity, “OL”, etc.) verify the motor thermostat wiring.

If resistance measurements are correct, reconnect the thermostat wiring at both the Motor and Drive.

6. **Brush Wear Input** – Some DC Motors are equipped with a brush wear switch which is designed to open when the carbon brushes become excessively worn. The brush wear switch is an alarm signal indicating brush wear maintenance is required.
NOTE: If the DC motor used for this application doesn’t possess a brush wear indicator, verify that terminals 12 and 14 of the regulator board terminal strip are jumpered (Figure 4.12).

**Figure 4.12**  
Brush Wear Option

Regulator Board Terminal Strip  
24VDC Brush Wear Circuit

7. Other Standard Inputs – Other I/O may or may not be wired to the Drive, depending on the application. The Drive may be operated through the Human Interface Module (HIM) without connecting the remaining I/O. Other inputs may be verified as described in the preceding steps.

NOTE: If the Drive will be operated using a SCANport device such as the Bulletin 1203-GD1/GK1, 1203-GD2/GK2, 1203-GK5, 1203-FB1 & FM1, or 1203 SM1 additional set-up is required. See the chapter entitled Programming Parameters and the installation manual of the specific SCANport device.

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**Motor and Feedback Polarity Checks**

**ATTENTION:** Prior to running polarity checks, you must provide a hard wired maintained external operator accessible coast/stop pushbutton at regulator board terminals 7 and 8 to disable the machine in case of improper operation. Uncontrolled machine operation can result if this is not done. Failure to observe this precaution could result in severe bodily injury or loss of life.
ATTENTION: If encoder/tachometer wiring is incorrect, sudden and rapid acceleration may result, which can cause overspeed of the motor. Run tach & encoder checks as detailed on pages 4-33 & 4-34. Failure to observe this precaution could result in personal injury and/or damage to equipment.

The following parameters MUST be TEMPORARILY lowered to 25% nominal to help guard against motor or equipment damage when running the following motor polarity checks:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group</th>
<th>Recommended Start-Up Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Process Speed (P. 042)</td>
<td>Setup</td>
<td>25% of Max Motor Speed</td>
</tr>
<tr>
<td>Positive Current Limit (P. 067)</td>
<td>Adv Setup</td>
<td>25%</td>
</tr>
<tr>
<td>Positive Current Limit Source (P. 069)</td>
<td>Adv Setup</td>
<td>Register</td>
</tr>
<tr>
<td>Negative Current Limit (P. 068)</td>
<td>Adv Setup</td>
<td>25%</td>
</tr>
<tr>
<td>Negative Current Limit Source (P.070)</td>
<td>Adv Setup</td>
<td>Register</td>
</tr>
</tbody>
</table>

1. Turn off and lock out all power to the Drive.
2. When checking motor polarity, the Drive will have power applied and the motor will rotate. The motor should be temporarily uncoupled from the load.
3. If the motor cannot be uncoupled from the load, the following motor checks are recommended:
   a) All electrical connections are tight.
   b) The brushes are properly seated.
   c) The motor shaft is free to rotate.
4. Connect a DC Voltmeter to Terminal A1 (+) and 45 (−) at the output of the Drive.
5. Apply power to the Drive.
6. Rotate the motor in the direction required by the driven equipment using an externally applied mechanical force.
7. Measure the voltage present between terminals A1 (+) and 45 (−). Set the meter to the 500 VDC range to start, and then work down until a measurement can be obtained. The voltage at A1 should be positive with respect to terminal 45 (voltage magnitude is unimportant).
8. If the voltage polarity is incorrect, remove power from the Drive and refer to the motor connection diagrams in Figures 4.13 & 4.14.
Figure 4.13
DC Motor Connections CCW Rotation

Straight Shunt Machine, CCW Rotation, Facing Commutator End

1.5 to 150 HP @ 230VAC
3 to 300 HP @ 460VAC

Basic Stabilized Shunt Machine, CCW Rotation, Facing Commutator End

400 to 600 HP @ 460VAC

9. Make certain power is turned off and locked out.

10. Switch armature leads connected A1 (+) and 45 (−). If it is inconvenient to switch the armature leads, the field leads connected at F1 and F2 may be switched instead on a straight shunt motor only. Be sure to document the final connection.

11. Apply power to the Drive.

12. Repeat steps 6 and 7 and verify that the motor rotation is correct.

NOTE: If both the field and armature connections are reversed no change in rotation direction will occur.
No Feedback Device Installed (Armature Voltage Control)

1. Verify that [Feedback Type] (P. 039) is set to Arm Volt for armature voltage control.

2. Proceed to Verification of Drive Calibration sequence.
Analog Tachometer Polarity Checks (Armature Voltage Control)

**ATTENTION:** Prior to running polarity checks, you must provide a hardwired maintained external operator accessible coast/stop pushbutton at regulator board terminals 7 and 8 to disable the machine in case of improper operation. Uncontrolled machine operation can result if this is not done. Failure to observe this precaution could result in severe bodily injury or loss of life.

1. Verify that [Feedback Type] (P. 039) is set to **DC Tach**.
2. Verify that the tach is properly terminated by monitoring [Anlg Tach Fdbk] (P. 194) when the motor is rotated in the same direction as it was in Step 6 of the Motor and Feedback Polarity checks.
3. The value in [Anlg Tach Fdbk] (P. 194) should be positive.
4. If the value observed is negative, remove power from the Drive and reverse the tachometer connections terminated at the Drive. DC tachometers are terminated at terminals 21 and 23 (high voltage range) or 22 and 23 (low voltage range) of the regulator terminal strip (Figure 4.15).

**ATTENTION:** The Drive can overspeed if jumper J14 is set incorrectly, or the tach is wired incorrectly. Failure to observe this precaution could result in damage to the drive or process equipment.

Figure 4.15
DC Tach Installation

Regulator Board Terminal Strip
High Voltage DC Tach Terminations

5. Proceed to verification of Drive Calibration.
Pulse Encoder Polarity Checks (Regenerative Drives Only)

ATTENTION: Prior to running polarity checks, you must provide a hardwired maintained external operator accessible coast/stop pushbutton at regulator board terminals 7 and 8 to disable the machine in case of improper operation. Uncontrolled machine operation can result if this is not done. Failure to observe this precaution could result in severe bodily injury or loss of life.

1. Verify that [Feedback Type] (P. 039) is set to Pulse Tach for pulse tachometer (encoder).

2. Verify that the pulse encoder is properly terminated by monitoring [Encoder Fdbk] (P. 189) when the motor is rotated in the same direction as it was in Step 6 of the Motor and Feedback Polarity checks.

3. The value in [Encoder Fdbk] (P. 189) should be positive (magnitude is unimportant).

4. If the value observed is negative, remove power from the Drive and reverse the pulse encoder connections terminated at the pulse encoder interface board. This interface board is located behind the regulator board, inside the regulator carrier.

   Reverse the polarity of only one channel, i.e B and B NOT located at terminals 75 and 76 of the pulse encoder interface board.

5. Proceed to Verification of Drive Calibration.


| Autotuning |

The 1397 utilizes digital speed regulator and a digital current regulator to control the DC motor. These regulators (or “loops”) may be automatically tuned by setting the appropriate tuning parameter and running the Drive when coupled to the machine (load).

**ATTENTION:** The motor will rotate during auto-tuning. Stay clear of rotating machinery to avoid contact with rotating parts. Failure to observe this precaution could result in bodily injury.

**ATTENTION:** Before starting auto-tuning, it must be verified that no overhauling or hanging loads are on the motor. Auto-tuning will not operate properly if this type of load exists. Failure to observe this precaution could result in bodily injury.

**ATTENTION:** Auto-tuning must not be performed on drives with motors that are mechanically coupled to one another through the process material. However, the Drive can be auto-tuned with load applied and with inertia connected. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

**ATTENTION:** Auto-tuning will not operate properly if prior adjustments in Chapter 4 are not performed. Perform all prior adjustment procedures contained in Chapter 4 before proceeding. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

**IMPORTANT:** Speed loop autotuning can only be performed on Drives with either pulse encoder feedback or analog tachometer feedback.

**Current loop autotuning** can be performed on Drives with encoder feedback, analog tach feedback or which are armature voltage controlled. This can also be performed if the Drive is configured as a current regulator (J15 = Current).
ATTENTION: Current loop tuning applies power to the motor armature and will rotate any coupled process or load. Potentially fatal voltages may be present at this time and danger of personal injury and/or equipment damage may exist due to rotation of the coupled equipment.

**Autotune Set-Up**

Speed loop auto tuning will tune the Drive speed regulator based on values contained in the following parameters:

[Auto Tune Bridge] (P. 112) – Determines which bridge will be used during the auto tune process. If this parameter is set to Reverse, the reverse bridge is used, and the motor runs in the reverse direction during the auto tune process. For non-regenerative Drives, this is automatically set to Forward, and cannot be changed. For most applications, satisfactory results are obtained when [Auto Tune Bridge] is set to forward.

[Auto Tune Fld Rng] (P. 113) – Scales the auto tune results based on the speed range that the Drive will operate when running the process. The value of this parameter is the ratio of [Max Motor Speed] to the motor’s base speed. For example, if the motor base speed is 1750 RPM and [Max Motor Speed] is 2100 RPM, [Auto Tune Fld Rng] should be set to 1.2. (i.e. 2100 RPM / 1750 RPM = 1.2). For applications where the motor runs less than 10% above base speed, satisfactory results are obtained when [Auto Tune Fld Rng] is set to a default of 1.00.

[Auto Tune Stability] (P. 114) – Provides a simple means for the user to adjust the performance of the speed loop without adjusting the individual gains. The default value of 25 produces a speed loop response which is satisfactory for most applications. If the user desires a faster response, a value less than 25 may be used. If the user desires a slower speed loop response (i.e. more stability), a value greater than 25 may be used.

IMPORTANT: Prior to performing the autotune, the application parameters whose values were previously lowered [Max Process Speed] (P. 042), [Negative Current Lim] (P. 068), [Pos Cur Lim Src] (P. 069), [Pos Cur Lim] (P. 067), must be programmed for their final value. Record the final values in Table 4.K.
Table 4.K
Application Parameters

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<th>Par No.</th>
<th>Default</th>
<th>Description</th>
<th>Final Setting</th>
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<tr>
<td>[Max Process Spd] Setup Group</td>
<td>P.042</td>
<td>500 RPM</td>
<td>The maximum speed of the drive that can be supported by the application or process.</td>
<td></td>
</tr>
<tr>
<td>[Pos Current Lim] Adv Setup Group</td>
<td>P.067</td>
<td>150% FLA</td>
<td>Selects the highest amount of current (% motor rated armature amps) for the forward bridge. This parameter is also a high limit for the speed loop PI block output.</td>
<td></td>
</tr>
<tr>
<td>[Neg Current Lim] Adv Setup Group</td>
<td>P.068</td>
<td>150% FLA</td>
<td>This parameter is only set for regenerative Drives. For non-regenerative Drives, it is automatically set to zero and cannot be changed. This input is also clamped to zero if [Feedback Type] is set to AC Tach or if [Feedback Type] is set to Pulse Tach and [Encoder Quad] is Off. [Neg Current Lim] selects the highest amount of current (% motor rated armature amps) for the reverse bridge. This parameter is also used as a low limit for the Speed Loop PI block output.</td>
<td></td>
</tr>
<tr>
<td>[Pos Current Lim Src] Adv Setup Group</td>
<td>P.069</td>
<td>0</td>
<td>This parameter selects the source for the positive current limit. If register is selected, the reference is [Pos Current Limit]</td>
<td></td>
</tr>
</tbody>
</table>

Autotune Execution

The speed loop and the current loop may be tuned in one step, or each loop may be selected and tuned individually.

To execute Autotune make certain the previously lowered parameters are set to their final value, then perform the following steps:

1. Set [Autotune Type] (P. 052), in the setup memory to the desired tuning mode. The available selections are: “Current Loop” or “Speed Loop” or “Current and Spd”.
   Note: If tuning the Speed Loop separately, the Current Loop should have been previously tuned for best results.

2. Press START
   Note: Current Loop tunes in approximately 3 to 4 seconds
   Speed Loop tunes in approximately 1 minute.
   If no faults occur, the Drive stops with tuned values in memory. In order to save these values the user must perform a memory save in the EEPROM menu so that these values are not lost if power is cycled. The Run key is now back to normal operation.

Save Parameters to EEPROM –
IMPORTANT – Upon competition of the auto tune procedure, the parameters must be written to the non–volatile EEPROM memory, or they will be lost when power is removed from the Drive.

NOTE: For applications requiring precise speed control, the speed regulator may require manual tuning to achieve the desired response. Manual adjustment of KP and KI velocity loops may be necessary in some applications. Consult the factory for assistance if tuning KP/KI loops becomes necessary.
Application Set-Up

There are several parameters associated with the use of the 1397 Drive for specific applications. At this point, the basic Drive control has been tuned for simple speed control. If it is desired to operate the Drive using one of the optional functions, refer to Chapter 5 for a description of the parameters associated with these functions. In addition to set up of the Drive parameters associated with these functions, it is also necessary to verify correct configuration of the Source to Sink Parameters for the external control device being used to control the Drive for the specific application. Refer to the appropriate adapter board instruction manual for a description of how to use the adapter board and how to interface the adapter board to the Drive when various Drive functions are desired.
Programming Parameters

Introduction

This chapter contains the information required to assist the user in programming the Drive for a specific application after initial start-up. Drives are shipped programmed with default values and are preconfigured for the factory installed options.

The Drive parameters are divided into the following categories:

**Diagnostics** – These parameters provide information on various test, status and alarm inputs.

**Masks** – These parameters contain binary masks for all control functions. The masks control which adapters can issue control commands.

**Owners** – These parameters contain binary information to display which group of adapters is issuing control command.

**Adapter I/O** – Input and Output parameters for the optional communication adapter board used with the 1397.

**Process Display** – These parameters provide input to the Human Interface Module programming device.

**Field** – These parameters allow you to alter Field Supply levels, delays, current references, gain, etc.

**Process PI** – Status & Reference parameters for the Outer Control Loop.

**Metering** – These parameters allow you to monitor various reference sources such as Analog Inputs, Speed Loops, Current Loops, Ramp Input and Outputs etc.

**Setup** – These parameters define basic operation and require configuration during the Start-Up procedure.

**Advanced Setup** – These parameters require configuration during Start-Up when selected options are used, or with advanced and complex applications.

**Reference Set** – These parameters allow you to select options such as Accel/Decel times, Preset speeds, Jog times etc.

**Feature Select** – This parameter group contains the necessary parameters to activate and program advanced features of the Drive.

**Input Configuration** – These parameters accept analog information from sources outside the Drive.

**Output Configuration** – These parameters provide analog & digital output information.

Record Keeping

Record any changes made to the parameters for future reference during troubleshooting or tuning. A User Parameter value chart is supplied in Appendix D.
Safety Precautions

ATTENTION: Hazards of bodily injury or equipment damage are associated with many parameter settings. You must read and observe specific precautions before changing any parameter. Contact Rockwell Automation for assistance if you do not understand the hazard.

Parameter Groups

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**Publication Information:**

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- **Date:** June, 2001

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*Note: The table above is a representation of the programming parameters as described in the document. The parameters include trim range, trim reference, output configuration, input configuration, and other settings with their respective units and default values.*
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<td>MAX</td>
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<td>100</td>
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<td>100</td>
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</table>
# Parameter Descriptions (By Parameter Group)

This section provides a list of 1397 parameters sorted into their respective parameter groups with their associated default values, Display/Drive units, description and group designation and any applicable enums.

**Tunable** — Parameter can be changed while the drive is running.

**Configurable** — Parameter can only be changed when the drive is not running.

To help differentiate parameter names and display text from other text in this manual, the following conventions will be used:

- Parameter names will appear in [Brackets]
- Display text will appear in “quotes”.

## METERING

### [Anlg In 1] — P.001

Analog reference 1 value measured by the drive after all hardware and software scaling.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
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<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Output</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−5369</td>
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<tr>
<td>Maximum Value:</td>
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</tbody>
</table>

### [Anlg In 2] — P.002

Analog reference value measured by the drive after all hardware and software scaling.

<table>
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<th>RPM</th>
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<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
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<tr>
<td>Parameter Type:</td>
<td>Output</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−5369</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>5369</td>
</tr>
</tbody>
</table>

### [Anlg In 3] — P.003

Only used if the I/O Expansion kit is installed. The value representing analog input 3 (terminals 50 and 51 on the I/O Expansion board) after gain and zero have been applied. Refer to the I/O Expansion Inputs (Fig. A.2) block diagram for additional information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>CNTS</th>
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<tbody>
<tr>
<td>Group:</td>
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<td>Output</td>
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<tr>
<td>Factory Default:</td>
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</tr>
<tr>
<td>Minimum Value:</td>
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<td>Maximum Value:</td>
<td>5369</td>
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</table>
### METERING

#### [Anlg In 4] — P.004

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<tr>
<td>Parameter Type:</td>
<td>Output</td>
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<tr>
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<td>Minimum Value</td>
<td>-5369</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>5369</td>
</tr>
</tbody>
</table>

Only used if the I/O Expansion kit is installed.
The value representing analog input 4 (terminals 50 and 51 on the I/O Expansion board) after gain and zero have been applied.

#### [Arm Volt] — P.005

<table>
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<tbody>
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<tr>
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<tr>
<td>Factory Default</td>
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<td>Minimum Value</td>
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</tr>
<tr>
<td>Maximum Value</td>
<td>675</td>
</tr>
</tbody>
</table>

Armature voltage value after all hardware and software scaling but before any IR compensation.
Actual Min/Max values will be determined by Motor Arm Volts (P.046) or Max Motor Speed (P.041)

#### [Cur Loop Fdbk] — P.006

<table>
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<th>AMPS</th>
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<tbody>
<tr>
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<tr>
<td>Parameter Type:</td>
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<tr>
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<tr>
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</tbody>
</table>

The Cur Loop Fdbk signal prior to the summing function.

#### [Curr Loop Error] — P.007

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<tr>
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</table>

The Curr Loop Error signal — The difference between [Cur Loop Ref] and [Cur Loop Fdbk].
METERING

[Cur Loop Ref] — P.008

The amplitude and rate limited value of the selected Current Loop Reference.

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<tbody>
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<tr>
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[Draw Percent Out] — P.009

Determined by the selected trim reference signal and [Trim Range] value. [Draw Percent Out] is used as a multiplier in the proportional trim mode for accel and decel rates. It is also used to generate the [Trim Output] value.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read Only – Output</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>+/- 0.10</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>+/- 100.0</td>
</tr>
</tbody>
</table>

[Field Feedback] — P.010

Motor field current feedback signal after scaling and gain. Used by the field current regulator and field loss detection circuit.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>AMPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td></td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−0.0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>20.0</td>
</tr>
</tbody>
</table>

[Frequency In] — P.011

Only used if the I/O Expansion kit is installed. Gain adjustment for analog input 1 (terminals 50 and 51 on the I/O Expansion board).

The digital value of the frequency input (terminals 39, 40, and 41 on the I/O Expansion board). Freq In is scaled between [Freq In Zero] and [Freq In Scale].

Freq In is zero when the frequency at the input is less than or equal to [Freq In Zero]. It is 4095 when the frequency equals [Freq In Scale].
**[Jog Ramp Output] — P.012**

An output that represents the jog reference value immediately after the jog ramp function.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>-5000</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>5000</td>
</tr>
</tbody>
</table>

**[Monitor 1 Output] — P.013**

Shows the present state of the respective monitor (On, Off).

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Enum Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0 (Off)</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1 (On)</td>
</tr>
</tbody>
</table>

**[Monitor 2 Output] — P.014**

Shows the present state of the respective monitor (On, Off).

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Enum Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0 (Off)</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1 (On)</td>
</tr>
</tbody>
</table>

**[MOP Output] — P.015**

The output of the motor operated potentiometer (MOP).

Refer to the [MOP Accel Time] input parameter and block diagram for additional information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>-5000</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>5000</td>
</tr>
</tbody>
</table>
# METERING

## [OCL Enable TP] — P.016

The status of the outer control loop (OCL). Off indicates the OCL is disabled or held in reset (the drive is not running). On (Enabled) means it is operating.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Enum Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0 (Disabled)</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1 (Enabled)</td>
</tr>
</tbody>
</table>

## [OCL Feedback] — P.017

The feedback value of the outer control loop. Refer to the [Outer Control Loop] (Fig. A.5) block diagram for additional information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>CNTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−5120</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>5120</td>
</tr>
</tbody>
</table>

## [OCL Output] — P.018

The output of the outer control loop in speed units. This is the OCL trim that is applied to the speed/voltage control loop. Refer to the [Outer Control Loop] block diagram (Fig. A.5) for additional information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−5000</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>5000</td>
</tr>
</tbody>
</table>

## [OCL Ramp Output] — P.019

The outer control loop reference ramp output in OCL user units. This is the OCL reference output after OCL reference rounding and S-curve have been applied. Refer to the [OCL Ramp Time] block diagram for additional information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>CNTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−4095</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>4095</td>
</tr>
</tbody>
</table>

## [OCL Reference TP] — P.020

The value of the currently selected OCL Reference Source.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>CNTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−4095</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>4095</td>
</tr>
</tbody>
</table>
## METERING

### [Spd Loop Error] — P.021

The speed loop error signal, which represents the difference between the [Spd Loop Ref] and the [Spd Loop Fdbk] signals.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Type:</td>
<td></td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>-8190</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>8190</td>
</tr>
</tbody>
</table>

### [Spd Loop Fdbk] — P.022

An output that represents the selected speed/voltage loop drive feedback value after all scaling.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Type:</td>
<td></td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>-4095</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>4095</td>
</tr>
</tbody>
</table>

### [Spd Loop Lag Out] — P.023

An output representing the value immediately after the Speed Loop Lag function.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Type:</td>
<td></td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>-4095</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>4095</td>
</tr>
</tbody>
</table>

### [Spd Loop Output] — P.024

Speed Loop PI function output value to the Current Loop.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>AMPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Type:</td>
<td></td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>-1440.0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1440.0</td>
</tr>
</tbody>
</table>
### METERING

#### [Spd Loop Ref] — P.025
An output that represents the reference value to be used by the speed loop regulator in the drive.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Type:</td>
<td></td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−5000.0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>5000.0</td>
</tr>
</tbody>
</table>

#### [Spd Src Output] — P.026
The user selected speed reference source value. It is an input to the speed reference ramp section.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Type:</td>
<td></td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−5000.0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>5000.0</td>
</tr>
</tbody>
</table>

#### [Spd Ramp In TP] — P.027
An output that represents the test point value immediately before the speed loop ramp function.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Type:</td>
<td></td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−5000.0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>5000.0</td>
</tr>
</tbody>
</table>

#### [Spd Ramp Output] — P.028
An output that represents the test point value immediately after the speed loop ramp function.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Type:</td>
<td></td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−5000.0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>5000.0</td>
</tr>
</tbody>
</table>
### METERING

#### [Speed Pot] — P.029

Analog reference value, scaled to max and min Process Speed, measured by the drive after all hardware and software scaling.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Type:</td>
<td></td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−5000.0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>5000.0</td>
</tr>
</tbody>
</table>

#### [Trim Output] — P.030

Shows the value of trim that will be added to speed reference [Spd Src Output]. Actual Min/Max values will be determined by Motor Arm Volts (P.046) or Max Motor Speed (P.041).

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Type:</td>
<td></td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−5000.0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>5000.0</td>
</tr>
</tbody>
</table>

#### [Torque Reference] — P.031

Shows the value (in amps) of the currently selected reference to the drive (see Fig. A.3).

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>AMPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Metering</td>
</tr>
<tr>
<td>Type:</td>
<td></td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−960.0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>960.0</td>
</tr>
</tbody>
</table>
**SETUP**

**[CT Turns Ratio] — P.036**

The drive current transformer turns ratio (Tp/Tn).

See Regulator board replacement instructions for information on determining the CT TURNS RATIO. This parameter is not restored if a Restore Defaults is done.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Tp/Tn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Setup</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>Value varies per HP rating (See table below)</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>1</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>32767</td>
</tr>
</tbody>
</table>

**ATTENTION:** The [CT Turns Ratio] parameter is also used in the calculation of the burden resistor value. Do not adjust/change the value of this parameter from its factory set value unless you are replacing the regulator board (see chart below). Failure to observe this precaution could result in damage to, or destruction of, the equipment.

<table>
<thead>
<tr>
<th>The Drive Current Transformer Turns Ratio (Tp/Tn):</th>
<th>Value to Enter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 HP at 230 V AC/3 HP at 460 V AC</td>
<td>139</td>
</tr>
<tr>
<td>2-7.5 HP at 230 V AC/5-15 HP at 460 V AC</td>
<td>208</td>
</tr>
<tr>
<td>10-15 HP at 230 V AC/20-30 HP at 460 V AC</td>
<td>417</td>
</tr>
<tr>
<td>20-30 HP at 230 V AC/40-60 HP at 460 V AC</td>
<td>833</td>
</tr>
<tr>
<td>40-75 HP at 230 V AC/75-150 HP at 460 V AC</td>
<td>2000</td>
</tr>
<tr>
<td>100-150 HP at 230 V AC/200-300 HP at 460 V AC</td>
<td>5230</td>
</tr>
<tr>
<td>400–600 HP at 460VAC</td>
<td>7770</td>
</tr>
<tr>
<td>7 Amps at 380/415 VAC</td>
<td>139</td>
</tr>
<tr>
<td>29 Amps at 380/415 VAC</td>
<td>208</td>
</tr>
<tr>
<td>55 Amps at 380/415 VAC</td>
<td>417</td>
</tr>
<tr>
<td>110 Amps at 380/415 VAC</td>
<td>833</td>
</tr>
<tr>
<td>265 Amps at 380/415 VAC</td>
<td>2000</td>
</tr>
</tbody>
</table>

**[Accel Time] — P.037**

Amount of time it will take the drive to reach [Max Motor Speed] from 0 speed. Smaller changes in speed will take proportionately less time.

In proportional trim mode, the actual time to accelerate will be modified by [Draw Percent Out].

Refer to the Speed Reference Ramp, Fig. A.4 block diagram, for additional information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>SECONDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Setup</td>
</tr>
<tr>
<td>Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>5.0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.1</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>300.0</td>
</tr>
</tbody>
</table>
SETUP

[Decel Time] — P.038

Selects the time it takes to decelerate from [Max Motor Speed] to 0. Smaller changes in speed take proportionately less time.

If [Trim Mode Type] is set to [Proportional], the actual time to decelerate might be modified by [Draw Percentage Out]. Refer to the Speed Reference Ramp Block illustration (A.4) for more information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>SECS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Setup</td>
</tr>
<tr>
<td>Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>5.0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.1</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>300.0</td>
</tr>
</tbody>
</table>

[Feedback Type] — P.039

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

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Setup</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0 (Arm Volt)</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0 (Arm Volt)</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>3 (AC Tach)</td>
</tr>
</tbody>
</table>

[Max Current] — P.040

The highest amount of current (positive or negative) for a given application. This input is used as the basis of armature current scaling. [Max Current] is limited to 200% of [Motor Arm Amps].

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>% FLA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Setup</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>150</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>25</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>200</td>
</tr>
</tbody>
</table>

[Max Motor Speed] — P.041

[Max Motor Speed] is the highest normal running speed of the motor. This parameter scales the feedback device.

