Allen-Bradley

1336 FORCE ™ Adjustable Frequency AC Drive

User Manual

0.75 – 485 kW (1 – 650 HP)

Standard Adapter 5.01

PLC Communications Adapter 5.01

Important User Information

Because of the variety of uses for the product described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley Company does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1 *Safety Guidelines for the Application, Installation, and Maintenance of Solid-State Control* (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and eletromechanical devices that should be taken into consideration when applying products such as those described in this publication.

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

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

Attentions help you:

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

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

1336 FORCE AC Drive User Manual

This document provides new and updated material for the 1336 FORCE Adjustable Frequency AC Drive User Manual, publication 1336 FORCE-5.12, dated September, 1998. **Please place this document with your manual for future reference.**

HIM Upload/Download Errors

The following information describes the possible errors that can be encountered during a HIM Upload/Download procedure.

HIM Upload/Download Errors

Fault Name	Error Displayed	Probable Cause	Action
HIM -> Drive	ERROR 1	The HIM calculated a checksum for the file to be downloaded, then checked the EEPROM checksum of the download. The checksums did not match, indicating the file stored in the HIM is invalid and the download was not successful.	Upload a valid, uncorrupted file from the source drive and then repeat the download.
	ERROR 2	The number of parameters in the HIM file is different than the number of parameters in the drive file. The smaller of the two numbers is the number of parameters downloaded. The last downloaded parameter number is displayed.	Verify that the correct file is being downloaded to the correct drive, then press the Enter key. Manually reprogram parameters with numbers higher than the last number downloaded or whose values were incorrect.
	ERROR 3	The file in the HIM is for a different type of drive than the drive to which it is connected (i.e. 1336 FORCE file to 1336 IMPACT drive). Downloads can only occur between like drive types.	None - Download not allowed.
	ERROR 4	The value just transferred to the drive is an illegal value (out of range, too high or too low) for the parameter.	Record the parameter number displayed and then press Enter to continue the download. Manually reprogram all recorded parameters after the download is complete.
	ERROR 5	The download was attempted while the drive was running.	Stop the drive and repeat the download attempt.
	ERROR 6	The file in the HIM is for a different HP or voltage drive than the drive to which it is connected (i.e. 1336 FORCE 10 HP file to 1336 FORCE 15 HP drive).	If the download is desired, press the Enter key. If not desired, press the ESCape key to end the download
Drive -> HIM	ERROR 1	The HIM calculated a checksum as the file was uploaded and compared it to the HIM file checksum stored after the upload. The checksums did not match, indicating the upload was not successful and the HIM file is now corrupted.	Repeat the Upload.

Motor Control Board (v6.xx)

The following changes should be noted if a v6.xx Motor Control Board is being used.

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The table has been updated to include v6.xx of the Motor Control Board.

Software Compatibility

MOTOR CONTROL BOARD

PLC COMM ADAPTER BOARD

	v1.xx	v2.xx	v3.xx	v5.xx/v6.xx
v1.xx	Compatible	Not Compatible	Not Compatible	Not Compatible
v2.xx	Not Compatible	Compatible	Compatible with exception: ✘ Drive Comm #9–19 non–linkable. ✘ Drive Comm Tx/Rx #14–19 max value 219. ✘ Torque Stop Configuration #58 not available. ✘ Service Factor #94 not available. ✘ Feedback Device Type #150 mode 7 not available. ✘ Calculated Torque #267 not available.	Compatible with exception: ✘ Drive Comm #9–19 non–linkable. ✘ Drive Comm Tx/Rx #14–19 max value 219. ✘ Torque Stop Configuration #58 not available. ✘ Service Factor #94 not available. ✘ Feedback Device Type #150 mode 7 not available. ✘ Calculated Torque #267 not available. ✘ Precharge Timeout #225 min value 0. ✘ Perunit Motor Voltage #186 not available. ✘ Transistor Diagnostics #257 bit 12 not available. ✘ Iq Rate Limit #181 max value 30%. ✘ Motor Overload Select #92 min value 150%. ✘ Motor Poles #233 max value 12. ✘ Base Motor Speed #229 max value 6000.
v3.xx	Not Compatible	Compatible with exception: ✘ Torque Stop Configuration #58 non–functional. ✘ Service Factor #94 non–functional. ✘ Feedback Device Type #150 mode 7 non–functional. ✘ Calculated Torque #267 non–functional.	Compatible with exception: ✘ V3.04 VP must be used with V3.03 AP and V3.03 Language or higher for B800 'H Frame' drive support.	Compatible with exception: ✘ V3.04 VP must be used with V3.03 AP and V3.03 Language or higher for B800 'H Frame' drive support. ✘ Perunit Motor Current #185 not available. ✘ Perunit Motor Current #186 not available. ✘ Transistor Diagnostics #257 bit 12 not available. ✘ Iq Rate Limit #181 max value 30% ✘ Motor Overload Select #92 min value 150%. ✘ Motor Poles #233 max value 12. ✘ Base Motor Speed #229 max value 6000.
v5.xx	Not Compatible	Compatible with exception: ✘ Torque Stop Configuration #58 non–functional. ✘ Service Factor #94 non–functional. ✘ Feedback Device Type #150 mode 7 non–functional. ✘ Calculated Torque #267 non–functional. ✘ Perunit Motor Current #185 non–functional. ✘ Perunit Motor Voltage #186 non–functional. ✘ Transistor Diagnostics #257 bit 12 non–functional.	Compatible with exception: ✘ V3.04 VP must be used with V3.03 AP and V3.03 Language or higher for B800 'H Frame' drive support. ✘ Perunit Motor Current #185 non–functional. ✘ Perunit Motor Voltage #186 non–functional. ✘ Transistor Diagnostics #257 bit 12 non–functional.	Compatible

Key:
VP = Velocity Processor
MCC = Main Control Board Language Module
APL = PLC Comm Language Module
AP = Application Processor on PLC Comm
CP = Current Processor
DP = Domino Processor on PLC Comm
SAL = Std. Adapter Language Module
SA = Std Adapter Processor

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The table has been updated to include v6.xx of the Motor Control Board. A note was added to v5.xx of the Standard Adapter Board.

MOTOR CONTROL BOARD

STANDARD ADAPTER BOARD	v1.xx	v2.xx	v3.xx	v5.xx/6.xx
v1.xx	Not Compatible	Compatible	Compatible with exception: ✘ Drive Comm #9–19 non–linkable. ✘ Drive Comm Tx/Rx #14–19 max value 219. ✘ Torque Stop Configuration #58 not available. ✘ Service Factor #94 not available. ✘ Feedback Device Type #150 mode 7 not available. ✘ Calculated Torque #267 not available. ✘ Precharge Timeout #225 min value 0	Compatible with exception: ✘ Drive Comm #9–19 non–linkable. ✘ Drive Comm Tx/Rx #14–19 max value 219. ✘ Torque Stop Configuration #58 not available. ✘ Service Factor #94 not available. ✘ Feedback Device Type #150 mode 7 not available. ✘ Calculated Torque #267 not available. ✘ Precharge Timeout #225 min value 0. ✘ Perunit Motor Current #185 not available. ✘ Perunit Motor Voltage #186 not available. ✘ Transistor Diagnostics #257 bit 12 not available. ✘ Iq Rate Limit #181 max value 30%. ✘ Motor Overload Select #92 min value 150%. ✘ Motor Poles #233 max value 12. ✘ Base Motor Speed #229 max val 6000.
v3.xx	Not Compatible	Compatible with exception: ✘ Torque Stop Configuration #58 non–functional. ✘ Service Factor #94 non–functional. ✘ Feedback Device Type #150 mode 7 non–functional. ✘ Calculated Torque #267 non–functional.	Compatible	Compatible with exception: ✘ V3.04 VP must be used with V3.03 AP and V3.03 Language or higher for B800 'H Frame' drive support. ✘ Perunit Motor Current #185 not available. ✘ Perunit Motor Voltage #186 not available. ✘ Transistor Diagnostics #257 bit 12 not available. ✘ Iq Rate Limit #181 max value 30% ✘ Motor Overload Select #92 min value 150%. ✘ Motor Poles #233 max value 12. ✘ Base Motor Speed #229 max val 6000.
v4.xx	Not Compatible	Compatible with exception: ✘ Torque Stop Configuration #58 non–functional. ✘ Service Factor #94 non–functional. ✘ Feedback Device Type #150 mode 7 non–functional. ✘ Calculated Torque #267 non–functional.	Compatible with exception: ✘ V3.04 VP must be used with V4.02 SA and V4.02 Language or higher for B800 'H Frame' drive support.	Compatible with exception: ✘ V5.xx VP must be used with V4.02 AP and V4.02 Language or higher for B800 'H Frame' drive support. ✘ Perunit Motor Current #185 not available. ✘ Perunit Motor Voltage #186 not available. ✘ Transistor Diagnostics #257 bit 12 not available. ✘ Iq Rate Limit #181 max value 30% ✘ Motor Overload Select #92 min value 150%. ✘ Motor Poles #233 max value 12. ✘ Base Motor Speed #229 max valu 6000.
v5.xx	Not Compatible	Compatible with exception: ✘ Torque Stop Configuration #58 non–functional. ✘ Service Factor #94 non–functional. ✘ Feedback Device Type #150 mode 7 non–functional. ✘ Calculated Torque #267 non–functi. ✘ Perunit Motor Curr #185 non–funct. ✘ Perunit Motor Volt #186 non–funct. ✘ Transistor Diag. #257 bit 12 non–funct.	Compatible with exception: ✘ V3.04 VP MUST be used with V3.03 AP and V3.03 Language or higher for B800 'H Frame' drive support. ✘ Calculated Torque #267 non–functi. ✘ Perunit Motor Curr #185 non–funct. ✘ Perunit Motor Volt #186 non–funct. ✘ Transistor Diag. #257 bit 12 non–funct.	v5.xx - Compatible. v6.xx - Drive to drive communications only compatible at 125k baud, Not Compatible at 250k or 500k.

Pages 3–20 through 3–24

GPT information does not apply.

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Important note added to “Drive Link Baud Rate” description.

Drive Link Baud Rate
[D2D Baud Rate]

This word parameter specifies the baud rate used on the drive-to-drive link (CAN) communication interface as follows:
00H = 125K baud
01H = 250K baud
02H = 500K baud

Important: If a v6.xx drive is added to the drive link that has v5.xx or less, it will only operate at 125k baud. If all drives on the drive link are v6.xx, it can operate at 250k and 500k baud.

Parameter Number	**10**
Parameter Type	Sink
Display Units	Kbaud
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	2

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Summary of Changes

Summary of Manual Changes

The 5.01 release of the 1336 FORCE 5.12 User Manual contains some new and updated information. The new and updated information is summarized in the table below. For further information, refer to the page numbers provided.

Description of New or Updated Information	Page	Type
H frame dimensions added	2-7	New
Line fuse ratings updated	2-7	Clarification
Motor Cable requirements added	2-16	New
H frame terminal block added	2-22	New
Figure 2–17 upgraded	2-29	Clarification
H Frame Terminal Block Location added	2-34	New
Frame D ControlNet connection info added	2-43	New
ControlNet Parameter Table added	5-24	New
Parameter 71 updated	5-35	Clarification
Parameter 92 updated	5-39	Clarification
Parameter 185 added	5-51	New
Parameter 186 added	5-52	New
Parameter 223 updated	5-53	Clarification
Parameter 224 updated	5-53	Clarification
Parameter 229 updated	5-54	Clarification
Parameter 233 updated	5-54	Clarification
Parameter 257 updated	5-57	Clarification
Parameter 258 updated	5-57	Clarification
Parameter 259 updated	5-57	Clarification
Parameter 294 updated	5-62	Clarification
Parameter 385 updated	5-76	Clarification
Understanding Precharge and Ridethru Faults	6–9	New
Understanding the Bus Voltage Tracker	6–15	New
Power structure and transistor Diag tests	6–20	New
Sequential Torque Block Tuning	6–24	New
H Frame Motor cable restrictions added	A-4	New
B/C 700 & B/C 800 Derating Guidelines added	A–15	New
700 – 800 HP Schematic added	A–25	New
Software Block Diagram updated	A–32	Clarification
Torque Block Firmware Diagram updated	A–45	Clarification
Lithium Battery Disposal information added	A–54	New
CE mechanical configuration diagram added	B–5, B–6, B–7	New
Spare Part Appendix added	D-1	New

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Chapter 2

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CE Conformity

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User Parameter Values

Appendix C

Spare Parts Information

Appendix D

Chapter 1

Introduction

Manual Objectives

The purpose of this manual is to provide the user with the necessary information to install, program, start up and maintain the 1336 FORCE Digital AC Drive. This manual should be read in its entirety before operating, servicing or initializing the 1336 FORCE Drive.

Who Should Use This Manual

This manual is intended for qualified service personnel responsible for setting up and servicing the 1336 FORCE AC Drive. You must have previous experience with and a basic understanding of electrical terminology, programming procedures, required equipment and safety precautions before attempting any service on the 1336 FORCE Drive.

ATTENTION: Only personnel familiar with the 1336 FORCE Drive and the associated machinery should plan or implement the installation, start–up, and subsequent maintenance of the Drive. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION: An incorrectly applied or installed 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.

Terminology

Detailed definitions of industrial automation and technical terms used throughout this manual may be found in the **INDUSTRIAL AUTOMATION GLOSSARY – a guide to Allen–Bradley technical terms,** Publication AG–7.1.

Standard Drive Features

The Bulletin1336 FORCE Field Oriented AC Drive is a microprocessor controlled Digital AC Drive with the following features:

- 1 to 650 HP at 0 – 250 HZ constant torque
- Four Quadrant operation available
- High Performance Digital Velocity Loop
- Microprocessor controlled, field oriented current loop
- Simplified programming through the use of a Parameter Table that features data entries in engineering units with English descriptions
- Nonvolatile Parameter Storage
- Extensive diagnostics, including both logic board and power structure tests
- Time stamped nonvolatile Fault/Warning Queue
- Real Time Clock
- Reference Time Stamp
- Run Time Accumulator
- Enclosed Construction
- Multiple Communication Interfaces
- Complete Encoder Interface
- Drive to Drive Link
- SCANport^{TM} Peripheral Interface

Performance Specifications

- Speed Regulation to 0.001% of top speed.
- Torque Regulation to ± 5% of rated motor torque.
- Power Loss Ride–Thru capability of two seconds.
- Flying Start: Capability of starting into a spinning motor.
- Torque Linearity 1%
- Overload Capability: 150% for 1 minute, 200% of motor rating for 10 seconds, up to inverter limit.
- Programmable Accel/Decel rates from 0 to 6553 seconds
- Current limit programmable from 200% of rated output current.

Control Specifications

- Indirect Self–Organized, Field–Oriented Control, Current–regulated, sine coded PWM with programmable carrier frequency.

HP	Drive Rating	Carrier Frequency
1–3 HP	4 kHz	1–12 kHz
7.5–30 HP	4 kHz	1–12 kHz
40–60 HP	4 kHz	1–12 kHz
75–125 HP	2 kHz	1–6 kHz
150–250	2 kHz	1–6 kHz
300–500	2 kHz	1–4 kHz
600–650	1.5 kHz	1–4 kHz
700–800	1 kHz	1–4 kHz

Refer to Derating Guidelines in the Appendix of this manual

- Output Voltage Range – 0 to rated voltage
- Output Frequency Range – 0 to 250 Hz.
- Speed Regulation with Encoder Feedback – 0.001% of Top Speed over a 100.1 Speed Range.

- Encoderless Speed Regulation – 1% of Top Speed over a 40:1 Speed Range.
- Accel/Decel – Independently programmable accel and decel times. Program from 0 to 6553 seconds in 0.1 second increments.
- Current Limit – Independent Motoring and Regenerative Limit
- Inverse Time Overload Capability – Class 20 protection with speed–sensitive response. Adjustable from 0–200% of rated output current in 3 speed ranges – 2:1, 4:1 & 10:1. UL Certified – Meets NEC Article 430.

Options

- Standard Adapter Board which provides:
  – 2 Analog Inputs +/–10V
  – 2 Analog Outputs +/– 10V
  – One 4–20mA input
  – One 4–20mA output
  – 5 or 12 vdc pulse input
  – +/– 10V reference voltages
  – At Speed, Run, Fault and Alarm contacts
- PLC Communication Adapter Board which provides:
  – 4 Analog Inputs +/–10V
  – 4 Analog Outputs +/– 10V
  – +/– 10V Reference voltages
  – RIO/DH™+ Communications (2 channels selectable)
  – Function Blocks
- DriveTools™; PC Windows ™ based programming software compatible with the 1336 FORCE Drive and also other Allen–Bradley 1336 and 1395 products.
- Dynamic Braking
- AC Motor Contactor

Protective Features

The 1336 FORCE Drive incorporates the following protective measures:

- Programmable Motor Overload Protection (I^2T) investigated by UL to comply with NEC Article 430.
- Programmable Inverter Overload Protection (IT)
- Overspeed Detection, even when operating as a torque follower.
- Programmable Stall Detection
- Peak output current monitoring to protect against excessive current at the output due to a phase to ground or phase to phase short.
- Ground fault monitoring
- DC Bus Voltage monitoring to protect against under/over voltage conditions.
- Power Structure Heatsink Temperature Monitoring

Environmental Specifications

The following environmental guidelines apply to both the 1336 FORCE Drive and all devices and accessories connected to the Drive.

- Ambient Operating Temperature:
  IP00, Open: 0 to 50 degrees C (32 to 122 degrees F).
  IP20, NEMA Type 1 Enclosed:
  0 to 40 degrees C (32 to 104 degrees F).
  IP65, NEMA Type 4 Enclosed:
  0 to 40 degrees C (32 to 104 degrees F).
- Storage Temperature (all constructions):
  –40 to 70 degrees C (–40 to 158 degrees F).
- Relative Humidity: 5 – 95% non–condensing
- Altitude: 1000m (3300 ft) without derating.
- Shock: 15g peak for 11ms duration (+ 1.0 ms).
- Vibration: 0.006 inches (0.152 mm) displacement. 1G peak.

Electrical Specifications

- Input Voltage Rating:
  200 – 240VAC, Standalone, 3 Phase, +10%, –15% nominal
  380 – 480VAC, Standalone, 3 Phase, +10%, –15% nominal
  500 – 600VAC Standalone, 3 Phase, +10%, –15% nominal
  513 – 621 VDC, Common Bus, +10%, –15% nominal
  776 VDC, Common Bus, +10%, –15% nominal
- Input Power Rating:
  2 – 134 KVA (230V)
  2 – 437 KVA (380V)
  2 – 555 KVA (460V)
  2/3 – 578/694 KVA (500/600V)
- Input Frequency: 50/60HZ (±3HZ)
- Standard Output Voltage*: Four frame sizes are available. Each frame size is line dependent and can power a motor between the following voltages:
  200 – 240 Vac (line dependent)
  380 – 480 Vac (line dependent)
  500 – 600 Vac (line dependent)
  *If voltage required for your application is not shown, contact Allen–Bradley for specific application.
- Output Current: 2.5 – 673A
- Output Power: 2 – 116 KVA (230V)
  2 – 190 KVA (380V)
  2 – 208 KVA (415V)
  2 – 537 KVA (460V)
  2 – 671 KVA (575V)
  Note: For information on factors that could effect the power output of the drive please refer to the Enclosure and Derating Guidelines in the Appendix of this manual.
- Output Horsepower (Continuous): 7.5 – 650HP
- Overload Capability:
  Continuous – 100% Fundamental current
  1 minute – 150%

- Output Frequency Range: 0 – 250 HZ
- Output Waveform: Sinusoidal (PWM)
- Max. Short Circuit Current Rating : 200,000A rms symmetrical, 600 volts (when used with specified AC input line fuses as detailed in Table 2.A).
- Ride Through: 2 seconds minimum
- Efficiency: 97.5% at rated amps, nominal line volts

Feedback Devices

- Encoder: Incremental, dual channel; 12 volts, 500mA, Supply, 5/12 Volt 10ma Min Inputs, isolated with differential transmitter, 102.5 KHz max.
  Quadrature: 90° ±27° @ 25°C, Duty Cycle: 50% + 10%.
- Speed Regulation with Encoder Feedback: 0.001% of Top Speed over a 100:1 Speed Range.
  Encoderless Speed Regulation: 0.5% of Top Speed over a 40:1 Speed Range.

Software Compatibility

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PLC COMM ADAPTER BOARD

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v3.xx	Not Compatible	Compatible with exception: ✘ Torque Stop Configuration #58 non–functional. ✘ Service Factor #94 non–functional. ✘ Feedback Device Type #150 mode 7 non–functional. ✘ Calculated Torque #267 non–functional.	Compatible	Compatible with exception: ✘ V3.04 VP must be used with V3.03 AP and V3.03 Language or higher for B800 ‘H Frame’ drive support. ✘ Perunit Motor Current #185 not available. ✘ Perunit Motor Voltage #186 not available. ✘ Transistor Diagnostics #257 bit 12 not available. ✘ Iq Rate Limit #181 max value 30% ✘ Motor Overload Select #92 min value 150%. ✘ Motor Poles #233 max value 12. ✘ Base Motor Speed #229 max val 6000.
v4.xx	Not Compatible	Compatible with exception: ✘ Torque Stop Configuration #58 non–functional. ✘ Service Factor #94 non–functional. ✘ Feedback Device Type #150 mode 7 non–functional. ✘ Calculated Torque #267 non–functional.	Compatible with exception: ✘ V3.04 VP must be used with V4.02 SA and V4.02 Language or higher for B800 ‘H Frame’ drive support.	Compatible with exception: ✘ V5.xx VP must be used with V4.02 AP and V4.02 Language or higher for B800 ‘H Frame’ drive support. ✘ Perunit Motor Current #185 not available. ✘ Perunit Motor Voltage #186 not available. ✘ Transistor Diagnostics #257 bit 12 not available. ✘ Iq Rate Limit #181 max value 30% ✘ Motor Overload Select #92 min value 150%. ✘ Motor Poles #233 max value 12. ✘ Base Motor Speed #229 max valu 6000.
v5.xx	Not Compatible	Compatible with exception: ✘ Torque Stop Configuration #58 non–functional. ✘ Service Factor #94 non–functional. ✘ Feedback Device Type #150 mode 7 non–functional. ✘ Calculated Torque #267 non–functi. ✘ Perunit Motor Curr #185 non–funct. ✘ Perunit Motor Volt #186 non–funct. ✘ Transistor Diag. #257 bit 12 non–funct.	Compatible with exception: ✘ V3.04 VP MUST be used with V3.03 AP and V3.03 Language or higher for B800 ‘H Frame’ drive support. ✘ Calculated Torque #267 non–functi. ✘ Perunit Motor Curr #185 non–funct. ✘ Perunit Motor Volt #186 non–funct. ✘ Transistor Diag. #257 bit 12 non–funct.	Compatible

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Chapter 2

Installation/Wiring

Chapter Objectives

Chapter 2 provides the information needed to properly mount and wire the 1336 FORCE Drive. Since most start–up difficulties are the result of incorrect wiring, every precaution must be taken to assure that the wiring is completed as instructed. All items must be read and understood before the actual installation begins.

IMPORTANT: The end user is responsible for completing the installation, wiring and grounding of the 1336 FORCE 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 the 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.

Mounting

When the 1336 FORCE drive is delivered in a NEMA Type 1 enclosure it must be mounted so that there is sufficient space at the top, sides and front of the cabinet to allow for heat dissipation as shown in Figure 2.1.

Attention: Care must be taken to prevent debris (metal shavings, conduit knockouts, etc.) from falling into the drive while performing any installation work on or around the drive. A hazard of personal injury and/or equipment damage exists if foreign material lodges inside the drive.

Figure 2.1.
Mounting Requirements

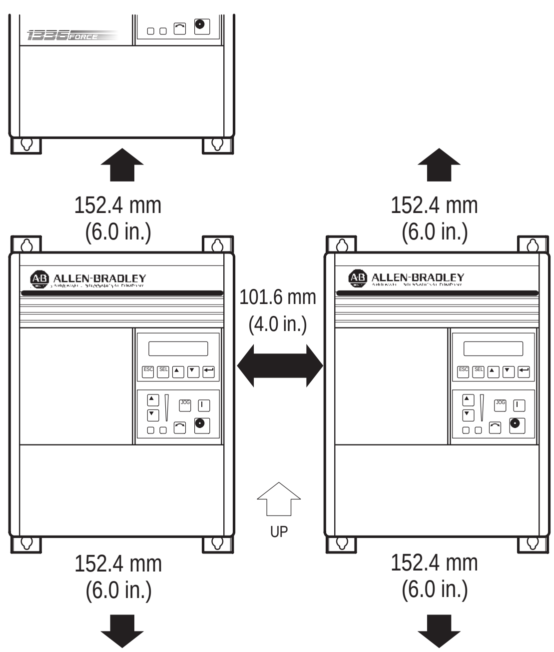
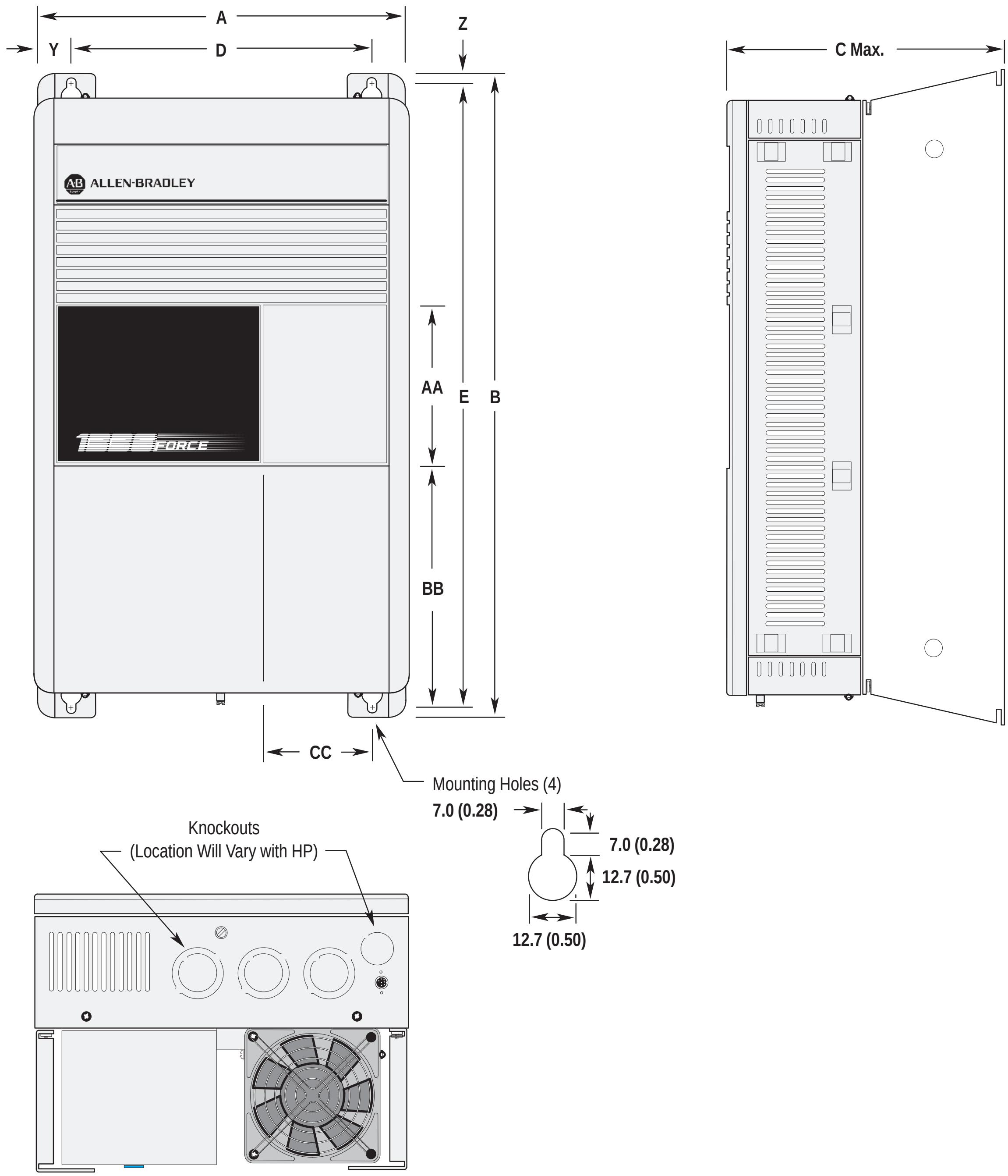


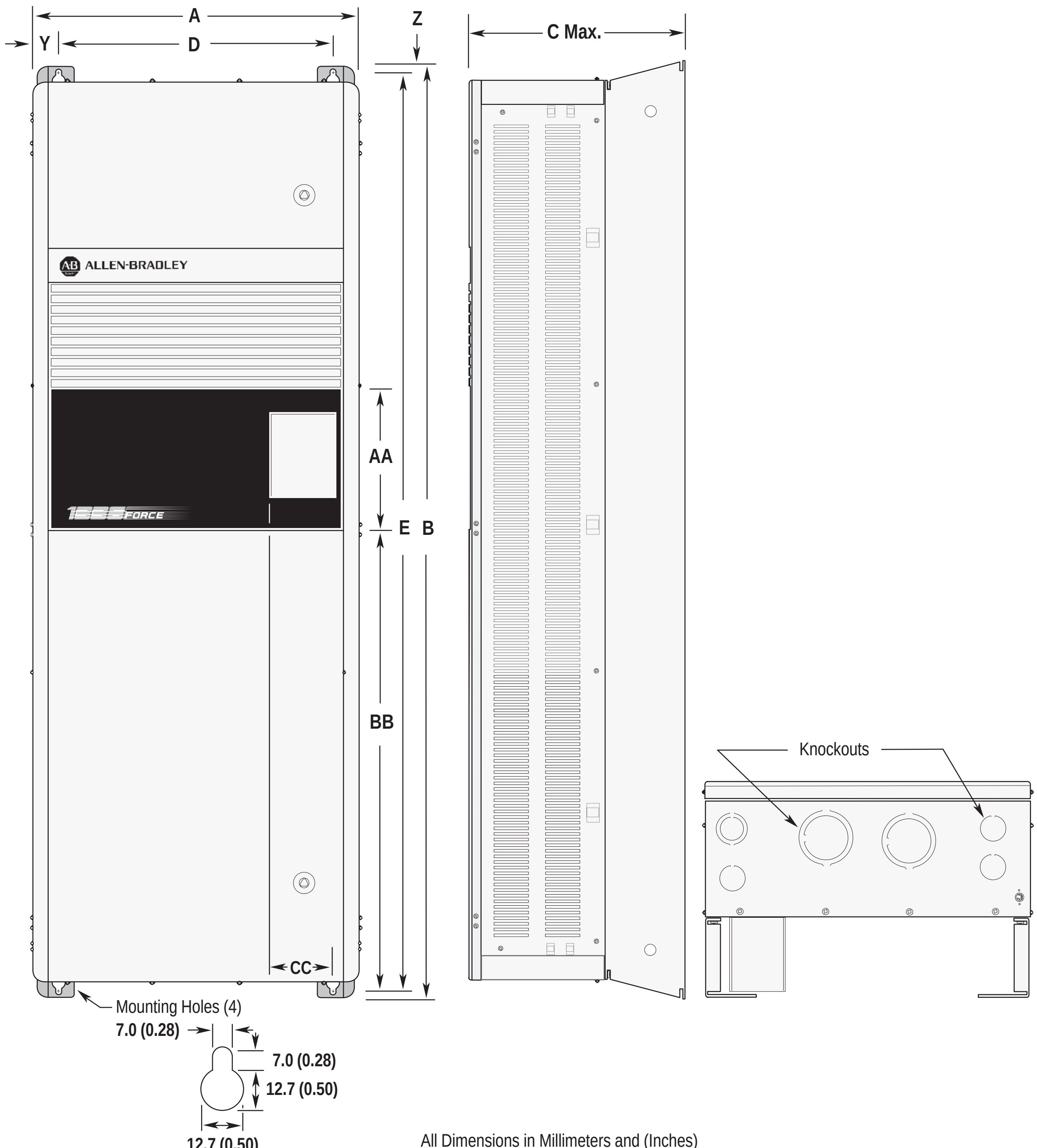
Figure 2.2. IP20 (NEMA Type 1) Dimensions – Frames B and C



All Dimensions in Millimeters and (Inches)
All Weights in Kilograms and (Pounds)

Frame [1] Reference	A	B	C Max.	D	E	Y	Z	AA	BB	CC	Knockouts 3–Dual Size, 1–Fixed	Shipping Weight
B1, B2	276.4 (10.88)	476.3 (18.75)	225.0 (8.86)	212.6 (8.37)	461.0 (18.15)	32.00 (1.26)	7.6 (0.30)	131.1 (5.16)	180.8 (7.12)	71.9 (2.83)	28.6/34.9, 22.2 (1.125/1.375, 0.875)	22.7 kg (50 lbs.)
C	301.8 (11.88)	701.0 (27.60)	225.0 (8.86)	238.0 (9.37)	685.8 (27.00)	32.00 (1.26)	7.6 (0.30)	131.1 (5.16)	374.7 (14.75)	71.9 (2.83)	28.6/34.9, 22.2 (1.125/1.375, 0.875)	38.6 kg (85 lbs.)

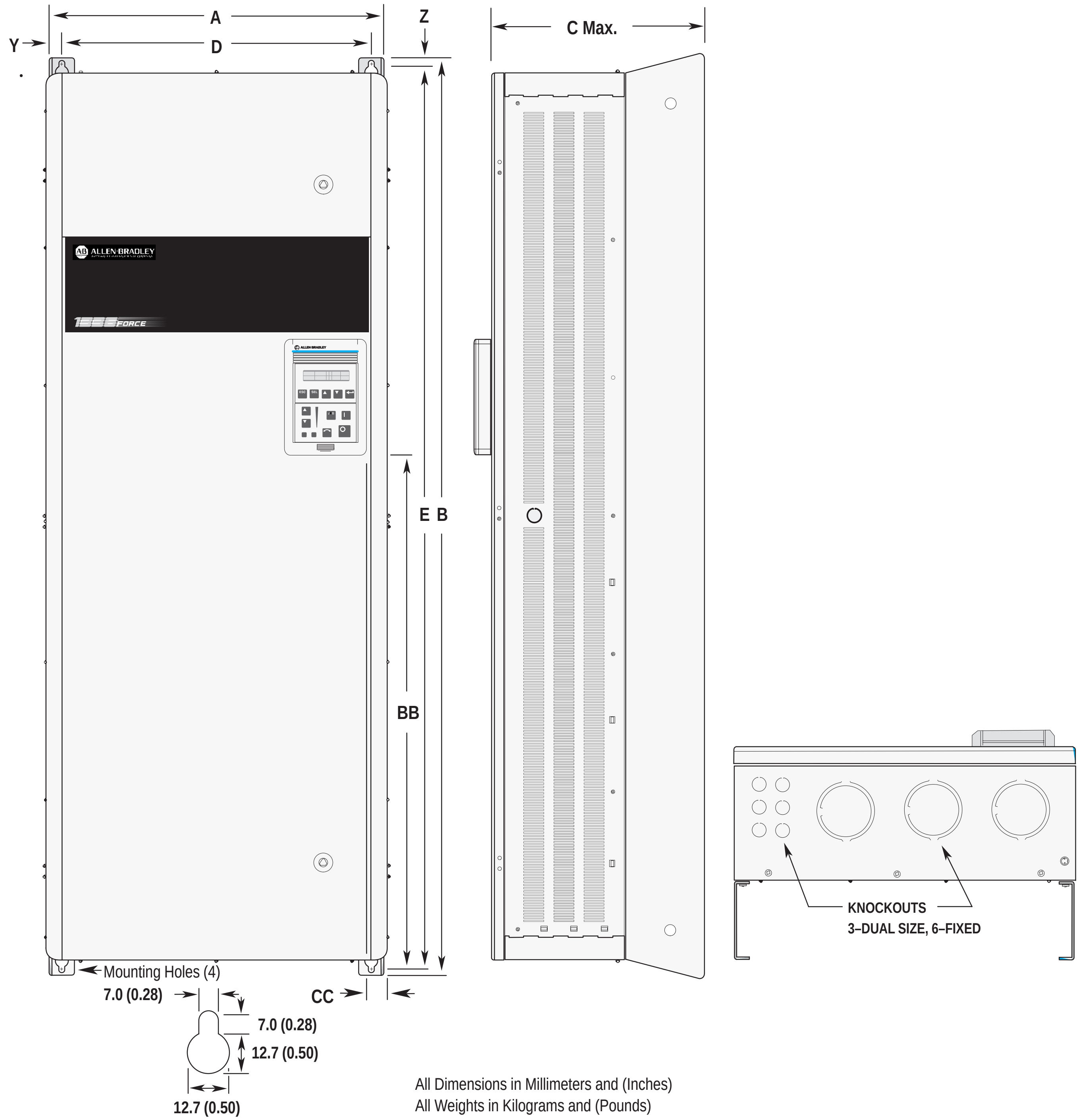
Figure 2.3.
IP 20 (NEMA Type 1) Dimensions – Frame D



All Dimensions in Millimeters and (Inches)
All Weights in Kilograms and (Pounds)

Frame[1] Reference	A	B	C Max.	D	E	Y	Z	AA	BB	CC	Knockouts 3–Dual Size, 3–Fixed	Shipping Weight
D	381.5 (15.02)	1240.0 (48.82)	270.8 (10.66)	325.9 (12.83)	1216.2 (47.88)	27.94 (1.10)	11.94 (0.47)	131.1 (5.16)	688.6 (27.11)	71.9 (2.83)	62.7/76.2, 34.9/50.0, 34.9 (2.47/3.00, 1.38/1.97, 1.38)	108.9 kg (240 lbs.)

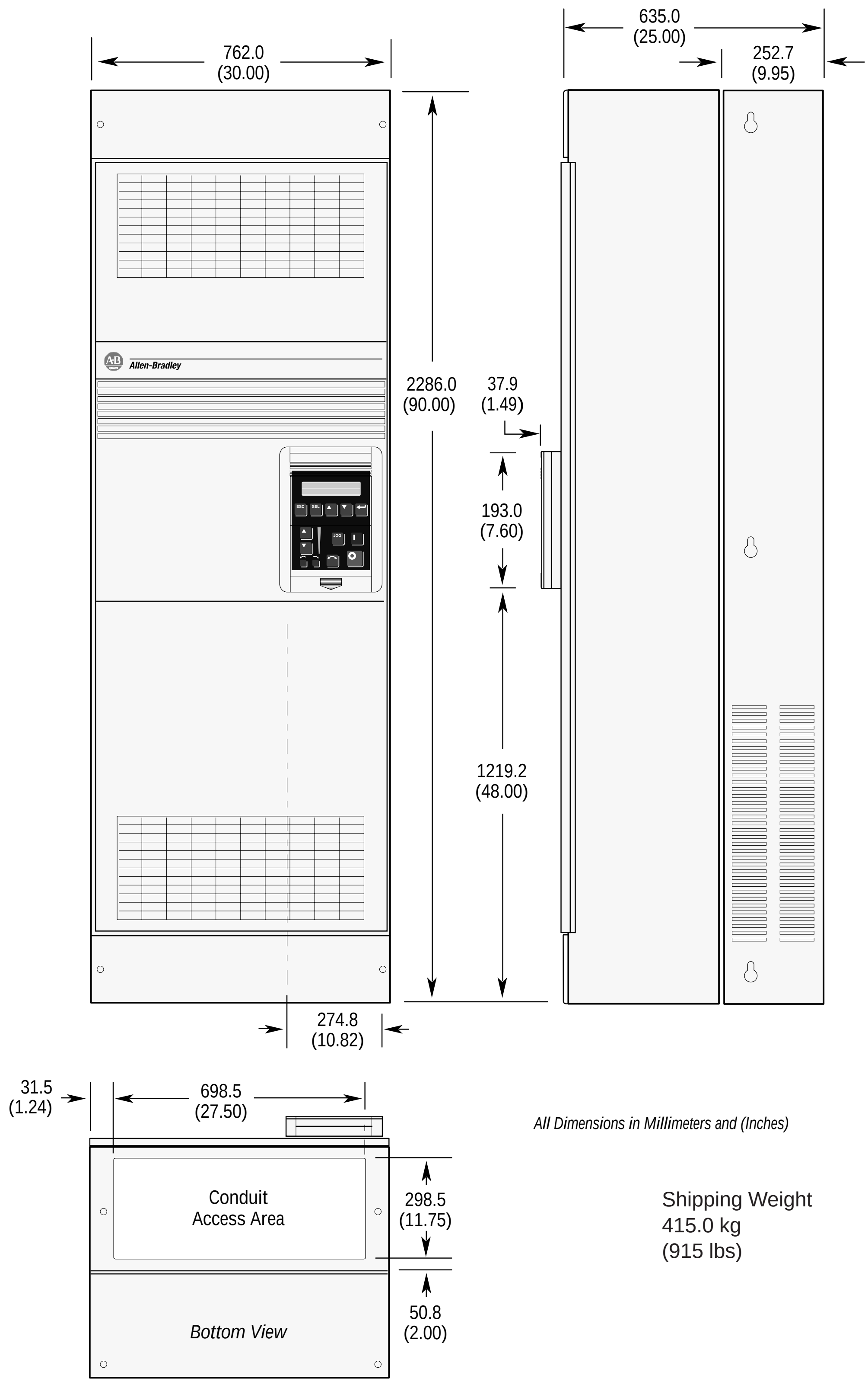
Figure 2.4.
IP 20 (NEMA Type 1) Dimensions – Frame E



All Dimensions in Millimeters and (Inches)
All Weights in Kilograms and (Pounds)

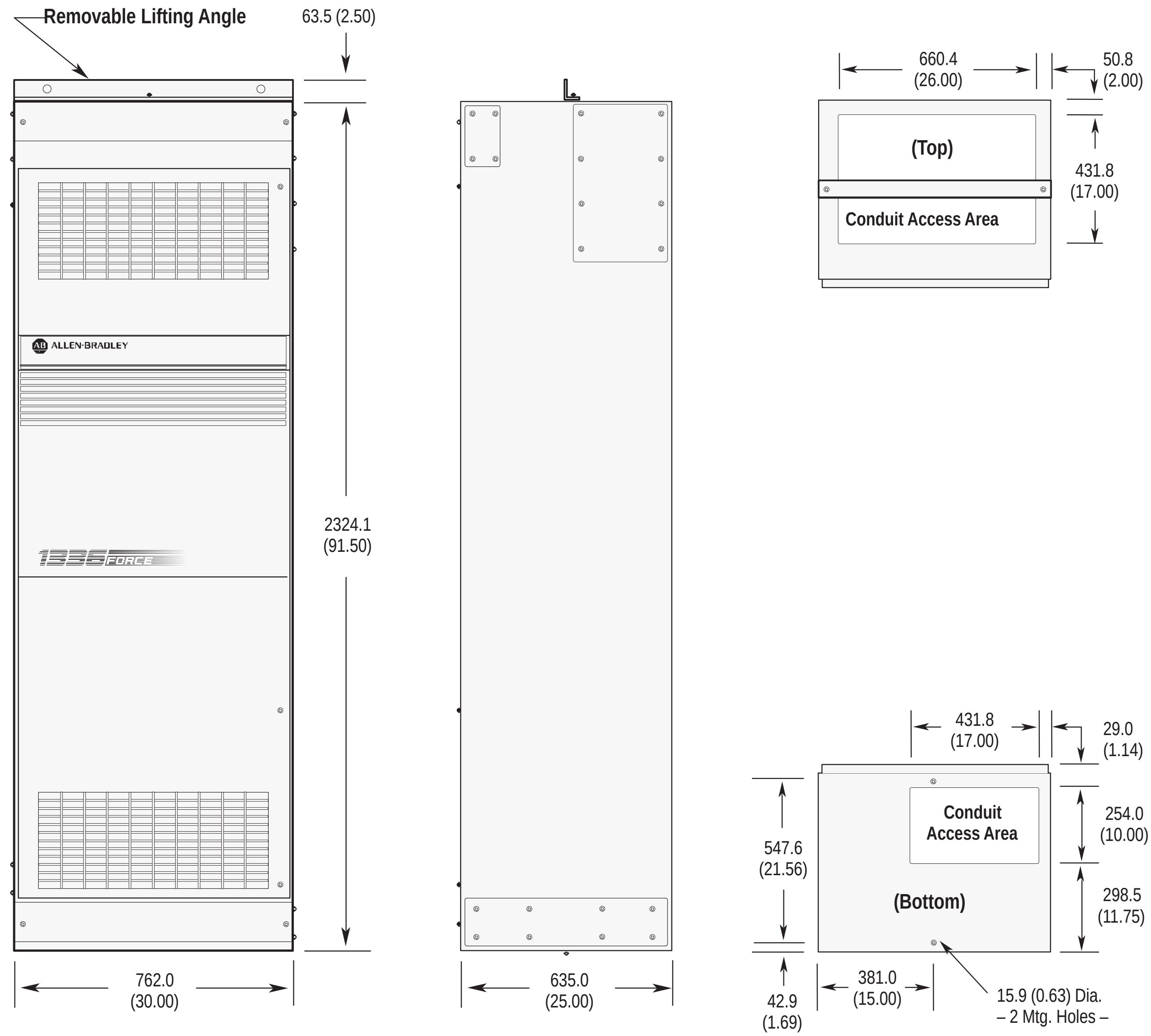
Frame [1] Reference	A	B	C Max.	D	E	Y	Z	AA	BB	CC	Knockouts 3–Dual Size, 6–Fixed	Shipping Weight
E–Enclosed	511.0 (20.12)	1498.6 (59.00)	424.4 (16.71)	477.5 (18.80)	1447.8 (57.00)	16.8 (0.66)	40.1 (1.61)	195.0 (7.68)	901.4 (35.49)	151.9 (5.98)	88.9/101.6, 12.7 (3.50/4.00, 0.50)	186 kg (410 lbs.)
E–Open	511.0 (20.12)	1498.6 (59.00)	372.6 (14.67)	477.5 (18.80)	1447.8 (57.00)	16.8 (0.66)	40.1 (1.61)	138.4 (5.45)	680.0 (26.77)	126.3 (4.97)		163 kg (360 lbs.)

Figure 2.5.
IP 20 (NEMA Type 1) Dimensions – Frame F



Shipping Weight
415.0 kg
(915 lbs)

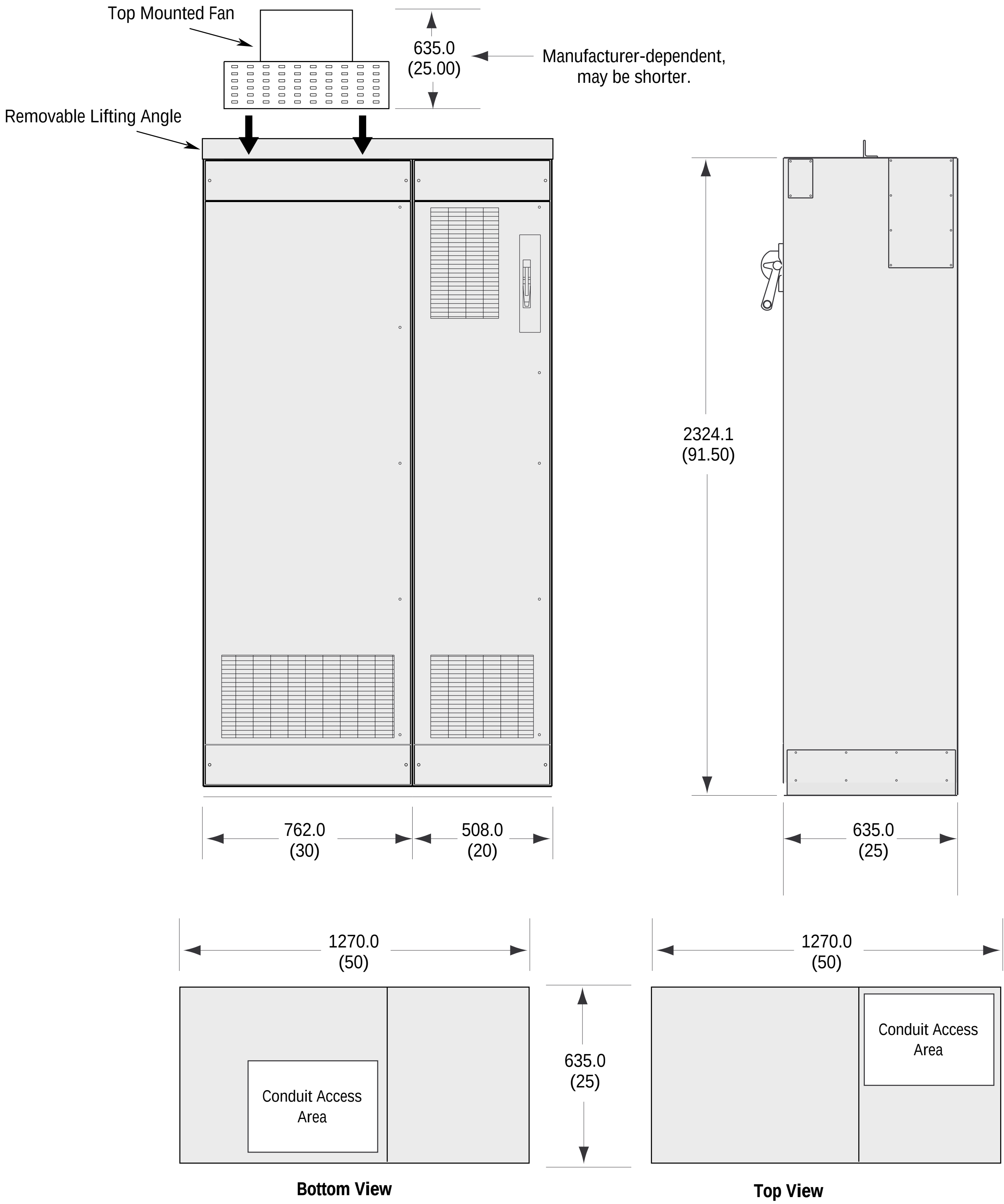
Figure 2.6.
IP 20 (NEMA Type 1) Dimensions – Frame G



All Dimensions in Millimeters and (Inches)
All Weights in Kilograms and (Pounds)

Shipping Weight
453.6 kg
(1000 lb)

Figure 2.7.
IP 20 (NEMA Type 1) Dimensions – Frame H



All Dimensions in Millimeters and (Inches)

Input/Output Ratings

The input and output current ratings grouped by drive voltage rating are provided in the following table:

200–240V

Cat No.	Input kVA	Input Amps	Output kVA	Output Amps
A001	2	5	2	4.5
A003	4–5	12	5	12
A007	10–12	28	11	27.2
A010	12–14	35	14	33.7
A015	17–20	49	19	48.2
A020	23–28	67	26	64.5
A025	25–30	73	31	78.2
A030	27–30	79	32	80
A040	43–51	123	48	120.3
A050	53–64	154	60	149.2
A060	60–72	174	72	180.4
A075	82–99	238	96	240
A100	100–120	289	116	291.4
A125	111–134	322	130	327.4

380–480V

Cat No.	Input kVA	Input Amps	Output kVA	Output Amps
B001	2	3	2	2.5
B003	4–5	6	5	6.0
B007	9–12	14	11	13.9
B010	14–18	22	17	20.9
B015	18–23	28	22	27.2
B020	23–29	35	27	33.7
B025	23–26	43	33	41.8
B030	32–41	49	38	48.2
BX040	40–50	62	47	58.7
B040	41–52	63	52	64.5
B050	48–60	75	61	78.2
BX060	62	75	61	78.2
B060	61–77	93	76	96.9
B075	78–99	119	96	120.3
B100	98–124	149	120	149.2
B125	117–148	178	143	180.4
BX150	148	178	143	180.4
B150	157–198	238	191	240.0
B200	191–241	290	233	291.4
BX250	231–291	350	282	353.6
B250	212–268	322	259	327.4
B300	265–335	403	324	406.4
B350	300–379	455	366	459.2
B400	330–416	501	402	505.1
B450	372–470	565	454	570.2
B500	391–494	594	477	599.2
B600	439–555	668	537	673.4
BP250	230–291	350	282	353.6
BP300	265–334	402	324	406.4
BP350	300–378	455	366	459.2
BP400	313–396	476	383	481.0
BP450	346–437	526	424	531.7
B700C	517–625	835	677	850
B800C	647–817	965	783	983
12B700C	517–625	835	677	850
12B800C	647–817	965	783	983

575V

Cat No.	Input kVA	Input Amps	Output kVA	Output Amps
C001	2–3	3	2	2.5
C003	5–6	6	6	6
C007	9–11	10	10	9.9
C010	11–13	12	12	12
C015	17–20	19	19	18.9
C020	21–26	25	24	23.6
C025	27–32	31	30	30
C030	31–37	36	35	34.6
C040	40–48	46	45	45.1
C050	48–57	55	57	57.2
C060	52–62	60	62	61.6
C075	73–88	84	85	85.8
C100	94–112	108	109	109.1
C125	118–142	137	137	138.6
C150	136–163	157	157	159.7
C200	217–261	251	251	252.5
C250	244–293	282	283	283.6
C300	256–307	296	297	298
C350	304–364	351	352	353.6
C400	349–419	403	405	406.4
C450	394–473	455	457	459.2
C500	434–520	501	503	505.1
C600	514–617	594	597	599.2
C650	578–694	668	671	673.4
C700	616–739	756	767	770
C800	639–767	786	797	800
12C700C	616–739	756	767	770
12C800C	639–767	786	797	800

AC Supply Source

11–485 kW (7.5–650HP) drives are suitable for use on a circuit capable of delivering up to a maximum of 200,000 rms symmetrical amperes, 600 volts maximum when used with the AC input line fuses specified in Table 2.A. The 1336 FORCE does not contain input power short circuit fusing. Specifications for the recommended size and type to provide drive input power protection against short circuits are on the following pages.

ATTENTION: To guard against personal injury and/or equipment damage caused by improper fusing, use only the recommended line fuses specified in Table 2.A. Branch circuit breakers or disconnect switches cannot provide this level of protection for drive components.

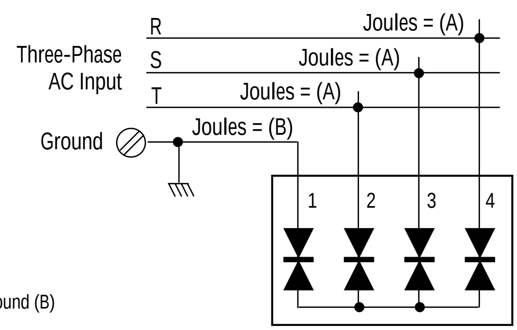
Unbalanced Distribution Systems

The drive is designed for use with conventional three–phase supplies which are symmetrical with respect to ground. Surge suppression devices are included to protect the drive from lightning–induced overvoltages between line and ground. For this reason the drive must not be used directly with supplies where one phase is grounded (Grounded Delta). In such cases an isolation transformer must be used to provide a supply balanced with respect to ground.

Ungrounded Distribution Systems

All 1336 FORCE drives are equipped with an MOV (Metal Oxide Varistor) that provides voltage surge protection and phase–to–phase plus phase–to–ground protection which is designed to meet IEEE 587. The MOV circuit is designed for surge suppression only (transient line protection), not continuous operation.

With ungrounded distribution systems, the phase–to–phase MOV connection could become a continuous current path to ground. MOV line–to–line and line–to–ground voltages should not exceed the values listed below. Exceeding these values may cause physical damage to the MOV.