[Max Motor 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: The incorrect setting of this parameter can cause an overspeed condition. This parameter must be set by a qualified person who understands the significance of setting it. Set the value of this parameter accurately per your application requirements. Failure to observe this precaution could result in bodily injury.
SETUP

[Max Process Spd] — P.042

The maximum speed of the drive that can be supported by the application or process. [Max Process Spd] can be less than or equal to [Max Motor Speed].

If raising this value causes [Min Process Speed] to become less than 10% of [Max Process Spd], an alarm is generated.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Setup</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>500 RPM</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>1 RPM</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>Max Motor Speed</td>
</tr>
</tbody>
</table>

**ATTENTION:** The incorrect setting of this parameter can cause an overspeed condition. This parameter must be set by a qualified person who understands the significance of setting it. Set the value of this parameter accurately per your application requirements. Failure to observe this precaution could result in bodily injury.

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

[Min Process Spd] — P.043

Selects the minimum speed of the drive without being stopped. It is typically greater than zero. If it is less than 10% of [Max Process Spd], an alarm is generated.

**NOTE:** This alarm will only occur after a speed change, not on power up.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Setup</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>250 RPM</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0 RPM</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>Max Process Speed</td>
</tr>
</tbody>
</table>

**ATTENTION:** This drive can operate at and maintain zero speed when this parameter is set to zero. The user is 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.
**SETUP**

**[Motor Field Amps] — P.044**

Motor nameplate value of the rated field amps. This parameter scales the field current feedback. Minimum and maximum values are dependent on the installed supply rating.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Setup</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0.01 amp</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.11 (4 amp) 0.28 (10 amp) 0.55 (20 amp)</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>4.00 (4 amp) 10.00 (10 amp) or 20.00 (20 amp)</td>
</tr>
</tbody>
</table>

**ATTENTION:** The incorrect setting of this parameter can cause a motor overvoltage condition. Set motor [Motor Field Amps] to the motor’s nameplate value. Make sure [Field Econ Ref] and/or [Field Reference] — P.280 is set greater than [Fld Loss Level] — P.277 to guard against field loss faults. Failure to observe this precaution can result in bodily injury and damage to the equipment.

**[Motor Arm Amps] — P.045**

The rated armature current from the motor nameplate.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Setup</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>8.0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.1</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>3000.0</td>
</tr>
</tbody>
</table>

**ATTENTION:** The drive will not operate properly if this parameter value is entered incorrectly. This parameter must be equal to the rated armature amps found on the motor nameplate. Overcurrent or excess heating of the motor could result. Failure to observe this precaution could result in damage to, or destruction of, the equipment.
**SETUP**

**[Motor Arm Volts] — P.046**

The rated armature voltage from the motor nameplate.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Configurable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td></td>
</tr>
<tr>
<td>Group:</td>
<td>Setup</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>240</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>160</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>675</td>
</tr>
</tbody>
</table>

**ATTENTION:** The incorrect setting of this parameter can cause an overspeed condition. This parameter must be set by a qualified person who understands the significance of setting it. Set the value of this parameter accurately per your application requirements. Failure to observe this precaution could result in bodily injury.

**[Anlg Tach V/1000] — P.047**

The 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.

Note: The use of an AC tachometer requires the AC Tachometer Feedback kit.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>V/1K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Setup</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>18.0/1000 RPM</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>18.0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>200.0</td>
</tr>
</tbody>
</table>

Note: The high limit might be less than 200.0 to prevent the tach voltage from exceeding 250V.

**ATTENTION:** The incorrect setting of this parameter can cause an overspeed condition. This parameter must be set by a qualified person who understands the significance of setting it. Set the value of this parameter accurately per your application requirements. Failure to observe this precaution could result in bodily injury.

**[Encoder PPR] — P.048**

Encoder pulses per revolution (PPR) from the encoder nameplate.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>PPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Setup</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>18</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>18</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>2500</td>
</tr>
</tbody>
</table>

**ATTENTION:** The incorrect setting of this parameter can cause an overspeed condition. This parameter must be set by a qualified person who understands the significance of setting it. Set the value of this parameter accurately per your application requirements. Failure to observe this precaution could result in bodily injury.
SETUP

[Encoder Quad] — P.049

Enables or disables encoder quadrature. Encoder quadrature must be used on regenerative drives that use an encoder.

Set On for a bidirectional encoder.

Set Off for a unidirectional encoder.

Display/Drive Units: Numeric/Text
Parameter Type: Configurable
Group: Setup
Factory Default: 1
Minimum Value: 0 (Off)
Maximum Value: 1 (On)

If [Encoder Quad] is set to Off and Pulse Tach is the selected [Feedback Type] type, [Neg Current Lim] will be set to 0 and [Reverse Disable] set to On (preventing reverse direction).

[Nominal AC Freq] — P.050

The nominal AC line frequency (typically 50 or 60 Hz).

Display/Drive Units: Hz
Parameter Type: Configurable
Group: Setup
Factory Default: 60
Minimum Value: 48
Maximum Value: 62

[Nominal AC Volt] — P.051

The nominal AC line RMS voltage.

Display/Drive Units: V AC
Parameter Type: Configurable
Group: Setup
Factory Default: 230
Minimum Value: 200
Maximum Value: 575

[AutoTune Type] — P.052

When the Drive is “Ready”, this parameter allows selection of the Auto Tune Mode.

After selection is made, pressing Run will start the tuning mode.

Display/Drive Units: Numeric/Text
Parameter Type: Configurable
Group: Setup
Factory Default: 0
Minimum Value: 0
Maximum Value: 3
Enums: 0 = None, 1 = Current+Spd, 2 = Current Loop, 3 = Spd Loop
**ADV SETUP**

**[Anlg Tach Gain] — P.057**

Used to scale the analog tachometer feedback signal after it has been conditioned by the drive hardware. Typically, it will be 1.000.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
</tr>
<tr>
<td>Group:</td>
</tr>
<tr>
<td>Factory Default:</td>
</tr>
<tr>
<td>Minimum Value:</td>
</tr>
<tr>
<td>Maximum Value:</td>
</tr>
</tbody>
</table>

**ATTENTION:** The incorrect setting of this parameter can cause an overspeed condition. This parameter must be set by a qualified person who understands the significance of setting it. Set the value of this parameter accurately per your application requirements. Failure to observe this precaution could result in bodily injury.

**[Anlg Tach Zero] — P.058**

Used to remove any hardware-introduced offset from the analog tachometer feedback signal. Typically, adjustment will be –20 to +20.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
</tr>
<tr>
<td>Group:</td>
</tr>
<tr>
<td>Factory Default:</td>
</tr>
<tr>
<td>Minimum Value:</td>
</tr>
<tr>
<td>Maximum Value:</td>
</tr>
</tbody>
</table>

**ATTENTION:** The incorrect setting of this parameter can cause an overspeed condition. This parameter must be set by a qualified person who understands the significance of setting it. Set the value of this parameter accurately per your application requirements. Failure to observe this precaution could result in bodily injury.

**[Arm Voltage Gain] — P.059**

Used to scale the armature voltage signal after it has been conditioned by the drive hardware. In most cases, this input will be 1.000.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
</tr>
<tr>
<td>Group:</td>
</tr>
<tr>
<td>Factory Default:</td>
</tr>
<tr>
<td>Minimum Value:</td>
</tr>
<tr>
<td>Maximum Value:</td>
</tr>
</tbody>
</table>

**ATTENTION:** The incorrect setting of this parameter can cause an overspeed condition. This parameter must be set by a qualified person who understands the significance of setting it. Set the value of this parameter accurately per your application requirements. Failure to observe this precaution could result in bodily injury.
ADV SETUP

[Arm Voltage Zero] — P.060
Used to remove any hardware-introduced offset from the armature voltage signal. In most cases, this input will be set to zero volts.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Tunable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Advanced Setup</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>–200</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>200</td>
</tr>
</tbody>
</table>

ATTENTION: The incorrect setting of this parameter can cause an overspeed condition. This parameter must be set by a qualified person who understands the significance of setting it. Set the value of this parameter accurately per your application requirements. Failure to observe this precaution could result in bodily injury.

[Cur Loop K Fdbk] — P.061
Current Loop Feedback gain adjustment. In most cases, this input will be set for unity gain. The range of this input may be affected by the software scaling factor calculated by the drive. Typically, it will be 1.000.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RD/S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Advanced Setup</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1.000</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>1.000</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1.100</td>
</tr>
</tbody>
</table>

[Cur Lp Lead Freq] — P.062
Lead break frequency for the Current Loop.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RD/S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Advanced Setup</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>100</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>10</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>500</td>
</tr>
</tbody>
</table>

[Cur Loop Kp] — P.063
Proportional gain for the Current Loop.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Tunable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Advanced Setup</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0.250</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>4.000</td>
</tr>
</tbody>
</table>
### [Cur Loop RateLim] — P.064

Minimum allowable time for selected Current Loop reference to change from zero to [Maximum Current].

<table>
<thead>
<tr>
<th>Display/Drive Units</th>
<th>MSEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group</td>
<td>Advanced Setup</td>
</tr>
<tr>
<td>Factory Default</td>
<td>40</td>
</tr>
<tr>
<td>Minimum Value</td>
<td>1.000</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>100</td>
</tr>
</tbody>
</table>

### [IR Compensation] — P.066

Sets the armature voltage compensation value used when the drive is configured as a voltage regulator. This parameter is also used by the field current regulator to set the field weakened threshold.

<table>
<thead>
<tr>
<th>Display/Drive Units</th>
<th>% [Motor Arm Volts (P046)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Advanced Setup</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>50%</td>
</tr>
</tbody>
</table>

### [Pos Current Lim] — P.067

Sets the highest amount of current (% motor rated armature amps) for the forward bridge. Used as a high limit for the speed loop PI block output.

<table>
<thead>
<tr>
<th>Display/Drive Units</th>
<th>% FLA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group</td>
<td>Advanced Set-Up</td>
</tr>
<tr>
<td>Factory Default</td>
<td>150%</td>
</tr>
<tr>
<td>Minimum Value</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>Max Setting of Param 040</td>
</tr>
</tbody>
</table>

*Note: Setting of this parameter is limited by the setting of Parm 040.*

### [Neg Current Lim] — P.068

Note: This parameter is only set for regenerative drives.

Selects the highest amount of current (% motor rated armature amps) for the reverse bridge. Used as a low limit for the Speed Loop PI block output.

<table>
<thead>
<tr>
<th>Display/Drive Units</th>
<th>% FLA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group</td>
<td>Advanced Setup</td>
</tr>
<tr>
<td>Factory Default</td>
<td>150%</td>
</tr>
<tr>
<td>Minimum Value</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>200%</td>
</tr>
</tbody>
</table>
## ADV SETUP

### [Pos Cur Lim Src] — P.069

Selects the source for the positive current limit.

If Register is selected, the reference is [Pos Cur Lim].

The I/O Expansion kit must be installed to use Analog In 3 (terminals 50 and 51 on the I/O Expansion board), Analog In 4 (terminals 52 and 53), or Frequency In (terminals 39, 40, and 41).

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Register</td>
</tr>
<tr>
<td></td>
<td>1 = Analog In 3</td>
</tr>
<tr>
<td></td>
<td>2 = Analog In 4</td>
</tr>
<tr>
<td></td>
<td>3 = Frequency In</td>
</tr>
<tr>
<td></td>
<td>4 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>5 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>7 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>8 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>9 = Adapter 6</td>
</tr>
</tbody>
</table>

Default Setting: Register  
Parameter Type: Configurable  
Group: Advanced Setup  
Factory Default: 0  
Minimum Value: 0  
Maximum Value: 9

### [Neg Cur Lim Src] — P.070

Selects the source for the negative current limit. If Register is selected, [Neg Cur Lim] is used as the limit.

The analog input choices are only available if the I/O Expansion kit is installed. The Network choices are only available if the Network Option kit is installed.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Register</td>
</tr>
<tr>
<td></td>
<td>1 = Analog In 3</td>
</tr>
<tr>
<td></td>
<td>2 = Analog In 4</td>
</tr>
<tr>
<td></td>
<td>3 = Frequency In</td>
</tr>
<tr>
<td></td>
<td>4 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>5 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>7 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>8 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>9 = Adapter 6</td>
</tr>
</tbody>
</table>

Default Setting: Register  
Parameter Type: Configurable  
Group: Advanced Setup  
Factory Default: 0  
Minimum Value: 0  
Maximum Value: 9

Note: Default is zero for non-regenerative drives, if [Feedback Type] is set to AC Tach, or if [Feedback Type] is set to Encoder and [Encoder Quad] is off.
ADV SETUP

[PLL Max Error] — P.071
Maximum allowable change in line period per AC line cycle. This input should only be increased when drive power is supplied by a source that cannot maintain a suitable fixed frequency output (such as an alternator) to prevent line synchronization-related faults.

<table>
<thead>
<tr>
<th>Display/Drive Unit:</th>
<th>uSEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Advanced Setup</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>2</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>2</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1000</td>
</tr>
</tbody>
</table>

[Spd LeadLag Freq] — P.072
If Lead/Lag is selected in [Spd Leadlag Type], this parameter represents the low lead frequency. If [Spd Leadlag Type] is set to Bypass, this parameter has no effect. If Lag/Lead is selected, it represents the low lag frequency.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RD/S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Advanced Setup</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>100</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>1</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>3490</td>
</tr>
</tbody>
</table>

[Spd LeadLag Rato] — P.073
Sets the ratio of low to high break frequencies for the lead/lag block. For example, if this parameter is set to 10, the high break frequency will be 10 times the low break frequency — specified by [Spd Leadlag Freq]. If [Spd Leadlag Type] is set to Bypass, this parameter has no effect.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Tunable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Advanced Setup</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>2</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>2</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>20</td>
</tr>
</tbody>
</table>

[Spd LeadLag Type] — P.074
Determines if the lead/lag block will act upon the speed loop feedback signal. If On, the lead/lag block is bypassed and the feedback signal is used directly by the speed loop summing junction.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Lead/Lag</td>
</tr>
<tr>
<td></td>
<td>1 = Bypass</td>
</tr>
<tr>
<td></td>
<td>2 = Lag/Lead</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Advanced Setup</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>2</td>
</tr>
</tbody>
</table>
### ADV SETUP

**[Spd Lp Lag Freq] — P.075**

Lag break frequency for the lag block. If [Spd Lp Lag Type] is set to Bypass, this parameter has no effect.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RD/S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter Type:</strong></td>
<td>Tunable</td>
</tr>
<tr>
<td><strong>Group:</strong></td>
<td>Advanced Setup</td>
</tr>
<tr>
<td><strong>Factory Default:</strong></td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Minimum Value:</strong></td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Maximum Value:</strong></td>
<td>69.81</td>
</tr>
</tbody>
</table>

**[Spd Lp Lag Type] — P.076**

Determines if the lead/lag block will act upon the speed loop feedback signal. If On, the lead/lag block is bypassed and the feedback signal is used directly by the speed loop summing junction.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter Range:</strong></td>
<td>0 = Lag       1 = Bypass</td>
</tr>
<tr>
<td><strong>Default Setting:</strong></td>
<td>Bypass</td>
</tr>
<tr>
<td><strong>Parameter Type:</strong></td>
<td>Tunable</td>
</tr>
<tr>
<td><strong>Group:</strong></td>
<td>Advanced Setup</td>
</tr>
<tr>
<td><strong>Factory Default:</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Minimum Value:</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>Maximum Value:</strong></td>
<td>1</td>
</tr>
</tbody>
</table>

**[Spd Lp Lead Freq] — P.077**

Speed loop PI block lead frequency. A setting of 0.00 allows proportional-only speed loop control.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RD/S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter Type:</strong></td>
<td>Tunable</td>
</tr>
<tr>
<td><strong>Group:</strong></td>
<td>Advanced Setup</td>
</tr>
<tr>
<td><strong>Factory Default:</strong></td>
<td>3.00 rad/sec</td>
</tr>
<tr>
<td><strong>Minimum Value:</strong></td>
<td>0 rad/sec</td>
</tr>
<tr>
<td><strong>Maximum Value:</strong></td>
<td>141.37 rad/sec</td>
</tr>
</tbody>
</table>

**[Spd Loop Kp] — P.078**

Speed loop PI block proportional gain. Refer to Fig A.7, Speed Loop Block Diagram for more information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Tunable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group:</strong></td>
<td>Advanced Setup</td>
</tr>
<tr>
<td><strong>Factory Default:</strong></td>
<td>4.40</td>
</tr>
<tr>
<td><strong>Minimum Value:</strong></td>
<td>0.10</td>
</tr>
<tr>
<td><strong>Maximum Value:</strong></td>
<td>128.0</td>
</tr>
</tbody>
</table>

**[Tach Loss Angle] — P.079**

Allows setting of Armature Delta firing angle before a Tach Loss fault will be generated.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter Type:</strong></td>
<td>Configuration</td>
</tr>
<tr>
<td><strong>Group:</strong></td>
<td>Advanced Setup</td>
</tr>
<tr>
<td><strong>Factory Default:</strong></td>
<td>109</td>
</tr>
<tr>
<td><strong>Minimum Value:</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>Maximum Value:</strong></td>
<td>127</td>
</tr>
</tbody>
</table>
REFERENCE SET

[MOP Accel Time] — P.084

Only available if the I/O Expansion kit is installed.

Time in which the motor operated potentiometer (MOP) output can change from zero to [Max Motor Speed].

The MOP function provides a manual reference to the speed/voltage loop when the MOP output is selected.

The [Mop Output] is increased through digital input 4 (terminal 63) and decreased through digital input 3 (terminal 62) on the I/O Expansion board. The [Mop Output] is limited to prevent going over [Max Process Spd] or under [Min Process Spd].

[Mop Accel Time] and [Mop Decel Time] set the time in which the [Mop Output] can change from zero to [Max Motor Speed] and vice versa.

To prevent the S-curve block from limiting the rate of change from the [Mop Output], [Mop Accel Time] has a low limit equal to [Accel Time].

When [Mop Reset Enable] is on, the MOP output goes to [Minimum Speed] when the drive stops. If it is off, the [Mop Output] remains at its present level when the drive stops.

[MOP Decel Time] — P.085

Only used if the I/O Expansion kit is installed.

Minimum time in which the [Mop Output] can change from [Max Motor Speed] to zero.

Refer to the [Mop Accel Time] parameter and block diagram for additional information.

[MOP Reset Enable] — P.086

Determines if the [Mop Output] resets or stays at the present level when the drive stops. When [Mop Reset Enable] is on, the MOP output goes to [Min Process Speed] when the drive stops. If it is off, the [Mop Output] remains at its present level when the drive stops.

Refer to the [Mop Accel Time] parameter and block diagram for additional information.
REFERENCE SET

[Preset Speed 1, 2 and 3] — P.87, P.88 and P.89

These parameters set up to three preset speed references when the Regulator Type jumper (J15 on the regulator board) is set for the speed/voltage control loop or current reference when J15 is set to current.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>%FLA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 to [Maximum Current] — %FLA</td>
</tr>
<tr>
<td>Default Setting:</td>
<td>150 %FLA</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Reference Set</td>
</tr>
<tr>
<td>Display/Drive Units:</td>
<td>RPM OR</td>
</tr>
<tr>
<td>Parameter Range:</td>
<td>[Min Process Speed] to [Max Process Speed] RPM</td>
</tr>
<tr>
<td>Default Setting:</td>
<td>250 RPM</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Reference Set</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>250</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>Min Process Speed</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>Max Process Speed</td>
</tr>
</tbody>
</table>

[Ref 1 Source] — P.090

Selects the source of external reference 1

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Anlg In 1</td>
</tr>
<tr>
<td></td>
<td>1 = Speed Pot</td>
</tr>
<tr>
<td></td>
<td>2 = MOP Output</td>
</tr>
<tr>
<td></td>
<td>3 = Anlg In 3</td>
</tr>
<tr>
<td></td>
<td>4 = Anlg In 4</td>
</tr>
<tr>
<td></td>
<td>5 = Frequency In</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>7 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>8 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>9 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>10 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>11 = Adapter 6</td>
</tr>
<tr>
<td></td>
<td>12 = Preset 1</td>
</tr>
<tr>
<td></td>
<td>13 = Preset 2</td>
</tr>
<tr>
<td></td>
<td>14 = Preset 3</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>R &amp; W</td>
</tr>
<tr>
<td>Group:</td>
<td>Reference Set</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>14</td>
</tr>
</tbody>
</table>
REFERENCE SET

[Ref 2 Source] — P.091
Selects the source of external reference 2.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Anlg In 1</td>
</tr>
<tr>
<td></td>
<td>1 = Speed Pot</td>
</tr>
<tr>
<td></td>
<td>2 = MOP Output</td>
</tr>
<tr>
<td></td>
<td>3 = Anlg In 3</td>
</tr>
<tr>
<td></td>
<td>4 = Anlg In 4</td>
</tr>
<tr>
<td></td>
<td>5 = Frequency In</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>7 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>8 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>9 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>10 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>11 = Adapter 6</td>
</tr>
<tr>
<td></td>
<td>12 = Preset 1</td>
</tr>
<tr>
<td></td>
<td>13 = Preset 2</td>
</tr>
<tr>
<td></td>
<td>14 = Preset 3</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>R &amp; W</td>
</tr>
<tr>
<td>Group:</td>
<td>Reference Set</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>14</td>
</tr>
</tbody>
</table>

[Jog Acc/Dec Time] — P.092
Sets the time it takes the jog reference circuit to reach [Jog Reference (P.093)] from zero. Smaller changes in speed take proportionally less time.
The [S-Curve Rounding] parameter does not affect the setting of this parameter.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>SEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Reference Set</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>3.0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.1</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>300.0</td>
</tr>
</tbody>
</table>

[Jog Reference] — P.093
The normal operating speed while the drive is jogging.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Reference Set</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>250</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>Max Process Speed</td>
</tr>
</tbody>
</table>

ATTENTION: This drive can operate at and maintain zero speed when this parameter is set to zero. The user is 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.
### [Jog Off Dly Time] — P.094

Sets the amount of delay from releasing the Jog until the drive contactor opens. Allows repeated jogging without cycling the contactor.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>SEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Reference Set</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>10</td>
</tr>
</tbody>
</table>
### FEATURE SELECT

**[Min Speed Bypass] — P.099**

Disables the [Min Process Spd] limit when "ON". When "Off" the [Min Process Spd] is the lower limit.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Selectable</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0 = Off</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1 = On</td>
</tr>
</tbody>
</table>

**ATTENTION:** This drive can operate at and maintain zero speed when this parameter is set to on. The user is 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.

**[Ref Ramp Bypass] — P.100**

Bypasses the Speed Loop Ramp block. The bypass is automatically overridden during a stop command.

**Note:** If bypassed, rapid speed change can result.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0 = Off</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1 = On</td>
</tr>
</tbody>
</table>

**[Current Compound] — P.101**

Sets the level of current compounding to be used during any mode of drive operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>%FLA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0%</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−50%</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>50%</td>
</tr>
</tbody>
</table>
FEATURE SELECT

[Inertia Comp Src] — P.102
Sets the source of the inertia compensation signal. Internal uses [Normal Inertia] and [Maximum Current] params to determine amount of inertia compensation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td></td>
</tr>
<tr>
<td>0 = NONE</td>
<td></td>
</tr>
<tr>
<td>1 = INTERNAL</td>
<td></td>
</tr>
<tr>
<td>2 = ANLG IN 3</td>
<td></td>
</tr>
<tr>
<td>3 = ANLG IN 4</td>
<td></td>
</tr>
<tr>
<td>4 = FREQUENCY IN</td>
<td></td>
</tr>
<tr>
<td>5 = ADAPTER 1</td>
<td></td>
</tr>
<tr>
<td>6 = ADAPTER 2</td>
<td></td>
</tr>
<tr>
<td>7 = ADAPTER 3</td>
<td></td>
</tr>
<tr>
<td>8 = ADAPTER 4</td>
<td></td>
</tr>
<tr>
<td>9 = ADAPTER 5</td>
<td></td>
</tr>
<tr>
<td>10 = ADAPTER 6</td>
<td></td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>10</td>
</tr>
</tbody>
</table>

[Monitor 1 Delay] — P.103
The delay time in seconds for the level detector 1 circuit. Sets the amount of time between when the level detector timer is triggered and when the output is set on. If the input source signal goes below the detector’s threshold value, the timer is immediately reset. Refer to the Level Detectors block diagram (Fig. A.12) for additional information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>SECS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Setting:</td>
<td>10.0 seconds</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1.0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>300.0</td>
</tr>
</tbody>
</table>
**[Monitor 1 Source] — P.104**

Selects the signal that drives monitor 1.

- **Display/Drive Units:** Numeric/Text
- **Parameter Range:**
  - 0 = Cur Lp Fdbk
  - 1 = Spd Lp Fdbk
  - 2 = Spd Ramp Out
  - 3 = Spd Ramp In
  - 4 = Spd Src Out
- **Parameter Type:** Configurable
- **Group:** Feature Select
- **Factory Default:** 1 (Spd Lp Fdbk)
- **Minimum Value:** 0
- **Maximum Value:** 4

---

**[Monitor 1 Level] — P.105**

The threshold for level detector 1. Refer to the Level Detectors block diagram (Fig. A.12) for additional information.

When the absolute value of the signal driving monitor 1 is ≥ this threshold, the associated timer starts. If the input signal is < this threshold, the timer is immediately reset and the level detector output is set to off.

- **Display/Drive Units:** %
- **Default Setting:** 10.0%
- **Parameter Type:** Tunable
- **Group:** Feature Select
- **Factory Default:** 10.0%
- **Minimum Value:** 0.1%
- **Maximum Value:** 100.0%

The parameter range for the level detector is automatically rescaled for speed or current based on the input selected by [Monitor 1 Source]. If [Cur Loop Fdbk] is selected for [Monitor 1 Source], the parameter range is 0.1 to [Maximum Current]. For any other [Monitor 1 Source] settings, the parameter range is 0.1 to 100.0%.
**FEATURE SELECT**

[Monitor 2 Delay] — P.106

The delay time in seconds for the monitor 2 circuit. Refer to the Level Detectors block diagram (A.12) for additional information.

- **Display/Drive Units:** SECS
- **Parameter Type:** Tunable
- **Group:** Feature Select
- **Factory Default:** 1.0 seconds
- **Minimum Value:** 0 seconds
- **Maximum Value:** 30.0 seconds

[Monitor 2 Source] — P.107

Selects the signal that drives monitor 2.

- **Display/Drive Units:** Numeric/Text
- **Parameter Range:**
  - 0 = Cur Lp Fdbk
  - 1 = Spd Lp Fdbk
  - 2 = Spd Ramp Out
  - 3 = Spd Ramp In
  - 4 = Spd Src Out
- **Parameter Type:** Configurable
- **Group:** Feature Select
- **Factory Default:** 3 (Spd Ramp In)
- **Minimum Value:** 0
- **Maximum Value:** 4
FEATURE SELECT

[Monitor 2 Level] — P.108

The threshold for monitor 2. Refer to the Level Detectors block diagram (Fig. A.12) for additional information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Setting:</td>
<td>10.0%</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>10.0%</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.1%</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

The parameter range for the level detector is automatically rescaled for speed or current based on the input selected by [Monitor 2 Source]. If [Cur Loop Fdbck] is selected for [Monitor 2 Source], the parameter range is 0.1 to [Maximum Current]. For any other [Monitor 2 Source] settings, the parameter range is 0.1 to 100.0%.