Line-to-Line MOV Rating
Energy Rating = 2 x Line-Line Rating (A)

Line-to-Ground MOV Rating
Energy Rating = Line-Line (A) + Line-Ground (B)

Frame Reference *Device Rating (V)*	**A** *240 480 600*	**B - C** *240 480 600*	**D - G** *240 480 600*
Line-Line (A)	160 140 NA	160 160 160	140 140 150
Line-Ground (B)	220 220 NA	220 220 220	220 220 220

Line–to–Line MOV Rating
Energy Rating = 320 Joules
Turn On Voltage = 1020V (nominal)

Line–to–Ground MOV Rating
Energy Rating = 380 Joules
Turn On Voltage = 1330V (nominal)
Input Devices Starting and Stopping the Motor

Input Devices

Starting and Stopping the Motor

ATTENTION: The drive start/stop 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 is required to remove AC line power to the drive. When AC power is removed, there will be a loss of inherent regenerative braking effect & the motor will coast to a stop. An auxiliary braking method may be required.

Repeated Application/Removal of Input Power

ATTENTION: The drive is intended to be controlled by control input signals that will start and stop the motor. A device that routinely disconnects then reapplies line power to the drive for the purpose of starting and stopping the motor is not recommended. If this type of circuit is used, a maximum of 3 stop/start cycles in any 5 minute period (with a minimum 1 minute rest between each cycle) is required. These 5 minute periods must be separated by 10 minute rest cycles to allow the drive precharge resistors to cool. Refer to codes and standards applicable to your particular system for specific requirements and additional information.

Bypass Contactors

ATTENTION: An incorrectly applied or installed system can result in component damage or reduction in product life. The most common causes are:

- Wiring AC line to drive output or control terminals.
- Improper bypass or output circuits not approved by Allen–Bradley.
- Output circuits which do not connect directly to the motor.
- Incorrect or inadequate AC supply.
- Excessive ambient temperature.

Contact Allen–Bradley for assistance with application or wiring.

Drive Output Disconnection

Any disconnecting means wired to Drive output terminals M1, M2 and M3 must be capable of disabling the Drive if opened during Drive operation. If opened during Drive operation, the Drive will fault. It is recommended that the Drive Enable be removed before the contactor is opened. When the Drive Enable is removed, the Drive will stop modulating.

Input Power Conditioning

Typically the 1336 FORCE is suitable for direct connection to a three–phase, AC power line. There are however certain power line conditions which may introduce the possibility of drive input power component malfunction. To reduce the possibility of these malfunctions, a line reactor or isolation type transformer may be required.

The basic rules for determining if a line reactor or isolation type transformer is required are as follows:

1. If the AC line supplying the drive has power factor correction capacitors connected, an AC line reactor or isolation type transformer must be connected between the capacitor bank and the input to the drive.
2. If the AC line frequently experiences transient power interruptions or significant voltage spikes, an AC line reactor or isolation type transformer may be required.

Refer to “Unbalanced Distribution Systems”.

Input Fusing

ATTENTION: The 1336 FORCE does not provide input power short circuit fusing. Specifications for the recommended fuse size and type to provide drive input power protection against short circuits are provided in Table 2.A. Branch circuit breakers or disconnect switches cannot provide this level of protection for drive components.

Table 2.A
Maximum Recommended AC Input Line Fuse Ratings (fuses are user supplied)

Drive Catalog Number	kW (HP) Rating	200–240V Rating	380–480V Rating	500–600V Rating
UL Class CC, T, J[1] – BS88 (non-UL installations)				
1336T– _ _ F10	0.75 (1)	10A	6A	–
1336T– _ _ F30	2.2 (3)	25A	15A	–
1336T– _ _ F50	3.7 (5)	40A	20A	–
1336T– _ _ 001	0.75 (1)	10A	6A	6A
1336T– _ _ 003	2.2 (3)	15A	10A	10A
1336T– _ _ 007	5.5 (7.5)	40A	20A	15A
1336T– _ _ 010	7.5 (10)	50A	30A	20A
1336T– _ _ 015	11 (15)	70A	35A	25A
1336T– _ _ 020	15 (20)	100A	45A	35A
1336T– _ _ 025	18.5 (25)	100A	60A	40A
1336T– _ _ 030	22 (30)	125A	70A	50A
1336T– _ _ 040	30 (40)	150A	80A	60A
1336T– _ _ 050	37 (50)	200A	100A	80A
1336T– _ _ X060	45 (60)	–	100A	–
1336T– _ _ 060	45 (60)	250A	125A	90A
1336T– _ _ 075	56 (75)	–	150A	110A
1336T– _ _ 100	75 (100)	–	200A	150A
1336T– _ _ 125	93 (125)	–	250A	175A
1336T– _ _ X150	112 (150)	–	250A	–
1336T– _ _ 150	112 (150)	–	300A	225A
1336T– _ _ 200	149 (200)	–	400A	350A
1336T– _ _ 250	187 (250)	–	450A	400A
1336T– _ _ X300	224 (300)	–	–	400A
Bussmann FWP/Gould Shawmut A–70C Semi–conductor Type				
1336T– _ _ X250	187 (250)	–	450A	–
1336E– _ _ P250[2]	187 (250)	–	450A[2]	–
1336T– _ _ 300T	224 (300)	–	450A	400A
1336E– _ _ 300[2]	224 (300)	–	500A[2]	450A
1336T– _ _ 350	261 (350)	–	500A	450A
1336E– _ _ 350[2]	261 (350)	–	600A[2]	
1336T– _ _ 400	298 (400)	–	600A	500A
1336E– _ _ 400[2]	298 (400)	–	600A[2]	
1336T– _ _ 450	336 (450)	–	800A	600A
1336E– _ _ 450[2]	336 (450)	–	700A[2]	600A
1336T– _ _ 500	373 (500)	–	800A	800A
1336T– _ _ 600	448 (600)	–	900A	800A
1336T– _ _ 650	485 (650)	–	–	800A
1336T– _ _ 700C[2]	522 (700)	–	600A[3]	700A[3]
1336T– _ _ 800C[2]	597 (800)	–	700A[3]	700A[3]

1 Both fast acting and slow blow are acceptable
2 Fuses are supplied with F and H Frame drives
3 Two fuses in parallel are required

Electrical Interference – EMI/RFI

Immunity

The immunity of 1336 FORCE drives to externally generated interference is good. Usually, no special precautions are required beyond the installation practices provided in this publication.

It is recommended that the coils of DC energized contactors associated with drives be suppressed with a diode or similar device, since they can generate severe electrical transients.

In areas subject to frequent lightning strikes, additional surge suppression is advisable. Suitable MOVs connected between each line and ground should be used (see Figure 2–8).

Emission

Careful attention must be given to the arrangement of power and ground connections to the drive to avoid interference with nearby sensitive equipment. Refer to "Motor Cables" Appendix A. The cable to the motor carries switched voltages and should be routed well away from sensitive equipment.

The ground conductor of the motor cable should be connected to the drive ground (PE) terminal directly. Connecting this ground conductor to a cabinet ground point or ground bus bar may cause high frequency current to circulate in the ground system of the enclosure. The motor end of this ground conductor must be solidly connected to the motor case ground.

Shielded or armored cable may be used to guard against radiated emissions from the motor cable. The shield or armor should be connected to the drive ground terminal (PE) and the motor ground as outlined above.

Common mode chokes are recommended at the drive output to reduce the common mode noise.

An RFI filter can be used and in most situations provides an effective reduction of RFI emissions that may be conducted into the main supply lines.

If the installation combines a drive with sensitive devices or circuits, it is recommended that the lowest possible drive PWM frequency be programmed.

RFI Filtering

1336 FORCE drives can be installed with an RFI filter, which controls radio–frequency conducted emissions into the main supply lines and ground wiring.

If the cabling and installation recommendation precautions described in this manual are adhered to, it is unlikely that interference problems will occur when the drive is used with conventional industrial electronic circuits and systems. Also refer to “Motor Cables” in the Appendix of this manual.

However, a filter is recommended if there is a likelihood of sensitive devices or circuits being installed on the same AC supply or if the motor cable exceeds 50 meters (164 feet). Beyond this length, capacitance to ground will increase the supply emissions.

Where it is essential that very low emission levels must be achieved or if conformity with standards is required (EN 55011, VDE0875, BSA, FCC) the optional RFI filter should be used.

Important: The conformity of the drive and filter to any standard does not assure that the entire installation will conform. Many other factors can influence the total installation and only direct measurements can verify total conformity.

RFI Filter Installation

The RFI filter must be connected between the incoming AC supply line and the drive power input terminals.

In general, it is best to install the filter on the same mounting plate, physically close (and with short connections) to the drive.

Important: To assure that the RFI filter is effective, the motor cable must be shielded or armored and the guidelines given in this manual must be followed. Refer to “Motor Cables” in the Appendix.

RFI Filter Leakage Current

The optional RFI filter may cause ground leakage currents. Therefore an appropriate ground connection must be provided (refer to grounding instructions on the following page).

ATTENTION: To guard against possible equipment damage RFI filters can only be used with AC supplies that are nominally balanced with respect to ground. In some countries, three–phase supplies are occasionally connected in a 3–wire configuration with one phase grounded (Grounded Delta). The filter must not be used in Ground Delta supplies.

Grounding

Refer to the grounding diagram on the following page. The drive must be connected to the system ground at the power ground (PE) terminal provided on the power terminal block (TB1). Ground impedance must conform to the requirements of national and local industrial safety regulations (NEC, VDE 0160, BSI, etc.) and should be inspected and tested at appropriate and regular intervals.

In any cabinet, a single, low–impedance ground point or ground bus bar should be used. All circuits should be grounded independently and directly. The AC supply ground conductor should also be connected directly to this ground point or bus bar.

Sensitive Circuits

It is essential to define the paths through which the high frequency ground currents flow. This will assure that sensitive circuits do not share a path with such current, and to minimize the area enclosed by these paths. Current carrying ground conductors must be separated. Control and signal ground conductors should not run near or parallel to a power ground conductor.

Motor Cable

The ground conductor of the motor cable (drive end) must be connected directly to the drive ground terminal (PE), not to the enclosure bus bar. Grounding directly to the drive (and filter, if installed) provides a direct route for high frequency current returning from the motor frame and ground conductor. At the motor end, the ground conductor should also be connected to the motor case ground.

If shielded or armored cables are used, the same grounding methods should be used for the shield/armor as well.

Encoder Connections

If encoder connections are required, they must be routed in grounded steel conduit. The conduit must be grounded at both ends. Ground the cable shield at the drive only.

Discrete Control and Signal Wiring

The control and signal wiring must be grounded at a single point in the system, remote from the drive. This means the 0V or ground terminal should be grounded at the equipment end, not the drive end. If shielded control and signal wires are used, the shield must also be grounded at this point.

Signal Ground – TE

The TE terminal block is used for all control signal shields internal to the drive. It must be connected to an earth ground by a separate continuous lead.

Any PLC I/O communication link must be run in grounded steel conduit. The conduit should be bonded to ground at both ends. Ground the cable shield at the drive end only.

The maximum and minimum wire size accepted by this block is 2.1 and 0.30 mm2 (14 and 22 AWG). Maximum torque is 1.36 N–m (12 lb.–in.). Use Copper wire Only.

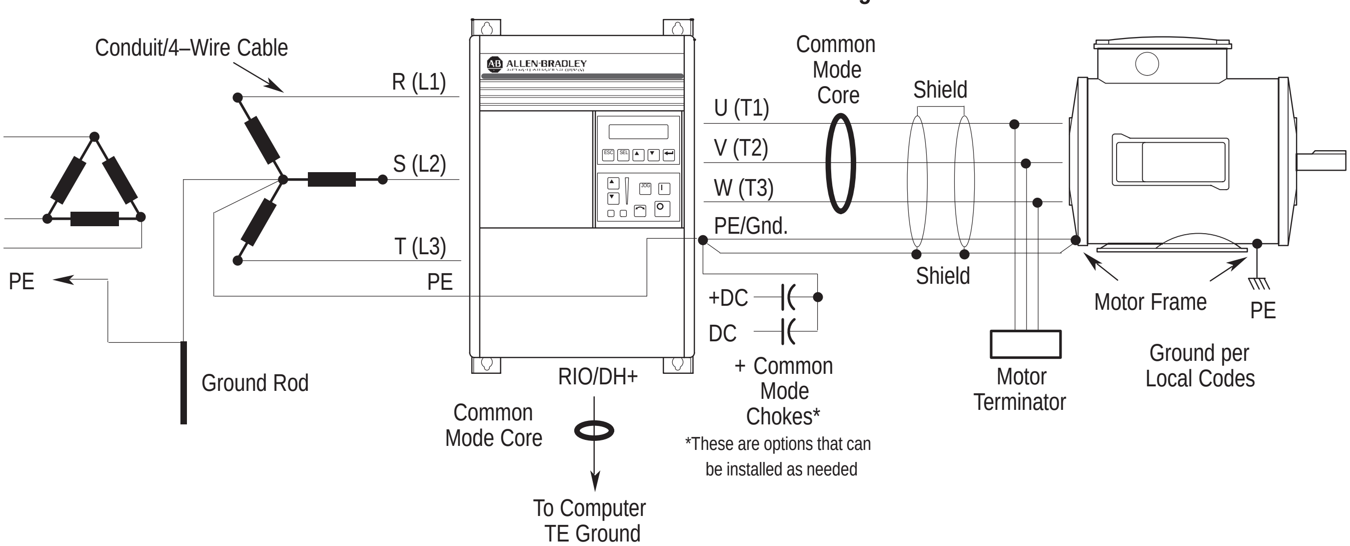
Safety Ground – PE

This is the safety ground required by code. The ground bus can be connected to adjacent building steel (girder, joist) or a floor ground loop, provided grounding points comply with NEC regulations.

RFI Filter

Important: Using an optional RFI filter may result in relatively high ground leakage currents. Surge suppression devices are also incorporated in the filter to clamp line surges to a limited voltage above ground potential. Therefore, the filter must be permanently installed and solidly grounded. Grounding must not rely on flexible cables and should not include any form of plug or socket that would permit inadvertent disconnection. The integrity of this connection should be periodically checked.

Figure 2.8.
Recommended 1336 FORCE Grounding



Power Cabling

Input and output power connections are performed through terminal block TB1 on the Gate Driver Board for Frame Size B (1–15 HP, 240V; 1–30 HP, 380V; 1–20 HP, 600V) drives. For larger horsepower drives (frame sizes C,D,E,G and H), TB1 terminal blocks are located on the bottom of the drive where both the input and output power connections are to be made.

Important: For maintenance and setup procedures, the drive may be operated without a motor connected.

Table 2.B
TB1 Signals

Terminal	Description
PE	Power Earth Ground
R (L1), S (L2), T (L3)	AC Line Input Terminals
+DC, –DC	DC Bus Terminals
U (T1), V (T2), W (T3)	Motor Connection

ATTENTION: The National Codes and standards (NEC, VDE, BSA etc.) 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.

Motor Cables

A variety of cable types are acceptable for use with the 1336 FORCE. The choice of cable type is important to a successful application. Motor cables must have an insulation thickness in excess of 15 mils. The THHN type wire or any wire with a nylon coating is not recommended for installations where there is a reasonable risk of wire damage (including small nicks in coating or insulation) due to pulling through conduit or where moisture is present. If wire integrity can be assured and no moisture is present, THHN wire must have a minimum insulation thickness greater than 15 mils, if conduit is used. Refer to page 2–18 under Conduit for recommendations on the number of cables per conduit.

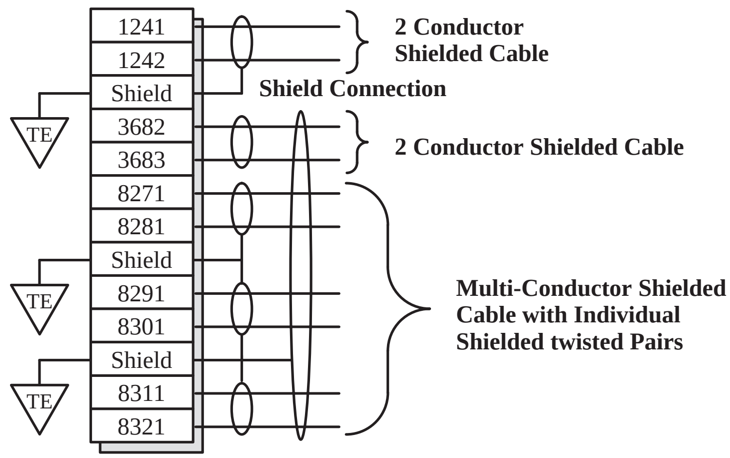
Refer to the Cable recommendations section in the Appendix of this manual for additional information on specific cables.

Wire Size and Type

Wire sizes must be selected individually, observing all applicable safety and NEC and local regulations. Due to the drive overload capacity, the conductors for the transformer primary and secondary must be sized (at a minimum) for 125% of the maximum motor current. The motor conductors must also be rated for 125% of the full load motor current. The distance between the drive and motor may affect the size of the conductors used.

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 16 AWG. The best interference suppression is obtained with a wire having an individual shield for every twisted pair. Figure 2.9 shows recommended cable shielding.

Figure 2.9.
Cable Shielding Recommendations



Lug Kits

D,E,F, and G frame drives have stud type terminals and/or bus bars/bolts that require standard crimp–type connectors for cable termination. Connectors such as T&B COLOR–KEYED® Connectors or equivalent are recommended. Table 2.C shows the lug selection for one possible cable choice. Choose connectors for each installation based on the desired cable sizes, the application requirements, and all applicable national, state, and local codes.

Table 2.C Lug Selection

	AC Input R, S, T Output U, V, W and PE				DC+ DC–[2]				TE			
Drive Catalog Number	**Cable** (per Phase) *Qty.*	*mm^2 (AWG)*	**T&B Part No.**[3] *Qty.*	*Number*	**Cable** (per Phase) *Qty.*	*mm^2 (AWG)*	**T&B Part No.**[3] *Qty.*	*Number*	**Cable** (per Phase) *Qty.*	*mm^2 (AWG)*	**T&B Part No.**[3] *Qty.*	*Number*
1336E–A040	(1)	53.5 (1/0)	(8)	54153[1]	(1)	13.3 (6)	(2)	54135[1]	(1)	13.3 (6)	(1)	54135[1]
1336E–A050	(1)	85.0 (3/0)	(8)	54163[1]	(1)	13.3 (6)	(2)	54135[1]	(1)	13.3 (6)	(1)	54135[1]
1336E–A060	(1)	107.2 (4/0)	(8)	54168[1]	(1)	13.3 (6)	(2)	54135[1]	(1)	21.2 (4)	(1)	54139[1]
1336E–A075	(2)	53.5 (1/0)	(8) (8)	54109T 54109B	(1)	33.6 (2)	(2)	54109	(1)	21.2 (4)	(1)	54139[1]
1336E–A100	(2)	85.0 (3/0)	(8) (8)	54111T 54111B	(1)	42.4 (1)	(2)	54148	(1)	33.6 (2)	(1)	54142[1]
1336E–A125	(2)	107.2 (4/0)	(8) (8)	54112T 54112B	(1)	67.4 (2/0)	(2)	54110	(1)	33.6 (2)	(1)	54142[1]
1336E–B060	(1)	42.4 (1)	(8)	54147[1]	(1)	8.4 (8)	(2)	54131[1]	(1)	13.3 (6)	(1)	54135[1]
1336E–B075	(1)	53.5 (1/0)	(8)	54153[1]	(1)	13.3 (6)	(2)	54135[1]	(1)	13.3 (6)	(1)	54135[1]
1336E–B100	(1)	85.0 (3/0)	(8)	54163[1]	(1)	13.3 (6)	(2)	54135[1]	(1)	13.3 (6)	(1)	54135[1]
1336E–B125	(1)	107.2 (4/0)	(8)	54168[1]	(1)	26.7 (3)	(2)	54147[1]	(1)	21.2 (4)	(1)	54139[1]
1336E–BX150	(1)	107.2 (4/0)	(8)	54168[1]	(1)	26.7 (3)	(2)	54147[1]	(1)	21.2 (4)	(1)	54139[1]
1336E–B150	(2)	53.5 (1/0)	(8) (8)	54109T 54109B	(1)	33.6 (2)	(2)	54110	(1)	21.2 (4)	(1)	54139[1]
1336E–B200	(2)	85.0 (3/0)	(8) (8)	54111T 54111B	(1)	42.4 (1)	(2)	54148	(1)	26.7 (3)	(1)	54142[1]
1336E–B250	(2)	107.2 (4/0)	(8) (8)	54112T 54112B	(1)	67.4 (2/0)	(2)	54110	(1)	33.6 (2)	(1)	54142[1]
1336E–BX250	(3)	53.5 (1/0)	(24)	54109	(1)	67.4 (2/0)	(2)	54110	NA		NA	
1336E–BP250	(3)	53.5 (1/0)	(24)	54109	(1)	67.4 (2/0)	(2)	54110	NA		NA	
1336E–B300	(3)	67.4 (2/0)	(24)	54110	(1)	42.4 (1)	(2)	54148	NA		NA	
1336E–BP300	(3)	67.4 (2/0)	(24)	54110	(1)	42.4 (1)	(2)	54148	NA		NA	
1336E–B350	(3)	85.0 (3/0)	(24)	54111	(1)	42.4 (1)	(2)	54148	NA		NA	
1336E–BP350	(3)	85.0 (3/0)	(24)	54111	(1)	42.4 (1)	(2)	54148	NA		NA	
1336E–B400	(3)	107.2 (4/0)	(24)	54112	(1)	42.4 (1)	(2)	54148	NA		NA	
1336E–BP400	(3)	107.2 (4/0)	(24)	54112	(1)	42.4 (1)	(2)	54148	NA		NA	
1336E–B450	(3)	127.0 (250 MCM)	(24)	54174	(1)	42.4 (1)	(2)	54148	NA		NA	
1336E–BP450	(3)	127.0 (250 MCM)	(24)	54174	(1)	42.4 (1)	(2)	54148	NA		NA	
1336E–B500	(3)	152.0 (300 MCM)	(24)	54179	(1)	53.5 (1/0)	(2)	54109	NA		NA	
1336E–B600	(3)	152.0 (300 MCM)	(24)	54179	(1)	53.5 (1/0)	(2)	54109	NA		NA	
1336E–C075	(1)	33.6 (2)	(8)	54142[1]	(1)	13.3 (6)	(2)	54135[1]	(1)	8.4 (8)	(1)	54131[1]
1336E–C100	(1)	53.5 (1/0)	(8)	54153[1]	(1)	13.3 (6)	(2)	54135[1]	(1)	13.3 (6)	(1)	54135[1]
1336E–C125	(1)	67.4 (2/0)	(8)	54158[1]	(1)	26.7 (3)	(2)	54147[1]	(1)	13.3 (6)	(1)	54135[1]
1336E–C150	(1)	107.2 (4/0)	(8)	54111	(1)	42.4 (1)	(2)	54148	(1)	13.3 (6)	(1)	54135[1]
1336E–C200	(2)	67.4 (2/0)	(8) (8)	54110T 54110B	(1)	42.4 (1)	(2)	54148	(1)	26.7 (3)	(1)	54142[1]
1336E–C250	(2)	85.0 (3/0)	(8) (8)	54111T 54111B	(1)	67.4 (2/0)	(2)	54110	(1)	26.7 (3)	(1)	54142[1]
1336E–CX300	(3)	85.0 (3/0)	(16)	54111					NA		NA	
1336E–C300	(3)	85.0 (3/0)	(16)	54111					NA		NA	
1336E–C350	(3)	53.5 (1/0)	(24)	54109					NA		NA	
1336E–C400	(3)	67.4 (2/0)	(24)	54110	Consult Factory				NA		NA	
1336E–C450	(3)	85.0 (3/0)	(24)	54111					NA		NA	
1336E–C500	(3)	107.2 (4/0)	(24)	54112					NA		NA	
1336E–C600	(3)	127.0 (250 MCM)	(24)	54174					NA		NA	
1336E–C700C	–		–		(3)	253.0 (500 MCM)	(6)	54118	(1)	67.4 (2/0)	(1)	54110
1336E–C800C	–		–		(3)	253.0 (500 MCM)	(6)	54118	(1)	67.4 (2/0)	(1)	54110

1 5/16" Stud. All other studs are 3/8".
2 Lugs shown for DC+/– are based on dynamic brake sizing of 50% of (motor rating X 1.25). Select proper lugs based on required braking torque.
3 T & B COLOR-KEYED® Connectors require T & B WT117 or TBM–6 Crimper tool or equivalent. Lugs should be crimped according to manufacturer's tool instructions.

Table 2.D.
Cable and Wiring Recommendations

Category	Wiring Class	Signal Definition	Signal Examples	Cable Type	Minimum Spacing in Inches between Classes – Steel Conduit/Tray: 1	2/3/4	5/6	7/8	9/10/11	Spacing Notes
Power	1	AC Power (600V or greater)	2.3kV 3/Ph AC Lines	per NEC & Local Codes	0	3/9	3/9	3/18	Note 6	1/2/5
	2	AC Power (less than 600V)	460V 3/Ph AC Lines	per NEC & Local Codes	3/9	0	3/6	3/12	Note 6	1/2/5
	3	AC Power	AC Motor	per NEC & Local Codes						
Control	5	115V AC/DC Logic	Relay Logic/PLC I/O Motor Thermostat	per NEC & Local Codes	3/9	3/6	0	3/9	Note 6	1/2/5
		115V AC Power	Power Supplies, Instruments							
	6	24V AC/DC Logic	PLC I/O	per NEC & Local Codes						
Signal (Process)	7	Analog Signals, DC Supplies	Reference/Feedback Signal, 5 to 24V DC	Shielded Cable – Belden 8735, 8737, 8404	3/18	3/12	3/9	0	1/3	2/3/4/5
		Digital (low speed)	TTL							
	8	Digital (high speed)	I/O, Encoder, Counter Pulse Tach	Shielded Cable – Belden 9728, 9730						
Signal (Comm)	9	Serial Communication	RS-232, 422 to Terminals/ Printers	Shielded Cable – Belden RS-232 – 8735, 8737 RS-422 – 9729, 9730	Note 6			1/3	0	
	11	Serial Communication (greater than 20k baud)	PLC Remote I/O, PLC Data Highway	Twinaxial Cable – , A-B 1770-CD						

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. Classes7 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 11may 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
6. Spacing of communication cables classes 2 thru 6 is:

CONDUIT SPACING	THRU AIR
115 Volts – 1 inch	115 Volts – 2 inches
230 Volts – 1.5 inches	230 Volts – 4 inches
460/575 Volts – 3 inches	460/575 Volts – 8 inches
575 volts – proportional to 6” per 1000 volts.	575 volts proportional to 12” per 1000 volts

General Notes

1. Steel conduit is recommended for all wiring classes. (Classes 7-11).
2. Spacing shown between classes is the minimum required for parallel runs less than 400 feet. Greater spacing should be used where possible.
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.
4. Power wire is selected by load. 16AWG is the minimum recommended size for control wiring.

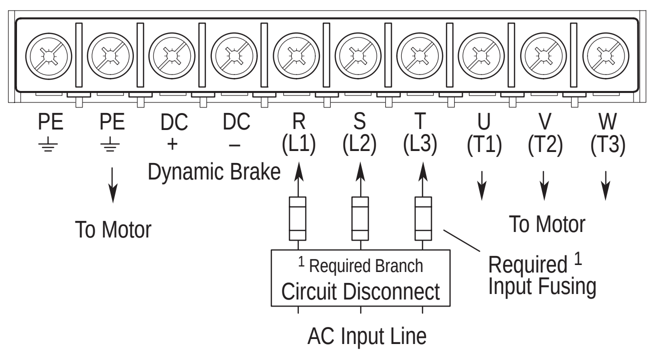
Power Wiring

On 1 to 30 HP drives, input and output power connections are performed through a 10 position terminal block, TB1 located on the Gate Driver Board. On drives larger than 30 HP, input and output power connections are made at seperate terminal strips located at the bottom of the drive. The drive connections are illustrated in Figure 2.10. The C thru G configurations of TB1 are stud terminations and require the use of lug type connectors to terminate the field installed conductors. Cat. No. 1336–LUG–XXXX Lug Kits are available for use with these configurations of TB1. The wire size used is determined by selecting the proper lug kit based on the Cat. No. of the drive. Refer to Table 2.C to determine the correct lug kit for your application.

Figure 2.10.
Terminal Block TB1

B1 Frame

200–240V, 0.75–5.5 kW (1–7.5 HP) Terminal Designations
380–480/500–600V, 0.75–11 kW (1–15 HP) Terminal Designations



200–240V, 7.5–11 kW (10–15 HP) Terminal Designations
380–480V, 15–22 kW (20–30 HP) Terminal Designations
500–600V, 15 kW (20 HP) Terminal Designations

B2 Frame

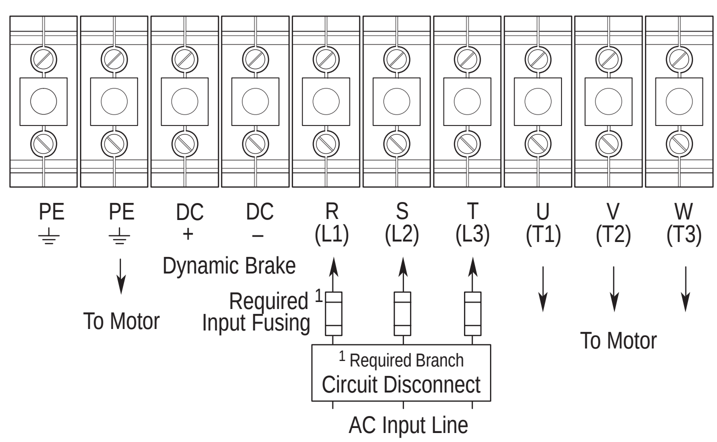
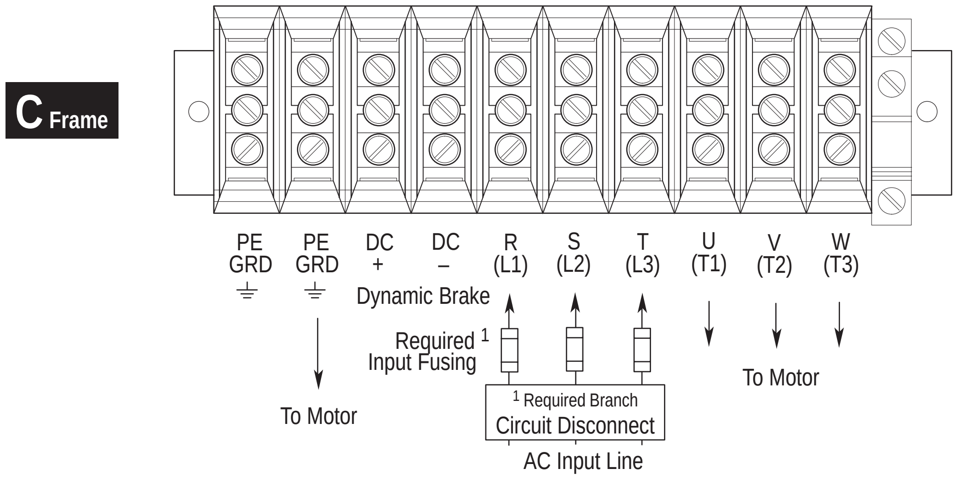
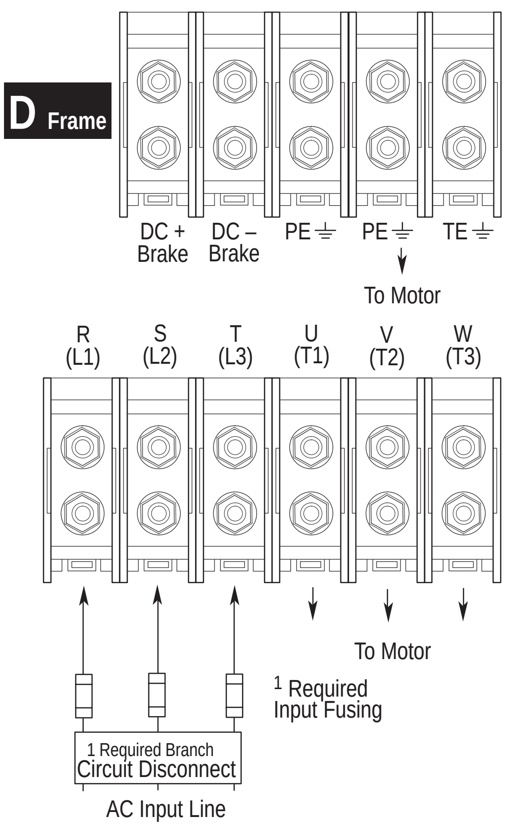


Figure 2.10.
Terminal Block TB1 cont.

200–240V, 15–22 kW (20–30 HP) Terminal Designations
380–480V, 30–45 kW (40–60 HP) Terminal Designations
500–600V, 18.5–45 kW (25–60 HP) Terminal Designations



200–240V, 30–45 kW (40–60 HP) Terminal Designations
380–480V, 45–112 kW (60–150 HP) Terminal Designations
500–600V, 56–112 kW (75–150 HP) Terminal Designations



380–480V, 224–448 kW (300–600 HP) Terminal Designations
500–600V, 187–485 kW (250–650 HP) Terminal Designations

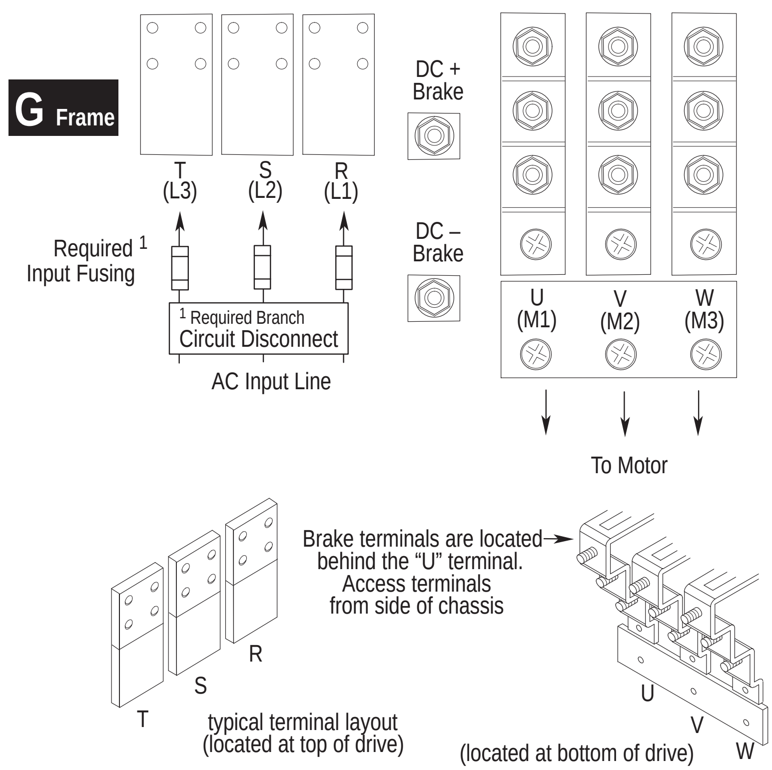
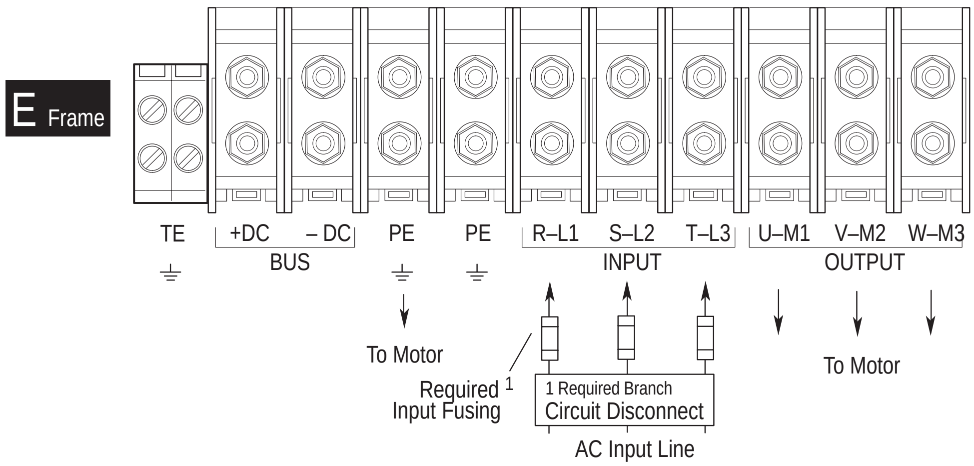
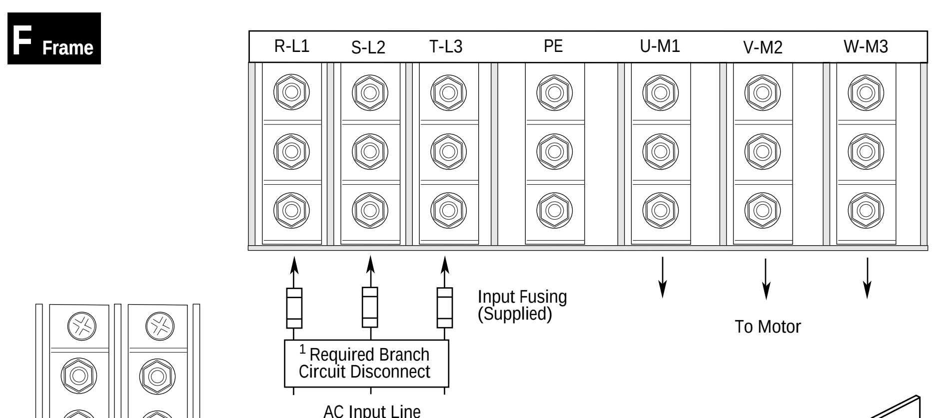


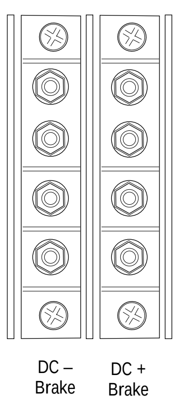
Figure 2.10. cont.
Terminal Block TB1

200–240V, 56–75 kW (75–100 HP) Terminal Designations
380–480V, 112–187 kW (150–250 HP) Terminal Designations
500–600V, 112–149 kW (150–200 HP) Terminal Designations



380-480V, 187-336 kW (250-450 HP) Terminal Designations





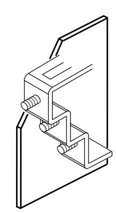
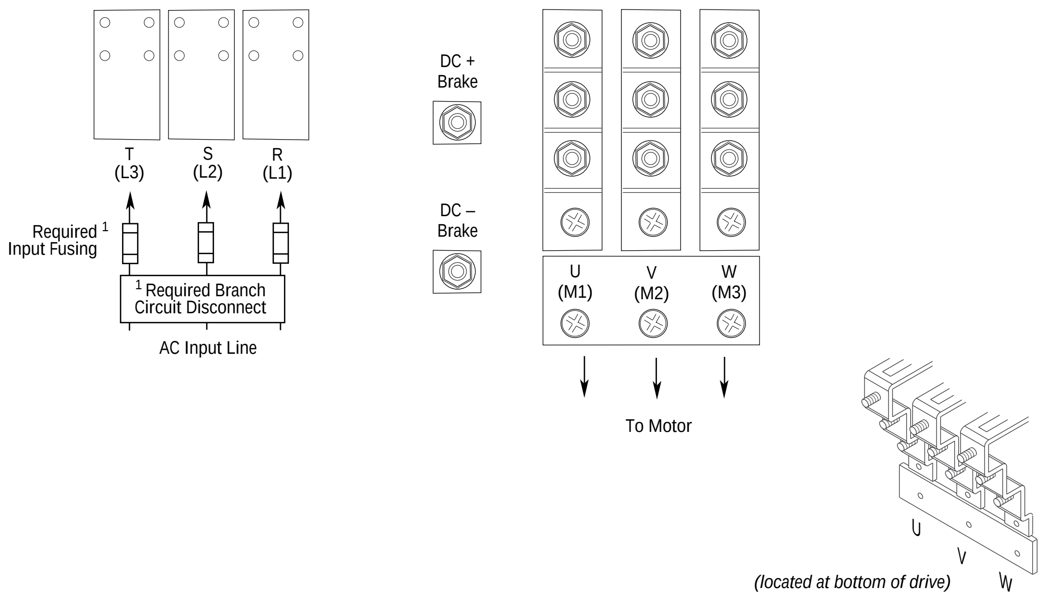

typical terminal

Figure 2.10. cont.
Terminal Block TB1

380-480V, 522-597 kW (700-800 HP) Terminal Designations
500-600V, 522-597 kW (700-800 HP) Terminal Designations

H Frame



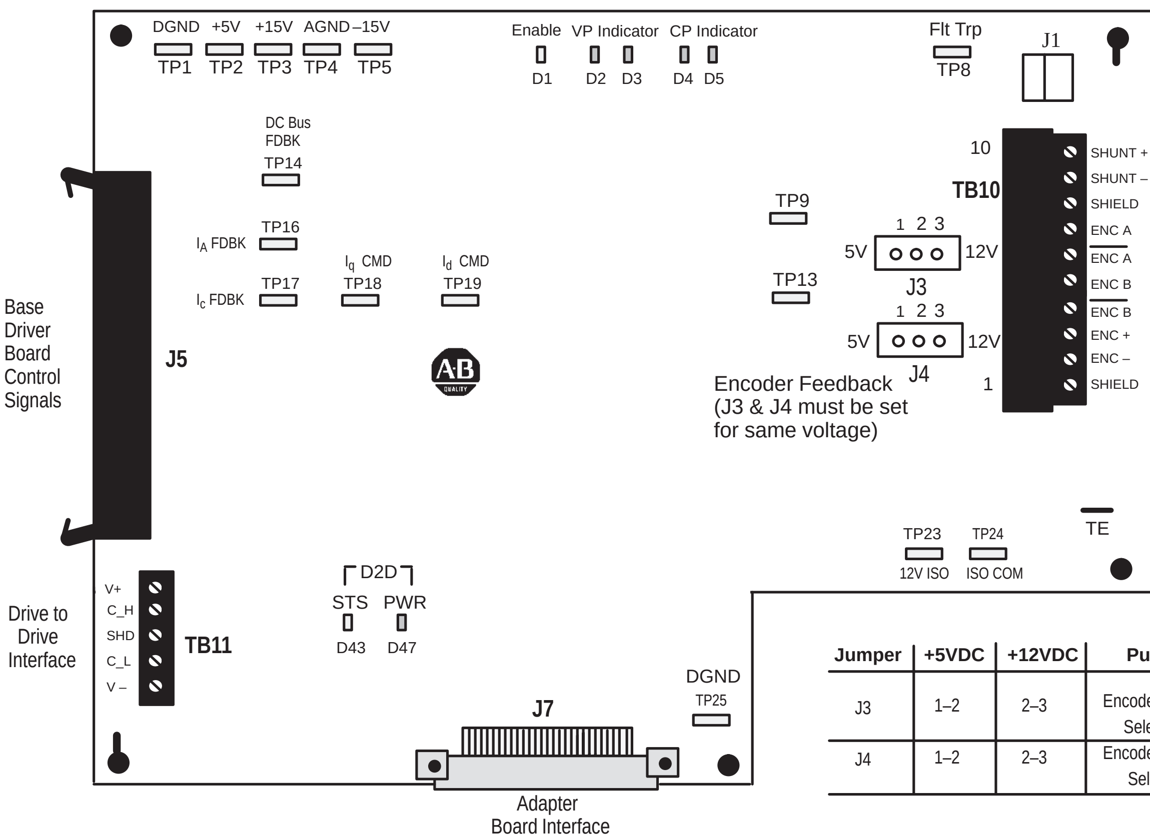
[1] User supplied.

Control Wiring

ATTENTION: When user installed control and signal wiring with an insulation rating of less than 600V is used, this wiring must be routed inside the drive enclosure so that it is separated from any other wiring and uninsulated live parts. Failure to do so could result in equipment damage or unsatisfactory Drive performance.

Encoder, Brake and Drive to Drive interface connections are performed on the Main Control Board (Fig. 2.11). The maximum and minimum wire size accepted by TB10 and TB11 on the Main Control Board is 3.3 and 0.06 mm^2 (12 and 30 AWG). Maximum torque for both terminal blocks is 0.79 N–m (7 lb–in.). Use copper wire only.

Figure 2.11.
Terminal Block Locations Main Control Board



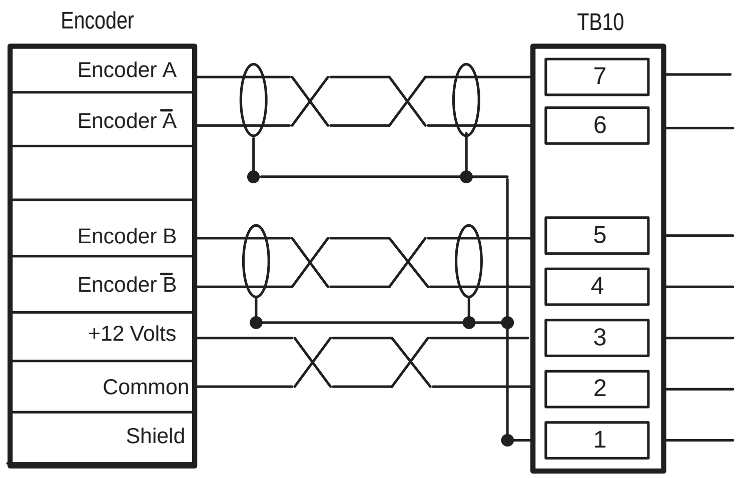
Jumper	+5VDC	+12VDC	Purpose
J3	1–2	2–3	Encoder Voltage Selection
J4	1–2	2–3	Encoder Voltage Selection

D1	Green	Drive Enable	ON – Drive Running, OFF – Drive Not Running
D2	Green	VP Indicator	ON – No Faults, OFF – See D3
D3	Red	VP Indicator	Refer to Fault Codes in Table 4.A
D4	Green	CP Indicator	ON – No Faults, OFF – See D5
D5	Red	CP Indicator	Refer to Fault Codes in Table 4.A
D43	Amber	Drive to Drive Status	Solid – OK, Blinking – Fault
D47	Green	Drive to Drive Power	ON – Power, OFF – No Power

Encoder Connections

The Encoder connections are made at terminal block TB10 on the Main Control Board as detailed in Figure 2.12.

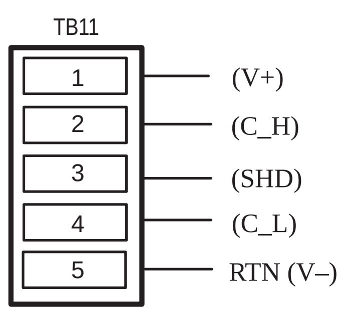
Figure 2.12.
Encoder Connections



Drive to Drive Communication

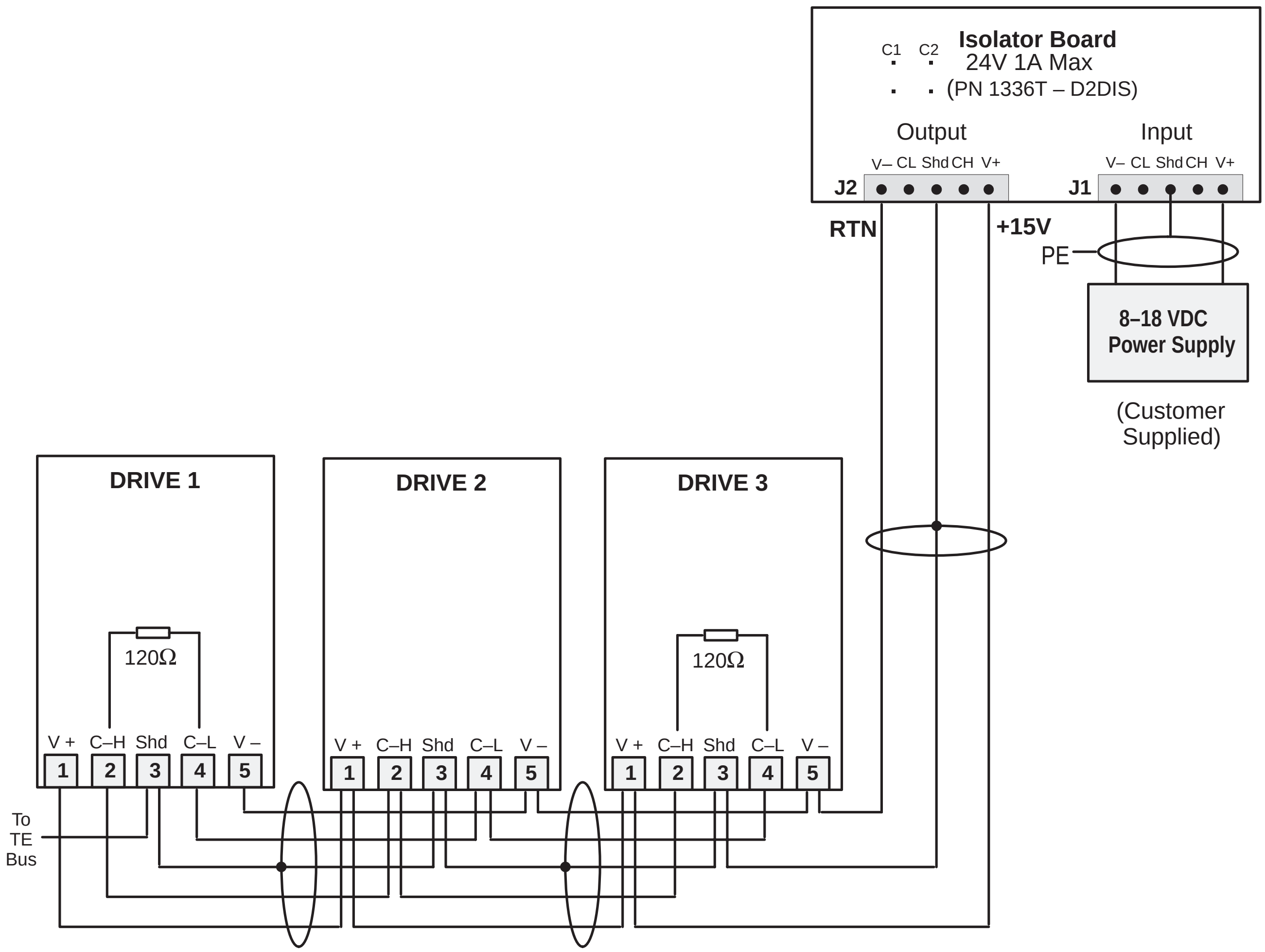
The TB11 connector on the Main Control Board (Figure 2.13) is used to connect the Drive to Drive Communication Interface.

Figure 2.13.
Drive to Drive Connections



Drive to Drive Setup – The hardware setup for Drive to Drive (D2D) consists of a shielded cable going from CN+ and CN– between the drives. The shields are to be tied together and grounded at one point (TE). TB11–3 SHD is an open connection and is used to tie ground wire together. A wire must go from TB11–3 to TE Bus. Place a 120Ω terminating resistor on both ends of the cable. You must supply the 8 –18 VDC that powers the D2D. Figure 2.14 shows a typical D2D connection using the required Allen–Bradley Isolation Board. Recommended cable is Drive to Drive cable (A–B 1485–C–PI–C) which is available in 50, 150, 300 and 600 meter lengths.

Figure 2.14.
Drive to Drive Hardware Connection



Standard Adapter Board

When installing and wiring the Standard Adapter board, you need to deal with the following issues:

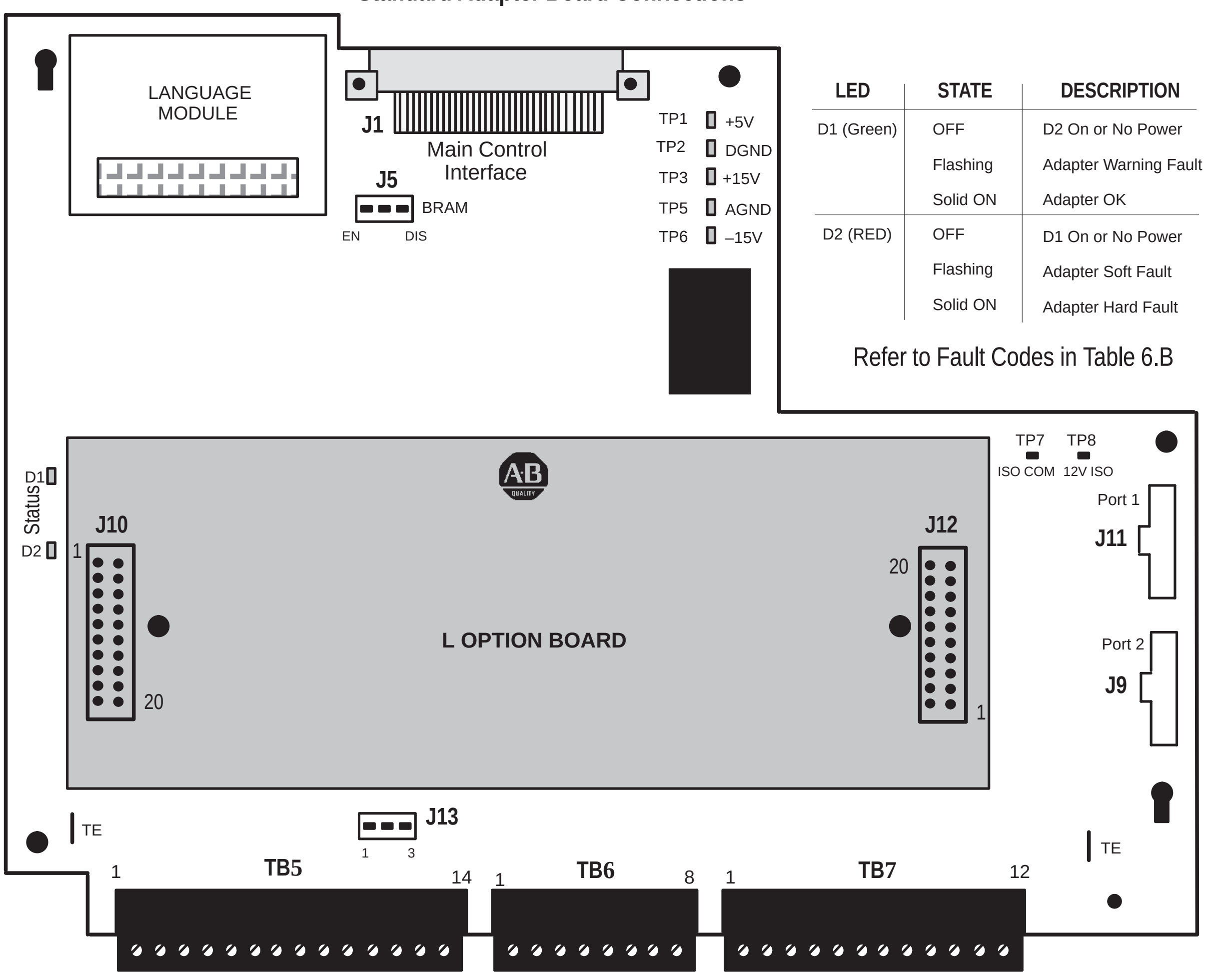
- Control and Signal Wiring
- Interface Board Installation and Removal

Control & Signal Wiring – If your 1336 FORCE Drive is equipped with a Standard Adapter Board, terminal blocks TB5, TB6 and TB7 located at the bottom center of the board (Figure 2.15) are used for control and signal wiring (Drive Permissives). The Standard Adapter Board is connected to the Main Control Board through J1, the Main Control Interface.