[Normal Inertia] — P.109

The time required to accelerate the motor and load inertia from zero to motor base speed at [Motor Arm Amps] and [Motor Field Amps].

This parameter is set by the speed loop self-tuning procedure or is entered by the operator directly.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>SECS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1.00 seconds</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.05 seconds</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>65.20 seconds</td>
</tr>
</tbody>
</table>

[Reverse Disable] — P.110

Note: [Reverse Disable] applies only to regenerative drives.

When On, [Reverse Disable] prevents the speed reference from dropping below zero. The reverse bridge cannot be activated and the drive cannot reverse.

When Off, the speed reference can drop below zero and the drive can reverse.

The default is on when:
- The drive has a non-regenerative (S6) power unit.
- [Feedback Type] is set to AC Tach.
- [Feedback Type] is set to Encoder and [Encoder Quad] is Off.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0 (Off)</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0 = OFF</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1 = ON</td>
</tr>
</tbody>
</table>

If [Encoder Quadrature] is set to Off and Pulse Tach is the selected [Feedback Type] type, [Neg Current Lim] will be set to 0 and [Reverse Disable] set to On (preventing reverse direction).
**FEATURE SELECT**

[S-Curve Rounding] — P.111

Rate of change (positive or negative) of acceleration and deceleration to smooth the Speed Loop Ramp output. For example, if equal to 20, then 40% of the acceleration and deceleration time will be spent smoothing and the remainder will be a linear ramp. 0% = linear ramp, no rounding 50% = smoothing for the entire ramp

In regard to [Trim Mode Type], [S-Curve Rounding] will interfere with the [Accel Time] and the [Decel Time] so that the draw will not be constant. Therefore, it is recommended that [S-Curve Rounding] be set to 0% if [Trim Mode Type] is set to Proportional. Incremental trim is not affected by this limitation.

<table>
<thead>
<tr>
<th>Display/Drive Units</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0%</td>
</tr>
<tr>
<td>Minimum Value</td>
<td>0%</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>50%</td>
</tr>
</tbody>
</table>

[AutoTune Bridge] — P.112

Selects the desired direction for auto tuning to operate.

<table>
<thead>
<tr>
<th>Display/Drive Units</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default</td>
<td>0 (Forward)</td>
</tr>
<tr>
<td>Minimum Value</td>
<td>0 = Forward</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>1 = Reverse</td>
</tr>
</tbody>
</table>
### FEATURE SELECT

#### [AutoTune Fld Rng] — P.113

Set to the ratio of [Max Motor Speed] and motor base speed = 1.00 when no field weakening is used. Applies to speed loop autotuning only. The higher the value, the faster the motor speed.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Tunable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1.00</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.90</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>5.00</td>
</tr>
</tbody>
</table>

#### [AutoTune Stablty] — P.114

Selects the desired performance of the speed loop after auto tuning. A higher value decreases the speed loop's response.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Tunable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>25</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>10</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>100</td>
</tr>
</tbody>
</table>

#### [Stop Mode Type] — P.115

Selects stopping mode of the drive in response to a Stop command. An open “customer interlock” only causes a coast stop. If the drive is configured as a current regulator, only Coast/DB can be selected.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Ramp, 1 = Curr Limit, 2 = Coast/DB</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>2 (Coast/DB)</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>2</td>
</tr>
</tbody>
</table>

#### [Stop Speed Level] — P.116

Sets the threshold speed below which the main contactor will automatically open after a ramp stop or current limit stop is asserted. This value should be less than or equal to [Min Process Speed].

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>50</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>Max Process Spd</td>
</tr>
</tbody>
</table>
**FEATURE SELECT**

**[Trim Mode Type] — P.117**
Selects the type of trim mode to be used by the drive:
- No Trim
- Incremental
- Proportional — Allows multiple drive sections with a common reference to operate and ramp at different values.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = No Trim</td>
</tr>
<tr>
<td></td>
<td>1 = Incremental</td>
</tr>
<tr>
<td></td>
<td>2 = Proportional</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>2</td>
</tr>
</tbody>
</table>

Proportional is a type of draw. By using draw, one section can operate 10% faster than an upstream section. When a ramp occurs on the common reference, the two sections will support the 10% draw throughout the ramp. [S-Curve Rounding] will interfere with the [Accel Time] and the [Decel Time] so that the draw will not be constant. Therefore, it is recommended that [S-Curve Rounding] be set to 0% if [Trim Mode Type] is set to Proportional. Incremental trim is not affected by this limitation.

This parameter also affects how the acceleration and deceleration times are interpreted.

**[Trim Range] — P.118**
Uses the selected trim reference signal to generate draw percentage. Determines how much the trim signal will affect the drive reference.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0%</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0%</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>100%</td>
</tr>
</tbody>
</table>

**[Trim Ref Source] — P.119**
Trim reference source selection.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Register</td>
</tr>
<tr>
<td></td>
<td>1 = Anlg In 1</td>
</tr>
<tr>
<td></td>
<td>2 = Anlg In 2</td>
</tr>
<tr>
<td></td>
<td>3 = Anlg In 3</td>
</tr>
<tr>
<td></td>
<td>4 = Anlg In 4</td>
</tr>
<tr>
<td></td>
<td>5 = Frequency In</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>7 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>8 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>9 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>10 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>11 = Adapter 6</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>11</td>
</tr>
</tbody>
</table>
# FEATURE SELECT

## [Trim Reference] — P.120

Drive register to manually set the trim reference value used by the drive.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>±100.0%</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−100%</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>+100%</td>
</tr>
</tbody>
</table>

## [OCL Enable Src] — P.121

Sets the source of the OCL enable signal. “Register” means it comes from [OCL Enable]. “Terminal Blk” means I/O Expansion #64.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Register 1 = Terminal Blk</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Parameter Setting:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1</td>
</tr>
</tbody>
</table>

## [Inertia Comp Reg] — P.122

Allows inertia compensation value to be entered (via Datalink also) when Inertia Comp Src P. 102 is set to “Register”. The value of this parameter is not saved through a power-cycle, it is reset to zero at power-up.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>CNTS Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 – 4095</td>
</tr>
<tr>
<td>Group:</td>
<td>Feature Select</td>
</tr>
<tr>
<td>Parameter Setting:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>4095</td>
</tr>
</tbody>
</table>
**INPUT CONFIG**

**[Anlg In 1 Gain] — P.127**

Used to scale the analog input 1 signal after it has been conditioned by the drive hardware. Typically, it will be 1.000.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Input Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1.000</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.750</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>2.250</td>
</tr>
</tbody>
</table>

**[Anlg In 1 Type] — P.128**

Selects the analog input 1 signal type.

Note: Jumpers J10 and J12 must be set for the same type of signal selected by this parameter.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = 0-10V</td>
</tr>
<tr>
<td></td>
<td>1 = ±10V</td>
</tr>
<tr>
<td></td>
<td>2 = 4-20mA</td>
</tr>
<tr>
<td></td>
<td>3 = 10-50mA</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Input Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>3</td>
</tr>
</tbody>
</table>

**[Anlg In 1 Zero] — P.129**

Used to remove any hardware introduced offset from the analog auto reference signal. Typically, it will be 0.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Input Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>-200</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>200</td>
</tr>
</tbody>
</table>

**[Anlg In 2 Gain] — P.130**

Scales the manual mode analog reference signal after it has been conditioned by the drive hardware. Typically, it will be 1.000.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Input Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1.000</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.750</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>2.250</td>
</tr>
</tbody>
</table>
### INPUT CONFIG

#### [Anlg In 2 Zero] — P.131

Removes any hardware introduced offset from the analog reference signal. Typically, it will be 0.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>−200 to +200</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Input Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−200</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>200</td>
</tr>
</tbody>
</table>

#### [Anlg In 3 Gain] — P.132

Only used if the I/O Expansion kit is installed. Scales analog input 3 (Terminals 50 & 51 on the I/O Exp). Typically 1.000

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Input Config</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1.000</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.750</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>2.250</td>
</tr>
</tbody>
</table>

#### [Anlg In 3 Type] — P.133

Only used if the I/O Expansion kit is installed. Selects the type of signal that the drive will expect to be connected to analog input 3 (terminals 50 and 51 on the I/O Expansion board). The value of this parameter must match the setting of jumpers J11 and J12 on the I/O Expansion board.

Refer to the I/O Expansion Inputs (Fig. A.2) block diagram for further information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric</th>
</tr>
</thead>
</table>
| Parameter Range:     | 0 = 0-10V  
|                      | 1 = ±10V  
|                      | 2 = 4-20mA  
|                      | 3 = 10-50mA |
| Default Setting:     | ±10V |
| Group:               | Input Config |
| Factory Default:     | 1 |
| Minimum Value:       | 0 |
| Maximum Value:       | 3 |
**INPUT CONFIG**

**[Anlg In 3 Zero] — P.134**

Only used if the I/O Expansion kit is installed.

Adjusts the zero point of analog input 3 (terminals 50 and 51 on the I/O expansion board) to remove any offset that might exist on the input.

Display/Drive Units: Numeric  
Parameter Type: Tunable  
Group: Input Config  
Factory Default: 0  
Minimum Value: –200  
Maximum Value: 200

To adjust the zero point, make small changes to this parameter until [Anlg In 3] (P.003) equals zero when the signal at terminals 50 and 51 is at its minimum (0 V).

**[Anlg In 4 Gain] — P.135**

Only used if I/O Expansion Kit Installed.  
Scales Analog Input 4 (Terminals 52 & 53).

Display/Drive Units: Numeric  
Parameter Type: Tunable  
Group: Input Config  
Factory Default: 1.00  
Minimum Value: 0.750  
Maximum Value: 2.250

**[Anlg In 4 Zero] — P.136**

Only used if the I/O Expansion Kit is installed.  
Adjusts the zero point of Analog Input 4 (52,53) on the I/O Expansion Board, to remove any offset that may exist on the input.

Display/Drive Units: Numeric  
Group: Input Config  
Factory Default: 0  
Minimum Value: –200  
Maximum Value: 200

To adjust the zero point, make small changes to this parameter until [Anlg In 4] (P.004) equals zero while the signal at terminals 52 and 53 is at its minimum (0 V).

**[Freq In Scale] — P.137**

Only available if the I/O Expansion kit is installed.  
Specifies the maximum input frequency. This is the frequency that corresponds to a full scale value. For example, if the frequency input will be used as the speed loop reference, this input frequency would correspond to [Max Motor Speed] — P.041, because [Max Motor Speed] is the basis for speed loop scaling.

Display/Drive Units: kHz  
Parameter Type: Configurable  
Group: Input Config  
Factory Default: 250.0 kHz  
Minimum Value: 2.0 kHz  
Maximum Value: 250.0 kHz
**[Freq In Zero] — P.138**

Only used if the I/O Expansion kit is installed.

Specifies the minimum input frequency. This is the frequency that corresponds to a value of zero. If the input frequency drops below the frequency specified by this input parameter, the resulting digital value remains zero (it will not go negative).

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Input Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>2.0 kHz</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>2.0 kHz</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>250.0 kHz</td>
</tr>
</tbody>
</table>
OUTPUT CONFIG

[Anlg Out 1 Gain] — P.144

Scales the Analog Output Signal at the regulator board terminal strip.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Display/Drive Units:</td>
<td>Numeric</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Output Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1.00</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.100</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1.900</td>
</tr>
</tbody>
</table>
OUTPUT CONFIG

[Anlg Out 1 Src] — P.145

Selects the drive testpoint that will source meter output 1 (terminals 24 and 25 on the regulator board).

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td></td>
</tr>
<tr>
<td>0 = Cur Lp Fdbk</td>
<td>11 = Arm Volt</td>
</tr>
<tr>
<td>1 = Cur Loop Ref</td>
<td>12 = ATach Fdbk</td>
</tr>
<tr>
<td>2 = Cur Loop Err</td>
<td>13 = Encoder Fdbk</td>
</tr>
<tr>
<td>3 = Spd Loop Fdbk</td>
<td>14 = Zero</td>
</tr>
<tr>
<td>4 = Spd Lp Ref</td>
<td>15 = Full Scale</td>
</tr>
<tr>
<td>5 = Spd Lp Error</td>
<td>16 = Power Output</td>
</tr>
<tr>
<td>6 = Spd Lp Out</td>
<td>17 = OCL Ref</td>
</tr>
<tr>
<td>7 = Spd Ramp Out</td>
<td>18 = OCL Ramp Out</td>
</tr>
<tr>
<td>8 = Spd Ramp In</td>
<td>19 = OCL Feedback</td>
</tr>
<tr>
<td>9 = Spd Src Out</td>
<td>20 = OCL Output</td>
</tr>
<tr>
<td>10 = Trim Output</td>
<td>21 = Field Ref</td>
</tr>
<tr>
<td>22 = Field Fdbk</td>
<td>22 = Field Fdbk</td>
</tr>
</tbody>
</table>

Note: See Table A below for Full Scale Values

Default Setting: 0 [Cur Lp Fdbk]
Minimum Value: 0 [Cur Lp Fdbk]
Maximum Value: 22 [Field Fdbk]
Parameter Type: Tunable
Group: Output — Output Config

Table A – Source Signal Values

<table>
<thead>
<tr>
<th>Signal Selected</th>
<th>Full Scale Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Cur Loop Fdbk] — P.006</td>
<td>[Motor Arm Amps (P.45)] × Maximum Current (P.40)</td>
</tr>
<tr>
<td>[Cur Loop Ref] — P.008</td>
<td>100 = FULL SCALE VALUE</td>
</tr>
<tr>
<td>[Cur Loop Error] — P.007</td>
<td></td>
</tr>
<tr>
<td>[Spd Loop Output] — P.024</td>
<td>Top Speed</td>
</tr>
<tr>
<td>[Spd Loop Fdbk] — P.022</td>
<td></td>
</tr>
<tr>
<td>[Spd Loop Ref] — P.025</td>
<td></td>
</tr>
<tr>
<td>[Spd Loop Error] — P.021</td>
<td></td>
</tr>
<tr>
<td>[Spd Ramp Output] — P.028</td>
<td></td>
</tr>
<tr>
<td>[Spd Ramp Input Tp] — P.027</td>
<td></td>
</tr>
<tr>
<td>[Spd Sc Output] — P.026</td>
<td></td>
</tr>
<tr>
<td>[Trim Output] — P.030</td>
<td></td>
</tr>
<tr>
<td>[Analog Tach Fdbk] — P.194</td>
<td></td>
</tr>
<tr>
<td>[Encoder Fdbk] — P.189</td>
<td></td>
</tr>
<tr>
<td>[OCL Output] — P.018</td>
<td></td>
</tr>
<tr>
<td>[Armature Voltage] — P.005</td>
<td></td>
</tr>
<tr>
<td>Power Output</td>
<td>[Motor Arm Volts]</td>
</tr>
<tr>
<td>[Motor Arm Volts] × [Motor Arm Amps] × Maximum Current</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>[Field Reference] — P.280</td>
<td>[Motor Field Amps]</td>
</tr>
<tr>
<td>[Field Feedback] — P.010</td>
<td></td>
</tr>
<tr>
<td>[OCL Reference TP] — P.020</td>
<td>4095</td>
</tr>
<tr>
<td>[OCL Ramp Output] — P.019</td>
<td></td>
</tr>
<tr>
<td>[OCL Feedback] — P.017</td>
<td></td>
</tr>
</tbody>
</table>
## OUTPUT CONFIG

### [Anlg Out 1 Zero] — P.146

Removes any hardware-introduced offset from the Analog 1 output signal at the regulator board terminal strip.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Output Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>-200</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>200</td>
</tr>
</tbody>
</table>

### [Anlg Out 2 Gain] — P.147

Scales the Analog 2 Output Signal at the regulator board terminal strip.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Output Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1.000</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.100</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1.900</td>
</tr>
</tbody>
</table>
**OUTPUT CONFIG**

[Anlg Out 2 Src] — P.148

Selects the drive testpoint that will source meter output 2 (terminals 25 and 26 on the regulator board).

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td></td>
</tr>
<tr>
<td>0 = Cur Lp Fdbk</td>
<td>10 = Arm Volt</td>
</tr>
<tr>
<td>1 = Cur Loop Ref</td>
<td>11 = ATach Fdbk</td>
</tr>
<tr>
<td>2 = Cur Loop Err</td>
<td>12 = Encoder Fdbk</td>
</tr>
<tr>
<td>3 = Spd Loop Fdbk</td>
<td>13 = Zero</td>
</tr>
<tr>
<td>4 = Spd Lp Ref</td>
<td>15 = Full Scale</td>
</tr>
<tr>
<td>5 = Spd Lp Error</td>
<td>16 = Power Output</td>
</tr>
<tr>
<td>6 = Spd Lp Out</td>
<td>17 = OCL Ref</td>
</tr>
<tr>
<td>7 = Spd Ramp Out</td>
<td>18 = OCL Ramp Out</td>
</tr>
<tr>
<td>8 = Spd Ramp In</td>
<td>19 = OCL Feedback</td>
</tr>
<tr>
<td>9 = Spd Src Out</td>
<td>20 = OCL Output</td>
</tr>
<tr>
<td>10 = Trim Output</td>
<td>21 = Field Ref</td>
</tr>
<tr>
<td>11 = Arm Volt</td>
<td>22 = Field Fdbk</td>
</tr>
</tbody>
</table>

Default Setting: [Spd Lp Fdbk]

Parameter Type: Tunable

Minimum Value: 0 [Cur Lp Feedback]

Maximum Value: 22 [Field Feedback]

Group: Output Config

Note: See Table A below for Full Scale Values

---

### Table A – Source Signal Values

<table>
<thead>
<tr>
<th>Signal Selected</th>
<th>Full Scale Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Cur Loop Fdbk] — P.006</td>
<td>[Motor Arm Amps (P.45)] × Maximum Current (P.40)</td>
</tr>
<tr>
<td>[Cur Loop Ref] — P.008</td>
<td></td>
</tr>
<tr>
<td>[Cur Loop Error] — P.007</td>
<td></td>
</tr>
<tr>
<td>[Spd Loop Output] — P.024</td>
<td></td>
</tr>
<tr>
<td>[Spd Loop Fdbk] — P.022</td>
<td>Top Speed</td>
</tr>
<tr>
<td>[Spd Loop Ref] — P.025</td>
<td></td>
</tr>
<tr>
<td>[Spd Loop Error] — P.021</td>
<td></td>
</tr>
<tr>
<td>[Spd Ramp Output] — P.028</td>
<td></td>
</tr>
<tr>
<td>[Spd Ramp Input Tp] — P.027</td>
<td></td>
</tr>
<tr>
<td>[Spd Sc Output] — P.026</td>
<td></td>
</tr>
<tr>
<td>[Trim Output] — P.030</td>
<td></td>
</tr>
<tr>
<td>[Analog Tach Fdbk] — P.194</td>
<td></td>
</tr>
<tr>
<td>[Encoder Fdbk] — P.189</td>
<td></td>
</tr>
<tr>
<td>[OCL Output] — P.018</td>
<td></td>
</tr>
<tr>
<td>[Armature Voltage] — P.005</td>
<td></td>
</tr>
<tr>
<td>Power Output</td>
<td></td>
</tr>
<tr>
<td>[Motor Arm Volts]</td>
<td></td>
</tr>
<tr>
<td>[Motor Arm Volts] × [Motor Arm Amps]</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>= Full Scale Value</td>
</tr>
<tr>
<td>4095</td>
<td></td>
</tr>
<tr>
<td>[Fld Reference] — P.280</td>
<td></td>
</tr>
<tr>
<td>[Field Feedback] — P.010</td>
<td></td>
</tr>
<tr>
<td>[OCL Reference TP] — P.020</td>
<td></td>
</tr>
<tr>
<td>[OCL Ramp Output] — P.019</td>
<td></td>
</tr>
<tr>
<td>[OCL Feedback] — P.017</td>
<td></td>
</tr>
</tbody>
</table>
## OUTPUT CONFIG

### [Anlg Out 2 Zero] — P.149

Removes any hardware-introduced offset from the Analog 2 output signal at the regulator board terminal strip.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Output Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>–200</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>200</td>
</tr>
</tbody>
</table>

### [Anlg Out 3 Gain] — P.150

Only used if the I/O Expansion kit is installed. Adjusts analog output 3 (terminals 54 and 55 on the I/O Expansion board) to allow it to produce a signal from 5.0 to approximately 13.0 V DC.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Output Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1.00</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.500</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1.300</td>
</tr>
</tbody>
</table>

This is typically used to adjust the 10 V full scale output to match the input voltage requirement of attached equipment. For example, this parameter would be set to 0.800 to match the requirements of equipment that accepts a 0 to 8 V DC signal.

The outputs are only rated to 10 V DC, so gain adjust values greater than 1.000 might cause the analog output circuit to saturate.
OUTPUT CONFIG

**[Anlg Out 3 Src] — P.151**

Only used if the I/O Expansion kit is installed.

Selects the signal used to drive analog output 3 (terminals 54 and 55 on the I/O Expansion board). When the analog output is at its maximum value, the selected signal is at its full scale value.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Parameter Range:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numeric/Text</td>
<td></td>
</tr>
<tr>
<td>0 = Cur Lp Fdbk</td>
<td>11 = Arm Volt</td>
</tr>
<tr>
<td>1 = Cur Loop Ref</td>
<td>12 = ATach Fdbk</td>
</tr>
<tr>
<td>2 = Cur Loop Err</td>
<td>13 = Encoder Fdbk</td>
</tr>
<tr>
<td>3 = Spd Loop Fdbk</td>
<td>14 = Zero</td>
</tr>
<tr>
<td>4 = Spd Lp Ref</td>
<td>15 = Full Scale</td>
</tr>
<tr>
<td>5 = Spd Lp Error</td>
<td>16 = Power Output</td>
</tr>
<tr>
<td>6 = Spd Lp Out</td>
<td>17 = OCL Ref</td>
</tr>
<tr>
<td>7 = Spd Ramp Out</td>
<td>18 = OCL Ramp Out</td>
</tr>
<tr>
<td>8 = Spd Ramp In</td>
<td>19 = OCL Feedback</td>
</tr>
<tr>
<td>9 = Spd Src Out</td>
<td>20 = OCL Output</td>
</tr>
<tr>
<td>10 = Trim Output</td>
<td>21 = Field Ref</td>
</tr>
<tr>
<td>11 = Arm Volt</td>
<td>22 = Field Fdbk</td>
</tr>
</tbody>
</table>

See Table A below for Full Scale Values

**Parameter Type:** Configurable
**Group:** Output Config
**Factory Default:** 0
**Minimum Value:** 0
**Maximum Value:** 22

Refer also to Parameters:
- [Maximum Current] — P.040
- [Motor Field Amps] — P.044
- [Motor Arm Amps] — P.045
- [Motor Arm Volts] — P.046
- [Max Motor Speed] — P.041

### Table A – Source Signal Values

<table>
<thead>
<tr>
<th>Signal Selected</th>
<th>Full Scale Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Cur Loop Fdbk] — P.006</td>
<td>[Motor Arm Amps (P. 45)] × Maximum Current (P. 40)</td>
</tr>
<tr>
<td>[Cur Loop Ref] — P.008</td>
<td></td>
</tr>
<tr>
<td>[Cur Loop Error] — P.007</td>
<td></td>
</tr>
<tr>
<td>[Spd Loop Fdbk] — P.024</td>
<td></td>
</tr>
<tr>
<td>Top Speed</td>
<td></td>
</tr>
<tr>
<td>[Spd Loop Ref] — P.025</td>
<td></td>
</tr>
<tr>
<td>[Spd Loop Error] — P.021</td>
<td></td>
</tr>
<tr>
<td>[Spd Ramp Output] — P.028</td>
<td></td>
</tr>
<tr>
<td>[Spd Ramp In TP] — P.027</td>
<td></td>
</tr>
<tr>
<td>[Spd Src Output] — P.026</td>
<td></td>
</tr>
<tr>
<td>[Trim Output] — P.030</td>
<td></td>
</tr>
<tr>
<td>[Analog Tach Fdbk] — P.194</td>
<td></td>
</tr>
<tr>
<td>[Encoder Fdbk] — P.189</td>
<td></td>
</tr>
<tr>
<td>[OCL Output] — P.018</td>
<td></td>
</tr>
<tr>
<td>[Armature Voltage] — P.005</td>
<td>[Motor Arm Volts]</td>
</tr>
<tr>
<td>Power Output</td>
<td>[Motor Arm Volts] × [Motor Arm Amps] × Maximum Current</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Publication 1397-5.0 — June, 2001
**OUTPUT CONFIG**

**[Anlg Out 3 Type] — P.152**

Only used if the I/O Expansion kit is installed.

Selects the type of signal to be generated by analog output 3 (terminals 54 and 55 on the I/O Expansion board). This setting must match the settings of jumpers J14 and J15 on the I/O Expansion board.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = 0-10V</td>
</tr>
<tr>
<td></td>
<td>1 = ±10V</td>
</tr>
<tr>
<td></td>
<td>2 = 4-20mA</td>
</tr>
<tr>
<td></td>
<td>3 = 10-50mA</td>
</tr>
<tr>
<td>Default Setting:</td>
<td>±10V</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Output Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>3</td>
</tr>
</tbody>
</table>

**[Anlg Out 4 Gain] — P.153**

Adjusts analog output 4. Only used if I/O Expansion kit is installed.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Output Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1.000</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.500</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1.300</td>
</tr>
</tbody>
</table>
**OUTPUT CONFIG**

**[Anlg Out 4 Src] — P.154**

Only available if the I/O Expansion kit is installed.

Selects the signal used to drive analog output 4 (terminals 56 and 57 on the I/O Expansion board). When the analog output is at its maximum value, the selected signal is at its full scale value.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td></td>
</tr>
<tr>
<td>0 = Cur Lp Fdbk</td>
<td>11 = Arm Volt</td>
</tr>
<tr>
<td>1 = Cur Loop Ref</td>
<td>12 = ATach Fdbk</td>
</tr>
<tr>
<td>2 = Cur Loop Err</td>
<td>13 = Encoder Fdbk</td>
</tr>
<tr>
<td>3 = Spd Loop Fdbk</td>
<td>14 = Zero</td>
</tr>
<tr>
<td>4 = Spd Lp Ref</td>
<td>15 = Full Scale</td>
</tr>
<tr>
<td>5 = Spd Lp Error</td>
<td>16 = Power Output</td>
</tr>
<tr>
<td>6 = Spd Lp Out</td>
<td>17 = OCL Ref</td>
</tr>
<tr>
<td>7 = Spd Ramp Out</td>
<td>18 = OCL Ramp Out</td>
</tr>
<tr>
<td>8 = Spd Ramp In</td>
<td>19 = OCL Feedback</td>
</tr>
<tr>
<td>9 = Spd Src Out</td>
<td>20 = OCL Output</td>
</tr>
<tr>
<td>10 = Trim Output</td>
<td>21 = Field Ref</td>
</tr>
<tr>
<td>11 = Arm Volt</td>
<td>22 = Field Fdbk</td>
</tr>
</tbody>
</table>

*See Table A below for Full Scale Values*

**Table A – Source Signal Values**

<table>
<thead>
<tr>
<th>Signal Selected</th>
<th>Full Scale Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Cur Loop Fdbk] — P.006</td>
<td>[Motor Arm Amps (P. 45)] × (Maximum Current )P. 40)</td>
</tr>
<tr>
<td>[Cur Loop Ref] — P.008</td>
<td>100</td>
</tr>
<tr>
<td>[Cur Loop Error] — P.007</td>
<td>= Full Scale Value</td>
</tr>
<tr>
<td>[Spd Loop Output] — P.024</td>
<td>Top Speed</td>
</tr>
<tr>
<td>[Spd Loop Fdbk] — P.022</td>
<td>[Motor Arm Volts]</td>
</tr>
<tr>
<td>[Spd Loop Ref] — P.025</td>
<td></td>
</tr>
<tr>
<td>[Spd Loop Error] — P.021</td>
<td></td>
</tr>
<tr>
<td>[Spd Ramp Output] — P.028</td>
<td></td>
</tr>
<tr>
<td>[Spd Ramp In TP] — P.027</td>
<td></td>
</tr>
<tr>
<td>[Spd Src Output] — P.026</td>
<td></td>
</tr>
<tr>
<td>[Trim Output] — P.030</td>
<td></td>
</tr>
<tr>
<td>[Analog Tach Fdbk] — P.194</td>
<td></td>
</tr>
<tr>
<td>[Encoder Fdbk] — P.189</td>
<td></td>
</tr>
<tr>
<td>[OCL Output] — P.018</td>
<td></td>
</tr>
<tr>
<td>[Armature Voltage] — P.005</td>
<td></td>
</tr>
<tr>
<td>Power Output</td>
<td>[Motor Arm Volts] × [Motor Arm Amps] × Maximum Current</td>
</tr>
<tr>
<td></td>
<td>100</td>
</tr>
<tr>
<td>[Fld Reference] — P.280</td>
<td>[Motor Field Amps]</td>
</tr>
<tr>
<td>[Field Feedback] — P.010</td>
<td></td>
</tr>
<tr>
<td>[OCL Reference TP] — P.020</td>
<td></td>
</tr>
<tr>
<td>[OCL Ramp Output] — P.019</td>
<td></td>
</tr>
<tr>
<td>[OCL Feedback] — P.017</td>
<td>4095</td>
</tr>
</tbody>
</table>

Publication 1397-5.0 — June, 2001
OUTPUT CONFIG

[Dig Out 1 Src] — P.155

Only available if the I/O Expansion Kit is installed.

Selects the signal that drives digital output 1 (terminals 66 and 67 on the I/O Expansion board).

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Monitor 1 Out</td>
</tr>
<tr>
<td></td>
<td>1 = Monitor 2 Out</td>
</tr>
<tr>
<td></td>
<td>2 = In Current Limit</td>
</tr>
<tr>
<td></td>
<td>3 = Drive Ready</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Output Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0 [Monitor 1 Out]</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0 [Monitor 1 Out]</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>3 [Drive Ready]</td>
</tr>
</tbody>
</table>

ATTENTION: This output is intended for use as an indication: DO NOT use this as a control source. If it is used as a control source, a dangerous condition can result. Failure to observe this precaution can result in severe bodily injury or loss of life.

[Dig Out 1 Type] — P.156

Only used if the I/O Expansion Kit is installed.

Selects whether digital output 1 (terminals 66 and 67 on I/O Expansion board) is normally open or normally closed.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Normal Open</td>
</tr>
<tr>
<td></td>
<td>1 = Normal Closed</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Output Configuration</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0 [Normal Open]</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0 [Normal Open]</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1 [Normal Closed]</td>
</tr>
</tbody>
</table>

ATTENTION: On a power cycle or reset, the contact is held at normally open until the drive software is initialized. Make sure that this condition does not result in a dangerous situation for your application. Failure to observe this precaution can result in severe bodily injury or loss of life.

If [Normal Open] is selected, digital output 1 is open when the signal is off and closed when it is on.

If [Normal Closed] is selected, digital output 1 is closed when the signal is off and open when it is on.
**OUTPUT CONFIG**

**[Dig Out 2 Src] — P.157**

Only used if the I/O Expansion Kit is installed.
Selects the signal used to drive digital output 2 (terminals 68 and 69 on the I/O Expansion board).

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Monitor1 Out</td>
</tr>
<tr>
<td></td>
<td>1 = Monitor2 Out</td>
</tr>
<tr>
<td></td>
<td>2 = In Cur Limit</td>
</tr>
<tr>
<td></td>
<td>3 = Drive Ready</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Output Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>3</td>
</tr>
</tbody>
</table>

**ATTENTION:** This output is intended for use as an indication. DO NOT use this as a control source. If it is used as a control source, a dangerous condition can result. Failure to observe this precaution can result in severe bodily injury or loss of life.

**[Dig Out 2 Type] — P.158**

Only used if the I/O Expansion Kit is installed.
Selects whether digital output 2 (terminals 68 and 69 on I/O Expansion board) is normally open or normally closed.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Normal Open</td>
</tr>
<tr>
<td></td>
<td>1 = Normal Closed</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Output Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1</td>
</tr>
</tbody>
</table>

**ATTENTION:** On a power cycle or reset, the contact is held at normally open until the drive software is initialized. Make sure that this condition does not result in a dangerous situation for your application. Failure to observe this precaution can result in severe bodily injury or loss of life.

If **[Normal Open]** is selected, digital output 2 is open when the signal is off and closed when it is on.
If **[Normal Closed]** is selected, digital output 2 is closed when the signal is off and open when it is on.

**[Freq Out Scale] — P.159**

Only used if the I/O Expansion kit is installed.
The frequency generated when the signal driving the frequency output is at full scale.
For example, if **[Freq Out Source]** is set to **[Cur Lp Fdbk]**, the frequency specified by this parameter is output when the armature current is at **[Maximum Current]** — **[Maximum Current]** is used as the basis for current minor loop scaling.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Output Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>250.0 kHz</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>2.0 kHz</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>250.0 kHz</td>
</tr>
</tbody>
</table>

**Reference Parameters:** **[Freq Out Source]** — P.160
**[Maximum Current]** — P.040
### Output Config

**[Freq Out Source] — P.160**

Only used if the I/O Expansion kit is installed. Selects the signal that drives the frequency output (terminals 42, 43, and 44 on the I/O Expansion board). When the frequency output is at its maximum value, the selected signal is at its full scale value.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td></td>
</tr>
<tr>
<td>0 = Cur Lp Fdbk</td>
<td>11 = Arm Volt</td>
</tr>
<tr>
<td>1 = Cur Loop Ref</td>
<td>12 = ATach Fdbk</td>
</tr>
<tr>
<td>2 = Cur Loop Err</td>
<td>13 = Encoder Fdbk</td>
</tr>
<tr>
<td>3 = Spd Loop Fdbk</td>
<td>14 = Zero</td>
</tr>
<tr>
<td>4 = Spd Lp Ref</td>
<td>15 = Full Scale</td>
</tr>
<tr>
<td>5 = Spd Lp Error</td>
<td>16 = Power Output</td>
</tr>
<tr>
<td>6 = Spd Lp Out</td>
<td>17 = OCL Ref</td>
</tr>
<tr>
<td>7 = Spd Ramp Out</td>
<td>18 = OCL Ramp Out</td>
</tr>
<tr>
<td>8 = Spd Ramp In</td>
<td>19 = OCL Feedback</td>
</tr>
<tr>
<td>9 = Spd Src Out</td>
<td>20 = OCL Output</td>
</tr>
<tr>
<td>10 = Trim Output</td>
<td>21 = Field Ref</td>
</tr>
<tr>
<td>11 = Arm Volt</td>
<td>22 = Field Fdbk</td>
</tr>
</tbody>
</table>

**Parameter Type:** Configurable

**Group:** Output Config

**Factory Default:** 14 (Zero)

**Minimum Value:** 0

**Maximum Value:** 22

### Signal Selected

<table>
<thead>
<tr>
<th>Signal Selected</th>
<th>Full Scale Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Cur Loop Fdbk] — P.006</td>
<td></td>
</tr>
<tr>
<td>[Cur Loop Ref] — P.008</td>
<td></td>
</tr>
<tr>
<td>[Cur Loop Error] — P.007</td>
<td></td>
</tr>
<tr>
<td>[Spd Loop Output] — P.024</td>
<td></td>
</tr>
</tbody>
</table>

### Power Output

Top Speed

<table>
<thead>
<tr>
<th>Power Output</th>
<th>[Motor Arm Volts] × [Motor Arm Amps] × Maximum Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Armature Voltage] — P.005</td>
<td>100</td>
</tr>
<tr>
<td>[Motor Arm Volts]</td>
<td></td>
</tr>
</tbody>
</table>

### Field Output

Top Speed

<table>
<thead>
<tr>
<th>Field Output</th>
<th>[Motor Field Amps]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Field Reference] — P.280</td>
<td></td>
</tr>
<tr>
<td>[Field Feedback] — P.010</td>
<td></td>
</tr>
</tbody>
</table>

### OCL Output

<table>
<thead>
<tr>
<th>OCL Output</th>
<th>Full Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>[OCL Reference TP] — P.020</td>
<td>4095</td>
</tr>
<tr>
<td>[OCL Ramp Output] — P.019</td>
<td></td>
</tr>
<tr>
<td>[OCL Feedback] — P.017</td>
<td></td>
</tr>
</tbody>
</table>

**Zero**

0
OUTPUT CONFIG

[Freq Out Zero] — P.161

Only used if the I/O Expansion kit is installed.
The frequency generated when the signal driving the frequency output is zero. If the signal goes negative, the frequency output maintains the frequency set by this parameter.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>2.0 to 250.0 kHz</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Output Config</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>2.0 kHz</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>2.0 kHz</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>250.0 kHz</td>
</tr>
</tbody>
</table>

DIAGNOSTICS

[Last Stop Cause] — P.166

Identifies the source of the signal which caused the most recent drive “stop”.
This parameter is Read Only

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric / Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Bit # Enum Text</td>
</tr>
<tr>
<td>0</td>
<td>External</td>
</tr>
<tr>
<td>1</td>
<td>Jog</td>
</tr>
<tr>
<td>2</td>
<td>Internal</td>
</tr>
<tr>
<td>3</td>
<td>Current Limit</td>
</tr>
<tr>
<td>4</td>
<td>Ramp</td>
</tr>
<tr>
<td>5</td>
<td>Coast</td>
</tr>
<tr>
<td>6,7</td>
<td>Not Used</td>
</tr>
<tr>
<td>8</td>
<td>Fault</td>
</tr>
<tr>
<td>9</td>
<td>TB Interlock</td>
</tr>
<tr>
<td>10</td>
<td>TB Coast / OB</td>
</tr>
<tr>
<td>11</td>
<td>M-Contactor</td>
</tr>
<tr>
<td>12–15</td>
<td>Not Used</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>N/A</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>N/A</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>N/A</td>
</tr>
</tbody>
</table>

[Open SCR Sens] — P.167

Open SCR diagnostic sensitivity adjustment. Unbalanced AC lines can cause load sharing differences between SCRs. This parameter should be increased to increase the tolerance of SCR load sharing differences due to unbalanced lines.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0%</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0%</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>100%</td>
</tr>
</tbody>
</table>
[Open SCR Trip Pt] — P.168

Open SCR trip threshold. Extremely unusual load conditions or severe current loop instability can cause nuisance open SCR faults. Increasing this input will increase the tolerance of such disturbances.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>800</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>800</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>4000</td>
</tr>
</tbody>
</table>

[Phase Tst Delta] — P.169  FACTORY TEST PARAMETER, NOT FOR CUSTOMER USE

The test firing conduction angle of the SCRs. If equal to 0, the armature power bridge is off. If it is set to 180, the armature power bridge is fully on.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>180</td>
</tr>
</tbody>
</table>

**ATTENTION:** The armature phase fire test is unregulated. To prevent excess motor speed, either disconnect the armature leads from the drive and replace with a similar load or disconnect the field leads from the drive. Lock the motor armature shaft securely to prevent rotation in either direction prior to selecting this test.

[Phase Tst Bridge] — P.170  FACTORY TEST PARAMETER, NOT FOR CUSTOMER USE

Selects which armature bridge (forward or reverse) is used during the phase fire test. This input can only be changed while the drive is stopped. OFF selects the forward bridge (A1 positive with respect to A2). ON selects the reverse bridge (A1 negative with respect to A2).

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>Forward</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>Forward (Off)</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>Reverse (On)</td>
</tr>
</tbody>
</table>

[Armature Bridge] — P.171

Shows which armature bridge in the drive is currently active.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Forward</td>
</tr>
<tr>
<td></td>
<td>1 = Reverse</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Output</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0 (Forward)</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0 (Forward)</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1 (Reverse)</td>
</tr>
</tbody>
</table>
### DIAGNOSTICS

#### [Armature Delta] — P.172

Shows the actual firing angle (in µs).

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>uSEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Output</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>–6480</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>6480</td>
</tr>
</tbody>
</table>

#### [Cur Compound TP] — P.173

An output testpoint that represents the current compounding value being used by the drive.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>N/A</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>–4095</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>4095</td>
</tr>
</tbody>
</table>

#### [Field Delta] — P.174

The firing angle of the output of the field current regulator to the regulated field supply gate firing circuit. Output of the field current PI block.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>DEG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>–5400</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>5400</td>
</tr>
</tbody>
</table>

#### [Fld Econ Active] — P.175

Indicates the present state of field economy mode.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Not Active 1 = Active</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1</td>
</tr>
</tbody>
</table>
**DIAGNOSTICS**

**[Field Ref TP] — P.176**

Field current reference testpoint. It is the limited value of [Field Reference] or the field economy reference — when [Field Econ Active] is On. Refer to the Field Control Loop (Dia A.10) block diagram for additional information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>AMPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>N/A</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>-0.1</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>15</td>
</tr>
</tbody>
</table>

Based on field regulator installed

**[Field Regulator] — P.177**

Indicates whether or not the Field Current Regulator kit is installed. If it is installed, lists the rating of the kit that is installed.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>ENUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Parameter Range:</td>
<td>Not Installed</td>
</tr>
<tr>
<td></td>
<td>4 Amp</td>
</tr>
<tr>
<td></td>
<td>10 Amp</td>
</tr>
<tr>
<td></td>
<td>20 Amp</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>n/a</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>Not Installed</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>20 Amp</td>
</tr>
</tbody>
</table>

**[Expansion I/O] — P.178**

Indicates whether or not the I/O Expansion kit is installed in the drive and if it has passed diagnostics. If the I/O Expansion Kit has failed diagnostics, the drive is not operable (the armature cannot become active).

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Not Installed</td>
</tr>
<tr>
<td></td>
<td>1 = Installed</td>
</tr>
<tr>
<td></td>
<td>2 = Failed Diags</td>
</tr>
<tr>
<td></td>
<td>3 = Failed Diags</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0 [Not Installed]</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0 [Not Installed]</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>3 [Failed Diagnostics]</td>
</tr>
</tbody>
</table>

**[IR Comp TP] — P.179**

An output testpoint that represents the level of [IR Comp] being used by the drive. This parameter only has meaning if the selected drive feedback is set to armature voltage.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>VOLT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Type:</td>
<td>Output</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>338.0</td>
</tr>
</tbody>
</table>
[J11 Tach V Scale] — P.180
Position in which to set J11 hardware jumper based on the values of [Max Motor Speed] and [Anlg Tach V/1000]. This is a READ ONLY parameter. Set Jumper J11 to the drive determined value that is displayed.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Low, High</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>−1920</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1920</td>
</tr>
</tbody>
</table>

[ATTENTION: The drive will not operate at the correct speed if this jumper is not set to the correct position. Failure to observe this precaution could result in damage to, or destruction of the equipment.]

[J14 Tach V Range] — P.181
Position in which to set J14 hardware jumper based on the values of [Top Speed] and [Analog Tach V/1000]. This is a READ ONLY parameter. Set Jumper J14 to the drive determined value that is displayed.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Low, 1 = High</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1</td>
</tr>
</tbody>
</table>

[J15 Reg Type] — P.182
Indicates the position of hardware jumper J15 Regulator Type, which selects the type of regulator: Speed/Voltage or Current/Torque. This jumper is only read at power-up.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Spd/Voltage, 1 = Curr/Torque</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1</td>
</tr>
</tbody>
</table>

[J18 Arm Fdbk Res] — P.183
Indicates the required burden resistor position to scale armature current feedback based on the values of [CT Turns Ratio], [Maximum Current] and [Motor Arm Amps].

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = J18 Error, 1 = Position 1, 2 = Position 2, 3 = Position 3, 4 = Position 4</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>4</td>
</tr>
</tbody>
</table>
**[J20 Fld Loss Det] — P.184**

Indicates the position of hardware jumper Field Loss Detect, which enables or disables field current loss detection. This jumper is only read on powerup. This jumper is not used if a field current regulator is installed.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Enabled</td>
</tr>
<tr>
<td></td>
<td>1 = Disabled</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1</td>
</tr>
</tbody>
</table>

**ATTENTION:** Disabling field loss detection can allow the motor to run with no or low field voltage which can result in high motor speed. Failure to observe this precaution could result in severe bodily injury or loss of life.

---

**[J21 Field Supply] — P.185**

Indicates the position of hardware jumper Field Supply Jumper, which must be set according to the jumper of the Enhanced Field Supply — positions A-C or B-C.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = B-C</td>
</tr>
<tr>
<td></td>
<td>1 = A-C</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1</td>
</tr>
</tbody>
</table>

This jumper only applies to the Enhanced Field Supply and does not effect the operation of the standard or current regulator field supplies. This jumper is only read on power-up. This parameter is not available if a Field Regulator Supply Kit is installed.

---

**[Power Unit Type] — P.186**

Indicates if the drives employs an S6R (regenerative) or an S6 (non-regenerative) power unit. If the power unit type is S6 (non-regenerative), [Neg Current Lim] will be automatically fixed to 0, and [Reverse Disable] fixed to On (preventing reverse direction).

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = S6R (Regen)</td>
</tr>
<tr>
<td></td>
<td>1 = S6 (Non-Rgn)</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td></td>
<td>Read Only</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1</td>
</tr>
</tbody>
</table>
## DIAGNOSTICS

### [Encoder Kit] — P.187
Indicates the presence of an encoder kit.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
</table>
| Parameter Range:     | 0 = Not Installed  
                      1 = Installed  
                      2 = Failed Diags |
| Group:               | Diagnostics |
| Parameter Type:      | Read Only    |
| Factory Default:     | 0            |
| Minimum Value:       | 0            |
| Maximum Value:       | 2            |

### [Regulator SW Ver] — P.188
Shows software version # of the regulator.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1.0x</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>1.04</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1.xx</td>
</tr>
</tbody>
</table>

### [Encoder Fdbk] — P.189
The digital value from the encoder after all hardware and software scaling. For use with pulse tachometer feedback only.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>-4001</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>4001</td>
</tr>
</tbody>
</table>
DIAGNOSTICS

[Logic Status] — P.190

Displays the logic condition. A typical value at power up would be 0000000000000101 (i.e. drive is ready, not running, forward direction commanded, no accel/decel, no alarm, no fault etc.).

<table>
<thead>
<tr>
<th>Bit</th>
<th>Definition</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Enabled</td>
<td>1=Enabled</td>
</tr>
<tr>
<td>1</td>
<td>Running</td>
<td>1=Running</td>
</tr>
<tr>
<td>2</td>
<td>Command Dir</td>
<td>1=Forward</td>
</tr>
<tr>
<td>3</td>
<td>Actual Direction</td>
<td>1=Forward</td>
</tr>
<tr>
<td>4</td>
<td>Acceleration</td>
<td>1=Accelerating</td>
</tr>
<tr>
<td>5</td>
<td>Deceleration</td>
<td>1=Decelerating</td>
</tr>
<tr>
<td>6</td>
<td>Warning</td>
<td>1=Warning</td>
</tr>
<tr>
<td>7</td>
<td>Fault</td>
<td>1=Faulted</td>
</tr>
<tr>
<td>8</td>
<td>At Ref (speed)</td>
<td>1=At Ref.</td>
</tr>
<tr>
<td>9-11</td>
<td>Local #</td>
<td>1=Local #</td>
</tr>
<tr>
<td>12-15</td>
<td>Reference *</td>
<td>1=Reference</td>
</tr>
</tbody>
</table>

Display/Drive Units: Numeric/Text
Parameter Range: Bit # Enum Text

<table>
<thead>
<tr>
<th>Bit</th>
<th>Enum Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Enabled</td>
</tr>
<tr>
<td>1</td>
<td>Running</td>
</tr>
<tr>
<td>2</td>
<td>Command Dir</td>
</tr>
<tr>
<td>3</td>
<td>Actual Dir</td>
</tr>
<tr>
<td>4</td>
<td>Acceleration</td>
</tr>
<tr>
<td>5</td>
<td>Deceleration</td>
</tr>
<tr>
<td>6</td>
<td>Alarm</td>
</tr>
<tr>
<td>7</td>
<td>Faulted</td>
</tr>
<tr>
<td>8</td>
<td>At Speed</td>
</tr>
<tr>
<td>9</td>
<td>Local ID</td>
</tr>
<tr>
<td>10</td>
<td>Local ID</td>
</tr>
<tr>
<td>11</td>
<td>Local ID</td>
</tr>
<tr>
<td>12-15</td>
<td>Reference ID</td>
</tr>
</tbody>
</table>

Group: Diagnostics
Factory Default: 0
Minimum Value: 0
Maximum Value: 15

[Drive Status] — P.191

This parameter displays the actual operating condition in text format.

Display/Drive Units: Numeric/Text
Parameter Range: 0 = Not Ready 4 = Tuning 1 = Ready 5 = Stopping 2 = Running 6 = Faulted 3 = Jogging

Group: Diagnostics
Factory Default: 0
Minimum Value: 0
Maximum Value: 6

[AC Line Period] — P.192

Shows AC line as measured by the drive.

Display/Drive Units: uSEC
Parameter Type: Read Only
Group: Diagnostics
Factory Default: None
Minimum Value: 16,124
Maximum Value: 20833
### DIAGNOSTICS

#### [AC Line Voltage] — P.193

Shows AC line voltage as measured by the drive.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>None</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>200</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>575</td>
</tr>
</tbody>
</table>

#### [Analog Tach Fdbk] — P.194

The digital value of the analog tachometer feedback input after all hardware and software scaling. For use with analog tachometer feedback (AC or DC) only.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>N/A</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Output</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>–4095</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>4095</td>
</tr>
</tbody>
</table>

#### [Exp I/O Dig In] — P.195

Only used if the I/O Expansion kit is installed. Shows the state of all I/O expansion digital inputs (terminals 59–64 on the I/O Expansion board). The input is On when +24 VDC is applied for more than 20 mS. It is Off when 0 VDC is applied. Information is displayed in binary format.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Bit # Enum Text</td>
</tr>
<tr>
<td></td>
<td>0 = Preset A</td>
</tr>
<tr>
<td></td>
<td>1 = Preset B</td>
</tr>
<tr>
<td></td>
<td>2 = Decrement</td>
</tr>
<tr>
<td></td>
<td>3 = Increment</td>
</tr>
<tr>
<td></td>
<td>4 = OCL Enable</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>4</td>
</tr>
</tbody>
</table>

#### [Fault Reset] — P.196

Allows resetting of the fault or alarm through the HIM.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Bit # Enum Text</td>
</tr>
<tr>
<td></td>
<td>0 = Ready</td>
</tr>
<tr>
<td></td>
<td>1 = Reset</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1</td>
</tr>
</tbody>
</table>
### DIAGNOSTICS

#### [Alarm Reset] — P.197

Allows resetting of the fault or alarm through the HIM.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Ready, 1 = Reset</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: Analog input 2 (terminals 52 and 53 on the I/O Expansion board) only accepts a ±10 V DC input signal and cannot be changed.

#### [CPU Loading] — P.198

Shows the amount in % that the CPU is busy. Should always display 100%.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>100</td>
</tr>
</tbody>
</table>

#### [Not Ready Cause] — P.199

Shows those inputs or conditions that cause the Drive to remain "Not Ready".

<table>
<thead>
<tr>
<th>Bit#</th>
<th>Enum</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Stop Asserted</td>
</tr>
<tr>
<td>1</td>
<td>TB Coast/DB</td>
</tr>
<tr>
<td>2</td>
<td>TB Interlock</td>
</tr>
<tr>
<td>3</td>
<td>Fault Active</td>
</tr>
<tr>
<td>4</td>
<td>Config Active</td>
</tr>
<tr>
<td>5</td>
<td>Field Perm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>5</td>
</tr>
</tbody>
</table>

#### [ScanPort Errors] — P.200

The value of this parameter is incremented everytime a SCANport message is not received when expected from a peripheral device. This value incrementing occasionally does not indicate a problem. The value will change, if SCANport devices are removed or reconnected to the drive. A value that is consistently incrementing, over a period of time, indicates a possible electrical noise problem or malfunctioning peripheral SCANport device.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Group:</td>
<td>Diagnostics</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>6500</td>
</tr>
</tbody>
</table>
[Start Mask] — P.201

This parameter controls which adapters can issue Run commands.

**Display/Drive Units:** Numeric/Text

**Parameter Range:**
- Bit # Enum Text
  - 0 = Terminal Block
  - 1 = Adapter 1
  - 2 = Adapter 2
  - 3 = Adapter 3
  - 4 = Adapter 4
  - 5 = Adapter 5
  - 6 = Adapter 6

**Parameter Type:** Read & Write

**Group:** Masks

**Minimum Value:** 0000000000000000

**Factory Default:** 0000000001111111

**Maximum Value:** 0000000001111111

[Direction Mask] — P.202

This parameter controls which adapters can issue forward/reverse commands. This mask contains a bit for each adapter. If a bit is set to 0 control is locked out, if it is set to 1, the adapter is permitted to have control.

**Display/Drive Units:** Numeric/Text

**Parameter Range:**
- Bit # Enum Text
  - 0 = Terminal Block
  - 1 = Adapter 1
  - 2 = Adapter 2
  - 3 = Adapter 3
  - 4 = Adapter 4
  - 5 = Adapter 5
  - 6 = Adapter 6

**Group:** Masks

**Minimum Value:** 0000000000000000

**Factory Default:** 0000000001111111

**Maximum Value:** 0000000001111111

[Jog Mask] — P.203

This parameter controls which adapters can issue jog commands.