The maximum and minimum wire size accepted by TB5, TB6 and TB7 is 3.3 and 0.06 mm^2 (12 and 30 AWG). Maximum torque for these terminal blocks is 0.79 N–m (7 lb. – in.). Recommended control signal wire is:

- Belden 8760 or equiv. – 0.750 mm^2 (18 AWG), Twisted Pair, Shielded
- Belden 8770 or equiv. – 0.750 mm^2 (18 AWG), 3 – Conductor, Shielded
- Belden 9460 or equiv. – 0.750 mm^2 (18 AWG), Twisted Pair, Shielded

Figure 2.15.
Standard Adapter Board Connections



LED	STATE	DESCRIPTION
D1 (Green)	OFF	D2 On or No Power
	Flashing	Adapter Warning Fault
	Solid ON	Adapter OK
D2 (RED)	OFF	D1 On or No Power
	Flashing	Adapter Soft Fault
	Solid ON	Adapter Hard Fault

Refer to Fault Codes in Table 6.B

Jumper	+5V DC	+12V DC	Purpose
J13	1 to 2	2 to 3	Pulse Input Voltage Selection

Jumper	Position	Purpose
J5	1 to 2 2 to 3	BRAM Write Enable BRAM Write Disabled

Interface Board Installation and Removal –
IMPORTANT: If the L Option Board is being installed, Standard Adapter Board jumpers at pins 3 & 4 and 17 & 18 of J10 must be removed and the proper Input Mode selected (Figure 2.16). If the L Option board is removed, these jumpers must be reinstalled and the Input Mode parameter must be programmed to “1”.

Figure 2.16.
Interface Board Jumper Locations

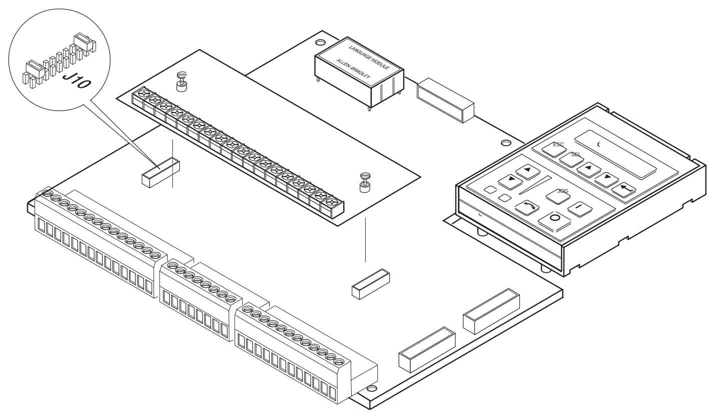
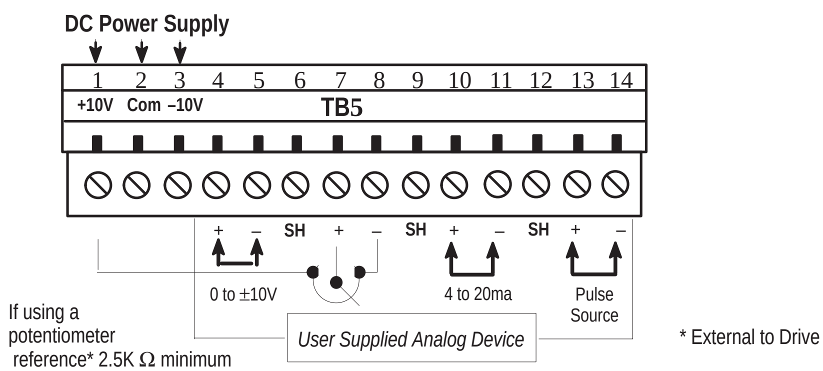
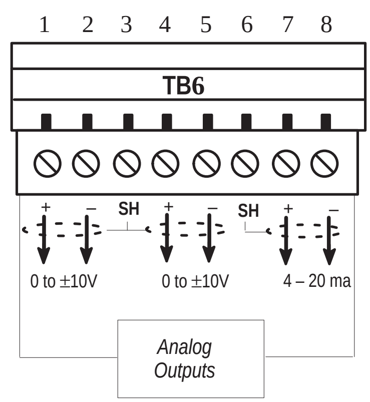


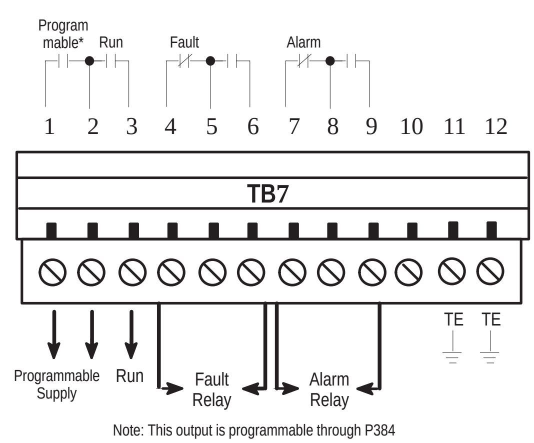
Figure 2.17.
Reference Signal Connections (Standard Adapter Board)





* External to Drive

Terminal Block	Terminal #	Signal	
TB5	SH	Shield Ground	
	1,2,3	DC Power Supply	+/– 10VDC, 50 mA per voltage
	4,5,6,7	0 to +/– 10V DC Input:	Input Impedance = 20K Ohms
	10,11	4 – 20ma Input:	Input Impedance = 130 Ohms
	13,14	Pulse Input for Frequency Ref.:	+5V DC – Jumper xx Set to xx +12V DC – Jumper xx Set to xx Scale Factor (Pulse PPR) must be set
TB6	SH	Shield Ground	
	1,2,4,5	0 to +/– 10 V DC Output:	Output Impedance = 100 Ohms Output Impedance = 100 Ohms
	7,8	4 – 20 ma DC Output	Output Impedance = 20 Ohms
TB7	TE	Logic Earth Ground / Shield Ground	
	4,5,6	Fault Contact	Resistive Rating = 115VAC/30VDC, 5.0A Inductive Rating = 115VAC/30VDC, 2.0A
	7,8,9	Alarm Contact	Resistive Rating = 115VAC/30VDC, 5.0A Inductive Rating = 115VAC/30VDC, 2.0A



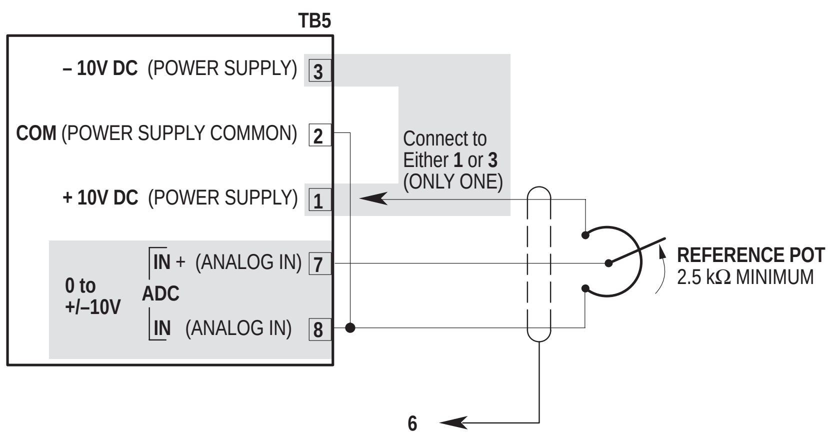
Analog Inputs – There are (2) analog inputs to the Standard Adapter Board (Figure 2.18) that have a range of ±10V, (1) 4–20 mA analog input and (1) pulse source input with a digital resolution of 12 bits. These inputs are differential inputs with noise rejection filtering.

Each input has a gain and offset adjustment. The A/D converter is a 12 bit device where an input value of +10V will result in a digital value of 2048. Likewise, an input value of –10V will result in a digital output value of –2048.

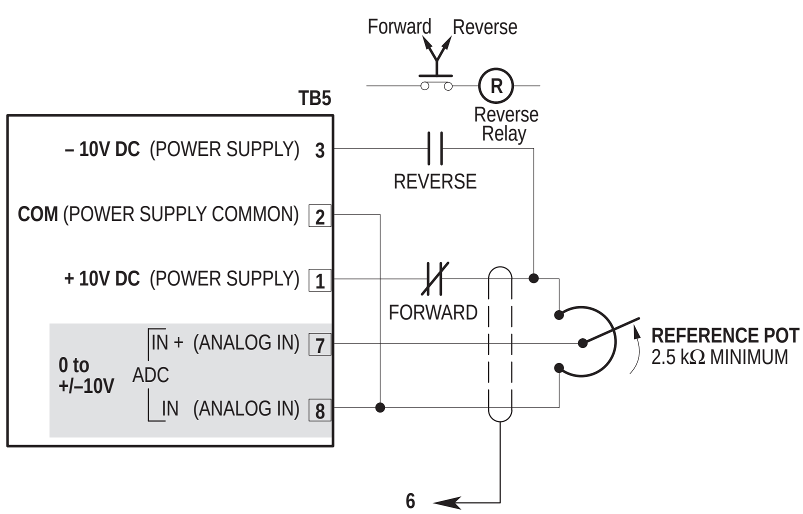
NOTE: Analog input parameters must be linked to a velocity reference parameter as well as a scaling and offset parameter for an analog input to function.

NOTE: Refer to Chapter 4, Startup, for Analog I/O configuration information.

Figure 2.18
Analog Input Connections



Typical Connections for Unidirectional Operation



Typical Connections for Bidirectional Operation

Analog Outputs – There are (2) analog outputs from the Standard Adapter Board that have a range of + 10V and (1) 4–20 mA output with a digital resolution of 12 bits.

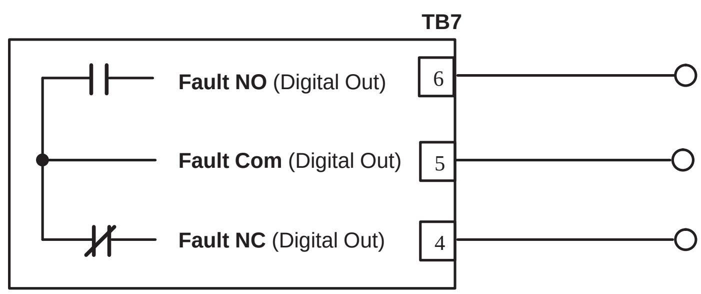
Discrete Outputs

Fault outputs from the 1336 FORCE are supplied at terminal block TB7 on the Standard Adapter Board. Fault outputs provide warning or fault signals based on Drive Programming.

Fault NC
Fault Com
Fault NO – A form C, NO/NC relay contact on the Standard Adapter Board programmed to provide external warning or fault change–of–state signals.

Contact Ratings = 2A @ 115 VAC
2A @ 30 VDC

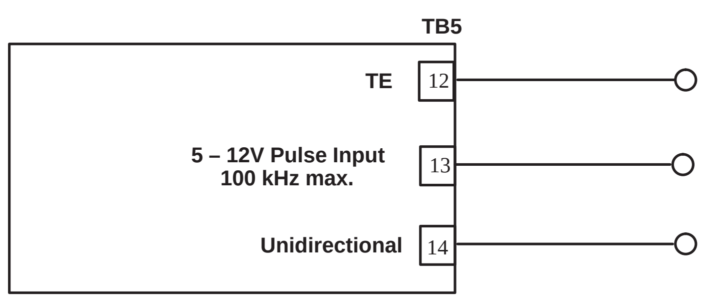
Figure 2.19
Typical Digital Output (Standard Adapter)



Pulse Input

The pulse input lets an external source provide the drive with a digital reference or trim signal. Pulse input is a differential input with a maximum frequency of 100 kHz.

Figure 2.20
Pulse Input Connection

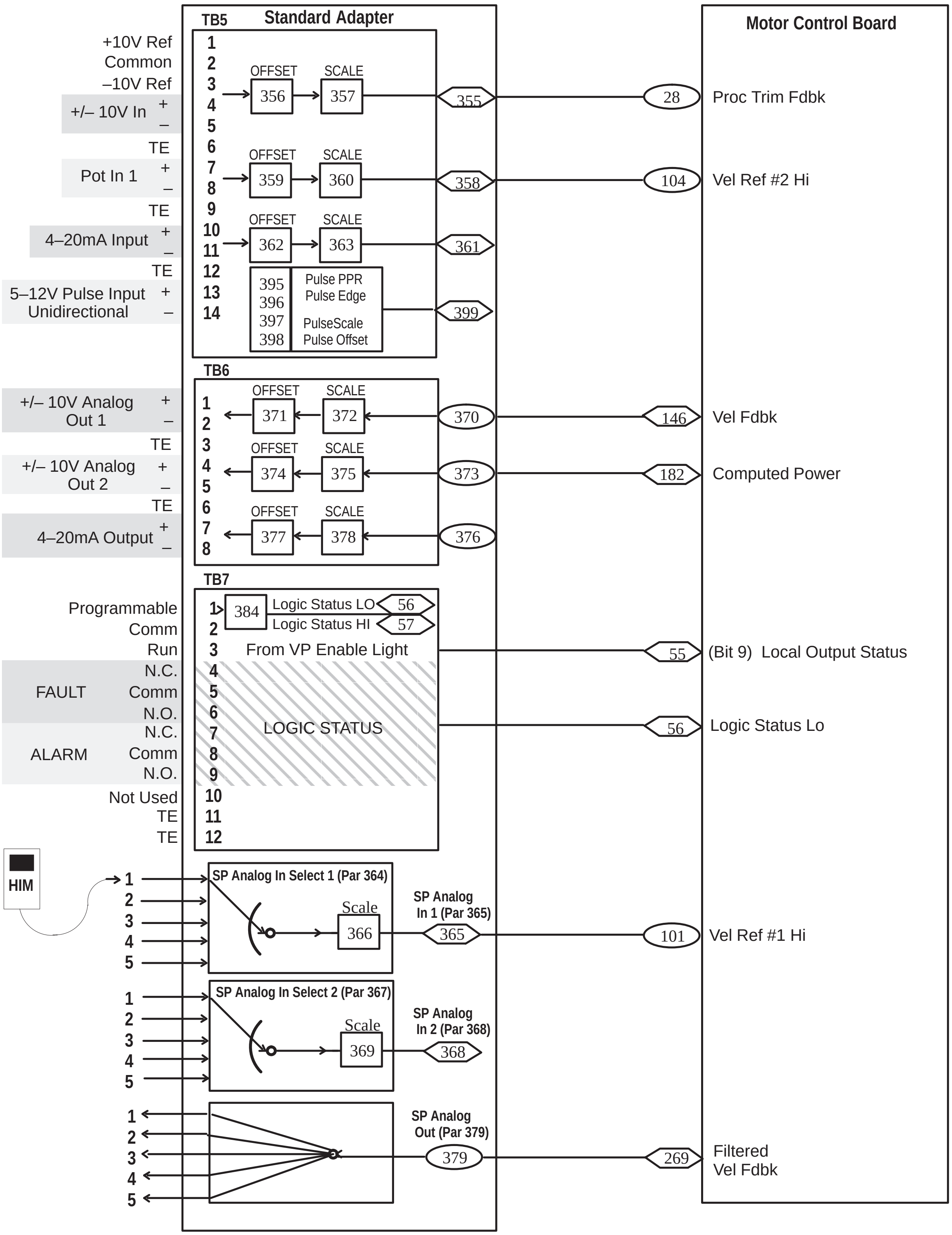


The pulse input can be useful if you have a system with multiple drives and you want encoder magnetic pickup or other drives that provide a pulse to supply the reference for additional drives. You could use this reference to ensure that all drives run at the same speed or to ensure that the speed of the other drives is related to the speed of the reference.

Configuration

The 1336 FORCE Drive is shipped pre–configured, meaning that some of the inputs and outputs are linked to a predefined signal. Figure 2.21 shows the 1336 FORCE standard configuration when equipped with a Standard Adapter Board. The user has the flexibility to configure the Drive for a particular application.

Figure 2.21.
Standard Adapter Links



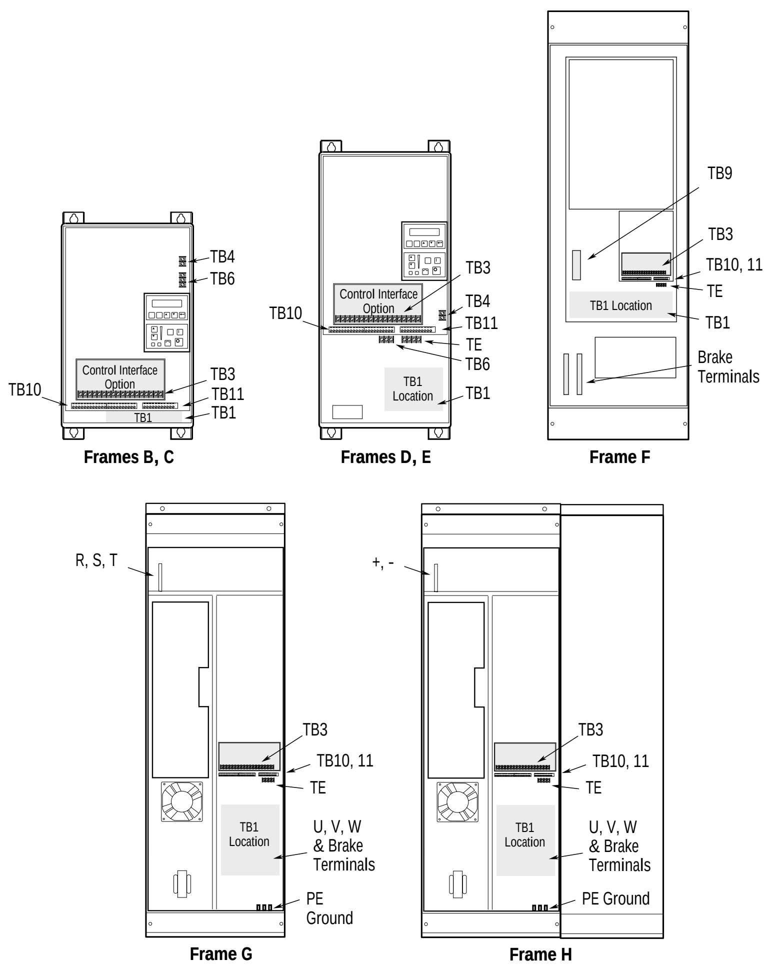
Starting & Stopping the Motor

ATTENTION: The 1336 FORCE 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 is 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.

Figure 2.22 illustrates the location of the terminal blocks that are used for interfacing control signals to a 1336 FORCE equipped with a Standard Adapter Board.

Figure 2.22.
Terminal Block Locations

TB1	Power Terminal Block
TB10, 11	Control & Signal Wiring
TB3	Control Interface Option
TB4	(For Factory Use Only)
TB6	(For Factory Use Only)
TB9	480V Output (F Frame Only)
TE	Shield Terminals



Control Interface Option – TB3

The Control Interface Option provides a means of interfacing various signals and commands to the 1336 FORCE by using contact closures.

Six different versions of the option are available:

L4	Contact Closure Interface
L4E	Contact Closure Interface with Encoder Feedback Inputs[1]
L5	+24V AC/DC Interface
L5E	+24V AC/DC Interface with Encoder Feedback Inputs[1]
L6	115V AC Interface
L6E	115V AC Interface with Encoder Feedback Inputs[1]

[1] Encoder feedback inputs are connected to TB10 on the FORCE Drive. **Do Not connect Encoder Feedback inputs to the Control Interface Option card.**

The user inputs are connected to the option board through TB3. The L4, L5 and L6 options each have nine control inputs. The function of each input must be selected through programming as explained later in this section. The L4E, L5E and L6E options are similar to L4, L5 and L6 with the addition of encoder feedback inputs, which are not used with the 1336 FORCE.

Available Inputs

A variety of combinations made up of the following inputs are available.

Start	**Enable**
Stop/Clear Fault	**Ext Flt**
Reverse	**2 Stop Mode Selects**
Digital Potentiometer (MOP)	**Run Forward**
2 Accel/Decel Rates	**Run Reverse**
3 Speed Selects	**Local Control**

The available combinations are shown in Figure 2.24. Programming the [Input Mode] parameter to one of the Input Mode numbers listed, will select that combination of input functions.

Important: The [Input Mode] parameter can be changed at any time, but the change will not affect drive operation until power to the drive has been removed and bus voltage has decayed completely. When changing the [Input Mode] parameter, the functions of the TB3 inputs will change when power is reapplied to the drive.

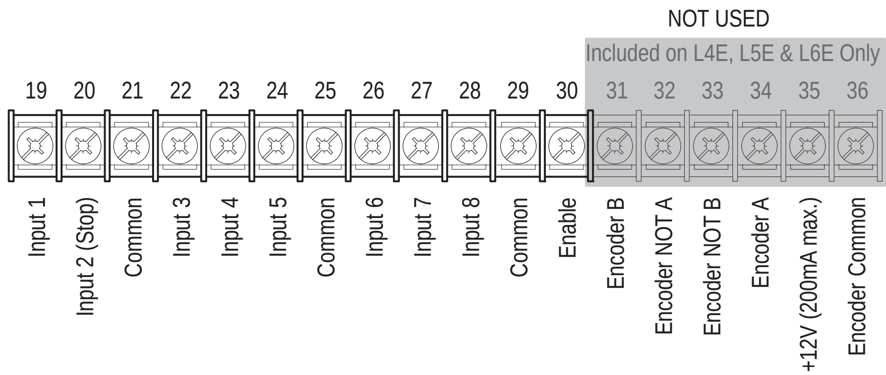
Important: If a Control Interface Option is not installed, the [Input Mode] parameter must be set to 1 (default) and jumpers must be installed. If the drive was shipped from the factory without the option, these jumpers will have been installed.

The programming options of the Control Interface Option allow the user to select an input combination to meet the needs of a specific installation. Appropriate selection of a combination may be done by using Figure 2.24. First determine the type of start/stop/direction control desired. Then select the remaining control functions available. Record the selected mode number below.

Selected Mode Number: ______________________

Figure 2.23 provides the terminal designations for TB3. The maximum and minimum wire size accepted by TB3 is 2.1 and 0.30 mm^2 (14 and 22 AWG). Maximum torque for all terminals is 1.36 N–m (12 lb.–in.). Use Copper wire only.

Figure 2.23.
TB3 Terminal Designations



NOTE: Terminals 31 thru 36 are not used with 1336 FORCE applications

The following table defines the input state of the Speed Select inputs for a desired frequency source.

Table 2.E
Speed Select Input State vs. Frequency Source

	Speed Select 3	Speed Select 2	Speed Select 1	Velocity Reference Source
TB3	Terminal 26	Terminal 27	Terminal 28	Interface Option (MOD L4,L5,L6)
	O	O	O	Ext Ref 1 Para 101*
	O	O	X	Preset Speed Ref 1 (P 119)
	O	X	O	Preset Speed Ref 2, (P 120)
	O	X	X	Preset Speed Ref 3, (P 121)
	X	O	O	Preset Speed Ref 4, (P 122)
	X	O	X	Preset Speed Ref 5, (P 123)
	X	X	O	External Reference 2 (P 104)
	X	X	X	Last State

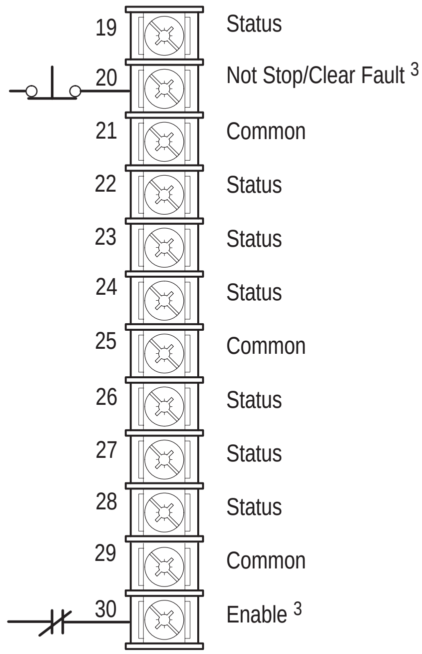
Equivalent truth table implemented in Parameter 52 Logic Command Word

Para 52	Bit 14	Bit 13	Bit 12	Velocity Reference Source Bits
	O	O	X	Ext Ref 1 (P 101)
	O	X	O	Preset Speed Ref 1 (P 119)
	O	X	X	Preset Speed Ref 2 (P 120)
	X	O	O	Preset Speed Ref 3 (P 121)
	X	O	X	Preset Speed Ref 4 (P 122)
	X	X	O	Preset Speed Ref 5 (P 123)
	X	X	X	External Reference 2 (P 104)
	O	O	O	No Reference or Last State

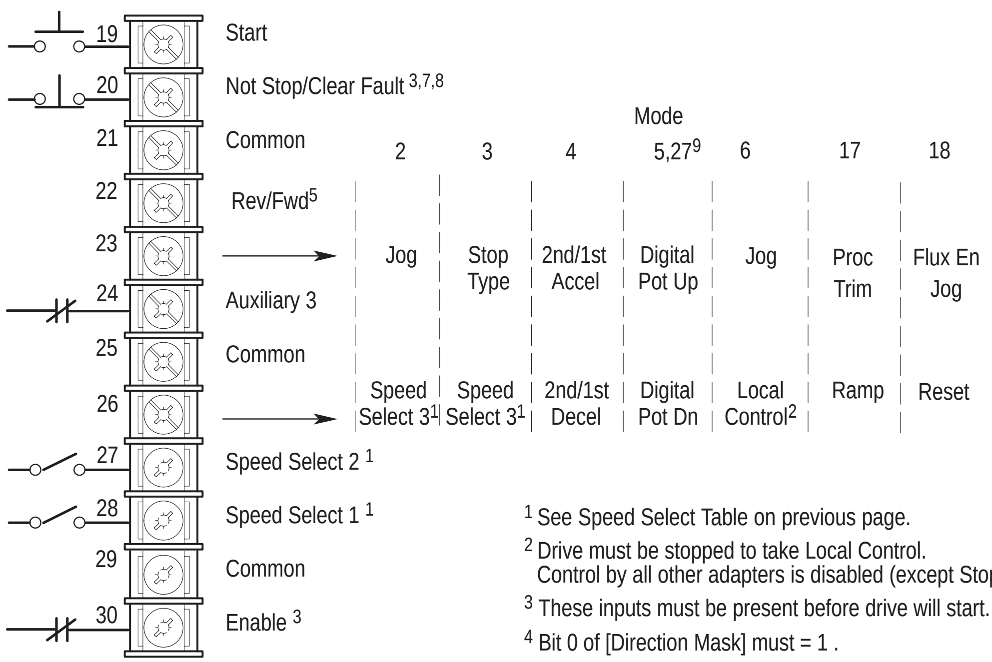
0 = Open – input removed, X = Closed – input present
* Unless otherwise configured, this will default to the HIM speed reference input.

Figure 2.24.
Input Mode Selection & Typical TB3 Connections

[Input Mode] 1
Factory Default



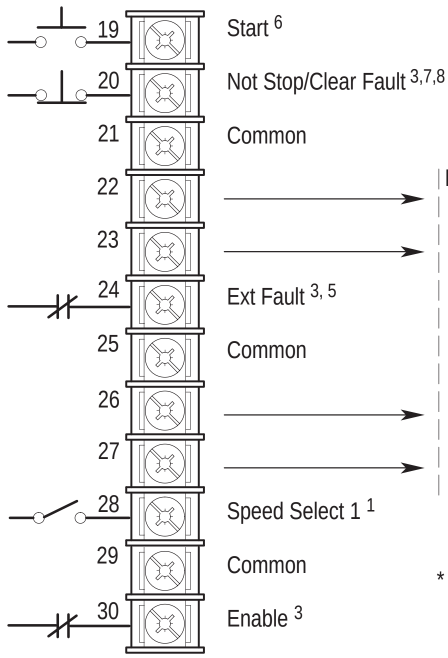
[Input Mode] 2–6, 17, 18
Three–Wire Control with Single–Source Reversing



[1] See Speed Select Table on previous page.
[2] Drive must be stopped to take Local Control. Control by all other adapters is disabled (except Stop).
[3] These inputs must be present before drive will start.
[4] Bit 0 of [Direction Mask] must = 1 .
[5] For Common Bus – Precharge Enable.
[6] Bit 12 of Para 59 Logic Options must = 0 for Reverse Direction Control.
[7] Soft Fault Reset Only, Must Cycle Power to Drive to Clear Hard Fault; Hard Fault = See Troubleshooting Section
[8] Soft Fault Refer to Para 59 to Configure Start & Stop Type.
9 Digital Pot Value Zeroed When Stop Asserted.