**Display/Drive Units:** Numeric/Text

**Parameter Range:**
- Bit # Enum Text
  - 0 = Terminal Block
  - 1 = Adapter 1
  - 2 = Adapter 2
  - 3 = Adapter 3
  - 4 = Adapter 4
  - 5 = Adapter 5
  - 6 = Adapter 6

**Parameter Type:** Read & Write

**Group:** Masks

**Minimum Value:** 0000000000000000

**Factory Default:** 0000000001111111

**Maximum Value:** 0000000001111111
### [Reference Mask] — P.204

This parameter controls which adapters can select an alternate reference.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Bit # Enum Text</td>
</tr>
<tr>
<td></td>
<td>0 = Terminal Block</td>
</tr>
<tr>
<td></td>
<td>1 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>2 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>3 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>4 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>5 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 6</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Masks</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0000000000000000</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0000000001111111</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>0000000001111111</td>
</tr>
</tbody>
</table>

### [Fault Reset Mask] — P.205

This parameter controls which adapters can reset a fault condition.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Masks</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0000000000000000</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0000000001111111</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>0000000001111111</td>
</tr>
</tbody>
</table>

### [MOP Mask] — P.206

This parameter controls which adapters can issue MOP commands to the drive.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Bit # Enum Text</td>
</tr>
<tr>
<td></td>
<td>0 = Terminal Block</td>
</tr>
<tr>
<td></td>
<td>1 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>2 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>3 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>4 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>5 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 6</td>
</tr>
<tr>
<td>Group:</td>
<td>Masks</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0000000000000000</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0000000001111111</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>0000000001111111</td>
</tr>
</tbody>
</table>
## MASKS

### [Logic Mask] — P.207

This parameter determines which adapters can control the drive. If the bit for an adapter is set to "0", the adapter will have no control functions except for stop. In addition, the adapter can be removed from the drive while power is applied without causing a serial fault.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Bit # Enum Text</td>
</tr>
<tr>
<td></td>
<td>0 = Terminal Block</td>
</tr>
<tr>
<td></td>
<td>1 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>2 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>3 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>4 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>5 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 6</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Masks or through Control Logic</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0000000000000000</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0000000001111111</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>0000000001111111</td>
</tr>
</tbody>
</table>

### [Local Mask] — P.208

This parameter controls which adapters are allowed to take exclusive control of drive logic commands (except stop). Exclusive "Local Control" can only be taken while the drive is stopped.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Bit # Enum Text</td>
</tr>
<tr>
<td></td>
<td>0 = Terminal Block</td>
</tr>
<tr>
<td></td>
<td>1 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>2 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>3 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>4 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>5 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 6</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Masks</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0000000000000000</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0000000001111111</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>0000000001111111</td>
</tr>
</tbody>
</table>
## OWNERS

### [Stop Owner] — P.214

This parameter displays which adapters are presently issuing a valid stop command.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Bit # Enum Text</td>
</tr>
<tr>
<td></td>
<td>0 = Terminal Block</td>
</tr>
<tr>
<td></td>
<td>1 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>2 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>3 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>4 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>5 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 6</td>
</tr>
</tbody>
</table>

Parameter Type: Read Only  
Group: Owners  
Minimum Value: 00000000000000000  
Factory Default: 00000000000000000  
Maximum Value: 00000000011111111

### [Start Owner] — P.215

This parameter displays which adapters are presently issuing a valid run command.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Bit # Enum Text</td>
</tr>
<tr>
<td></td>
<td>0 = Terminal Block</td>
</tr>
<tr>
<td></td>
<td>1 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>2 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>3 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>4 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>5 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 6</td>
</tr>
</tbody>
</table>

Parameter Type: Read Only  
Group: Owners  
Minimum Value: 00000000000000000  
Factory Default: 00000000000000000  
Maximum Value: 00000000011111111

### [Direction Owner] — P.216

This parameter displays which adapter currently has exclusive control of direction changes.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Bit # Enum Text</td>
</tr>
<tr>
<td></td>
<td>0 = Terminal Block</td>
</tr>
<tr>
<td></td>
<td>1 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>2 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>3 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>4 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>5 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 6</td>
</tr>
</tbody>
</table>

Parameter Type: Read Only  
Group: Owners  
Minimum Value: 00000000000000000  
Factory Default: 00000000000000000  
Maximum Value: 00000000011111111
### OWNERS

#### [Jog Owner] — P.217

This parameter displays which adapters are presently issuing a valid jog command.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Bit # Enum Text</td>
</tr>
<tr>
<td></td>
<td>0 = Terminal Block</td>
</tr>
<tr>
<td></td>
<td>1 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>2 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>3 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>4 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>5 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter Type:</th>
<th>Read Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Owners</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0000000000000000</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0000000000000000</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>0000000001111111</td>
</tr>
</tbody>
</table>

#### [Reference Owner] — P.218

Shows current reference owner.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Bit # Enum Text</td>
</tr>
<tr>
<td></td>
<td>0 = Terminal Block</td>
</tr>
<tr>
<td></td>
<td>1 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>2 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>3 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>4 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>5 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter Type:</th>
<th>Read Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Owners</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0000000000000000</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0000000000000000</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>0000000001111111</td>
</tr>
</tbody>
</table>
OWNERS

[Flt Reset Owner] — P.219
This parameter displays which parameter is currently resetting a fault.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Bit # Enum Text</td>
</tr>
<tr>
<td></td>
<td>0 = Terminal Block</td>
</tr>
<tr>
<td></td>
<td>1 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>2 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>3 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>4 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>5 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 6</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Group:</td>
<td>Owners</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0000000000000000</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0000000000000000</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>0000000001111111</td>
</tr>
</tbody>
</table>

[MOP Owner] — P.220
This parameter displays which adapters are currently issuing increases or decreases in MOP Command Frequency.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Bit # Enum Text</td>
</tr>
<tr>
<td></td>
<td>0 = Terminal Block</td>
</tr>
<tr>
<td></td>
<td>1 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>2 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>3 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>4 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>5 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 6</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Group:</td>
<td>Owners</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0000000000000000</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0000000000000000</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>0000000001111111</td>
</tr>
</tbody>
</table>

[Local Owner] — P.221
This parameter displays which adapter has requested exclusive control of all drive logic functions. If an adapter is in local lockout, all other functions (except stop) on all other adapters are locked out and non–functional. Local control can only be obtained when the drive is not running.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Bit # Enum Text</td>
</tr>
<tr>
<td></td>
<td>0 = Terminal Block</td>
</tr>
<tr>
<td></td>
<td>1 = Adapter 1</td>
</tr>
<tr>
<td></td>
<td>2 = Adapter 2</td>
</tr>
<tr>
<td></td>
<td>3 = Adapter 3</td>
</tr>
<tr>
<td></td>
<td>4 = Adapter 4</td>
</tr>
<tr>
<td></td>
<td>5 = Adapter 5</td>
</tr>
<tr>
<td></td>
<td>6 = Adapter 6</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read Only</td>
</tr>
<tr>
<td>Group:</td>
<td>Owners</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0000000000000000</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0000000000000000</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>0000000001111111</td>
</tr>
</tbody>
</table>
### Adapter I/O

#### [Data In A1] — P.226

This parameter displays the parameter number to which PLC output data table information will be directly written during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>

#### [Data In A2] — P.227

This parameter displays the parameter number to which PLC output data table information will be directly written during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>

#### [Data In B1] — P.228

This parameter displays the parameter number to which PLC output data table information will be directly written during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>

#### [Data In B2] — P.229

This parameter displays the parameter number to which PLC output data table information will be directly written during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>
### Adapter I/O

#### [Data In C1] — P.230
This parameter displays the parameter number to which PLC output data table information will be directly written during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>

#### [Data In C2] — P.231
This parameter displays the parameter number to which PLC output data table information will be directly written during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>

#### [Data In D1] — P.232
This parameter displays the parameter number to which PLC output data table information will be directly written during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>

#### [Data In D2] — P.233
This parameter displays the parameter number to which PLC output data table information will be directly written during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>
### Adapter I/O

#### [Data Out A1] — P.234

This parameter displays the parameter number whose value will be written into the PLC input data table during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>

#### [Data Out A2] — P.235

This parameter displays the parameter number whose value will be written into the PLC input data table during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>

#### [Data Out B1] — P.236

This parameter displays the parameter number whose value will be written into the PLC input data table during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>

#### [Data Out B2] — P.237

This parameter displays the parameter number whose value will be written into the PLC input data table during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>
### Adapter I/O

#### [Data Out C1] — P.238

This parameter displays the parameter number whose value will be written into the PLC input data table during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>

#### [Data Out C2] — P.239

This parameter displays the parameter number whose value will be written into the PLC input data table during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>

#### [Data Out D1] — P.240

This parameter displays the parameter number whose value will be written into the PLC input data table during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>

#### [Data Out D2] — P.241

This parameter displays the parameter number whose value will be written into the PLC input data table during PLC operation.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Adapter I/O</td>
</tr>
<tr>
<td>Type:</td>
<td>Configurable</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>
### Process Display

#### [Process 1 Par] — P.247

This parameter should be set to the number of the parameter whose scaled value will be displayed on Line 1 of the HIM Display Panel.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>5</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>

#### [Process 1 Scale] — P.248

This value sets the scaling multiplier for [Process 1 Par].

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>$-32768$</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1.00</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>32767</td>
</tr>
</tbody>
</table>

#### [Process 1 Text 1] — P.249

Sets the "User Units" description for the value determined by [Process 1 Par] and [Process 1 Scale]. The 8 character description will be shown on line 1 of the display.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Alphanumeric</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>32</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>86</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>127</td>
</tr>
</tbody>
</table>

#### [Process 1 Text 2] — P.250

Sets the "User Units" description for the value determined by [Process 1 Par] and [Process 1 Scale]. The 8 character description will be shown on line 1 of the display.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Alphanumeric</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>32</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>111</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>127</td>
</tr>
</tbody>
</table>
### Process Display

#### [Process 1 Text 3]  —  P.251

Sets the "User Units" description for the value determined by [Process 1 Par] and [Process 1 Scale]. The 8 character description will be shown on line 1 of the display.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Alphanumeric</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>32</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>108</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>127</td>
</tr>
</tbody>
</table>

#### [Process 1 Text 4]  —  P.252

Sets the "User Units" description for the value determined by [Process 1 Par] and [Process 1 Scale]. The 8 character description will be shown on line 1 of the display.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Alphanumeric</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>32</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>116</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>127</td>
</tr>
</tbody>
</table>

#### [Process 1 Text 5]  —  P.253

Sets the "User Units" description for the value determined by [Process 1 Par] and [Process 1 Scale]. The 8 character description will be shown on line 1 of the display.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Alphanumeric</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>32</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>115</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>127</td>
</tr>
</tbody>
</table>

#### [Process 1 Text 6]  —  P.254

Sets the "User Units" description for the value determined by [Process 1 Par] and [Process 1 Scale]. The 8 character description will be shown on line 1 of the display.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>Alphanumeric</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>32</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>32</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>127</td>
</tr>
</tbody>
</table>
### Process Display

#### [Process 1 Text 7] — P.255

Sets the “User Units” description for the value determined by [Process 1 Par] and [Process 1 Scale]. The 8 character description will be shown on line 1 of the display.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display/Drive Units:</td>
<td>Numeric/Text</td>
</tr>
<tr>
<td>Parameter Range:</td>
<td>Alphanumeric</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>32</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>32</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>127</td>
</tr>
</tbody>
</table>

#### [Process 1 Text 8] — P.256

Sets the “User Units” description for the value determined by [Process 1 Par] and [Process 1 Scale]. The 8 character description will be shown on line 1 of the display.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display/Drive Units:</td>
<td>Numeric/Text</td>
</tr>
<tr>
<td>Parameter Range:</td>
<td>Alphanumeric</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>32</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>32</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>127</td>
</tr>
</tbody>
</table>

#### [Process 2 Par] — P.257

This parameter should be set to the number of the parameter whose scaled value will be displayed on Line 2 of the HIM Display Panel.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display/Drive Units:</td>
<td>Numeric/Text</td>
</tr>
<tr>
<td>Parameter Range:</td>
<td>Alphanumeric</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>6</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>308</td>
</tr>
</tbody>
</table>

#### [Process 2 Scale] — P.258

This value sets the scaling multiplier for [Process 2 Par].

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display/Drive Units:</td>
<td>Numeric/Text</td>
</tr>
<tr>
<td>Parameter Range:</td>
<td>$-3127.69$ − $327.68$</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>$-32768$</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>100</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>32767</td>
</tr>
</tbody>
</table>
**Process Display**

<table>
<thead>
<tr>
<th>[Process 2 Text 1] — P.259</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sets the &quot;User Units&quot; description for the value determined by [Process 2 Par] and [Process 2 Scale]. The 8 character description will be shown on line 2 of the display.</td>
</tr>
<tr>
<td><strong>Display/Drive Units:</strong></td>
</tr>
<tr>
<td><strong>Parameter Range:</strong></td>
</tr>
<tr>
<td><strong>Parameter Type:</strong></td>
</tr>
<tr>
<td><strong>Group:</strong></td>
</tr>
<tr>
<td><strong>Minimum Value:</strong></td>
</tr>
<tr>
<td><strong>Factory Default:</strong></td>
</tr>
<tr>
<td><strong>Maximum Value:</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>[Process 2 Text 2] — P.260</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sets the &quot;User Units&quot; description for the value determined by [Process 2 Par] and [Process 2 Scale]. The 8 character description will be shown on line 2 of the display.</td>
</tr>
<tr>
<td><strong>Display/Drive Units:</strong></td>
</tr>
<tr>
<td><strong>Parameter Range:</strong></td>
</tr>
<tr>
<td><strong>Parameter Type:</strong></td>
</tr>
<tr>
<td><strong>Group:</strong></td>
</tr>
<tr>
<td><strong>Minimum Value:</strong></td>
</tr>
<tr>
<td><strong>Factory Default:</strong></td>
</tr>
<tr>
<td><strong>Maximum Value:</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>[Process 2 Text 3] — P.261</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sets the &quot;User Units&quot; description for the value determined by [Process 2 Par] and [Process 2 Scale]. The 8 character description will be shown on line 2 of the display.</td>
</tr>
<tr>
<td><strong>Display/Drive Units:</strong></td>
</tr>
<tr>
<td><strong>Parameter Range:</strong></td>
</tr>
<tr>
<td><strong>Parameter Type:</strong></td>
</tr>
<tr>
<td><strong>Group:</strong></td>
</tr>
<tr>
<td><strong>Minimum Value:</strong></td>
</tr>
<tr>
<td><strong>Factory Default:</strong></td>
</tr>
<tr>
<td><strong>Maximum Value:</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>[Process 2 Text 4] — P.262</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sets the &quot;User Units&quot; description for the value determined by [Process 2 Par] and [Process 2 Scale]. The 8 character description will be shown on line 2 of the display.</td>
</tr>
<tr>
<td><strong>Display/Drive Units:</strong></td>
</tr>
<tr>
<td><strong>Parameter Range:</strong></td>
</tr>
<tr>
<td><strong>Parameter Type:</strong></td>
</tr>
<tr>
<td><strong>Group:</strong></td>
</tr>
<tr>
<td><strong>Minimum Value:</strong></td>
</tr>
<tr>
<td><strong>Factory Default:</strong></td>
</tr>
<tr>
<td><strong>Maximum Value:</strong></td>
</tr>
</tbody>
</table>
### Process Display

<table>
<thead>
<tr>
<th>Parameter Range:</th>
<th>Alphanumeric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>32</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>32</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>127</td>
</tr>
</tbody>
</table>

Sets the “User Units” description for the value determined by Process 2 Par and Process 2 Scale. The 8 character description will be shown on line 2 of the display.

---

### [Process 2 Text 6] — P.264

<table>
<thead>
<tr>
<th>Parameter Range:</th>
<th>Alphanumeric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>32</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>32</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>127</td>
</tr>
</tbody>
</table>

Sets the “User Units” description for the value determined by Process 2 Par and Process 2 Scale. The 8 character description will be shown on line 2 of the display.

---

### [Process 2 Text 7] — P.265

<table>
<thead>
<tr>
<th>Parameter Range:</th>
<th>Alphanumeric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>32</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>32</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>127</td>
</tr>
</tbody>
</table>

Sets the “User Units” description for the value determined by Process 2 Par and Process 2 Scale. The 8 character description will be shown on line 2 of the display.

---

### [Process 2 Text 8] — P.266

<table>
<thead>
<tr>
<th>Parameter Range:</th>
<th>Alphanumeric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Read &amp; Write</td>
</tr>
<tr>
<td>Group:</td>
<td>Process Display</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>32</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>32</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>127</td>
</tr>
</tbody>
</table>

Sets the “User Units” description for the value determined by Process 2 Par and Process 2 Scale. The 8 character description will be shown on line 2 of the display.
### Field Parameters

#### [E–Fld Volts Adj] — P.272

<table>
<thead>
<tr>
<th>Field Parameter</th>
<th>Display/Drive Units</th>
<th>Parameter Type</th>
<th>Group</th>
<th>Minimum Value</th>
<th>Factory Default</th>
<th>Maximum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only used if enhanced field supply option is installed. Adjusts the field output voltage.</td>
<td>Degrees</td>
<td>Tunable</td>
<td>Field</td>
<td>0</td>
<td>84</td>
<td>180</td>
</tr>
</tbody>
</table>

#### [Fld Econ Delay] — P.273

<table>
<thead>
<tr>
<th>Field Parameter</th>
<th>Display/Drive Units</th>
<th>Parameter Type</th>
<th>Group</th>
<th>Minimum Value</th>
<th>Factory Default</th>
<th>Maximum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>After the motor stops, the drive maintains full field for [Field Econ Delay] minutes before entering field economy. When the motor starts again, the drive immediately returns to full field. [Field Econ Delay] has no effect on the operation of the standard field supply. Field economy cannot be disabled.</td>
<td>Minutes</td>
<td>Tunable</td>
<td>Field</td>
<td>0</td>
<td>5</td>
<td>27</td>
</tr>
</tbody>
</table>

#### [Fld Econ Ref] — P.274

<table>
<thead>
<tr>
<th>Field Parameter</th>
<th>Display/Drive Units</th>
<th>Parameter Type</th>
<th>Group</th>
<th>Minimum Value</th>
<th>Factory Default</th>
<th>Maximum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only available if the Field Current Regulator kit is installed. The percentage of MOTOR FIELD AMPS (P.510) set as a reference for field economy mode. This parameter must be set above the FIELD LOSS THRESHOLD (P.512) value to avoid field loss faults.</td>
<td>%</td>
<td>Tunable</td>
<td>Field</td>
<td>0</td>
<td>70</td>
<td>100</td>
</tr>
</tbody>
</table>
[Fld Auto Weak] — P.275

Only used if the Field Current Regulator Kit is installed.

Enables or disables field weakening by the field control loop. When it is disabled, the field current PI block high limit is fixed at 180°. If [Feedback Select] is set to [Armature Volt], this is automatically set to [Disabled] and cannot be changed.

When [Armature Voltage] exceeds [Fld Weaken Level] and the field begins to weaken, the field control loop regulates armature voltage. [Armature Voltage] and [Fld Weaken Level] try to maintain a zero input to the first PI block. If armature voltage increases, a negative value is input to the PI block. This results in a lower current input into the next PI block. This in turn lowers the armature voltage, lowering the input to the first PI block so that it is closer to zero. The field control loop only affects armature voltage control if a tachometer is used and if [Field Auto Weak] is set to [Enabled].

[Fld Delta Hi Lim] — P.276

High limit of the field current PI block. See [Field Auto Weak] for block diagram.
**Field**

**[Fld Loss Level] — P.277**

Only used if the Field Current Regulator Kit is installed.

The value that is compared to [Field Feedback] to check for field loss. [Fld Loss Level] is set as a percentage of [Motor Field Amps]. It is usually set to 85% of the motor nameplate value of field weaken.

Refer to [Field Econ Ref] for additional information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Field</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0%</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>60%</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>100%</td>
</tr>
</tbody>
</table>

**ATTENTION:** The incorrect setting of this parameter can cause a motor overvoltage condition. Set [Motor Fld Amps] to the motor’s nameplate value. Make sure [Field Economy Ref] and/or [Field Ref] — P.280 is set greater than [Field Loss Level] — P.277 to avoid field loss faults. Failure to observe this precaution can result in bodily injury and damage to the equipment.

**[Fld Lp Lead Freq] — P.278**

Only used if the Field Current Regulator Kit is installed.

Lead frequency for the field current PI block.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>RD/S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Field</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>10.0</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>282.7</td>
</tr>
</tbody>
</table>

**[Fld Loop Kp] — P.279**

Only available if the Field Current Regulator kit is installed.

Proportional gain setting for the field current PI block.

Refer to the Field Control Loop (Fig. A.10) block diagram for additional information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Tunable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Field</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.01</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0.30</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>128.0</td>
</tr>
</tbody>
</table>
### Field

#### [Field Reference] — P.280

Only used if the Field Current Regulator kit is installed.

Current reference for the field control loop field. This is the field current reference when the drive is not in field economy. Refer to the [Motor Field Amps] block diagram for additional information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>AMPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Field</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.00</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>128.0</td>
</tr>
</tbody>
</table>

#### [Fld Loop K–Fdbk] — P.281

Only used if the Field Current Regulator kit is installed.

Gain adjustment for the field feedback. Refer to the [Motor Field Amps] block diagram for additional information.

In most cases, this will be set for unity gain, typically 1.00.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Tunable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Field</td>
</tr>
<tr>
<td>Group:</td>
<td></td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.90</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1.00</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1.100</td>
</tr>
</tbody>
</table>

#### [Fld Weak Ld Freq] — P.282

Only used if the Field Current Regulator kit is installed.

PI block lead frequency of the field control loop's armature voltage regulator. Refer to the [Field Auto Weak] block diagram for additional information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>VOLT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Field</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.00 rad/sec</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0.30 rad/sec</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>282.7 rad/sec</td>
</tr>
</tbody>
</table>

#### [Fld Weaken Kp] — P.283

Only used if the Field Current Regulator kit is installed.

The proportional gain of the field control loop's armature voltage regulator. Refer to the [Field Auto Weak] block diagram for additional information.

<table>
<thead>
<tr>
<th>Parameter Type:</th>
<th>Tunable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group:</td>
<td>Field</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.10</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0.80</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>128.00</td>
</tr>
</tbody>
</table>

#### [Fld Weaken Level] — P.284

Only available if the Field Current Regulator kit is installed.

Sets the point at which the field control loop begins regulating armature voltage and the field begins to weaken. If IR compensation is used, the threshold is less [IR Compensation] at rated armature current. Refer to the Field Auto Weak block diagram for additional information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>VOLT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Field</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>228</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>4095  (4095 corresponds to MOTOR RATED ARM VOLTS)</td>
</tr>
</tbody>
</table>
[OCL Fdbk Source] — P.290

Selects whether the outer control loop (OCL) feedback signal is obtained from an I/O Expansion kit analog input or from an eight-sample average of the current minor loop (CML) feedback signal.

Selecting [Cur Lp Fdbk] allows an outer current loop to be implemented.

Display/Drive Units: Numeric/Text
Parameter Range:
- 0 = None
- 1 = Cur Lp Fdbk
- 2 = Analog In 3
- 3 = Analog In 4
- 4 = Frequency In
- 5 = Adapter 1
- 6 = Adapter 2
- 7 = Adapter 3
- 8 = Adapter 4
- 9 = Adapter 5
- 10 = Adapter 6

Default Setting:
Parameter Type: Configurable
Group: Process PI
Minimum Value: 0
Factory Default: 1 (Cur Lp Fdbk)
Maximum Value: 10

[OCL LeadLag Freq] — P.291

Lead/lag low break frequency of the outer control loop. Sets the lead break frequency if [OCL LeadLag Type] is set to Lead/Lag. Sets the lag break frequency if [OCL LeadLag Type] is set to Lag/Lead.

Display/Drive Units: RD/S
Parameter Type: Tunable
Group: Process PI
Minimum Value: 0.01 rad/sec
Factory Default: 1.00 rad/sec
Maximum Value: 6.98 rad/sec

The OCL lead/lag high break frequency is determined by the settings of this parameter and the [OCL Leadlag Rato]. For example, if the low break frequency is 0.50 rad/sec and the ratio is 10, the high break frequency is 5.00 rad/sec.
**[OCL LeadLag Ratio] — P.292**

The ratio between the low break frequency and high break frequency of outer control loop lead/lag. The settings of this parameter and the [OCL LeadLag Freq] determine the high break frequency.

Refer to the [OCL LeadLag Freq] parameter and block diagram for additional information.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display/Drive Units</td>
<td>Numeric/Text</td>
</tr>
<tr>
<td>Parameter Range</td>
<td>2 to 20</td>
</tr>
<tr>
<td>Default Setting</td>
<td>10</td>
</tr>
<tr>
<td>Parameter Type</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group</td>
<td>Process PI</td>
</tr>
<tr>
<td>Minimum Value</td>
<td>2</td>
</tr>
<tr>
<td>Factory Default</td>
<td>10</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>20</td>
</tr>
</tbody>
</table>

**[OCL LeadLag Type] — P.293**

Selects the outer control loop as lead/lag, lag/lead, or bypassed.

If the OCL is configured as a type 1 position regulator, this should be set to Bypass. For a type 2 position regulator, the lead/lag block can be used if necessary.

Refer to the [OCL LeadLag Freq] parameter and block diagram for additional information.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display/Drive Units</td>
<td>Numeric/Text</td>
</tr>
<tr>
<td>Parameter Range</td>
<td>0 = Lead/Lag</td>
</tr>
<tr>
<td></td>
<td>1 = Bypass</td>
</tr>
<tr>
<td></td>
<td>2 = Lag/Lead</td>
</tr>
<tr>
<td>Parameter Type</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group</td>
<td>Process PI</td>
</tr>
<tr>
<td>Minimum Value</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default</td>
<td>1</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>2</td>
</tr>
</tbody>
</table>

**[OCL Kp] — P.294**

The proportional gain of the outer control loop PI block. Refer to the [OCL LeadLag Freq] block diagram for additional information.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display/Drive Units</td>
<td>Tunable</td>
</tr>
<tr>
<td>Parameter Type</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group</td>
<td>Process PI</td>
</tr>
<tr>
<td>Minimum Value</td>
<td>0.10</td>
</tr>
<tr>
<td>Factory Default</td>
<td>2.0</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>128.00</td>
</tr>
</tbody>
</table>
[OCL Lead Freq] — P.295

The lead break frequency of the proportional integral (PI) block of the outer control loop. If the OCL is configured as a type 1 position regulator, set equal to 0.00 (proportional only).

Display/Drive Units: RD/S
Parameter Range: 0.00 to 141.37 rad/sec
Parameter Type: Tunable
Group: Process PI
Minimum Value: 0.00
Factory Default: 1.00 rad/sec
Maximum Value: 141.37 rad/sec

[OCL Pos Limit] — P.296

Outer Control Loop PI block positive limit. The output of OCL PI block is never above this limit. Refer to the [Outer Control Loop] block diagram (Fig. A.5) for additional information.

Display/Drive Units: % of Max Motor Speed
Parameter Type: Tunable
Group: Process PI
Minimum Value: 0.00 %
Factory Default: 100%
Maximum Value: 100%

[OCL Neg Limit] — P.297

The negative limit of the outer control loop PI block. The output of the OCL PI block is never below this limit. Refer to the [Outer Control Loop] block diagram (Fig. A.5) for additional information.

Display/Drive Units: % of Max Motor Speed
Parameter Type: Tunable
Group: Process PI
Minimum Value: 0.00 %
Factory Default: 100%
Maximum Value: 100%
Process PI

[OCL Ramp Time] — P.298

The ramp time for the outer control loop reference. Sets the minimum amount of time for the OCL S-curve output to change from 0 to full scale and vice versa. If set to 0.0, the ramp block is bypassed.

Note: If the ramp block is bypassed, rapid speed change can result.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>SEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Process PI</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.0 sec.</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>10.0 sec.</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>300.0 sec.</td>
</tr>
</tbody>
</table>

[OCL Reference] — P.299

The reference value for the outer control loop. Displayed in OCL user units.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>CNTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Process PI</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>-4095</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>4095</td>
</tr>
</tbody>
</table>
Process PI

[OCL Ref Rounding] — P.300

Specifies the amount of reference smoothing (rounding) for the outer control loop. It is set as a percentage of the [OCL Ramp Time]. Rounding is performed at the beginning and end of an OCL reference change.