Figure 2.25.
Input Mode Selection & Typical TB3 Connections

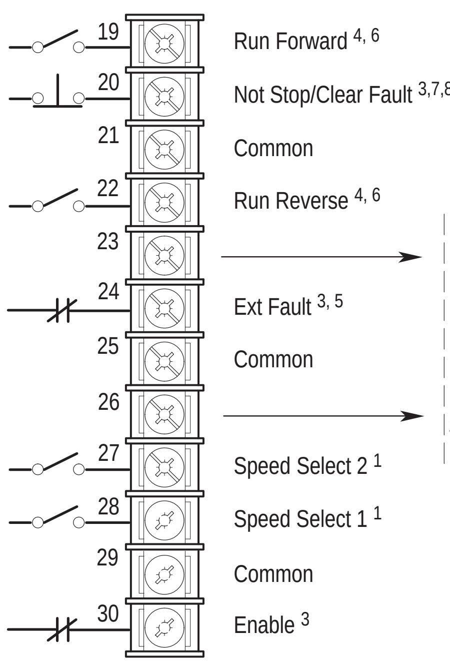
[Input Mode] 7–11
Three–Wire Control with Multi–Source Reversing



Terminal	Mode 7	8	9, 28[9]	10, 29[9]	11	19*	20*	21	22*
22	Reverse [4, 6]	Reverse [4,6]	Digital Pot Up	Reverse [4, 6]	1st Accel	Spd/Tq3	Spd/Tq3	Rev	Spd/Tq3
23	Forward [6]	Forward [6]	Digital Pot Dn	Forward [6]	2nd Accel	Spd/Tq2	Spd/Tq2	Fwd	Spd/Tq2
26	Jog	Speed Select 3 [1]	Speed Select 3 [1]	Digital Pot Up	1st Decel	Spd/Tq1	Spd/Tq1	Ramp Dis	Spd/Tq1
27	Speed Select 2 [1]	Speed Select 2 [1]	Speed Select 2 [1]	Digital Pot Dn	2nd Decel	Proc Trim	Flux En	Reset	Spd Sel 2

** Parameter 53 (Spd/Trq Mode Sel) becomes read only*

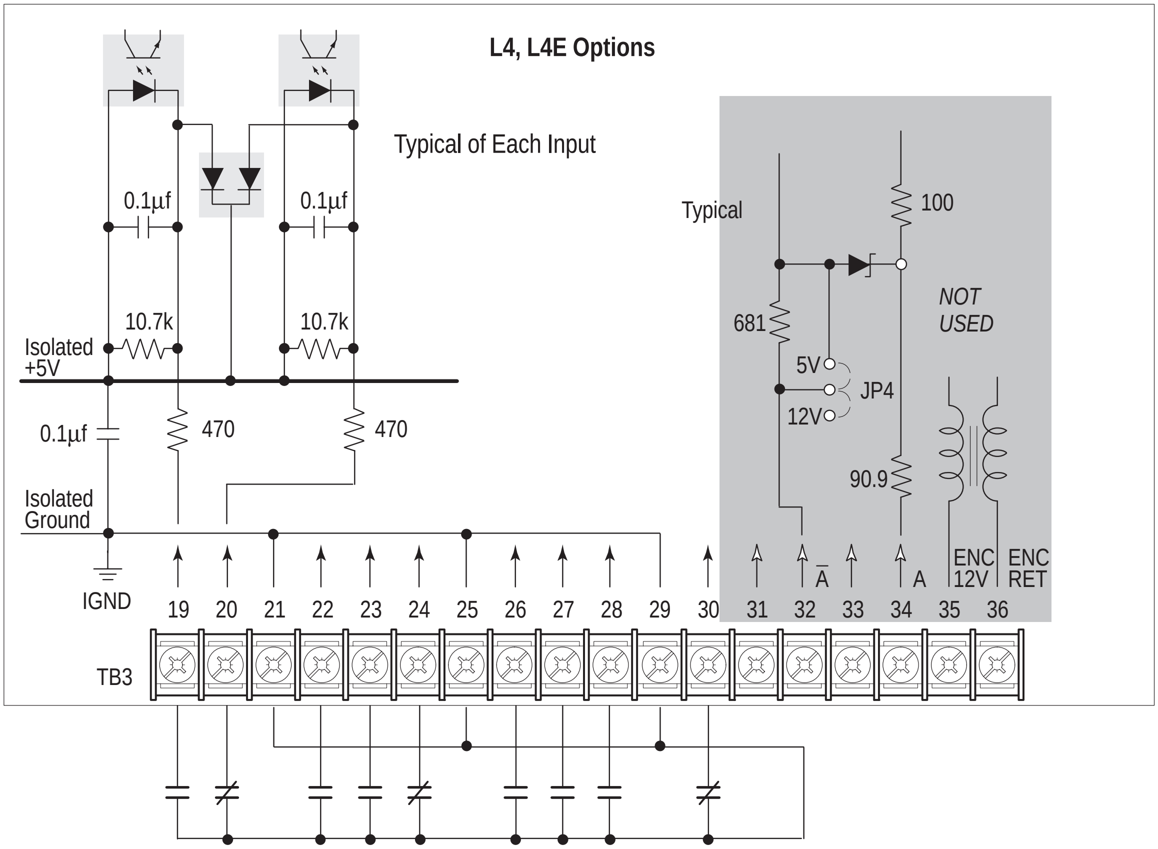
[Input Mode] 12–16
Two–Wire Control, Single–Source Control



Terminal	Mode 12	13	14	15, 30[9]	16	23	24	25	26
23	Local Control [2]	Stop Type	2nd/1st Accel	Digital Pot Up	Local Control [2]	Proc Trim	Flux En	Proc Trim	Jog
26	Speed Select 3 [1]	Speed Select 3 [1]	2nd/1st Decel	Digital Pot Dn	Stop Type	Reset	Reset	Ramp Dis	Spd Sel 3

[1] See Table 2.E.
[2] Drive must be stopped to take Local Control. Control by all other adapters is disabled (except Stop).
[3] These inputs must be present before drive will start.
[4] Bit 0 of [Direction Mask] must = 1 to allow operation.
[5] For Common – Precharge Enable
[6] Bit 12 of Para 59 Logic Options must = 0 for reverse direction control.
[7] Soft Fault Reset Only, Must recycle power to drive to clear; Hard fault – see Troubleshooting
[8] Refer to Para 59 to configure Start & Stop type.
9 Digital Pot Value Zeroed When Stop Asserted

Figure 2.26.
Option L4/L4E Wiring



Contacts shown are general, refer to Figure 2.24 for
Input Mode selection and recommended contact types.

Option L4/L4E – Contact Closure Interface Board Requirements

Circuits used with Option L4/L4E must be capable of operating with low = true logic. Reed type input devices are recommended.

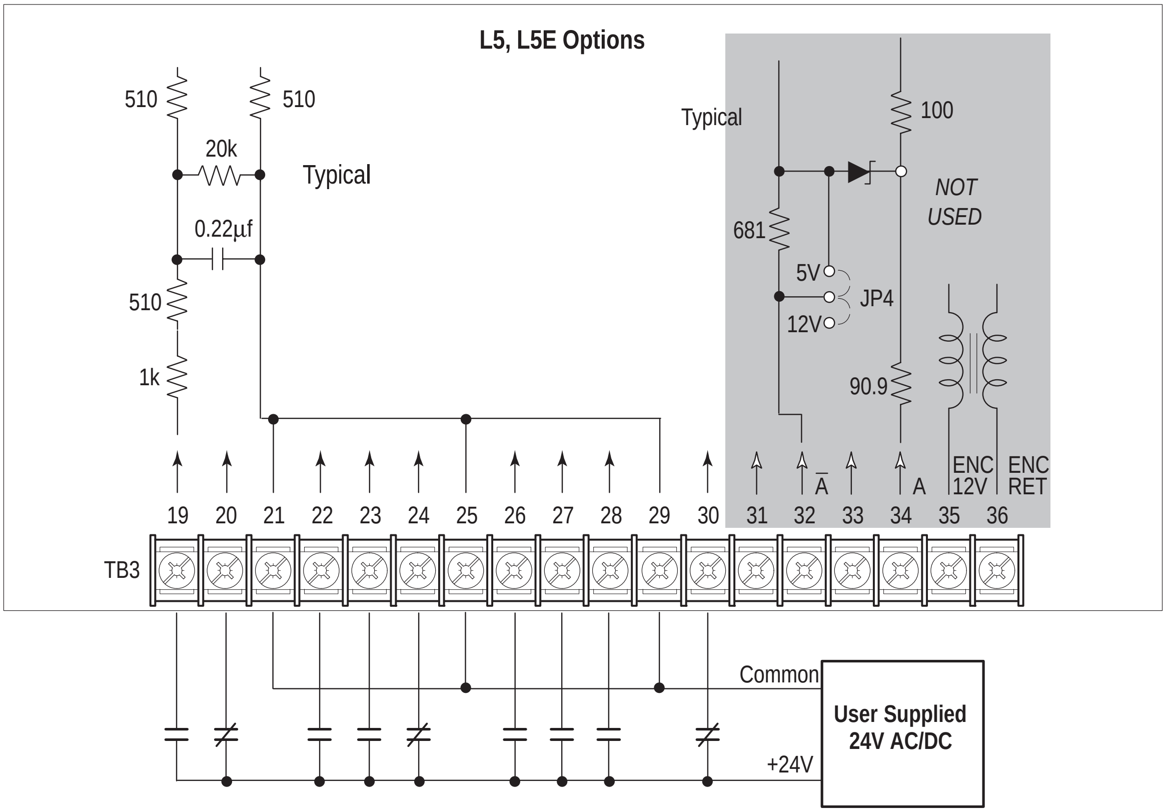
In the low state, external circuits must be capable of a sinking current of approximately 10mA to pull the terminal voltage low to 3.0V DC or less.

In the high state, external circuits must allow the terminal voltage to rise to a voltage of 4.0–5.0V DC.

The L4/L4E option is compatible with the following Allen–Bradley PLC modules:

- 1771–OYL
- 1771–OZL

Figure 2.27.
Option L5/L5E Wiring



Contacts shown are general, refer to Figures 2.24 & 2.25 for Input Mode selection and recommended contact types.

Option L5/L5E – 24V AC/DC Interface Board Requirements

Circuits used with Option L5/L5E must be capable of operating with high = true logic.

DC external circuits in the low state must generate a voltage of no more than 8V DC. Leakage current must be less than 1.5 mA into a 2.5k ohm load.

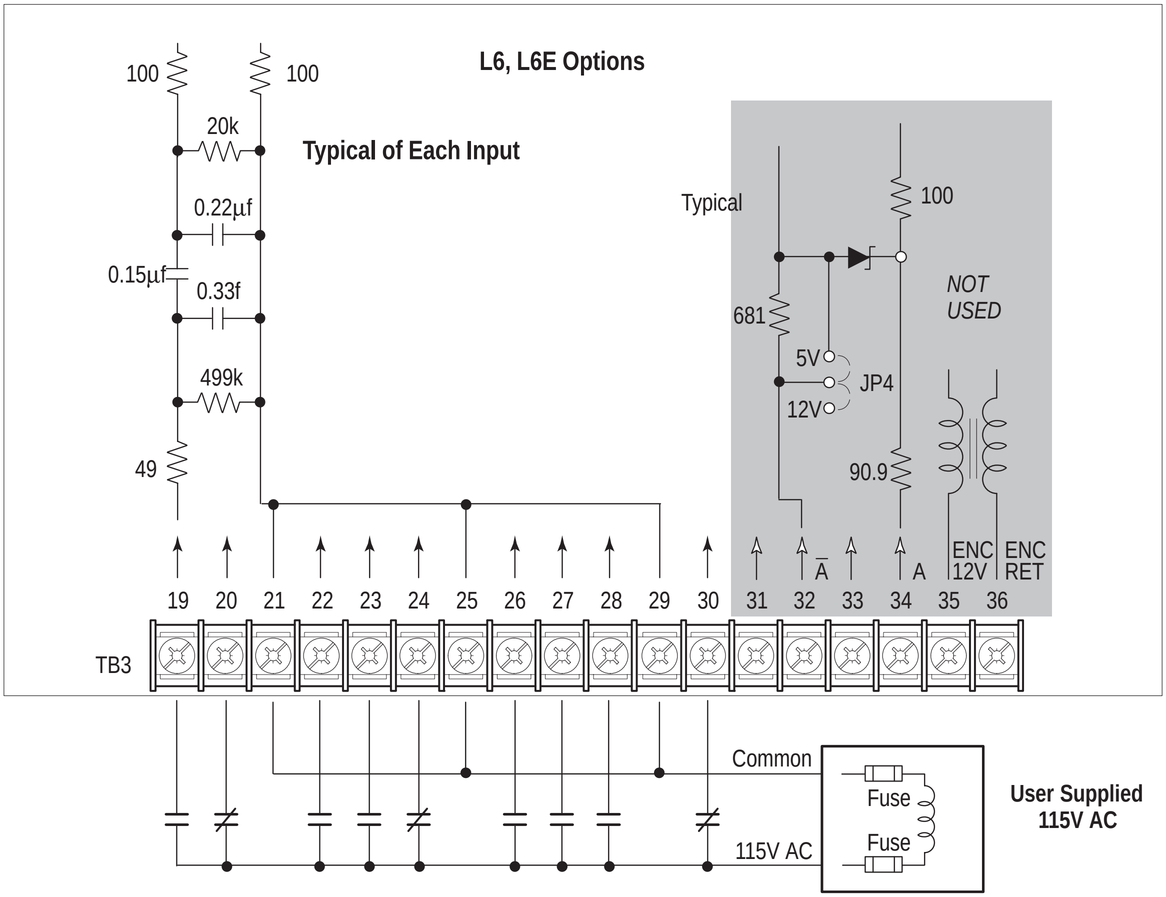
AC external circuits in the low state must generate a voltage of no more than 10V AC. Leakage current must be less than 2.5 mA into a 2.5k ohm load.

Both AC and DC external circuits in the high state must generate a voltage of +20 to +26 volts and source a current of approximately 10 mA for each input.

The L5/L5E option is compatible with these Allen–Bradley PLC modules:

• 1771–OB	• 1771–OQ16	• 1771–OB16
• 1771–OBD	• 1771–OYL	
• 1771–OBN	• 1771–OZL	
• 1771–OQ	• 1771–OBB	

Figure 2.28.
Option L6/L6E Wiring



Contacts shown are general, refer to Figure 2.24 for Input Mode selection and recommended contact types.

Option L6/L6E – 115V AC Interface Board Requirements

Circuits used with Option L6/L6E must be capable of operating with high = true logic. In the low state, circuits must generate a voltage of no more than 30V AC. Leakage current must be less than 10 mA into a 6.5k ohm load. In the high state, circuits must generate a voltage of 90–115V AC +/–10% and source a current of approximately 20 mA for each input.
The L6/L6E option is compatible with these Allen–Bradley PLC modules:

- 1771–OW
- 1771–OA
- 1771–OWN
- 1771–OAD (contact factory for recommended series/ rev. level.)

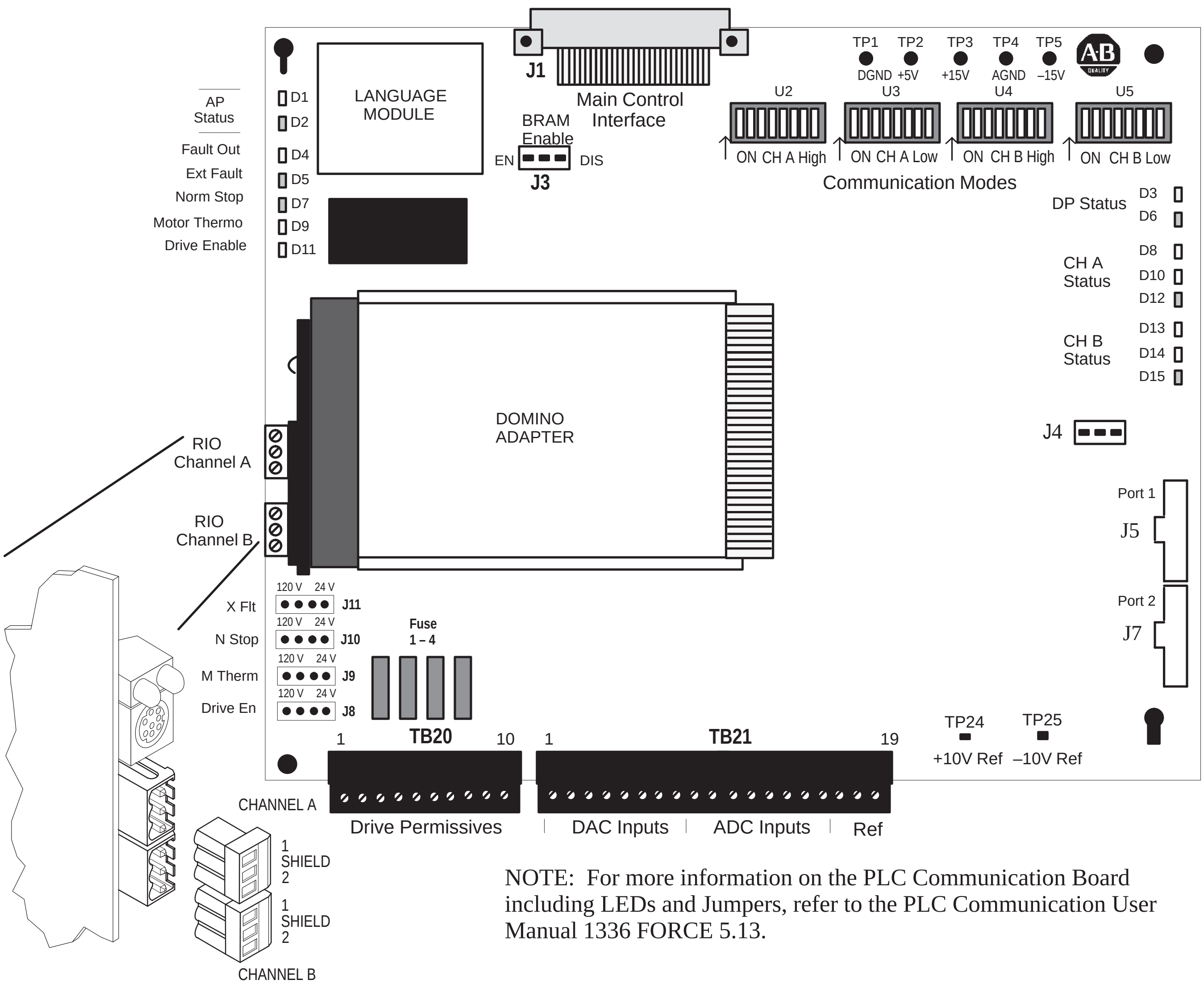
PLC Communication Adapter Board

Control and Signal Wiring – When installing and wiring the PLC Communication Adapter Board, you need to deal with the following issues:

- Control and Signal Wiring
- Jumper Settings for I/O Circuits

If your 1336 FORCE Drive is equipped with a PLC Comm Adapter Board, terminal blocks TB20 & TB21 located at the bottom center of the PLC Comm Board (Figure 2.29) are used for control and signal wiring (Drive Permissives). Connector TB21 provides the interface for Analog Input and Output reference signals as detailed in Figure 2.30.

Figure 2.29.
PLC Comm Board Connections

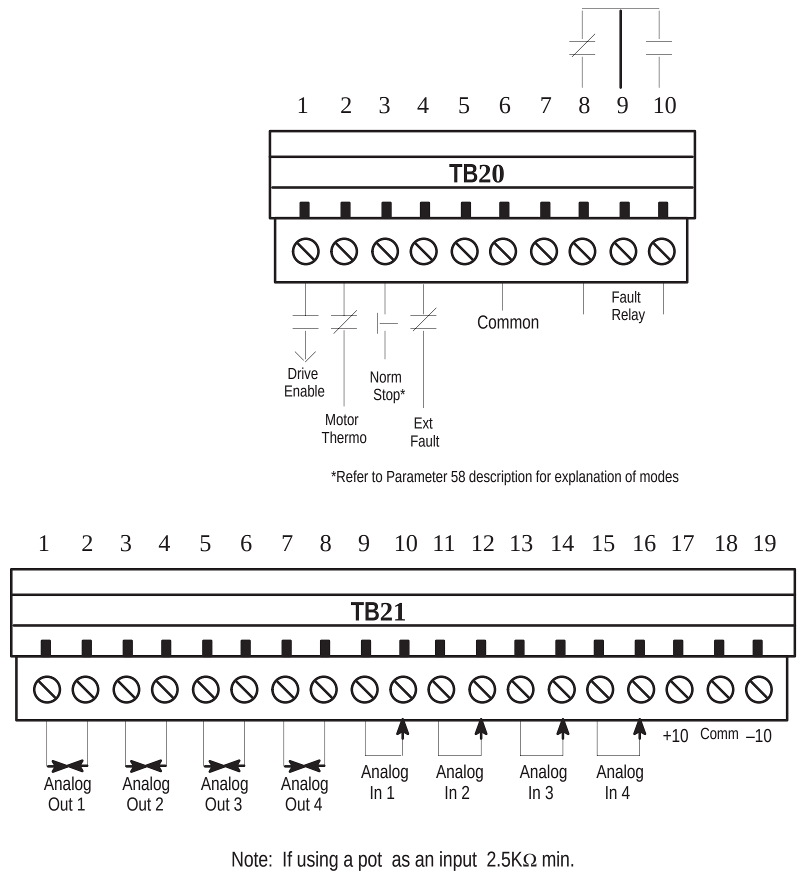


NOTE: For more information on the PLC Communication Board including LEDs and Jumpers, refer to the PLC Communication User Manual 1336 FORCE 5.13.

The maximum and minimum wire size accepted by TB20, TB21, Channel A and Channel B is 3.3 and 0.06 mm^2 (12 and 30 AWG). Maximum torque for these terminal blocks is 0.79 N–m (7 lb. – in.). Only copper wire may be used.

Figure 2.30.
Reference Signal Connections (PLC Comm Adapter)

Terminal Block	Terminal Number(s)	Signal
TB20	1	Drive Enable (NO)
	2	Motor Thermoguard (NC)
	3	Normal Stop (NC)
	4	External Fault (NC)
	5	
	6	Input Common
	7	
	8	Fault Output (NC)
	9	Fault Output (COM)
	10	Fault Output (NO)
TB21	1	OUT 1
	2	COM 1
	3	OUT 2
	4	COM 2
	5	OUT 3
	6	COM 3
	7	OUT 4
	8	COM 4
	9	IN 1+
	10	IN 1–
	11	IN 2+
	12	IN 2–
	13	IN 3 +
	14	IN 3–
	15	IN 4+
	16	IN 4 –
	17	+10V
	18	COM
	19	–10V



Pin jumper J3 on the PLC Communication Adapter Board Enables or Disables the BRAM (Battery Backup RAM) Write function as follows:

Jumpered 1 – 2 = Enabled
Jumpered 2 – 3 = Disabled

The PLC Communication Adapter Board 120V/24V jumper settings for I/0 circuits (J8 – J11) are detailed in the 1336 FORCE PLC Communications Adapter User Manual Publication 1336 FORCE– 5.13.

Switch Settings – There are DIP switches and jumpers located on the PLC Communications Adapter Board that have been preset at the factory. Communication is received through Channels A and B. This communication protocol is defined through SW U2 – U5. If you need to reconfigure the switches or jumpers consult the 1336 FORCE PLC Communications Adapter User Manual.

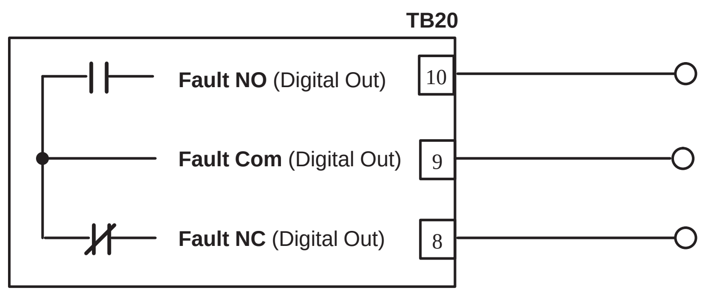
Discrete Outputs

Fault outputs from the 1336 FORCE are supplied at terminal block TB20 on the PLC Communication Adapter Board. Fault outputs provide warning or fault signals based on drive programming.

Fault NC
Fault Com
Fault NO – A form C, NO /NC relay contact on the Standard Adapter Board programmed to provide external warning or fault change–of–state signals.

Contact Ratings = 2A @ 115 VAC
2A @ 30 VDC

Figure 2.31.
Typical Digital Output



Discrete Inputs

Discrete Inputs to the 1336 FORCE are only supplied when a PLC Communication Adapter Board is used. These inputs are supplied at terminal block TB20.

Discrete inputs serve to enable and stop the Drive as well as provide checks on drive and motor operation.

Figure 2.32.
Typical Digital Output

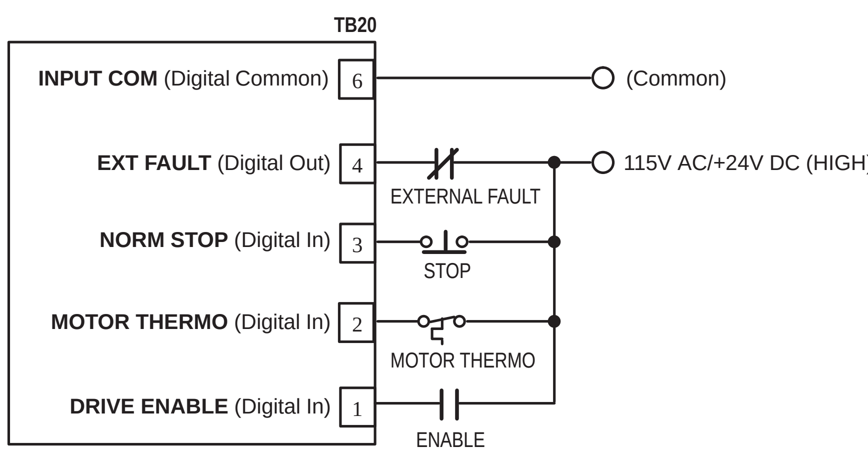
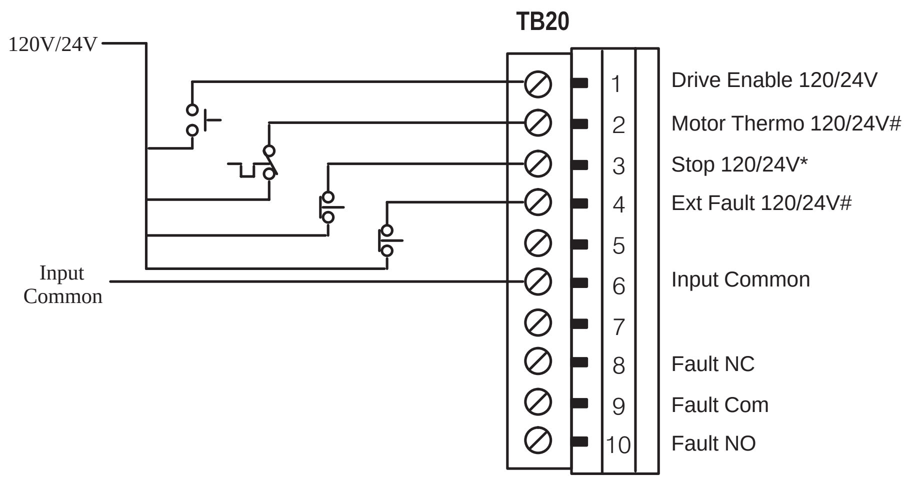


Figure 2–33 illustrates a typical stop control scheme that might be used when the 1336 FORCE is equipped with a PLC Communication Adapter Board. For further information on PLC Communication Adapter board operation and configuration, refer to the PLC Communication Adapter Board User Manual 1336 FORCE 5.13.

Figure 2.33.
Control Scheme



Note: Terminal Blocks TB20 & TB21 are pull apart terminal blocks to aid in making cable connections. Both terminal blocks will accept wire sizes from 30–12 AWG (0.06 – 3.3 mm^2).

*This is a configurable stop, see parameter 59 under the Drive Logic group for Start and Stop options.
#Input must be jumpered if not used.

Computer Connections to Frame D drives

In some cases it will be necessary to use a DH+ port connection kit when connecting some computers to a 1336 FORCE drive in FRAME D ONLY!

Refer to the Installation instructions included with Frame D drives for more information on the use and installation of this kit.

ControlNet Fiber Optic Cable Connections to Frame D drives

If you are installing the fiber optic cable for ControlNet on a Frame D drive, special note should be taken of the following:

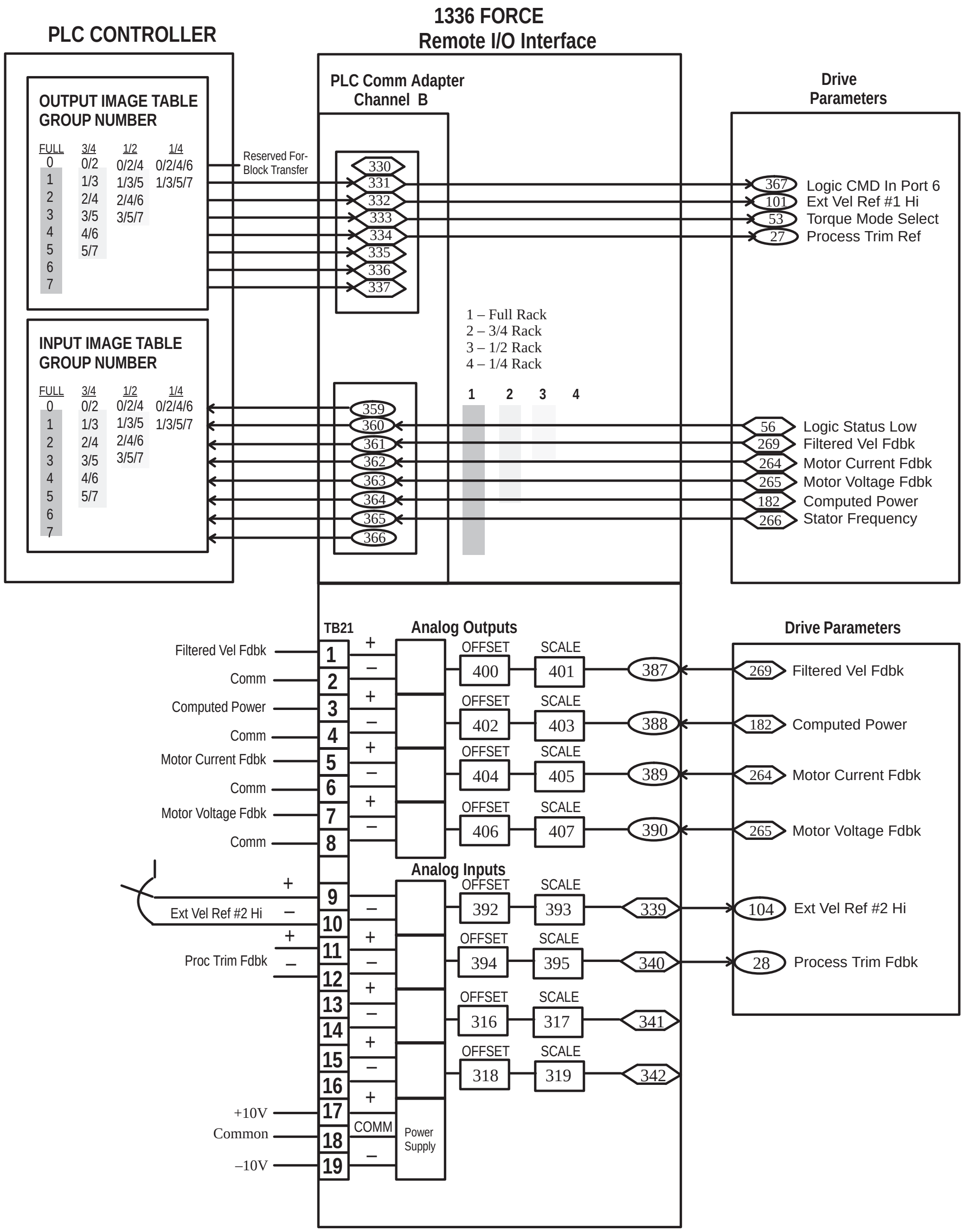
– The strain relief/latching cover assembly must be removed from the cable connectors due to space constraints. The cable connectors must then be separately plugged into the ControlNet board connectors on Frame D drives ONLY!

– Correct orientation of the loose cables is determined by the color of the connectors. The blue connector must be plugged into the dark grey connection on the board. The black connector plugs into the light grey connection on the board. The cable with the black connector is the transmit cable (TX) and the cable with the blue connector is the receive (RX) cable. Reset the drive after connecting the cables, and the ControlNet system should be ready to operate.

Configuration

The 1336 FORCE Drive is shipped pre-configured, which means that some of the inputs and outputs are linked to a predefined signal. Figure 2.34 shows the 1336 FORCE standard configuration when equipped with a PLC Communication Adapter Board. The user has the flexibility to configure the Drive for a particular application.

Figure 2.34.
PLC Comm Adapter Links



Chapter 3

Programming Terminals

Chapter Objectives

Chapter 3 provides an overview of the optional Programming Terminals available for use with the 1336 FORCE Drive. The various controls and indicators found on the Human Interface Module (HIM) and the Graphic Programming Terminal (GPT) are both explained in this chapter. Additional in depth information on the Graphic Programming Terminal can be found in the GPT programming Manual.

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.

ATTENTION: When a drive mounted HIM is not supplied on enclosed NEMA Type 1 (IP 20) drives, the blank cover plate (option HAB) must be installed to close the opening in the front cover of the enclosure. Failure to install the blank cover plate allows access to electrically live parts which may result in personal injury and/or equipment damage.

When a drive mounted HIM is supplied with enclosed NEMA Type 1 (IP 20) drives, but has been removed from its mounting cradle for remote operation, the blank cover plate must be installed in place of the HIM.

The HIM is divided into two sections; Display 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.

Figure 3.1
Human Interface Module Location

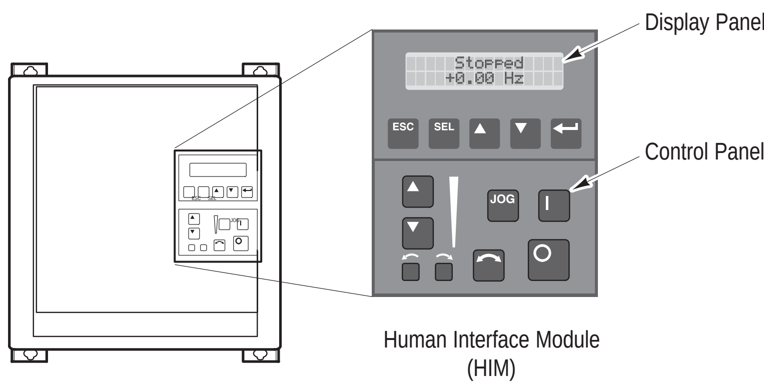
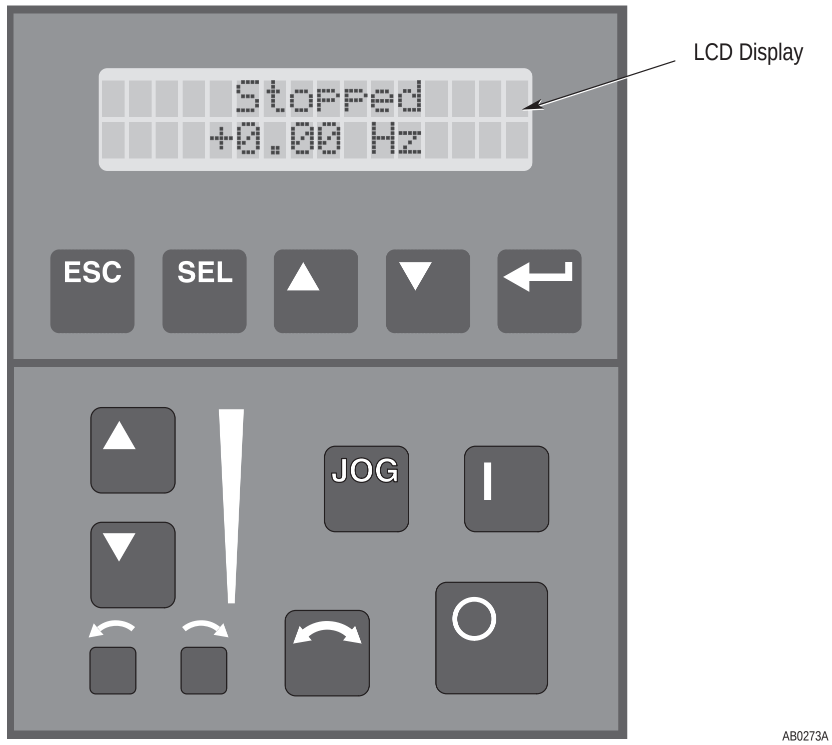


Figure 3.2
HIM Front Panel



Key Descriptions

Descriptions of the keys used with the 1336 FORCE Drive are presented in the following paragraphs. Remaining keys that are not described (shaded in figure above) are not used and reserved for future use.

AB0270A

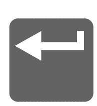
Escape
When pressed, the ESCape key will cause the programming system to go back one level in the menu tree.

AB0282A

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.

AB0295A AB0267A

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



AB0269A

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.

Key Descriptions *(continued)*

AB0285A

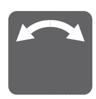
Start
By default, this key will initiate drive operation if hardware is enabled and no other control devices are sending a Stop command. To change this function, the [Command Mask] and [Typ 1 Logic Axis] parameters must be reconfigured. Refer to Chapter 5.

AB0287A

Stop
When pressed, a stop sequence will be initiated at the System Module causing a controlled stop to be initiated in each axis, as determined by [Stop Mode], [Stop Time Lim] and [Stopping Cur].

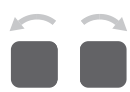
AB0275A

Jog
By default, when this key is pressed the motor will jog at a speed determined by the [Jog Vel] parameter for any axis that is enabled (default will be 20% of motor rated speed). Releasing the key will stop the function.



AB0281A

Change Direction (Jog/Digital Velocity Reference Modes Only**)**
Pressing this key will cause the motor to change direction. The appropriate Direction Indicator will light to indicate direction.



AB0265A

Direction LEDs (Indicators)
These LEDs will illuminate to indicate the direction of motor rotation for Axis 0 (by default).

AB0295A

AB0267A

Up/Down Arrows *(only available with digital speed control)*
Pressing these keys will increase or decrease the HIM frequency command. An indication of this command will be shown on the visual Speed Indicator. The drive will run at this command if the HIM is the selected frequency reference. See [Freq Select 1/2].

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

Note:
Pot Range
0 – 32767

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

AB0283A

Speed Indicator *(only available with digital speed control)*
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.

Module Removal

For handheld operation, the module can be removed and located up to 10 meters (33 feet) from the Drive.

ATTENTION: Some voltages present behind the Drive front cover are at incoming line potential. To avoid an electric shock hazard, use extreme caution when removing/replacing the HIM.

Important: Removing a HIM (or other SCANport device) from a drive while power is applied will cause a “Serial Fault,” unless the [Logic Mask] parameter has been set to disable this fault or Control Logic (Control Status menu) has been disabled (Series A, version 3.0 or Series B HIM). Setting Bit 1 of the [Logic Mask] parameter to “0” will disable “Serial Fault” from a HIM on port 1. Note that this also disables all HIM control functions except Stop.

To remove the module:

❑ 1. Assure that power has been removed, [Logic Mask] has been set or Control Logic has been disabled.

❑ 2. Take the drive front cover off and simply slide the module down and out of its cradle. Remove cable from module.

❑ 3. Remove HIM as described in the following sequence. If Jog control is required after the HIM is reconnected, repeat steps 1, but select “Enable.”

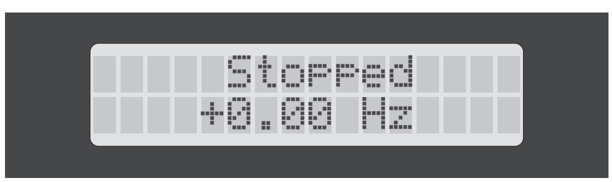
❑ 4. Connect the appropriate cable between the HIM and the Communications Port (Adapter 2,3, 4 or 5).

❑ 5. Reverse the above steps to replace the module. Apply power, reset Bit 1 of the [Logic Mask] or enable Control Logic.

HIM Operation

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 (see Figure 3.3) will be shown.

Figure 3.3
Status Display



AB0286A

This display shows the current status of the drive (i.e. “Stopped,” “Running,” etc.) or any faults that may be present (refer to Chapter 6 for fault information). On a Series A (version 3.0) or Series B HIM (see back of HIM) 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.

EEPROM
This mode allows all parameters to be reset to the factory default settings. In addition, a Series B HIM will allow parameter upload/download between the HIM and drive. BRAM (Battery Backup RAM) jumper must be in “Enable” position in order to change parameters.

Search (Series A, version 3.0 or Series B HIM Only)
This mode will search for parameters that are not at their default values.

Control Status (Series A, version 3.0 or Series B HIM Only)
Permits the drive logic mask to be disabled/enabled allowing HIM removal while drive power is applied. Disabling the logic mask with a Series A HIM below version 3.0 can be accomplished with [Logic Mask] as explained on page 3–4. This menu also provides access to a fault queue which will list the last four faults that have occurred. “Trip” displayed with a fault indicates the actual fault that tripped the drive. A clear function clears the queue – it <u>will not</u> clear an active fault.

Link
Link mode provides a method of transferring data from a source parameter to a linkable sink parameter. When a PLC Comm Adapter Board is used, up to (50) links are allowed. Links can be programmed only when the Drive is not running. Links are stored in BRAM and established at power up, BRAM recall, and/or system reset.

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.

Refer to the Password section of the example that follows.

Program Mode

The Program mode allows access to change parameters.

From the Status Display, press Enter. “Choose Mode” will be shown.

```
Choose Mode
Display
```

Press the Increment (or Decrement) key to show “Program” if it is not currently shown.

```
Choose Mode
Program
```

Press Enter. The Choose File Display will appear. Use the Increment (or Decrement) key to select the ‘Diagnostics’, ‘Velocity Torque’, ‘Communication I/O’ or ‘Startup’ file.

```
Choose File
Velocity Torque
```

Press Enter. The Choose Group Display will appear.

```
Choose Group
Logic
```

Press the Increment (or Decrement) key until the desired group is displayed (In this case Torque Ref).
Press Enter.

```
Choose Group
Torque Ref
```

Press the Increment (or Decrement) key to scroll to the desired parameter (In this case Parameter 53, Torque Mode Sel).

```
Torque Mode Sel
```

If the parameter you have selected has bit definition information use the Select key to access the 2nd or 3rd line. Continue to press the Select key to access the desired bit. Use the Inc or Dec key to change the value.
NOTE: If the cursor is a blinking underline instead of a flashing character, you are either in Display mode or are trying to change a read–only parameter. For detailed information on changing bit coded parameters refer to the Bit Enums section in this chapter.

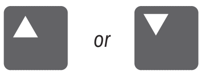
Press the Enter key to save your changes.

Display Mode

The Display mode allows access to view parameters.

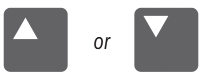
From the Status Display, press Enter. “Choose Mode” will be shown.

```
Choose Mode
Process
```



Press the Increment (or Decrement) key to show “Display” if it is not currently shown.

```
Choose Mode
Display
```

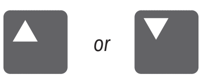


Press Enter. The Choose File Display will appear. Use the Increment (or Decrement) key to select the ‘Diagnostics’, ‘Velocity Torque’, ‘Communication I/O’ or ‘Startup’ file.

```
Choose File
Velocity Torque
```

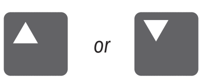
Press Enter. The Choose Group Display will appear.

```
Choose Group
Monitor
```



Press the Increment (or Decrement) key until the desired group is displayed (In this case Info). Choices include: Transistor Diag., Motor Overload, Fault Sel/Sts, Testpoints, Monitor, Linear List and Info. Press Enter.

```
Choose Group
Info
```



Press the Increment (or Decrement) key to scroll to the desired parameter (In this case Adapter ID, Param. 300).

```
Adapter ID
```

Bit ENUMs

With drive software versions above 2.00 and a Series A (software version 3.0) or Series B HIM, bit ENUMS (16 character text strings) will be displayed to aid interpretation of bit parameters.

```
Masks
Logic Mask
```

```
TB3
X1111111
```

or

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

SEL

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 as 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 be changed by pressing the Increment/Decrement keys.

Link

The Link Option allows you to view all current links in the drive and change or clear these links.

From the Status display, press Enter. "Choose Mode" will be shown.

```
Choose Mode
Process
```

or

Press the Increment or Decrement key to reach the Link Option.

```
Choose Mode
Link
```

Press Enter and either the Clear Links or Set Links option screen will appear. Toggle between the screens using the Inc or Dec key.

or

```
Link
Clear All Links
```

From the Clear Links screen use the Enter key to clear all links.

```
Drive SW Version
< 1 >  < – – 0 >
```

or

SEL

To change links, use the Inc or Dec key to reach the link you wish to change. Use the Sel key to access the 2nd line in the display and then change the link using the Inc or Dec key.

Process Mode

When selected, the Process mode will allow you to monitor 6 different pre–programmed processes. 2 of these processes can be displayed at one time.

Use the Enter key to select the Process Mode.

```
Choose Mode
Process
```

Press the Enter key again to access the Process Variable display.

```
Process Var 1=1
Process Var 2=2
```

Press the Enter key again if you wish to monitor the processes under Process Variable 1.

or

Use the Inc/Dec keys to view the six processes that are currently programmed on line 1.

```
+ 0.00 Freq Cmd
+ 0.00 Vel FB
```

SEL

To move to the second Process Variable Line, Press the Select key. This will allow you to access the six processes under Process Variable 2.

ESC

To return to a previous level press the Escape key.

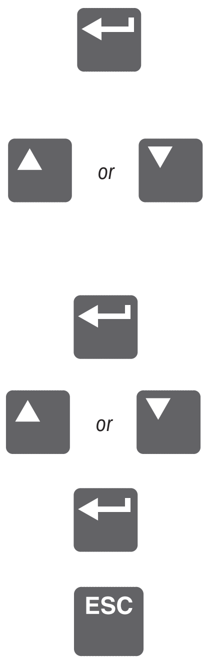
Note: HIM Series B Version 1.06 will allow changing of the 6 process displays.

EEProm Mode

The EEProm mode is used to restore all settings to factory default values or upload/download parameters between the HIM and drive (Series B HIM, Only).

Reset Defaults

To restore factory defaults:



AB0270A

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

```
Choose Mode
Display
```

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.

```
Choose Mode
EEProm
```

Press Enter.

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

```
EEProm
Reset Defaults
```

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

Press ESC. Display returns to Choose Mode Screen.

```
Choose Mode
EEPROM
```

Press the Stop key to reset the fault.

AB0287A

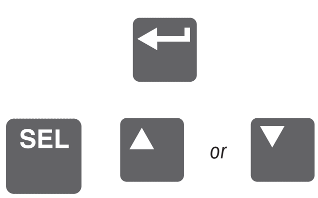
Note: Reset Defaults only modifies parameters in RAM. To save in EE, do a “Save” or to recall what is in EE to RAM do a “Recall”.

```
Stopped
+0.00 Hz
```

Important: If [Input Mode] was previously set to a value other than “1,” cycle drive power to reset.

Drive –> HIM

To upload a parameter profile from the drive to the HIM, you must have a Series B HIM.



AB0282A

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

```
EEProm
Drive -> HIM
```

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
1 A
```

Drive –> HIM ***(continued)***

Press Enter. An informational display will be shown, indicating the drive type and firmware version.

```
1336T Vector
Version 3.02
```

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.

```
Drive –> HIM 60
|||||
```

“COMPLETE” displayed on line 2 will indicate a successful upload. Press Enter. If “ERROR” is displayed, see Chapter 6.

```
Drive –> HIM 210
COMPLETE
```

HIM –> Drive

To download a parameter profile from the HIM to a drive, you must have a Series B HIM.

Important: The download function will only be available when there is a valid profile stored in the HIM.

or

From the EEProm menu, press the Increment/Decrement keys until “HIM –> Drive” is displayed.

```
EEprom
HIM –> Drive
```

or

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).

```
HIM –> Drive
1 A
```

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.

```
1336T Vector
3.02 – > 3.02
```

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.

```
HIM –> Drive 60
|||||
```

A successful download will be indicated by “COMPLETE” displayed on line 2 of the HIM. Press Enter. If “ERROR” is displayed, see Chapter 6.

```
Drive –> HIM 210
COMPLETE
```

Search Mode

The Search Mode is only available with a Series A (version 3.0) or Series B HIM.

This mode allows you to search through the parameter list and display all parameters that are not at the factory default values. This mode also offers an option to search parameter links for links that are not factory defaults.

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

```
Choose Mode
Display
```

Press the Increment (or Decrement) key until "Search" is displayed.

```
Choose Mode
Search
```

Press Enter. The HIM will display the Search Parameters, or Search Links screen. Use the Increment or Decrement key to toggle between screens.

```
Search
Parameters
```

From the Search Parameters display, press Enter. The HIM will search through all parameters and display any parameters that are not at their factory default values.

```
Proc Trim Fdbk
–0.03%          2
```

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

To search parameter links, toggle to the Search Links display from the Search Parameters display using the Increment or Decrement key.

```
Search
Links
```

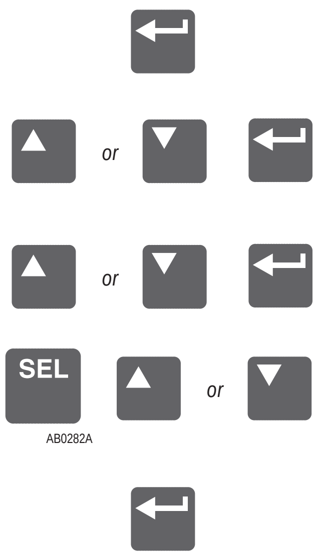
From the Search Links display, press Enter. The HIM will search through all links and display any links that are not at their factory default values.

```
Proc Trim Fdbk
<28x – – – 355
```

Control Status Mode

The Control Status mode is only available with a Series A (version 3.0) or Series B HIM.

This mode allows the drive logic mask to be disabled, thus preventing a Serial Fault when the HIM is removed with drive power applied. The logic mask can be disabled with Series A HIM versions below 3.0 by using [Logic Mask] as explained on page 3.4.



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

```
Choose Mode
Display
```

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

```
Choose Mode
Control Status
```

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

```
Control Status
Control Logic
```

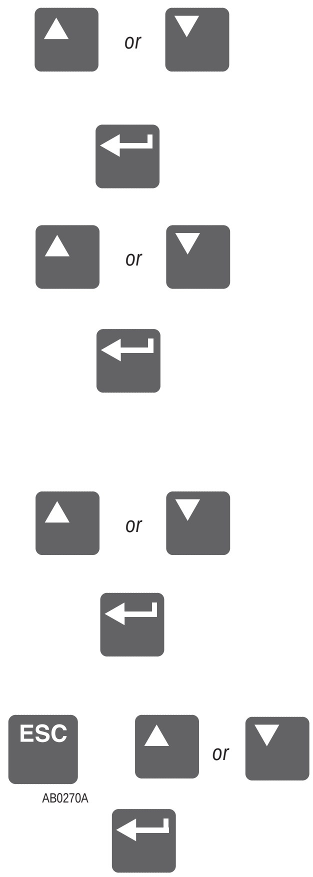
Press the SELect key, then use the Increment (or Decrement) key to select “Disabled” (or “Enable”).

```
Control Logic
Disabled
```

Press Enter. The logic mask is now disabled (or enabled).

Control Status Mode *(continued)*

Fault Queue/Clear Faults



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

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

```
Control Status
Fault Queue
```

Press Enter.

Press the Increment (or Decrement) key until "View Queue" is displayed.

```
Fault Queue
View Queue
```

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

```
Serial Fault
F    10   Trip 1
```

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

```
Reprogram Fault
F    48        2
```

If you wish to view the time and date of the fault occurrence, press the Enter key.

```
1:20:22      1/1
```

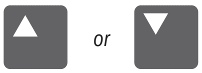
To clear the fault queue, press ESCape. Then use the Increment/Decrement keys to select "Clear Queue." Press Enter. Please note that "Clear Queue" will not clear active faults.

```
Fault Queue
Clear Queue
```

Control Status Mode *(continued)*

Warning Queue/Clear Warnings

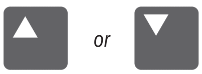
This menu provides a means to view the warning queue and clear it when desired.



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

```
Control Status
Warning Queue
```

Press Enter.

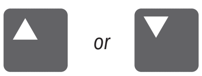


Press the Increment (or Decrement) key until “View Queue” is displayed.

```
Warning Queue
View Queue
```

Press Enter. The warning queue will be displayed.

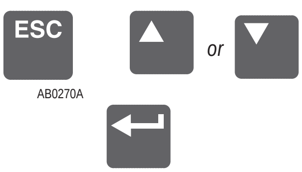
```
Vel Fdbk Lvl
F    5048     5
```



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

If you wish to view the time and date of the warning occurrence, press the Enter key.

```
1:20:22     1/1
```



To clear the warning queue, press ESCape. Then use the Increment/Decrement keys to select “Clear Queue.” Press Enter. Please note that “Clear Queue” will not clear active warnings.

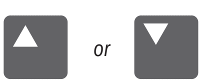
```
Warning Queue
Clear Queue
```

Reset Sequence

A reset sequence is available on Series B HIMs with 1.06 or later software.

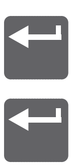
From the Startup Completed display press the Enter key.

```
Start Up
Completed
```



Press the Increment (or Decrement) key until *“Startup Reset Sequence”* is displayed. Press Enter.

```
Start Up
Reset Sequence
```



Press the Enter key again to relaunch the Startup sequence.

```
Entering Start U
Press ‘ENTER’
```

Password Mode

The factory default password is 0 (which disables password protection). To change the password and enable password protection, perform the following steps.

Key	Step	Display
	From the Status Display, press Enter (or any key). “Choose Mode” will be shown.	`Choose Mode` `Display`
or	Press the Increment (or Decrement) key until “Password” is displayed.	`Choose Mode` `Password`
	Press Enter.	
or	Press the Increment (or Decrement) key until “Modify” is displayed.	`Password` `Modify`
	Press Enter. “Enter Password” will be displayed.	`Enter Password` `<     0>`
or	Press the Increment (or Decrement) key to scroll to your desired new password. With a Series A (version 3.0) or Series B HIM, the SELect key will move the cursor.	`Enter Password` `<   123>`
	Press Enter to save your new password.	`Choose Mode` `Password`
	Press Enter again to return to the Password Mode.	`Password` `Login`
or	Press the Increment (or Decrement) key until “Logout” is displayed.	`Password` `Logout`
	Press Enter to log out of the Password mode.	`Choose Mode` `Password`
or	With a Series A (version 3.0) or Series B HIM, the Password mode can be programmed to appear when drive power is applied. Simultaneously press the Increment and Decrement keys while the Password display is shown.	**Sets Password Display as Power-Up Display**

Password Mode *(continued)*
Login to the Drive

The Program/EEProm modes and the Control Logic/Clear Queue menus are now password protected and will not appear in the menu. To access these modes, perform the following steps.

or

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

```
Choose Mode
Password
```

Press Enter. “Login” will be displayed.