- **Display/Drive Units:** %
- **Parameter Range:** 0 to 50%
- **Default Setting:** 0%
- **Parameter Type:** Tunable
- **Group:** Process PI
- **Minimum Value:** 0%
- **Factory Default:** 0%
- **Maximum Value:** 50%

If [OCL Ref Rounding] is set to 0%, the OCL performs a linear ramp function. If set to 50%, the entire ramp time is smoothed: 50% at the beginning of the reference change and 50% at the end.

If [OCL Ref Ramp Time] is 0.0 (ramp block bypassed), this parameter has no affect on the OCL reference signal.

Refer to the [OCL Ramp Time] block diagram for additional information.

![Reference ramp diagrams](Diagram)

[OCL Ref Source] — P.301

Selects the reference for the outer control loop.

- **Display/Drive Units:** Numeric/Text
- **Parameter Range:**
  - 0 = Register
  - 1 = Anlg In 3
  - 2 = Anlg In 4
  - 3 = Frequency In
  - 4 = Adapter 1
  - 5 = Adapter 2
  - 6 = Adapter 3
  - 7 = Adapter 4
  - 8 = Adapter 5
  - 9 = Adapter 6
- **Parameter Type:** Configurable
- **Group:** Process PI
- **Minimum Value:** 0
- **Factory Default:** 0
- **Maximum Value:** 9

The I/O Expansion Kit must be installed to use Analog In 3 (terminals 50 and 51 on the I/O expansion board), Analog In 4 (terminals 52 and 53), or Frequency In (terminal 39, 40, and 41).
### [OCL Trim Range] — P.302

The trim range for the outer control loop. This specifies the amount of control the outer control loop output signal has on the speed/voltage loop reference. It is set as a percentage of [Max Process Speed]. Refer to the [OCL Lead Freq] block diagram for additional information.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Process PI</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0.0%</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>0.0%</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

### [OCL Enable] — P.303

Parameter that controls enabling or disabling the OCL when [OCL Enable Src] is set to “Register”.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Numeric/Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>0 = Enable</td>
</tr>
<tr>
<td></td>
<td>1 = Disable</td>
</tr>
<tr>
<td>Default Setting:</td>
<td>Disable</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Process PI</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>1</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>1</td>
</tr>
</tbody>
</table>

### [OCL Fdbk Reg] — P.304

Allows Outer Control Loop Feedback value to be entered (via Datalink also) when OCL Fdbk Source (P. 290) is set to “Register”. This parameter’s value is not saved through a power cycle, it is reset to zero at powerup.

<table>
<thead>
<tr>
<th>Display/Drive Units:</th>
<th>Cnts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter Range:</td>
<td>+/- 4095</td>
</tr>
<tr>
<td>Default Setting:</td>
<td>0</td>
</tr>
<tr>
<td>Parameter Type:</td>
<td>Tunable</td>
</tr>
<tr>
<td>Group:</td>
<td>Process PI</td>
</tr>
<tr>
<td>Minimum Value:</td>
<td>0</td>
</tr>
<tr>
<td>Factory Default:</td>
<td>-4096</td>
</tr>
<tr>
<td>Maximum Value:</td>
<td>+4095</td>
</tr>
</tbody>
</table>
This table provides an alphabetized list of 1397 parameters with the associated page number reference for full parameter descriptions.

<table>
<thead>
<tr>
<th>Name</th>
<th>No.</th>
<th>See Page:</th>
<th>Name</th>
<th>No.</th>
<th>See Page:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accel Time</td>
<td>037</td>
<td>5–22</td>
<td>AutoTune Type</td>
<td>052</td>
<td>5–27</td>
</tr>
<tr>
<td>AC Line Period</td>
<td>192</td>
<td>5–69</td>
<td>AutoTune Stability</td>
<td>114</td>
<td>5–44</td>
</tr>
<tr>
<td>AC Line Voltage</td>
<td>193</td>
<td>5–70</td>
<td>CPU Loading</td>
<td>198</td>
<td>5–71</td>
</tr>
<tr>
<td>Alarm Reset</td>
<td>197</td>
<td>5–71</td>
<td>Current Compound</td>
<td>101</td>
<td>5–38</td>
</tr>
<tr>
<td>Anlg In 3 Gain</td>
<td>132</td>
<td>5–48</td>
<td>Current Compound TP</td>
<td>173</td>
<td>5–64</td>
</tr>
<tr>
<td>Anlg In 3 Type</td>
<td>133</td>
<td>5–48</td>
<td>Curr Loop Error</td>
<td>007</td>
<td>5–15</td>
</tr>
<tr>
<td>Anlg In 3 Zero</td>
<td>134</td>
<td>5–49</td>
<td>Cur Loop Fdbk</td>
<td>006</td>
<td>5–15</td>
</tr>
<tr>
<td>Anlg In 4 Gain</td>
<td>135</td>
<td>5–49</td>
<td>Cur Loop K Fdbk</td>
<td>061</td>
<td>5–29</td>
</tr>
<tr>
<td>Anlg In 4 Zero</td>
<td>136</td>
<td>5–49</td>
<td>Cur Lp Lead Freq</td>
<td>062</td>
<td>5–29</td>
</tr>
<tr>
<td>Anlg In 1</td>
<td>001</td>
<td>5–14</td>
<td>Cur Loop RateLim</td>
<td>064</td>
<td>5–30</td>
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<tr>
<td>Anlg In 2</td>
<td>002</td>
<td>5–14</td>
<td>Cur Loop Ref</td>
<td>008</td>
<td>5–16</td>
</tr>
<tr>
<td>Anlg In 3</td>
<td>003</td>
<td>5–14</td>
<td>CT Turns Ratio</td>
<td>036</td>
<td>5–22</td>
</tr>
<tr>
<td>Anlg In 4</td>
<td>004</td>
<td>5–15</td>
<td>Data In A1</td>
<td>226</td>
<td>5–78</td>
</tr>
<tr>
<td>Anlg In 1 Gain</td>
<td>127</td>
<td>5–47</td>
<td>Data In A2</td>
<td>227</td>
<td>5–78</td>
</tr>
<tr>
<td>Anlg In 1 Type</td>
<td>128</td>
<td>5–47</td>
<td>Data In B1</td>
<td>228</td>
<td>5–78</td>
</tr>
<tr>
<td>Anlg In 1 Zero</td>
<td>129</td>
<td>5–47</td>
<td>Data In B2</td>
<td>229</td>
<td>5–78</td>
</tr>
<tr>
<td>Anlg In 2 Gain</td>
<td>130</td>
<td>5–47</td>
<td>Data In C1</td>
<td>230</td>
<td>5–79</td>
</tr>
<tr>
<td>Anlg In 2 Type</td>
<td>131</td>
<td>5–48</td>
<td>Data In C2</td>
<td>231</td>
<td>5–79</td>
</tr>
<tr>
<td>Autotune Bridge</td>
<td>112</td>
<td>5–43</td>
<td>Data Out A1</td>
<td>234</td>
<td>5–80</td>
</tr>
<tr>
<td>Anlg Out 1 Gain</td>
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<td>5–51</td>
<td>Data Out A2</td>
<td>235</td>
<td>5–80</td>
</tr>
<tr>
<td>Anlg Out 1 Src</td>
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<td>5–52</td>
<td>Data Out B1</td>
<td>236</td>
<td>5–80</td>
</tr>
<tr>
<td>Anlg Out 1 Zero</td>
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<td>5–53</td>
<td>Data Out B2</td>
<td>237</td>
<td>5–80</td>
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<tr>
<td>Anlg Out 2 Gain</td>
<td>147</td>
<td>5–53</td>
<td>Data Out C1</td>
<td>238</td>
<td>5–81</td>
</tr>
<tr>
<td>Anlg Out 2 Src</td>
<td>148</td>
<td>5–54</td>
<td>Data Out C2</td>
<td>239</td>
<td>5–81</td>
</tr>
<tr>
<td>Anlg Out 2 Zero</td>
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<td>5–55</td>
<td>Data Out D1</td>
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<td>5–81</td>
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<tr>
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<td>150</td>
<td>5–55</td>
<td>Data Out D2</td>
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<td>5–81</td>
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<tr>
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<td>5–56</td>
<td>Decel Time</td>
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<tr>
<td>Anlg Out 3 Type</td>
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<td>5–57</td>
<td>Direction Mask</td>
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<td>5–72</td>
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<td>Anlg Out 4 Gain</td>
<td>153</td>
<td>5–57</td>
<td>Direction Owner</td>
<td>216</td>
<td>5–75</td>
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<td>Anlg Out 4 Src</td>
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<td>5–58</td>
<td>Dig Out 1 Src</td>
<td>155</td>
<td>5–59</td>
</tr>
<tr>
<td>Armature Bridge</td>
<td>171</td>
<td>5–63</td>
<td>Dig Out 1 Type</td>
<td>156</td>
<td>5–59</td>
</tr>
<tr>
<td>Armature Delta</td>
<td>172</td>
<td>5–64</td>
<td>Dig Out 2 Src</td>
<td>157</td>
<td>5–60</td>
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<tr>
<td>Arm Volt</td>
<td>005</td>
<td>5–15</td>
<td>Dig Out 2 Type</td>
<td>158</td>
<td>5–60</td>
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<td>5–28</td>
<td>Draw Percent Out</td>
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<td>5–16</td>
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<tr>
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<td>060</td>
<td>5–29</td>
<td>Drive Status</td>
<td>191</td>
<td>5–69</td>
</tr>
<tr>
<td>AutoTune Fld Ring</td>
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<td>5–44</td>
<td>E–Fid Volts Adj</td>
<td>272</td>
<td>5–87</td>
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<tr>
<td>Encoder Kit</td>
<td>187</td>
<td>5–68</td>
<td>J20 Fld Loss Det</td>
<td>184</td>
<td>5–67</td>
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<td>Encoder PPR</td>
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<td>Expansion I/O</td>
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<td>5–65</td>
<td>AC Line Period</td>
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<td>Exp I/O Dig In</td>
<td>195</td>
<td>5–70</td>
<td>Last Stop Cause</td>
<td>166</td>
<td>5–62</td>
</tr>
<tr>
<td>Fault Reset</td>
<td>196</td>
<td>5–70</td>
<td>Local Mask</td>
<td>208</td>
<td>5–74</td>
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<tr>
<td>Fault Reset Mask</td>
<td>205</td>
<td>5–73</td>
<td>Local Owner</td>
<td>221</td>
<td>5–77</td>
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<tr>
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<td>5–77</td>
<td>Logic Mask</td>
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<td>5–74</td>
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<tr>
<td>Feedback Type</td>
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<td>Logic Status</td>
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<td>5–69</td>
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<tr>
<td>Field Delta</td>
<td>174</td>
<td>5–64</td>
<td>Monitor 1 Delay</td>
<td>103</td>
<td>5–39</td>
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<tr>
<td>Field Feedback</td>
<td>010</td>
<td>5–16</td>
<td>Monitor 1 Level</td>
<td>105</td>
<td>5–40</td>
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<tr>
<td>Field Ref TP</td>
<td>176</td>
<td>5–65</td>
<td>Motor Field Amps</td>
<td>044</td>
<td>5–25</td>
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<tr>
<td>Fld Auto Weak</td>
<td>275</td>
<td>5–88</td>
<td>Monitor 1 Source</td>
<td>104</td>
<td>5–40</td>
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<tr>
<td>Fld Econ Active</td>
<td>175</td>
<td>5–64</td>
<td>Monitor 2 Delay</td>
<td>106</td>
<td>5–41</td>
</tr>
<tr>
<td>Field Regulator</td>
<td>177</td>
<td>5–65</td>
<td>Monitor 2 Level</td>
<td>108</td>
<td>5–42</td>
</tr>
<tr>
<td>Fld Delta Hi Lim</td>
<td>276</td>
<td>5–88</td>
<td>Maximum Current</td>
<td>040</td>
<td>5–23</td>
</tr>
<tr>
<td>Fld Econ Delay</td>
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<td>5–87</td>
<td>Max Motor Speed</td>
<td>041</td>
<td>5–23</td>
</tr>
<tr>
<td>Fld Econ Ref</td>
<td>274</td>
<td>5–87</td>
<td>Max Process Spd</td>
<td>042</td>
<td>5–24</td>
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<tr>
<td>Fld LP Lead Freq</td>
<td>278</td>
<td>5–89</td>
<td>Min Process Speed</td>
<td>043</td>
<td>5–24</td>
</tr>
<tr>
<td>Fld Loop K–Fdbk</td>
<td>281</td>
<td>5–90</td>
<td>Min Speed Bypass</td>
<td>099</td>
<td>5–38</td>
</tr>
<tr>
<td>Fld Loop Kp</td>
<td>279</td>
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Hidden Parameters

The parameters shown in the following table are unused and are hidden in 1397 Drives with V 1.XX or greater firmware. These parameters are for future expansion of functions in the Drive and have no effect on Drive operation. These parameters are neither visible nor accessible through the HIM. When using DriveTools or DeviceNet manager, however, all parameters can be seen (even ones marked as hidden). While visible, they are not functional.

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Troubleshooting

Introduction

Chapter 6 provides a guide to help you troubleshoot the 1397 Drive. Included is a listing and description of the various Drive faults and alarms with possible solutions, when applicable.

ATTENTION: Only qualified personnel familiar with the 1397 Drive and associated machinery should perform troubleshooting or maintenance functions on the Drive. Failure to comply may result in personal injury and/or equipment damage.

During Startup you should have recorded board jumper settings for each board, software version numbers, and the Drive and motor nameplate data in Tables 4.A, 4.E and 4.G. If they were not, record them at this time before beginning any troubleshooting procedures.

Required Equipment

For initial troubleshooting, a HIM programming device is required to read fault codes. In addition to a programming device, the following equipment is recommended before initiating any troubleshooting procedures:

- Digital Multimeter (DMM) capable of 1000V DC/750VAC, with one megohm minimum input impedance.
- Clamp on Ammeter (AC/DC) with current ratings to 2X rated current output of 1397 DC Drive.
- Dual trace oscilloscope with differential capability, digital storage, two X10 and one X100 calibrated probes (optional but recommended).

ATTENTION: Potentially fatal voltages may result from improper usage of an oscilloscope and other test equipment. The oscilloscope chassis may be at potentially fatal voltage if not properly grounded. Allen-Bradley does not recommend use of an oscilloscope to directly measure high voltages. Use an isolated measuring device with a high voltage probe. Contact Allen-Bradley for recommendations.

- Hand tachometer used to monitor motor velocities.
- HIM Programming Device Instruction Manual and reference manuals for any option used with the 1397 Drive.
ATTENTION: The [CT Turns Ratio] (Param 36) is used in the calculation of the burden resistor value. Do not adjust/change the value of this parameter from its factory set value unless you are replacing the regulator board. Failure to observe this precaution could result in damage to, or destruction of, the equipment. Refer to Chapter 5 if the CT Turns Ratio value needs to be changed from the factory supplied value.

HIM Fault Display

The HIM LCD display is used to indicate a fault by displaying a fault code and fault number (See Figure 6.1).

**Figure 6.1**
**Typical Fault Description Display**

```
Arm Overvoltage
F 011
```

Clearing a Fault

When a fault occurs in the 1397, the cause must be corrected before the fault can be cleared. After corrective action has been taken, simply cycling Drive power will clear a fault.

NOTE: The HIM and other SCANport peripherals can clear faults as well as the Fault Queue. If a stop push button is used, terminal 10 can also clear a fault.

Clearing an Alarm

When an alarm occurs in the 1397, the cause must be corrected before the alarm can be cleared. After corrective action has been taken, perform the following steps to clear the alarm:

1. In the Control Status menu cycle to the Alarm Queue using the increment and decrement key.
2. Press Enter.
3. Press the Increment (or Decrement) key until “Clear Queue” is displayed.

The alarm queue is now cleared.
<table>
<thead>
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<th>Fault No.</th>
<th>Fault Name</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>&quot;IET Overcurrent&quot;</td>
<td>Armature current instantaneously exceeded 180% of [Maximum Current] (P.040) Possibly due to: • Incorrect armature current feedback scaling</td>
<td>Check the motor and all thyristors. Ensure that armature current feedback scaling is correct. Replace the motor if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• One or more thyristors not operating</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Improper Current Minor Loop tuning</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>• Motor Armature winding damaged</td>
<td></td>
</tr>
<tr>
<td>002</td>
<td>&quot;Tachometer Loss&quot;</td>
<td>Tachometer feedback signal missing possibly due to: • Tach coupling broken or loose • Disconnected, loose or damaged tach wires • Pulse Tach supply voltage low • Incorrect Analog Tach scaling • Incorrect Pulse Tach configuration • Motor armature winding not connected or open circuit • Blown DC fuse • Tach malfunction</td>
<td>Check the tach coupling, tach scaling, tach configuration, fuses and motor armature windings. Replace the tach and/or motor if necessary.</td>
</tr>
<tr>
<td>003</td>
<td>&quot;Overspeed Fault&quot;</td>
<td>Motor Speed exceeded 110% of [Max Motor Speed] (P.041) possibly due to: • Incorrect tach scaling • Blown field supply fuses • Improper speed loop tuning • Pulse Tach Quadrature set to ON for a non-regenerative drive. • Incorrect pulse tach wiring</td>
<td>Check pulse tach wiring, tach scaling, fuses and speed loop tuning. Replace tach if necessary.</td>
</tr>
<tr>
<td>004</td>
<td>&quot;Fld Current Loss&quot;</td>
<td>The field loss detection circuit has not sensed any field current flowing in the motor shunt field possibly due to: • Motor field winding not connected or an open circuit • Blown field supply fuse(s) • Blown AC line fuse(s) • Field supply failure • Wiring harness damaged, loose or disconnected</td>
<td>Check fuses, field supply, wiring and motor windings. Replace motor if necessary.</td>
</tr>
<tr>
<td>005</td>
<td>&quot;Sustained Overld&quot;</td>
<td>Inverse time overload circuit trip possibly caused by: • Incorrect armature current feedback scaling • Blown A C line fuses • Mechanical binding preventing the motor shaft from rotating freely</td>
<td>Check process equipment and motor for binding. Check for blown fuses. Check armature current feedback scaling. Replace motor if necessary.</td>
</tr>
<tr>
<td>006</td>
<td>&quot;Blower Starter&quot;</td>
<td>Blower motor starter is open. If a blower motor starter kit is not installed, connector P8 must be fitted with the proper substitute connector to inhibit this fault. Other possible causes: • Blown motor starter fuse(s) • Disconnected, loosely connected or damaged blower motor starter wiring • Blower motor overload</td>
<td>Check motor starter fuses and wiring. Replace blower motor starter and/or blower motor if necessary.</td>
</tr>
<tr>
<td>007</td>
<td>&quot;Open Armature&quot;</td>
<td>The motor armature circuit is open possibly due to: • Motor armature winding not connected or an open circuit • Blown inverting fault (DC) fuse • Inverting fault breaker tripped</td>
<td>Check breakers and fuses. Check motor armature windings. Replace motor if necessary.</td>
</tr>
<tr>
<td>Fault No.</td>
<td>Fault Name</td>
<td>Description</td>
<td>Action</td>
</tr>
<tr>
<td>----------</td>
<td>------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 008      | Motor Over Temp  | The motor thermostat is indicating a high temperature, or if no motor thermostat is installed, the customer terminal board pins 13 and 14 have not been jumpered correctly to inhibit this fault:  
Other possible causes include:  
• Damaged thermostat or disconnected wiring  
• Inadequate ventilation  
• Blower Motor Malfunction  
• Incorrect blower rotation  
• Blocked ventilation slots  
• Clogged filters  
• Excessive armature current  
• One or more thyristors inoperable | Check filters, blowers and thermostat, repairing or replacing as necessary. Replace thyristors if necessary. Check motor ventilation and provide additional air movement or cooling if necessary. |
| 009      | Cntlr Over Temp  | The Controller thermostat is indicating an overtemperature condition possibly due to:  
• Inadequate heat sink ventilation  
• Inadequate cabinet ventilation  
• Heat sink fan malfunction  
• Damaged, disconnected or improperly connected thermostat wiring | Check the fan and thermostat repairing or replacing as necessary. Check cabinet & heat sink ventilation and provide additional air movement or cooling as required. |
| 010      | AC Line Sync Flt | Three–phase AC line synchronization circuit malfunction possibly due to:  
• Blown AC line fuses (s)  
• AC line frequency outside the required range of 48–62Hz  
• Excessive AC line noise or distortion  
• Unstable AC line frequency  
• Disconnected, improperly connected or damaged J6 ribbon cable | Check all cables and connections. Replace blown line fuses if necessary. Line filters or a transformer may be necessary to cure line frequency or noise problems. |
| 011      | Arm Over Voltage | Armature voltage exceeded 130% of Motor Arm Volts (Par 046) due to:  
• Motor Arm Volts not set properly  
• Improper voltage loop tuning  
• [E–Fld Volts Adj] (Par 272) set too high (Enhanced Field Supply only). | Reset Parameters 44 and 272 if necessary. Rerun Voltage Loop Tuning if required. |
| 012      | CAN Comm Lost    | Drive to Drive or Drive to Control communication lost. | Check attached communication peripherals for proper operation. Replace if necessary. |
| 015      | SCR #1 Open Flt  | Indicates SCR number 1 is non–operational | Check SCR wiring and connections and replace SCR if necessary |
| 016      | SCR #2 Open Flt  | Indicates SCR number 2 is non–operational | Check SCR wiring and connections and replace SCR if necessary |
| 017      | SCR #3 Open Flt  | Indicates SCR number 3 is non–operational | Check SCR wiring and connections and replace SCR if necessary |
| 018      | SCR #4 Open Flt  | Indicates SCR number 4 is non–operational | Check SCR wiring and connections and replace SCR if necessary |
| 019      | SCR #5 Open Flt  | Indicates SCR number 5 is non–operational | Check SCR wiring and connections and replace SCR if necessary |
| 020      | SCR #6 Open Flt  | Indicates SCR number 6 is non–operational | Check SCR wiring and connections and replace SCR if necessary |
| 021      | SCR #11 Open Flt | Indicates SCR number 11 is non–operational | Check SCR wiring and connections and replace SCR if necessary |
| 022      | SCR #12 Open Flt | Indicates SCR number 12 is non–operational | Check SCR wiring and connections and replace SCR if necessary |

NOTE: Incorrect setting of [CT TURNS RATIO] (P. 036) can also cause faults 015 thru 027. Set the correct value in Parameter 36 and repeat the jumper setting and autotune process.
<table>
<thead>
<tr>
<th>Fault No.</th>
<th>Fault Name</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>023</td>
<td>“SCR #13 Open Flt”</td>
<td>Indicates SCR number 13 is non-operational</td>
<td>Check SCR wiring and connections and replace SCR if necessary</td>
</tr>
<tr>
<td>024</td>
<td>“SCR #14 Open Flt”</td>
<td>Indicates SCR number 14 is non-operational</td>
<td>Check SCR wiring and connections and replace SCR if necessary</td>
</tr>
<tr>
<td>025</td>
<td>“SCR #15 Open Flt”</td>
<td>Indicates SCR number 15 is non-operational</td>
<td>Check SCR wiring and connections and replace SCR if necessary</td>
</tr>
<tr>
<td>026</td>
<td>“SCR #16 Open Flt”</td>
<td>Indicates SCR number 15 is non-operational</td>
<td>Check SCR wiring and connections and replace SCR if necessary</td>
</tr>
<tr>
<td>027</td>
<td>“Multi SCR’s Open”</td>
<td>One or more thyristor (SCR) is not carrying an equal load possibly due to:</td>
<td>Check SCRs, SCR wiring and AC Line fuses. Repair or replace as necessary. Run Speed/Voltage Loop tuning if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Disconnected, loosely connected or damaged thyristor gating circuit.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Blown AC line fuse(s)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Improper Speed/Voltage Loop tuning</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Malfunctioning thyristor (SCR)</td>
<td></td>
</tr>
<tr>
<td>030–044</td>
<td>“SCR Shorted Flt”</td>
<td>One or more SCRs have shorted out possibly due to:</td>
<td>Replace shorted SCRs using the correct heat sink compound and torquing techniques.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Improper Heat Sink preparation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Improper Torquing of SCR</td>
<td></td>
</tr>
<tr>
<td>045</td>
<td>“SelfTune Abort”</td>
<td>Auto Tune aborted by external input Possible causes include:</td>
<td>Check for drive faults, open interlocks or programmed stop routines. Cycle power to reset drive and attempt to run Auto Tune again.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Operator stop initiated</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Drive interlock(s) open</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Drive fault became active</td>
<td></td>
</tr>
<tr>
<td>046</td>
<td>“ST Spd Fdbk Flt”</td>
<td>A non-zero speed feedback value exists at self tune start possibly due to:</td>
<td>Check process equipment to determine if overhauling load exists. If not, reset feedback scaling and offset.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Incorrect speed feedback scaling or offset</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Overhauling load causing motor shaft rotation</td>
<td></td>
</tr>
<tr>
<td>047</td>
<td>“ST Inductance”</td>
<td>Calculated armature inductance is out of range possibly due to:</td>
<td>Check for blown fuses and open circuit breakers, replace, reset and tune as necessary. Check motor armature inductance and windings. Repair or replace as necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Motor armature winding not connected or an open circuit exists.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Blown inverting fault (DC) fuse</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Inverting fault breaker tripped</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Armature inductance too high, tune current loop manually</td>
<td></td>
</tr>
<tr>
<td>048</td>
<td>“ST Max Current”</td>
<td>A maximum current condition with minimum rotation exists possibly due to:</td>
<td>Check the process equipment for possible overloads caused by bad bearings, slipping belts, outside interference etc. Uncouple motor from load and check that it rotates freely when unloaded.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Inability of the motor to rotate freely due to mechanical friction.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Motor load is too high</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Motor field is not at normal operating temperature</td>
<td></td>
</tr>
<tr>
<td>049</td>
<td>“ST Inertia Fault”</td>
<td>Attached inertia is out of range possibly due to:</td>
<td>Check the process equipment for a possible overhauling load condition. Check process equipment for overload or mechanical binding condition.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Maximum Auto Tune speed reached</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Overhauling load present</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• High mechanical friction present</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The Speed Loop cannot be auto tuned. Tune Speed Loop manually.</td>
<td></td>
</tr>
<tr>
<td>050</td>
<td>“ST Stability Flt”</td>
<td>Speed instability exists possibly due to:</td>
<td>Check tachometer leads for damage, incorrect connection or improper conduit routing of leads.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Current Loop not properly tuned prior to the Speed Loop</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Tachometer feedback connected incorrectly</td>
<td></td>
</tr>
<tr>
<td>051</td>
<td>“ST Stab&lt;50 Fault”</td>
<td>Auto Tune Stability is too low, due to:</td>
<td>Use 50 or greater.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Specified stability is less than that calculated by current loop tuning</td>
<td></td>
</tr>
<tr>
<td>052</td>
<td>“ST Stab&lt;75 Fault”</td>
<td>Auto Tune Stability is too low, possibly due to:</td>
<td>Use 75 or greater.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Specified stability is less than that calculated by current loop tuning</td>
<td></td>
</tr>
<tr>
<td>074–084</td>
<td>“ST Fatal Fault”</td>
<td>An autotuning fault occurred, with self tuning unable to complete its routine.</td>
<td>Attempt to rerun autotune routine, or tune manually to bypass the problem.</td>
</tr>
<tr>
<td>Fault No.</td>
<td>Fault Name</td>
<td>Description</td>
<td>Action</td>
</tr>
<tr>
<td>----------</td>
<td>----------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 085      | “Main Contactor” | The main (FN) contactor did not open following a run or jog. Possible causes include:  
- Disconnected, loosely connected, or damaged FN, FN AUX, Dynamic Braking or Auxiliary Dynamic Braking wiring.  
- FN, FN AUX, DB or DB AUX contactor malfunction  
- Disconnected, loosely connected, or damaged main contactor or dynamic braking control wiring (MCR or DBCR) | Check all wiring and connections to the dynamic brake and dynamic brake contacts. Repair or replace as necessary.                                    |
| 086      | “Power Failure”  | The power supply input voltage momentarily went below tolerance. Possible causes include:  
- AC line voltage dip (20% tolerance)  
- Disconnected, loosely connected, or damaged J7 ribbon cable or power supply input wiring | Check J7 ribbon cable and power supply input wiring, repair or replace as necessary. If AC line voltage dips are occurring regularly, an isolation transformer or line reactor may be required. |
| 087      | “NVM Checksum Flt” | ● EEPROM Checksum invalid                                                                  | ● Restore factory defaults  
● Save to EEPROM  
● Clear fault queue.  
Reset all parameters to correct values                                                                                                                                 |
| 088      | “Fault Log Error” | The fault log information stored in retentive memory was determined to be invalid, the fault log has been cleared. Possible causes include:  
- Power loss occurred during a prior fault log save  
- Regulator Board malfunction | Check regulator board and replace if necessary.                                                                                      |
| 089      | “Invalid Field”  | The installed field supply is not supported by the regulator possibly due to:  
- Disconnected, loosely connected or damaged field supply wires.  
- Regulated field supply malfunction  
- Regulator board malfunction | Check the field supply wiring, the regulated field supply and the regulator board. Repair or replace as necessary. |
| 090      | “Fid Fdbk Offset” | Regulated field supply feedback offset is too high, possibly due to:  
- Disconnected, loosely connected or damaged field supply wires  
- Regulated field supply malfunction  
- Regulator board malfunction | Check the field supply wiring, the regulated field supply and the regulator board. Repair or replace as necessary. |
| 091      | “uP HW/SW Fault” | ● Regulator microprocessor malfunction  
● Electrical noise due to improper wiring practices or unsuppressed brake coils, relays, or contactors.  
- Disconnected, loosely connected or damaged Microbus ribbon cable.  
- Malfunctioning regulator board | Check regulator board and replace if necessary.                                                                                      |
| 100–599  | “Microbus Fault”  | An error occurred on the Microbus possibly due to:  
- Electrical noise due to improper wiring practices or unsuppressed brake coils, relays, or contactors.  
- Disconnected, loosely connected or damaged Microbus ribbon cable.  
- Malfunctioning regulator board  
- Malfunctioning microbus peripheral  
- Microbus peripheral found that is not supported by the regulator firmware. | Check the microbus ribbon cable and replace if necessary. Check the regulator board and replace if necessary. Check for noise sources and correct if possible. Make certain all leads and wiring are separated correctly and run in proper conduit with correct shield terminations. |
| 600–699  | “Memory Fault”   | ● Regulator board memory malfunction                                                     | Check regulator board and replace if necessary.                                                                                      |
| 700–749  | “uP Hardware Flt” | ● Regulator board hardware malfunction                                                   | Check regulator board and replace if necessary.                                                                                      |
| 750–799  | “uP Exception Flt” | ● Unexpected regulator board interrupt.  
- Possibly due to electrical noise from improper wiring practices or unsuppressed brake coils, relays or contactors. | Check regulator board and replace if necessary.                                                                                      |
### Alarms

Table 6.B presents a listing and description of the Drive alarms. CTB = Control Terminal Block in the following table.

#### Table 6.B
**Alarm Conditions**

<table>
<thead>
<tr>
<th>Alarm No.</th>
<th>Alarm Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| 001       | "Brush Wear Low"      | The Motor brush wear detector indicates the brushes are worn, or that the customer terminal block pins CTB–12 & CTB–14 have not been jumpered in cases where a brush wear detector is not supplied. Other possible causes include:  
  - Disconnected, loosely connected or damaged motor brush wear indicator wiring  
  - Brush wear indicator has malfunctioned. |
| 002       | "AC Line Volt Low"    | The AC line voltage has fallen below 90% of the figure established in Nominal AC Line Voltage. Possible causes include:  
  - Low AC line voltage  
  - An incorrect value has been entered for Nominal AC Volts (P. 051)  
  - Blown AC line fuse(s) |
| 003       | "AC Line Vlt High"    | The AC line voltage rose 115% above the figure established in Nominal AC Volts (P.051) Possible causes include:  
  - High AC line voltage  
  - Incorrect value entered for Nominal AC Volts (P. 051) |
| 020       | "Fld Loss Det Dis"    | Field Loss detection has been disabled through a jumper on the regulator board (J20). NOTE: Option used only when no field exists. |
| 030       | "Contcr Not Open"     | The main (FN) contactor did not open following a stop. If a dynamic braking (DB) kit is used, the DB AUX contact is wired in series with the FN AUX contact. Possible causes include:  
  - Disconnected, loosely connected or damaged FN, FN AUX, DB or DB AUX wiring.  
  - FN, FN AUX, DB or DB AUX contactor failure.  
  - Disconnected, loosely connected or damaged main contactor or dynamic brake control wiring (MCR or DBCR). |
| 031       | "Contcr Not Closed"   | The main (FN) contactor did not close following a run or jog command. If a dynamic braking (DB) kit is used, the DB AUX contact is wired in series with the FN AUX contact. Possible causes include:  
  - Disconnected, loosely connected or damaged FN, FN AUX, DB or DB AUX wiring.  
  - FN, FN AUX, DB or DB AUX contactor failure.  
  - Disconnected, loosely connected or damaged main contactor or dynamic brake control wiring (MCR or DBCR). |
| 032       | "Sustained Speed"     | Motor speed did not fall below the value set in Stop Speed Level (P. 116) in the required period of time during a stop (automatically set to 2x the Decel Time (P. 038) setting). Possible causes include:  
  - Decel Time not set properly  
  - Stop Speed Level (P.116) not set properly  
  - Incorrect speed/voltage feedback scaling |
| 033       | "Sustained Arm I"     | Armature current was unable to reach discontinuous conduction while stopping the Drive. Possible causes include:  
  - Motor CEMF too high or line voltage too low for proper commutation |
<p>| 034       | &quot;Aux Contact Open&quot;    | M Contactor Auxiliary contact opened unexpectedly – check contactor for proper operation. |</p>
<table>
<thead>
<tr>
<th>Alarm No.</th>
<th>Alarm Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>050</td>
<td>“CML Fdbk Scaling”</td>
<td>Armature current feedback could not be scaled properly based on the values entered for Motor Arm Amps (P. 045) and Maximum Current (P.046). Verify that CT Turns Ratio (P.036) has been set to the value shown in the user manual that corresponds to your drive type.</td>
</tr>
<tr>
<td>051</td>
<td>“Low Min Speed”</td>
<td>The Min Process Spd (P. 043) value is less than 10% of the Max Process Spd (P. 042) value. This alarm will not be triggered on power-up. It only occurs when maximum or minimum speed has changed. Verify that these parameter values are correct for your application.</td>
</tr>
<tr>
<td>700</td>
<td>“NV Mem Save Fail”</td>
<td>An attempt to save information (parameter values, fault log data etc.) to retentive memory failed. The drive may continue to be operated. A possible cause of this error is a Regulator Board Malfunction</td>
</tr>
</tbody>
</table>
Figure A.1
Standard Inputs

**ANALOG INPUTS**

Analog Input 1
(+ CTB-19)
(- CTB – 20)

**Analog Input 2**
(+ CTB-17)
(- CTB – 28)
1 × (10V) CTB-16

**DRAW PERCENT OUT**

**Analog In 1 Type**
(P. 128)
**Analog In 1 Zero**
(P. 128)
**Analog In 1 Gain**
(P. 127)

**Analog In 2 Zero**
(P. 131)
**Analog In 2 Gain**
(P. 130)

**Max Motor Speed**
(P. 041)

**LIMIT**

HI
LO

**SOFTWARE SCALING**

**MAX MOTOR SPEED**

**MAX/MIN SPD SCALING**

**MAX Process Speed**
(P. 041)
**Min Process Speed**
(P. 043)

**A/D**

**To Any Switch Selection**
Labeled "ANLG IN 1"

**To Any Switch Selection**
Labeled "ANLG IN 2"

1 ➔ J19 must be set to POT (2–3) to use the internal 10V power supply

* = Default Selection
Digital Inputs \((n = 1\text{–}5)\):

- \(n = 1\) CTB–59 (Preset Speed Select B)
- \(n = 2\) CTB–60 (Preset Speed Select A)
- \(n = 3\) CTB–62 (MOP Decrement)
- \(n = 4\) CTB–63 (MOP Increment)
- \(n = 5\) CTB–64 (OCL Enable)

+24VDC at CTB–14 (regulator board) and CTB–61 (I/O Expansion board) +/−10V

MOP Reset Enable (P. 086)

I/O Expansion Inputs

Figure A.2

ANALOG INPUTS:

Analog Input 3

Analog Input 4

FREQUENCY INPUT:
Figure A.3
Speed/Trim Reference Select

From Standard Inputs Block Diagram
- Analog In 1 (P.001)
- Speed Pot (P.029)
- MOP Output (P.015)
- Analog In 3 (P.003)
- Analog In 4 (P.004)
- Freq In (P.011)

From SCANport
- Preset 1 (P.087)
- Preset 2 (P.088)
- Preset 3 (P.089)

From I/O Expansion Inputs Block Diagram
- Analog In 1 (P.001)
- Speed Pot (P.029)
- MOP Output (P.015)
- Analog In 3 (P.003)
- Analog In 4 (P.004)
- Freq In (P.011)

From Standard Inputs Block Diagram
- Analog In 1 (P.001)
- Speed Pot (P.029)
- MOP Output (P.015)
- Analog In 3 (P.003)
- Analog In 4 (P.004)
- Freq In (P.011)

From SCANport
- Preset 1 (P.087)
- Preset 2 (P.088)
- Preset 3 (P.089)

From I/O Expansion Inputs Block Diagram
- Analog In 1 (P.001)
- Speed Pot (P.029)
- MOP Output (P.015)
- Analog In 3 (P.003)
- Analog In 4 (P.004)
- Freq In (P.011)

From SCANport
- Preset 1 (P.087)
- Preset 2 (P.088)
- Preset 3 (P.089)

To CML Reference Block Diagram
- Reference Mask (P.090)

To Speed Reference Ramp Block Diagram
- Draw Percent Out (P.009)

* Default Selection

Note: Set via Bits 14,13,12 of SCANport Logic Control

The Terminal Block reference selection inputs will assume ownership until Reference Mask Bit 0 is set to 00

If the I/O Expansion board is not installed, this input is fixed at 00

When configured as a Current Regulator (J15 = Current), the CML uses TORQUE REFERENCE as an input (bypassing the Speed Loop).

When configured as a Speed Regulator (J15 = Speed), the CML uses SPD SOURCE SELECT OUT to generate the CML input.
NOTE 1: “REF RAMP BYPASS” will be automatically turned OFF during a Ramp Stop Command. This is to prevent a Current Limit stop from occurring during a Ramp Stop command.
Figure A.5
Outer Control Loop

NOTES:
1> The _ocl_–enable signal must be ON in order for the Outer Control Loop to execute. When _ocl_–enable is OFF, the S-curve Lead/Lag and PI blocks are held in reset causing the initial value (INITV) to be copied to each block’s output.

2> The OCL reference ramp block can be bypassed by setting OCL RAMP TIME to 0.0.

*Indicates default selection
Figure A.6
Speed Reference Mode Select

*Indicates default selection
Figure A.8
Current Minor Loop Reference

From Speed/Trim Reference Select Block Diagram

From Speed Loop Block Diagram

Maximum Current (P. 040)

S-curve rate output from Speed Ref Ramp Block Diagram

From I/O Exp. Inputs Block Diagram

From SCANport

Torque Reference (P. 031)

Spd Loop Output (P. 024)

Normal Inertia (P. 109)

Inertia Comp Ref (P. 122)

ANLG IN 3

ANLG IN 4

FREQUENCY IN

ADAPTOR 1-6

SOFTWARE SCALING

REGISTER

INTERNAL

ANLG IN 3

ANLG IN 4

FREQUENCY IN

CURRENT/TORQUE

*SPEED/VOLTAGE

RATELIM

LIMIT

HIGH

LIMIT

LOW

ACC/DEC

To Current Minor Loop Block Diagram

Positive current limit from Speed Loop Block Diagram

J15 Reg Type (P. 182)

Cur Loop Ref (P. 008)

Cur Loop Ratem (P. 064)

Negative current limit from Speed Loop Block Diagram

* Default Selection

From I/O Exp. Inputs Block Diagram

From SCANport

* Default Selection
Figure A.9
Current Minor Loop

From Current Minor Loop Reference Block Diagram

Current Loop Ref (P. 008)

Current Loop Fdbk (P. 006)

Cur - Loop K-Fdbk (P. 061)

DIFF

OUT

MUL

IN

GAIN

SCALING

SOFTWARE

ANALOG

TO DIGITAL

CONVERTER

Current Loop Kp (P. 063)

Current Loop Fdbk (P. 006)

ARM PHASE FIRE

RATE LIMIT

ADAPTIVE

GAIN

LOGIC

Kp

IN

OUT

Ki

PHASE

FIRING

LOGIC

ARM BRIDGE (P. 171)

ARM DELTA (P. 172)

DRIVE TEST
MODE

3 - Phase AC Line

CT TURNS RATIO (P. 036)

15 ohm

20 ohm

30 ohm

39 ohm

LJ18 ARM FDBK RES

Hardware scaling jumper

LJ18 "ARM FDBK RES"

Ground Jumper J22 "GROUND"

* Default Selection

RECTIFIER

20k ohm

20k ohm

20k ohm

20k ohm

S6/S6R

POWER

UNIT

A1

A2

MOTOR

Ground Jumper J22 "GROUND"

Current Feedback Test Point Jumper J17 "ARM 1"

Lead Freq (P. 062)

Current Loop Ref (P. 008)

MOTOR

From Current Minor Loop Reference Block Diagram

Current Loop Kp (P. 063)
NOTE 1: FIELD AUTO WEAK is clamped to DISABLED when FEEDBACK TYPE = ARM VOLT
Figure A.11
Standard Outputs

Analog (Metering) Outputs \((n = 1, 2)\)

From Current Minor Loop Block Diagram
- \(n = 1\)
  - CUR LOOP REF
  - CUR LOOP ERR
- \(n = 2\)
  - SPD LP FBK
  - SPD LP REF
  - SPD LP ERROR
  - SPD LOOP OUT
  - SPD RAMP OUT
  - SPD RAMP IN
  - ARM VOLT
  - ATACH FDBK
  - ENCODER FDBK
  - ZERO

From Speed Loop Block Diagram
- AVG TIME
  - SOFTWARE SCALING
  - D/A

From Engineering Units Outputs Block Diagram
- POWER OUTPUT
  - FULL SCALE

From Outer Control Loop Block Diagram
- OCL REF
  - OCL RAMP OUT
  - OCL FEEDBACK
  - OCL OUTPUT

From Field Control Loop Block Diagram
- FIELD REF
  - FIELD FBK

Analog Output 1 \((+)CTB–24 (-)CTB–25\)
- 100 ms
- ANLG OUT 1 GAIN
- ANLG OUT 1 ZERO

Analog Output 2 \((+)CTB–26 (-)CTB–25\)
- 100 ms
- ANLG OUT 2 GAIN
- ANLG OUT 2 ZERO

* Default Selection
Figure A.12
Level Detectors

From Speed Loop Block Diagram
From Speed Reference Ramp Block Diagram
From Speed/Trim Ref Select Block Diagram

CUR LP FEEDBACK
8 sample average
SPD Lp Fdbk
SPD RAMP OUT
SPD RAMP IN
SPD SRC OUT
AB
MONITOR 1 SRC
A
B
MONITOR 1 DELAY
A > B
Timer
Delay Time
Start/Stop
(MONITOR 1 OUTPUT)
Block Diagram to I/O Expansion Outputs

(OML FEEDBACK)
6 sample average
1 SPD Lp Fdbk
2 SPD RAMP IN
SPD SRC OUT
AB
MONITOR 2 SRC
A
B
MONITOR 2 DELAY
A > B
Timer
Delay Time
Start/Stop
(MONITOR 2 OUTPUT)
Block Diagram to I/O Expansion Outputs

* Default Selection
Figure A.13
I/O Expansion Outputs

Digital Outputs (n = 1, 2)

- From Level Detector Block Diagram
  - "n" = Monitor 1 Out
  - "n" = Monitor 2 Out
  - IN CUR LIMIT
  - DRIVE READY

- From Internal Drive Signals
  - "n" = Monitor 1 Out
  - "n" = Monitor 2 Out

Analog & Frequency Outputs

- From Current Minor Loop Block Diagram
  - CUR LP FEEDBACK
  - CUR LOOP REF
  - CML ERROR
  - SPD LP FDBK
  - SPD LP REF
  - SPD LP ERROR
  - SPD LOOP OUT
  - SPD RAMP OUT
  - SPD RAMP IN
  - SPD SRC OUT
  - TRIM OUTPUT
  - ARM VOLT
  - ATACH FDBK
  - ENCODER FDBK
  - *ZERO
  - FULL SCALE
  - POWER OUTPUT
  - OCL REF
  - OCL RAMP OUT
  - OCL FEEDBACK
  - OCL OUTPUT
  - FIELD REF
  - FIELD FDBK

- From Speed Loop Block Diagram
- From Speed Reference Ramp Block Diagram
- From Speed Loop Block Diagram

Digital Outputs

- n = 1, (+) CTB 66, (-) CTB 67
- n = 2, (+) CTB 68, (-) CTB 69

* Default Selection
CE Conformity

EMC Compliance

This appendix provides information on installing 1397 Drives for compliance with European Union Electromagnetic Compatibility (EMC) Standards. It covers:

- Requirements for standards compliance
- Guidelines on installing the AC mains filter and inductor
- Instructions on how the Drive must be installed, wired, and grounded for compliance. These instructions are in addition to the normal installation instructions.

IMPORTANT: This appendix is not applicable to 1397 drives rated above 300HP @ 460 VAC. These higher horsepower drives are not designed to be CE-compliant.

EMC Requirements

For the 1397 Drive to conform to the standards listed on the Declaration of Conformity (DOC) above, the Drive must:

- Be accompanied by the DOC for that Drive
- Be specified by model number on the DOC
- Have a CE mark, which is below the Drive nameplate
- Be mounted and wired on the conductive, non-coated back panel of an electrical cabinet.
- Include an AC Line filter and inductor as specified in this Appendix.
- Be installed according to the instructions in this Appendix
- Be operated with the electrical cabinet doors closed.

NOTE: Conformity of the 1397 Drive does not guarantee that the entire installation will be in conformance.

Equipment Requirements

In addition to the Drive, you will need the following to install the 1397 for CE compliance:

- Electrical cabinet with back mounting panel
- AC Line filter
- AC Line inductor

Mounting Panel and Electrical Cabinet Selection – The 1397 Drive, AC Line filter, AC Line inductor, and any other electronic or electrical equipment must be mounted in an electrical cabinet. The back mounting panel where this equipment is mounted must have a good electrically conductive surface, such as aluminized cold-roll steel, Galvalume, or galvanized steel. It must be free of any insulating coatings, such as varnish or paint. This establishes a good ground plane for the mounted equipment.
The degree of enclosure does not play a significant role in the containment of RF emissions. The cabinet can have ventilation louvers or openings for fans and filters. None of these openings however, can be located within a zone 10 inches above and below the height of the Drive, as shown in Figure B.1.

**Selecting an AC Line Filter** – AC line filters limit the conducted electromagnetic emissions to the AC power mains from the 1397 Drives. Tables B.A thru B.C list the 1397 Drives, full load amps, inductance, and the AC Line Filter model number required for each Drive. The inductance is the minimum input inductance for 2% impedance, assuming a 5 to 6% source impedance.

### Table B.A
AC Line Filter Model Numbers 1.5 to 150HP @ 230 VAC

<table>
<thead>
<tr>
<th>HP Rating</th>
<th>AC Full Load Amps</th>
<th>Minimum Inductance (in microhenries) (uH)</th>
<th>AC Line Filter Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>10</td>
<td>850</td>
<td>3DF4353</td>
</tr>
<tr>
<td>2</td>
<td>11</td>
<td>770</td>
<td>3DF4354</td>
</tr>
<tr>
<td>3</td>
<td>13</td>
<td>650</td>
<td>3DF4355</td>
</tr>
<tr>
<td>5</td>
<td>19</td>
<td>470</td>
<td></td>
</tr>
<tr>
<td>7.5</td>
<td>26</td>
<td>340</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>33</td>
<td>255</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>48</td>
<td>175</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>63</td>
<td>135</td>
<td>3DF4357</td>
</tr>
<tr>
<td>25</td>
<td>80</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>94</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>125</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>154</td>
<td>55</td>
<td>3DF4359</td>
</tr>
<tr>
<td>60</td>
<td>186</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>226</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>307</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>370</td>
<td>23</td>
<td>Two 3DF4359 filters</td>
</tr>
<tr>
<td>150</td>
<td>443</td>
<td>19</td>
<td>connected in parallel</td>
</tr>
</tbody>
</table>

### Table B.B
AC Line Filter Model Numbers 8.8 – 89.7 kW @ 380VDC
2.1 – 1029 kW @ 415 VAC

<table>
<thead>
<tr>
<th>Amp Rating</th>
<th>HP Rating</th>
<th>AC Full Load Amps</th>
<th>Minimum Inductance (in microhenries) (uH)</th>
<th>AC Line Filter Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>1.8</td>
<td>10</td>
<td></td>
<td>3DF4353</td>
</tr>
<tr>
<td>29</td>
<td>9</td>
<td>26</td>
<td></td>
<td>3DF4354</td>
</tr>
<tr>
<td>55</td>
<td>17.9</td>
<td>48</td>
<td></td>
<td>3DF4355</td>
</tr>
<tr>
<td>110</td>
<td>35.8</td>
<td>94</td>
<td></td>
<td>3DF4357</td>
</tr>
<tr>
<td>265</td>
<td>89.5</td>
<td>226</td>
<td></td>
<td>3DF4358</td>
</tr>
</tbody>
</table>
## Table B.C

**AC Line Filter Model Numbers**  
3 to 300HP @ 460 VAC

<table>
<thead>
<tr>
<th>HP Rating</th>
<th>AC Full Load Amps</th>
<th>Minimum Inductance (in microhenries) (µH)</th>
<th>AC Line Filter Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>10</td>
<td>1680</td>
<td>3DF4353</td>
</tr>
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<td>5</td>
<td>12</td>
<td>1400</td>
<td>3DF4354</td>
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<td>7.5</td>
<td>15</td>
<td>1125</td>
<td>3DF4355</td>
</tr>
<tr>
<td>10</td>
<td>18</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>24</td>
<td>700</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>31</td>
<td>550</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>39</td>
<td>430</td>
<td>3DF4357</td>
</tr>
<tr>
<td>30</td>
<td>45</td>
<td>375</td>
<td>3DF4358</td>
</tr>
<tr>
<td>40</td>
<td>60</td>
<td>270</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>74</td>
<td>225</td>
<td></td>
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<td>60</td>
<td>86</td>
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<td>75</td>
<td>110</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>143</td>
<td>120</td>
<td>3DF4359</td>
</tr>
<tr>
<td>125</td>
<td>177</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>213</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>281</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>351</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>421</td>
<td>40</td>
<td>Two 3DF4359 filters connected in parallel</td>
</tr>
</tbody>
</table>

### Selecting an AC Line Inductor –

**IMPORTANT:** A user supplied AC Line inductor must be installed between the Line filter and the AC power input of the 1397 Drive. The inductor provides the impedance required by the line filter, as shown in Table B.A, B.B or B.C. This inductor also limits the SCR line commutation notch to less than 80% when the Drive is connected to a 5% to 6% impedance source. This meets the requirements of DIN 160 Line Notching.

If the Drive is to be used in an overload condition, an inductor must be chosen that is rated for the resulting average RMS current and that will not saturate during overload.

### Selecting an Operator Control Station –

If an operator control station is connected to the Drive, its enclosure must be conductive metal. The enclosure cover must be bonded to an internal ground point with a braided strap across the hinge. Standard industrial operator devices, such as pushbuttons, switches and meters can be used.
Mounting the Equipment

Mount all electronic and electromagnetic components, including the Drive and the line filter, firmly to the base mounting panel. The mounting panel must have good conductivity, as described in the paragraph Selecting a Mounting Panel and Electrical Cabinet.

Mounting the Drive—If the cabinet includes ventilation louvers or filter and fan openings in the sides or door, the openings cannot be located within a zone 254 mm (10 inches) above and below the height of the Drive as shown in Figure B.1.

Mounting the AC Line Filter—Refer to Figures B.2 and B.3 for filter mounting dimensions. The filter can be mounted either flat, with its back against the panel, or on its side, with either side against the panel. If the 3DF4359 is mounted on its side, it must be mounted on the L bracket (included with the filter). Mount the 3DF4359 in the L bracket first, then mount the L bracket using 12mm screws.
Figure B.2
Filter Dimensions

3DF4353 and 3DF4354 Filter Dimensions

3DF4355 Filter Dimensions
Figure B.2 cont.
Filter Dimensions

3DF4357 Filter Dimensions

3DF4359 Filter Dimensions
Mounting the AC Line Inductor – Note: Many inductors are coated with varnish. Any varnish on the mounting area must be removed to ensure conductivity.

See the manufacturer’s documentation for additional mounting instructions.
Grounding Requirements

Star grounding must be used and must provide traditional product safety grounds, such as high current, low frequency, and high frequency noise control.

System Power Ground — The common power distribution system found in European countries includes the grounded neutral of the WYE transformer, as shown in Figure B.4. This fourth wire provides the system ground for the electrical equipment and a return path for ground current. A ground terminal of adequate size for the expected ground conductor must be provided for this ground wire because it will enter the cabinet combined with the three–phase power leads.

If the power distribution ground lead is not provided, you must provide a fine-braided copper strap conductor of sufficient current capacity to handle system ground fault currents. This strap must be connected from the system ground terminal to the building’s steel works.

Figure B.4
Typical European Power Distribution

Control System Ground — A star ground system must be provided. For convenience, the star ground can be extended by using copper bus bar that is at least 10 times wider than it is thick.

All electronic and electromagnetic equipment on the panel must be connected to the star system. Equipment that must be connected includes the 1397 Drive, the AC line filter, the AC line inductor, the cabinet door, and all non-welded (side and back) panels. To connect the equipment, use fine-wire braided copper strap. The strap should be at least 3.2 mm x 12.7 mm (0.125’ x 0.5’) with 150 strands.

Provide a convenience termination ground for the connection of the shield of shielded signal and power cables. Refer to Figures B.5 and B.6 for proper termination of shielded cables.
When using a conduit termination fitting to terminate the shield or rigid conduit, the area around the entry hold must be free of paint and protected from corrosion.
System ground must be extended to all connected enclosures and components by running a ground conductor with the power and signal conductors to these enclosures and components, as shown in Figure B.7. Follow the electrical cabinet guidelines described in this Appendix for all remote electrical enclosures.

**Figure B.7**
Ground System and Conduit Screen Termination

The minimum cross-sectional area of a copper ground conductor shall be per EN60204-1: Safety of Machinery - Electrical equipment of machines - Part 1: General requirements, section 5.2, Table 1.

The ground conductor must be secured at both ends in a solid connection. Poor termination of a ground connection is the single biggest source of EMC problems. For connections, use fittings intended for solid, long-term connections to a grounded surface, or continue the screen or conduit beyond the cabinet barrier to a ground terminal or copper bar extension. Fittings should be rust resistant. It is preferred to terminate the screen or conductive conduit to a system ground copper bar internal on the back of the panel and not rely on the conduit fitting to maintain the ground circuit. Shielded cable should use a drain wire for the electrical bonding of the shield to the ground system.

**Wiring the Equipment**

Wiring guidelines are provided here for wiring that is external and internal to the electrical cabinet and also for specific components.

**External Wiring Guidelines** – External control, signal, and power wiring must be in shielded cable or rigid continuous conductive conduit.

If the system includes a remote operator station that is connected to the 1397 Drive, the operator station wiring must be in rigid continuous conductive conduit. Shielded cable cannot be used for the operator station.

**NOTE:** Many flexible metal conduit products have not been designed for RF containment and are not adequate to maintain compliance.
**Internal Wiring Guidelines** – All cables and wires must be run as closely to the panel as possible. AC, DC and control wires should be stacked and run as shown in Figure B.8.

**Figure B.8**
**Dressing Power and Control Wires**

When the AC power leads must leave the ground plane of the mounting panel to make connection to elevated device terminals, a ground wire should be run with that wire bundle. Refer to Figures B.10 and B.11 for typical panel electrical layouts.

**Wiring the AC Line Filter** – The line filter is connected in series from the AC supply line to the AC line inductor to the input terminals in the Drive as shown in Figure B.9.

AC power wiring from the electrical cabinet power entry to the line filter must be:

- As short as possible.
- Separated from any other wiring to prevent coupling high frequency noise back to the filtered leads.
- Run as close to the ground plane as possible.
**Wiring the AC Line Inductor** – Install the Line Inductor between the line filter and the AC power input of the 1397 Drive as shown in Figure B.9.

**Wiring the Motor** – Field and armature circuit wiring that is internal to the electrical cabinet must be:

- Separated from all other wiring on the panel
- As close to the ground plane as possible. This is especially important if an inverting fault breaker or dynamic braking circuit is part of the armature circuit.

The external motor wiring must be run in a shielded cable or continuous conductive conduit. The motor shunt field and armature leads can be run together in the same cable. A ground wire must be run that bonds the motor to the system star ground. Refer to Figure B.6 for proper connection of the conduit shield and bonding wire.

Motor cable length is a major contributor to common mode conducted emissions. The 1397 mains filters are sized for up to 75 meters (250 feet) of shielded motor power cables (total installed length). If your installation requires a greater length, contact Allen-Bradley.

**Wiring the Kits** – The Bulletin 1397 has a number of option kits. The kits listed in Table B.D are EMC benign – they have no impact on the EMC compliance of the product if properly installed. See the appropriate kit Instruction Manuals for installation and wiring information.

<table>
<thead>
<tr>
<th>Kit Name</th>
<th>Model Number</th>
</tr>
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<tbody>
<tr>
<td>115 VAC Control Interface</td>
<td>1397 – LII</td>
</tr>
<tr>
<td>460 VAC to 230 VAC Fuse Conversion</td>
<td>1397 – FC</td>
</tr>
<tr>
<td>AC Line Disconnect</td>
<td>1397 – DS</td>
</tr>
<tr>
<td>Blower Motor Starter</td>
<td>1397 – MB</td>
</tr>
<tr>
<td>Enhanced Field Supply</td>
<td>1397 – FS3</td>
</tr>
<tr>
<td>Field Current Regulator</td>
<td>1397 – FS2</td>
</tr>
<tr>
<td>Inverting Fault Circuit Breaker</td>
<td>1397 – IFB</td>
</tr>
</tbody>
</table>

**I/O Expansion Board (Model Number 914FK0101)** – Wiring connected to this board must be run in shielded cable or continuous conductive conduit.
Dynamic Braking Kit – The Standard dynamic braking resistor kits can be installed on the top of the electrical cabinet either in an expanded sheet metal enclosure or solid plate enclosure without impact on compliance. The kit enclosure can be used for the resistors and dynamic braking circuit. The DC motor armature leads to the resistor enclosure are to be dressed close to the mounting panel as shown in Figure B.8.

Encoder Pulse and AC Tachometer Kits – The tachometer cables for these kits must be run as shielded cable or in a continuous conductive conduit. A ground wire must be run with the tachometer wires and terminated to ground at both ends. The shield or conduit must be terminated to ground as discussed above and shown in Figures 2.4 and B.7.
Figure B.10
Typical 1397 Wiring for EMC Compliance
With I/O Expansion Board Installed
Figure B.11
Typical 1397 Wiring Diagram for EMC Compliance with Dynamic Braking Kit installed
End of Appendix
Derating

High Ambient Temperature Conditions

The watts loss values provided in Table C.A is based on 40 degree C ambient and allow a 15 degree rise to 55 degree C (internal). If your application conditions require the enclosure to be mounted in a higher than 40 degree C ambient temperature, use Table C.B to derate the cabinet heat dissipation capacity.

### Table C.A
1397 Three Phase DC Drive
Heat Dissipation (Watts Loss)

<table>
<thead>
<tr>
<th>HP Rating</th>
<th>230V</th>
<th>460V</th>
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<tr>
<td>5</td>
<td>360</td>
<td>403</td>
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<td>7.5</td>
<td>369</td>
<td>409</td>
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<tr>
<td>10</td>
<td>420</td>
<td>424</td>
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<td>15</td>
<td>474</td>
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<td>20</td>
<td>523</td>
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<tr>
<td>25</td>
<td>582</td>
<td>547</td>
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<td>30</td>
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<td>50</td>
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<td>500</td>
<td>4900</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>5500</td>
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</tbody>
</table>

### Table C.B
High Ambient Temperature Derating Factors

<table>
<thead>
<tr>
<th>Ambient Temperature</th>
<th>Correction Factor</th>
</tr>
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<tbody>
<tr>
<td>40°C (104°F)</td>
<td>Cabinet heat capacity x 1</td>
</tr>
<tr>
<td>45°C (113°F)</td>
<td>Cabinet heat capacity x .602</td>
</tr>
<tr>
<td>50°C (122°F)</td>
<td>Cabinet heat capacity x .253</td>
</tr>
<tr>
<td>55°C (131°F)</td>
<td>Use separate ventilation</td>
</tr>
</tbody>
</table>
Altitude is also a factor in enclosure heat dissipation capability. All heat dissipation capacities in Table C.A are based on an altitude of 3300 feet (1000 meter) or less. At higher altitudes, air density, fan efficiency, and heat transfer efficiency are all decreased. Derate the heat dissipation capacity of the enclosure by 3% for each additional 1000 feet above 3300 feet.

An alternative to heat dissipation through radiation and conduction in totally-enclosed cabinets is to cool the cabinet air through air conditioning. Since air conditioners are rated in terms of BTU/HR, controller watts loss must be converted to BTU/HR. This is done by multiplying watts loss by 3.413. Use this value to select an appropriately-sized air conditioner.

If space heaters are required in cold or damp environments when the Drive is not being operated, select space heaters to produce approximately one-half of the heat dissipation capacity of the enclosure.
Using SCANport Capabilities

Chapter Objectives

This appendix provides information for changing the default configuration to customize the way SCANport works for you.

<table>
<thead>
<tr>
<th>This Topic</th>
<th>Starts on page:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding the Logic Status parameter</td>
<td>D1</td>
</tr>
<tr>
<td>Configuring the SCANport controls</td>
<td>D3</td>
</tr>
<tr>
<td>Setting the loss of communications fault</td>
<td>D–5</td>
</tr>
<tr>
<td>Using the SCANport I/O image</td>
<td>D–5</td>
</tr>
</tbody>
</table>

Logic Status Parameter

[Logic Status] (P. 190) on the 1397 Drive provides a record of which functions are currently executing. To use SCANport capabilities effectively, you must understand how [Logic Status] works.

[Logic Status] bits include:

<table>
<thead>
<tr>
<th>BIT:</th>
<th>FUNCTION:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Ready</td>
</tr>
<tr>
<td>1</td>
<td>Running</td>
</tr>
<tr>
<td>2</td>
<td>Command Dir</td>
</tr>
<tr>
<td>3</td>
<td>Actual Dir</td>
</tr>
<tr>
<td>4</td>
<td>Accelerating</td>
</tr>
<tr>
<td>5</td>
<td>Decelerating</td>
</tr>
<tr>
<td>6</td>
<td>Alarm</td>
</tr>
<tr>
<td>7</td>
<td>Fault</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BIT:</th>
<th>FUNCTION:</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>At Speed</td>
</tr>
<tr>
<td>9</td>
<td>Local I.D.</td>
</tr>
<tr>
<td>10</td>
<td>Local I.D.</td>
</tr>
<tr>
<td>11</td>
<td>Local I.D.</td>
</tr>
<tr>
<td>12</td>
<td>Reference I.D.</td>
</tr>
<tr>
<td>13</td>
<td>Reference I.D.</td>
</tr>
<tr>
<td>14</td>
<td>Reference I.D.</td>
</tr>
<tr>
<td>15</td>
<td>Reference I.D.</td>
</tr>
</tbody>
</table>

You cannot change the values shown in the Logic Status parameter by directly accessing the parameter. Instead, the Logic Status parameter receives information from the logic evaluation block (Fig. D.1).

Figure D.1
SCANport Interaction with Logic Status
You can attach any combination of Human Interface Modules (HIMs), Graphic Programming Terminals (GPTs), and/or SCANport gateway communications modules to any of the six SCANports.

You can access ports 1 and 2 directly from the regulator board. To access ports 3, 4, and 5, you need to plug a Port Expander into port 2. Normally, port 1 is connected to a HIM. The terminal block is always present. On the 1397 Drive, there is no direct access to Port 6. However an adapter identified as 6 will still be scanned.

Figure D.2 shows the parameter interactions involved with Logic Status.

**Figure D.2**
Parameter Interactions

<table>
<thead>
<tr>
<th>SCANport 1</th>
<th>SCANport 2</th>
<th>SCANport 3</th>
<th>SCANport 4</th>
<th>SCANport 5</th>
<th>SCANport 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logic Mask (P. 207)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Run Mask (P. 201)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jog Mask (P. 203)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flt/Res Mask (P. 205)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Mask (P. 204)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOP Mask (P. 206)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Mode (P. 208)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direction Mask (P. 202)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SCANport 1</th>
<th>SCANport 2</th>
<th>SCANport 3</th>
<th>SCANport 4</th>
<th>SCANport 5</th>
<th>SCANport 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logic Status (Parameter 190)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 0 - Ready</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 1 - Running</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 2 - Command Dir</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 3 - Actual Dir</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 4 - Accelerating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 5 - Decelerating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 6 - Alarm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 7 - Fault</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 8 - At Speed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 9 - Local ID</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 10 - Local ID</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 11 - Local ID</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 12 - Ref ID</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 13 - Ref ID</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 14 - Ref ID</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bit 15 - Ref ID</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ref ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000 - Ext Ref 1</td>
</tr>
<tr>
<td>0001 - Preset 1</td>
</tr>
<tr>
<td>0010 - Preset 2</td>
</tr>
<tr>
<td>0011 - Preset 3</td>
</tr>
<tr>
<td>0100 - N/A</td>
</tr>
<tr>
<td>0101 - N/A</td>
</tr>
<tr>
<td>0110 - N/A</td>
</tr>
<tr>
<td>0111 - N/A</td>
</tr>
<tr>
<td>1000 - Ext ref 2</td>
</tr>
<tr>
<td>1001 - Port 1 ref</td>
</tr>
<tr>
<td>1010 - Port 2 ref</td>
</tr>
<tr>
<td>1011 - Port 3 ref</td>
</tr>
<tr>
<td>1100 - Port 4 ref</td>
</tr>
<tr>
<td>1101 - Port 5 ref</td>
</tr>
<tr>
<td>1110 - Port 6 ref</td>
</tr>
<tr>
<td>1111 - Int Jog ref</td>
</tr>
</tbody>
</table>
SCANport consists of two parts: control and analog I/O. The SCANport controls are functions that control the motor, such as start, stop, and jog. The control can come from up to six SCANport devices and one Terminal Board simultaneously. The control is based on an ownership mechanism that allows certain functions to have only one owner and other functions to have multiple owners.

Ownership is determined when a SCANport device commands a function. As long as that function is commanded, that device is the owner of that function.

For Example: If device 1 is commanding a forward direction, which is a one owner function, no other device can change the direction until device 1 stops commanding the forward direction. If device 1 is commanding a start, which is a multiple owner function, other devices can also command a start. If device 1 stops commanding the start, the Drive does not stop running if another device is still commanding the start.

A rising edge is required for start and jog functions. If a jog or start is still commanded after the Drive is stopped, start and jog functions will not operate from any device until the jog or start commands are removed.

Start commands from SCANport devices are 3 - wire (maintained) latched.

**Determining Function Ownership** – To determine which device is issuing a specific command, use parameters 214 through 221.

<table>
<thead>
<tr>
<th>File: Program/Display Group: Owners</th>
<th>To determine which device is issuing this command:</th>
<th>Check this Parameter:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop Owner</td>
<td>Stop</td>
<td>214</td>
</tr>
<tr>
<td>Direction Owner</td>
<td>Direction Owner</td>
<td>216</td>
</tr>
<tr>
<td>Run Owner</td>
<td>Run</td>
<td>215</td>
</tr>
<tr>
<td>Jog Owner</td>
<td>Jog</td>
<td>217</td>
</tr>
<tr>
<td>Reference Owner</td>
<td>Speed reference</td>
<td>218</td>
</tr>
<tr>
<td>Flt Reset Owner</td>
<td>Clear Fault</td>
<td>219</td>
</tr>
<tr>
<td>MOP Owner</td>
<td>MOP</td>
<td>220</td>
</tr>
<tr>
<td>Local Owner</td>
<td>Local</td>
<td>221</td>
</tr>
</tbody>
</table>

For each of these parameters, each bit represents a device as detailed in the following table:
Using SCANport Capabilities

If this bit is set: The owner is:

<table>
<thead>
<tr>
<th>Bit</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Terminal Block</td>
</tr>
<tr>
<td>1</td>
<td>SCANport device 1</td>
</tr>
<tr>
<td>2</td>
<td>SCANport device 2</td>
</tr>
<tr>
<td>3</td>
<td>SCANport device 3</td>
</tr>
<tr>
<td>4</td>
<td>SCANport device 4</td>
</tr>
<tr>
<td>5</td>
<td>SCANport device 5</td>
</tr>
<tr>
<td>6</td>
<td>SCANport device 6</td>
</tr>
</tbody>
</table>

NOTE: Bit 7 is not used in this application.

NOTE: The SCANport device number is determined by the SCANport connection it is plugged into.

Masking Control Functions – Control functions can be masked. This allows you to enable or disable a control function for all or some of the devices.

IMPORTANT: The Stop command CANNOT be masked. Any device attached to the 1397 Drive can stop the Drive at any time.

To set a mask for a control function, you can use the parameters detailed in the following table:

<table>
<thead>
<tr>
<th>File: Program/Display Group: Masks</th>
<th>To set a mask to control this function:</th>
<th>Check this Parameter:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logic Mask</td>
<td>Control which ports can accept the control functions</td>
<td>207</td>
</tr>
<tr>
<td>Direction Mask</td>
<td>Issue forward/reverse commands</td>
<td>202</td>
</tr>
<tr>
<td>Run Mask</td>
<td>Issue a Run command</td>
<td>201</td>
</tr>
<tr>
<td>Jog Mask</td>
<td>Issue a Jog command</td>
<td>203</td>
</tr>
<tr>
<td>Reference Mask</td>
<td>Select an alternate reference or preset speed</td>
<td>204</td>
</tr>
<tr>
<td>Flt Reset Mask</td>
<td>Generate a clear fault command</td>
<td>205</td>
</tr>
<tr>
<td>MOP Mask</td>
<td>Which adapters can issue MOP commands</td>
<td>206</td>
</tr>
<tr>
<td>Local Mask</td>
<td>Which adapters can take exclusive “local control”</td>
<td>208</td>
</tr>
</tbody>
</table>

For each of these parameters, each bit represents a device:

<table>
<thead>
<tr>
<th>This bit (for low):</th>
<th>Represents:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Terminal Block</td>
</tr>
<tr>
<td>1</td>
<td>SCANport device 1</td>
</tr>
<tr>
<td>2</td>
<td>SCANport device 2</td>
</tr>
<tr>
<td>3</td>
<td>SCANport device 3</td>
</tr>
<tr>
<td>4</td>
<td>SCANport device 4</td>
</tr>
<tr>
<td>5</td>
<td>SCANport device 5</td>
</tr>
<tr>
<td>6</td>
<td>SCANport device 6</td>
</tr>
</tbody>
</table>

NOTE: Bit 7 is not used in this application.

NOTE: The SCANport device number is determined by the SCANport connection it is plugged into.

If a bit is clear (0) for a mask parameter, the control function is disabled. If a bit is set (1), the control function is enabled.
Setting the Loss of Communications Fault

You can specify how you want to be notified if SCANport loses the connection to a port.

<table>
<thead>
<tr>
<th>If you want a communications loss to be:</th>
<th>Then:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reported as a fault</td>
<td>Set appropriate bit in LogicMask (p. 207) corresponding to the SCANport device number or set Control Logic to enabled.</td>
</tr>
<tr>
<td>Ignored</td>
<td>Clear appropriate bit in Logic Mask (p. 207) corresponding to the SCANport device number, or set Control Logic disabled.</td>
</tr>
</tbody>
</table>

The following table specifies which bit represents a device:

<table>
<thead>
<tr>
<th>To specify this device:</th>
<th>Set this bit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCANport device 1</td>
<td>1</td>
</tr>
<tr>
<td>SCANport device 2</td>
<td>2</td>
</tr>
<tr>
<td>SCANport device 3</td>
<td>3</td>
</tr>
<tr>
<td>SCANport device 4</td>
<td>4</td>
</tr>
<tr>
<td>SCANport device 5</td>
<td>5</td>
</tr>
<tr>
<td>SCANport device 6</td>
<td>6</td>
</tr>
</tbody>
</table>

For Example: If you want a fault condition reported when communication is lost with device 3, you need to set bit 3 of Logic Mask.

NOTE: When a device is configured to NOT cause a fault upon disconnection, this device cannot control any functions in the Drive.

Using the SCANport I/O Image

The SCANport I/O image provides the interface between the SCANport devices and the Drive. The SCANport I/O image is used to transfer realtime data in the same way as the PLC image is used. The devices on SCANport allocate the SCANport I/O image so multiple devices can use different sections of the image.

To view the values in the I/O image table, use parameters 226 through 233 for input and 234 through 241 for output.
Within the 1397 Drive, the I/O image table resembles the following:

<table>
<thead>
<tr>
<th>Logic Command</th>
<th>Logic Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit 0 Stop</td>
<td>Bit 0 Ready</td>
</tr>
<tr>
<td>Bit 1 Run</td>
<td>Bit 1 Running</td>
</tr>
<tr>
<td>Bit 2 Jog</td>
<td>Bit 2 Command Dir</td>
</tr>
<tr>
<td>Bit 3 Clear Fault</td>
<td>Bit 3 Rotating Dir</td>
</tr>
<tr>
<td>Bit 4 Forward</td>
<td>Bit 4 Accelerating</td>
</tr>
<tr>
<td>Bit 5 Reverse</td>
<td>Bit 5 Decelerating</td>
</tr>
<tr>
<td>Bit 6 Local</td>
<td>Bit 6 Warning</td>
</tr>
<tr>
<td>Bit 7 MOP Increment</td>
<td>Bit 7 Faulted</td>
</tr>
<tr>
<td>Bit 8 N A</td>
<td>Bit 8 At Set Speed</td>
</tr>
<tr>
<td>Bit 9 N A</td>
<td>Bit 9 Local ID</td>
</tr>
<tr>
<td>Bit 10 N A</td>
<td>Bit 10 Local ID</td>
</tr>
<tr>
<td>Bit 11 N A</td>
<td>Bit 11 Local ID</td>
</tr>
<tr>
<td>Bit 12 Ref Select</td>
<td>Bit 12 Ref ID</td>
</tr>
<tr>
<td>Bit 13 Ref Select</td>
<td>Bit 13 Ref ID</td>
</tr>
<tr>
<td>Bit 14 Ref Select</td>
<td>Bit 14 Ref ID</td>
</tr>
<tr>
<td>Bit 15 MOP Decrement</td>
<td>Bit 15 Ref ID</td>
</tr>
</tbody>
</table>

000 – No Command
001 – Ref 1 (Selectable)
010 – Ref 2 (Selectable)
011 – Ref 3 (Preset 1)
100 – Ref 4 (Preset 2)
101 – Ref 5 (Preset 3)
110 – N/A
111 – N/A

The following examples are provided to show how the 1397 Drive interfaces with some of the available adapters. These are only examples. You should also refer to the appropriate manual for your gateway for additional information.
**SLC to SCANport Module:**
The following figure shows how the I/O image table for the SLC programmable controller relates to the 1397 Drive. In this example, the Drive is connected to channel 1 of the SLC module in enhanced mode. If this were an example of basic mode, only the O:1.2, O:1.3, I:1.2, and I:1.3 entries would be used.

---

**Legend:**
- Available only in enhanced mode.
- Optionally enabled via G file in SLC processor.
DeviceNet Communications Module:
The following figure shows how the I/O image table for a DeviceNet scanner relates to the 1397 Drive when a DeviceNet Communications Module is used.

(Optionally enabled using DIP switches on the module)
Serial Communications Module:
The following figure shows how the I/O image table for the programmable controller relates to the 1397 Drive when a Serial Communications Module is used.

Optionally enabled using DIP switches on the adapter.
**Remote I/O Communications Module:**
The following figure shows how the I/O image table for the programmable controller relates to the 1397 Drive when a Remote I/O Communications Module is used.

---

**Flex I/O Module:**
The following figure shows how the I/O image table for the programmable controller relates to the 1397 Drive when a Flex I/O Module is used.

---

(1) Optionally enabled using DIP switches on the module.
### Supported SCANport Messages:
The 1397 Drive supports the following SCANport messages. The formats and methods to use these messages vary depending on the type of gateway used. Not all gateways support messaging or all message types. Consult your gateway manual(s) or application notes when determining the level for any gateway.

<table>
<thead>
<tr>
<th>This Message:</th>
<th>Lets you:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scattered Parameter Value Read</td>
<td>Read a scattered list of parameters</td>
</tr>
<tr>
<td>Scattered Parameter Value Write</td>
<td>Write to a scattered list of parameters and return the status of each parameter.</td>
</tr>
<tr>
<td>Read Product Number</td>
<td>Request the product number from a device</td>
</tr>
<tr>
<td>Product Text String Read</td>
<td>Request the product text from a device</td>
</tr>
<tr>
<td>Last Parameter Number Read</td>
<td>Request the last parameter number</td>
</tr>
<tr>
<td>EE Command Write</td>
<td>Activate the specified EE function</td>
</tr>
<tr>
<td>Read Full Parameter</td>
<td>Request all known attributes for the requested parameters</td>
</tr>
<tr>
<td>Parameter Value Read</td>
<td>Request the value for a specific parameter</td>
</tr>
<tr>
<td>Parameter Value Write</td>
<td>Write a value to a specific parameter</td>
</tr>
<tr>
<td>Fault Command Write</td>
<td>Clear faults, clear the fault queue, and reset</td>
</tr>
<tr>
<td>Fault Queue Size</td>
<td>Read the number of fault entries allowed in the fault fault queue</td>
</tr>
<tr>
<td>Trip Fault Read</td>
<td>Request which fault queue entry caused the drive to trip</td>
</tr>
<tr>
<td>Fault Queue Entry Read Full</td>
<td>Read the contents of the specified fault queue entry</td>
</tr>
<tr>
<td>Warning Command Write</td>
<td>Clear faults and clear the warning queue</td>
</tr>
<tr>
<td>Warning Queue Size</td>
<td>Read the number of fault entries allowed in the warning queue</td>
</tr>
<tr>
<td>Warning Queue Entry Read Full</td>
<td>Read the contents of the specified warning queue entry</td>
</tr>
</tbody>
</table>
LOGIC STATUS FORMAT

<table>
<thead>
<tr>
<th>Bit 15</th>
<th>Bit 14</th>
<th>Bit 13</th>
<th>Bit 12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Reference ID</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Reference Device</td>
</tr>
<tr>
<td>Ref 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Preset 1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Preset 2</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Preset 3</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Not Used</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Not Used</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Not Used</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Not Used</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Ref 2</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Adapter 1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Adapter 2</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Adapter 3</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
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<td>Adapter 4</td>
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Publication 1397-5.0 — June, 2001
User Parameter Values

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Lifting Instructions

Introduction

This publication will guide you through the steps needed to properly lift and mount the following Drives on a vertical surface:

- 1397 DC Drives (60-600 HP)

ATTENTION: To guard against possible personal injury or equipment damage . . .

- Do Not allow any part of the Drive or lifting mechanism to make contact with electrically charged conductors or components.
- At no time should a person or their limbs be directly underneath the items being lifted.
- Do not subject the load to high rates of acceleration or deceleration.
- Inspect all lifting hardware for proper attachment before lifting Drive unit.

Lifting Component Ratings

All lifting equipment and lifting components (Hooks, bolts, lifts, slings, chains etc.) must have a minimum lifting capacity of 1,000 lb.

Drive Mounting

Perform the following steps to mount the Drive.

NOTE: Horizontal mounting is NOT permitted.

1. Check the hole pattern on the panel to which the Drive will be mounted. Refer to Figure 2 thru 5 for the correct pattern.

2. Insert, but DO NOT fully tighten three bolts in the top holes of the panel. Bolts must be fully threaded into the panel before hanging the Drive as shown in Figure 1.

Figure E.1
Mounting Bolt Engagement

3/4" Max Projection
One Full Thread Engagement
Beyond Panel Required
Figure E.4
Mounting Hole Pattern 300 HP Drives

Figure E.5
Mounting Hole Pattern 600 HP Drives
3. Insert properly sized and rated lifting hooks into the top two 1” holes of the Drive chassis (Figure E6). To limit pull in forces on the Drive, the lifting devices connected to the hooks must be long enough to make the angle between the chain and a vertical line extending up from the cabinet edge less than 45 degrees as illustrated in Figure E6.

NOTE: 60 HP and smaller Drives do not have lift holes in the top of the Drive chassis. If using hooks or lift eyes with these units, place them in the handholds on the side of the cabinet.

4. Lift Drive into place over the top (3) bolts. Verify that the bolt heads on the panel engage properly into the keyhole slots on the Drive.

5. Once the top bolts are properly seated, the bottom bolts can be installed and tightened.

6. Tighten all bolts to a torque of 22.6 N-m (200 lb.-in.).
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