```
Password
Login
```

Press Enter, “Enter Password” will be displayed.

```
Enter Password
<    0>
```

or

Press the Increment (or Decrement) key until your correct password is displayed. With a Series A (version 3.0) or Series B HIM, the SELect key will move the cursor.

```
Enter Password
<  123>
```

Press Enter.

```
Choose Mode
Password
```

The Program and EEProm modes will now be accessible. To prevent future access to program changes, logout as described in step 1.

Logout from the Drive

To prevent unauthorized changes to parameters, Logout must be performed as described below.

or

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

```
Choose Mode
Password
```

Press Enter.

```
Password
Login
```

or

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

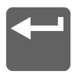
```
Password
Logout
```

Press Enter to log out of the Password mode.

```
Choose Mode
Password
```

Startup Mode

An automated Quick Startup sequence is available on the HIM to lead you through all data entry, configuration and diagnostic tests that must be performed when starting up the 1336 FORCE drive.



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

```
Choose Mode
Display
```

Press the Increment (or Decrement) key until "Startup" is displayed. Press Enter.

```
Choose Mode
Startup
```

The "Setup Motor Nameplate" display will appear. If you DO NOT need to enter motor nameplate data toggle to the No (N) selection and press Enter.
A display asking you to run the Motor Connect Diagnostics will appear.

```
Setup Motor
Nameplate     N
```

```
Motor Connect
Diagnostics?  Y
```

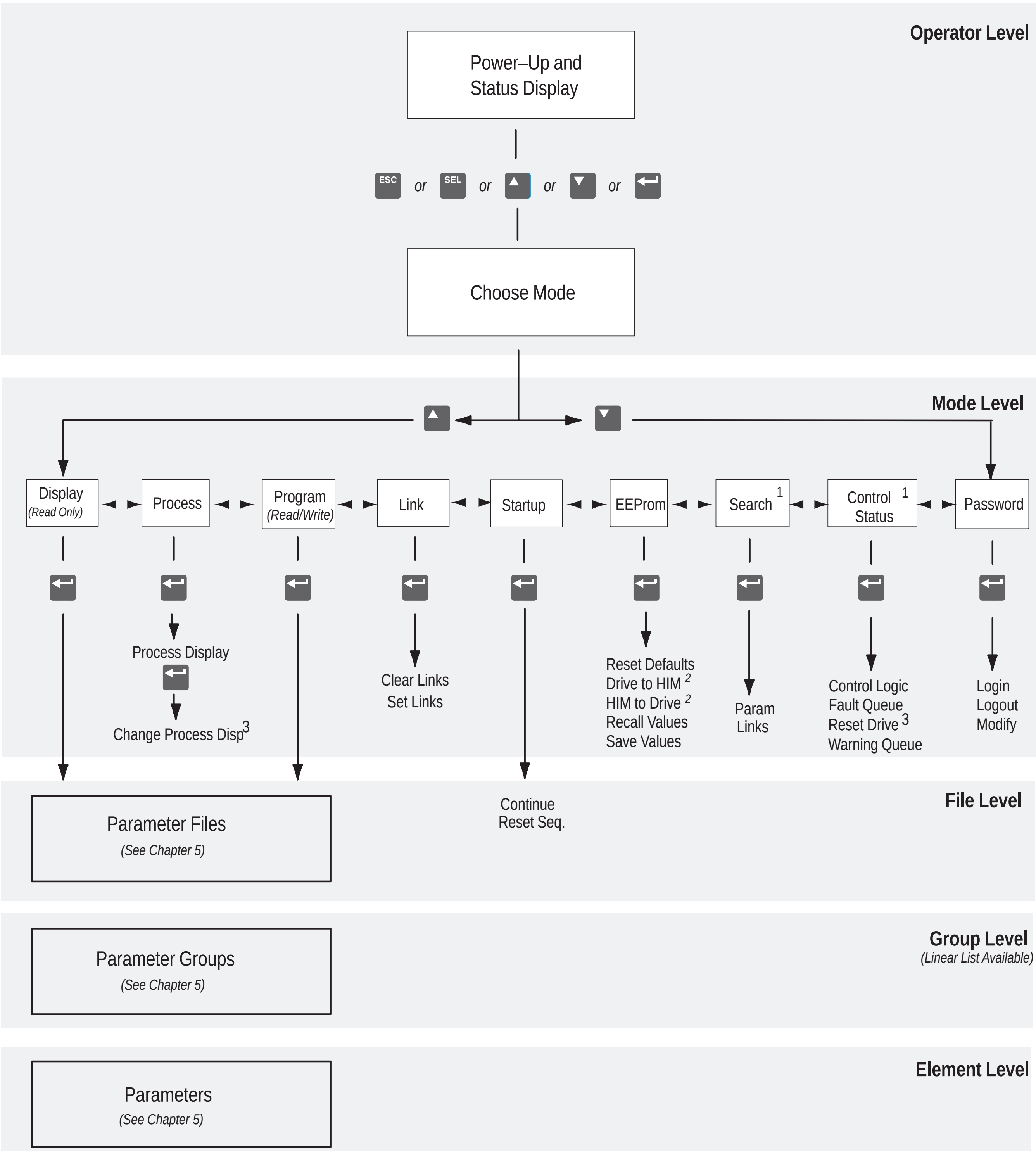
If you have not previously entered the Motor Nameplate data toggle to the Yes (Y) selection in the Setup Motor Nameplate display and press Enter.

The first motor informational screen will appear. Use the Select key to access the second line and make any changes with the Increment and Decrement keys. In subsequent displays you will be asked to provide the following motor information:
Base Motor Current
Base Motor Volts
Base Motor Frequency
Motor Poles
Base Motor Speed
Feedback Device Type

```
Base Motor HP
30.0 HP
```

NOTE: For more information on the complete Quick Startup sequence refer to Chapter 4. All tests and entries are covered in greater detail in the Startup chapter.

Figure 3.4
HIM Programming Steps

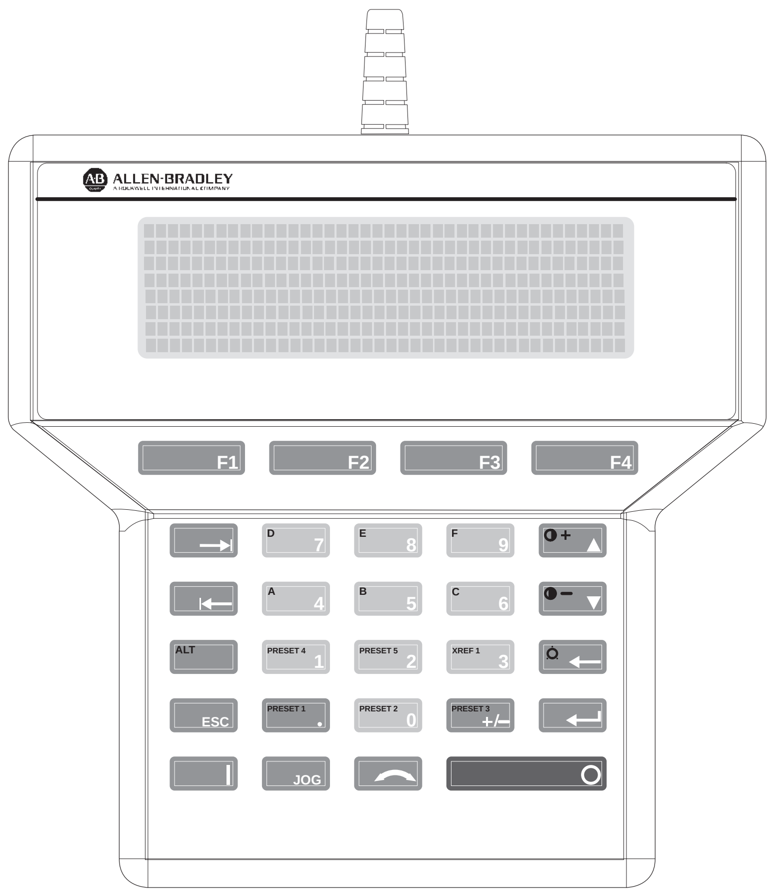


1 Him Versions 2.02 & Up
2 Series B HIM Only
3 Series B V 1.06 & up

GPT Description

When an optional GPT (Figure 3.5) is supplied, it will be either mounted to the front of the Drive as a panel mount terminal, or supplied as a remote device with a 1.8 meter (6 foot) long cable. The GPT offers a 40 by 8 character display that can also be used as a graphics display to show trending graphs etc.

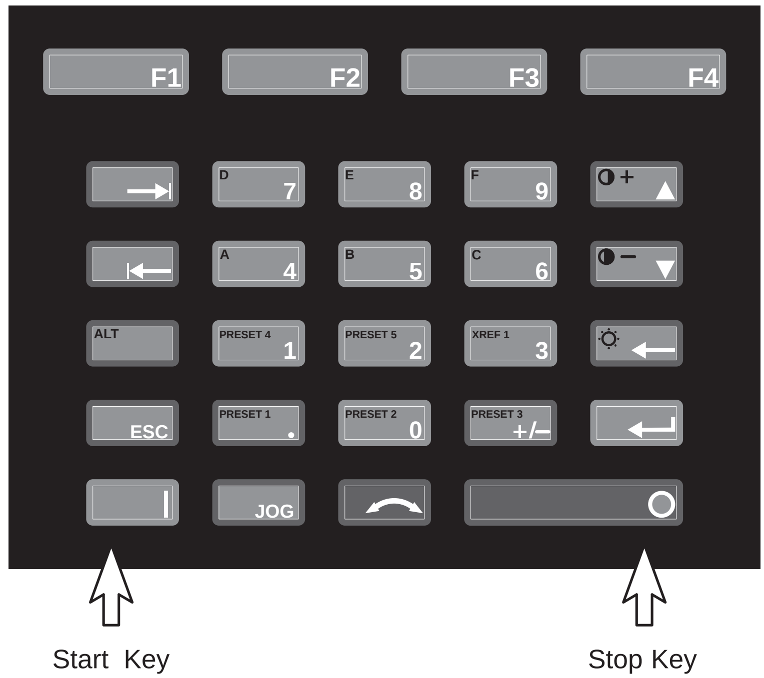
Figure 3.5
1201 Graphic Programming Terminal



Keypad Description

The GPT keyboard (Figure 3.5) is provided as either a 26 key version (non–runtime) or 30 key (runtime version). The runtime version as shown in Figure 3.6 provides additional Start, Stop, Jog and Direction keys.

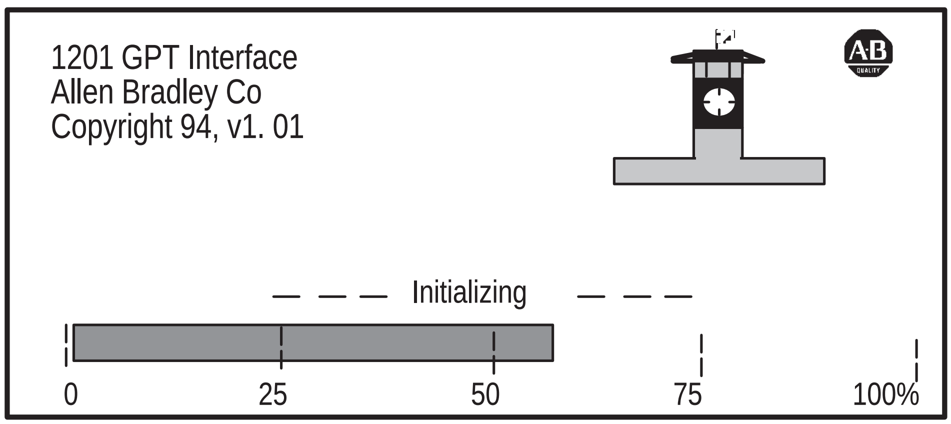
Figure 3.6
GPT Keypad



GPT Operation

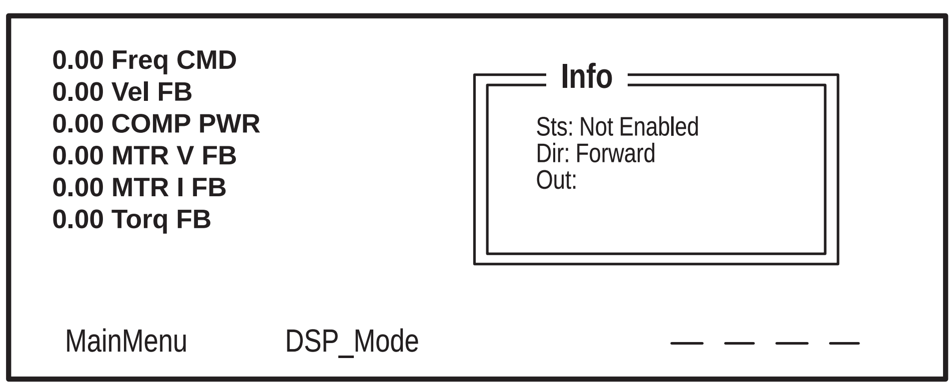
When power is first applied to the drive or device, a series of hardware diagnostic tests will run before the Power Up Logo Screen shown in Figure 3.7 appears. Once the initialization has been completed and all information from the drive is uploaded, the terminal will display either the Main Menu screen or the Process Display screen depending on the terminal setup information.

Figure 3.7
GPT Power Up Logo Screen



If it has not been deactivated through the terminal during setup, the Process Display Screen (Figure 3.8) showing you the programmed process variables will appear next. If the Process Display Screen is deactivated, the Main Menu Screen (3.9) will appear first.

Figure 3.8
Process Display Screen

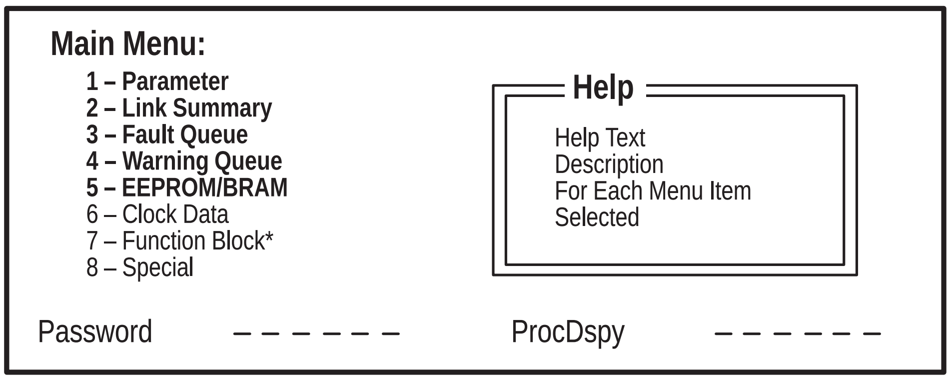


When the Process Display Screen is active, it is necessary to press the Main Menu Option (F2 soft designator) on the Process Display to reach the Main Menu. The Main Menu contains the password option that provides a highlighted dialog box for password entry.

The Configuration option (F1 soft designator) allows you to directly access Process parameters from the Process Display screen. The Display Mode option (F3 soft designator) allows you to enter the Logo, Status or Meter modes for the Process Display parameters.

IMPORTANT: Main Menu screens are dynamic and will change based on functionality provided by adapter and drive status.

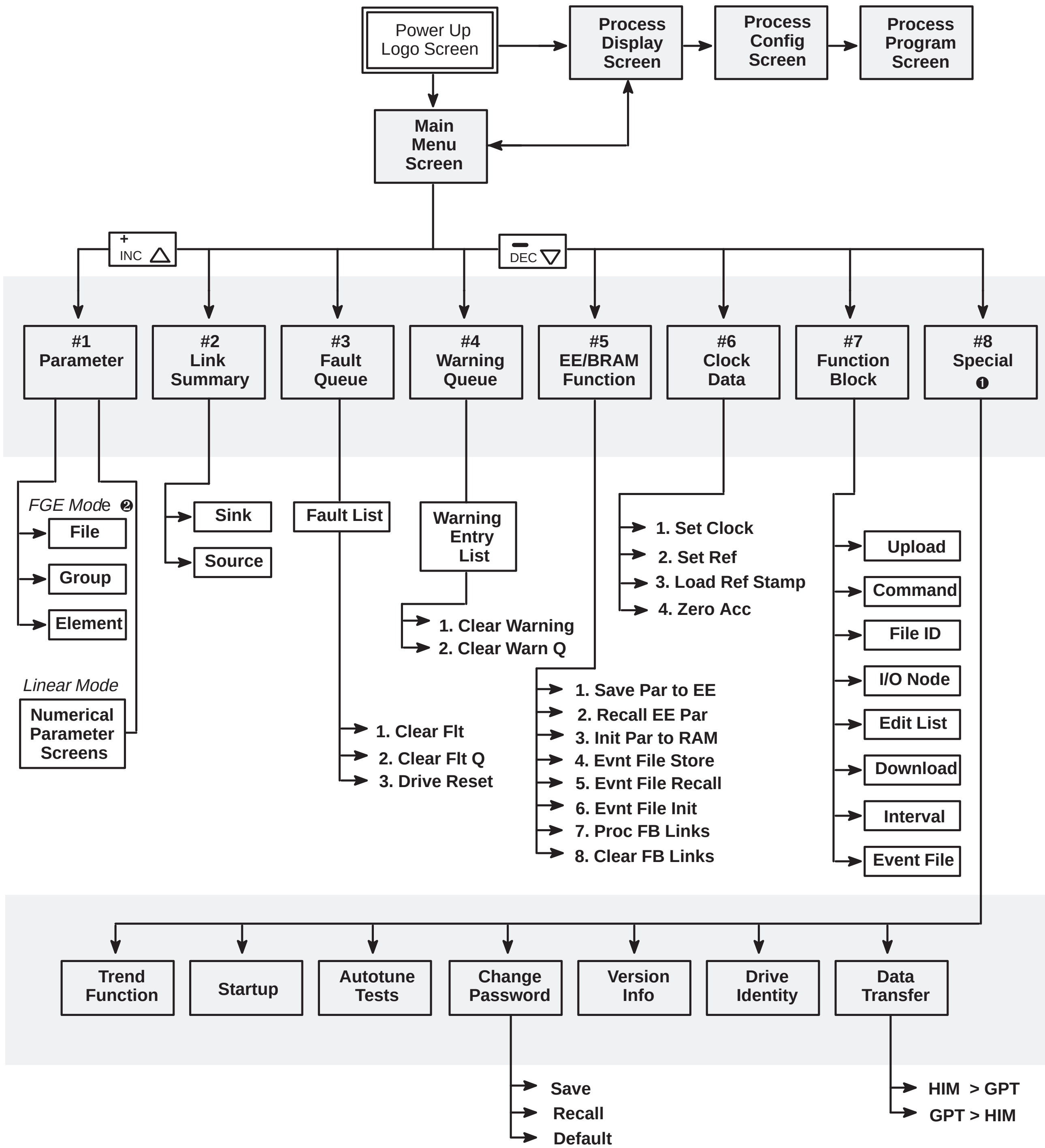
Figure 3.9
Main Menu Screen



IMPORTANT: Only 5 of the 8 Main Menu options are displayed at one time on the screen. Scroll with the Inc/Dec keys to access all eight selections.

Figure 3.10 details the complete menu tree for the GPT Programming Terminal. This menu is dynamic and all options may not be supported by your Drive or SCANport device. If you need more detailed information on Key functions, Menu Screens or general Terminal operation refer to the appropriate chapter in the GPT user manual.

Figure 3.10
GPT Programming Options



❶ *This list is dynamic and will change for various Drive States and Drive Product functions.*

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Chapter 4

Start–Up

Introduction

This chapter describes the procedure for the proper start up and tuning of the 1336 FORCE AC drive. Among the procedures you must perform in this chapter are the following:

- Pre–power checks
- Power–on checks
- Communication Configuration
- Parameter Programming
- Motor and Feedback Polarity Checks
- Drive Tuning and Calibration

Safety Precautions

ATTENTION: Hazard of Electric Shock exists in this drive. Power circuits are optically isolated from control driver circuits. Power circuit components are “floating” with respect to “ground”. Use only approved methods of isolating test equipment when making measurements in power circuits.

ATTENTION: Only qualified personnel familiar with the 1336 FORCE AC 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.

ATTENTION: Working with 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. Multiple sources of power may be connected to this drive. Recommended practice is to disconnect and lock out control equipment from power sources, and discharge stored energy in capacitors, if present before coming in contact with any equipment in this cabinet. During startup it will be necessary to work in the vicinity of energized equipment. The Safety Related Practices of NFPA 70E, “ELECTRICAL SAFETY FOR EMPLOYEE WORKPLACES” must be followed at all times.
DO NOT work alone on energized equipment!

ATTENTION: Potentially fatal voltages may result from improper useage of an oscilliscope and other test equipment. The oscilliscope chassis may be at potentially fatal voltage if not properly grounded. Allen–Bradley does not recommend use of an oscilliscope to directly measure high voltages. Use an isolated measuring device with a high voltage probe. Contact Allen–Bradley for recommendations.

ATTENTION: This Drive contains ESD (Electro–Static Discharge) sensitive devices. Static control precautions are required when installing, testing, servicing or repairing this assembly. These precautions should be applied when working with logic boards AND any components in the power section. A properly grounded wrist strap should be worn when contacting any component in the drive. If you are not familiar with static control procedures, before servicing, reference Allen–Bradley Publication 8000–4.5.2, Guarding against Electrostatic Damage or any other applicable ESD protection handbook.

Required Tools and Equipment

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

- Digital Multimeter (DMM) capable of 1000V DC/750V AC, with input resistance of at least 1 megohm.
- Hand Tachometer used to monitor motor velocities.
- User Manuals for optional equipment.
- DriveTools Software (optional)

This start–up sequence specifies using hand instruments such as multimeters, tachometers, ammeters and an oscilliscope to carry out this start–up test procedure. If you have the optional DriveTools software for the 1336 FORCE Drive, it can be used to simplify the startup procedure. This option can be used to set input commands, manipulate parameters and verify frequencies and voltage levels.

IMPORTANT: This startup sequence for a Series B Drive assumes that you have a HIM Programming Terminal. If a different programming device is used, you must alter the startup accordingly.

Drive Information

During Startup the following information must be recorded for reference. It is important that an accurate list of drive components be maintained and referred to when contacting service personnel.

Table 4.A. Data Checks –

DRIVE NAMEPLATE DATA

Catalog Number: ____________________
Serial Number: ____________________
Series: ____________________
AC Input ____________ Volts ____________ Amps
AC Output ____________ Volts ____________ Amps
Horsepower Rating: ____________ kw ____________

MOTOR NAMEPLATE DATA:

Catalog Number: ____________________
Serial Number: ____________________
Series: ____________________
AC Input ____________ Volts ____________ Amps
Horsepower Rating: ____________ kw ____________
Poles: ____________
RPM: ____________
Hz: ____________

ENCODER NAMEPLATE DATA:

Catalog Number: ____________________
Serial Number: ____________________
Series: ____________________
Input Power Supply: ____________ Volts
Input Signal Level: ____________ Volts
Output Type: ____________
Pulses Per Rev: ____________ PPR
Maximum Speed: ____________
Maximum Frequency: ____________

MAIN CONTROL BOARD:

Board Revision Level: ____________

PLC COMM BOARD:

Board Revision Level: ____________

GATE DRIVER BOARD:

Board Revision Level: ____________

STANDARD ADAPTER BOARD:

Board Revision Level: ____________

Standard Adapter Board Jumper Settings:

	Position	Position
J5:	1 – 2____	2 – 3____
J10:	3 – 4____	17 – 18____
J13:	1 – 2____	2 – 3____

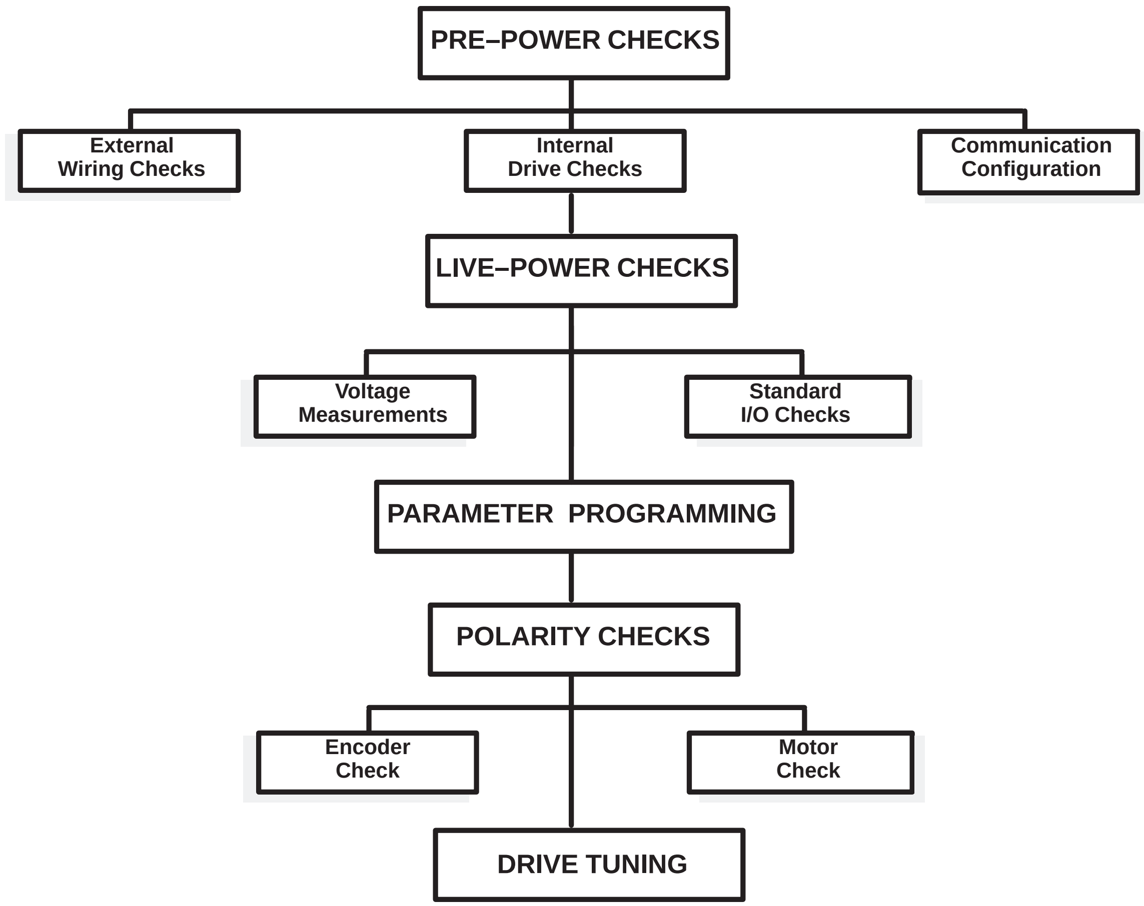
PLC Comm Adapter Board Switch Settings:

U2:	1___	2___	3___	4___	5___	6___	7___	8___
U3:	1___	2___	3___	4___	5___	6___	7___	8___
U4:	1___	2___	3___	4___	5___	6___	7___	8___
U5:	1___	2___	3___	4___	5___	6___	7___	8___

General

Only qualified electrical technicians and/or electrical engineers familiar with solid state controls and circuitry should attempt a 1336 FORCE start–up. Figure 4.1 outlines the sequence that is required to start–up the 1336 FORCE Drive.

Figure 4.1.
Bulletin 1336 FORCE Start–Up Sequence



Pre–Power Checks

Pre–Power checks are meant to identify any problems prior to applying voltage to the system. The drive should be checked for any damage that may have occurred during shipment and installation. You should also verify that all jumpers and configuration controls are properly applied for the application at hand. Finally, you must check all wiring external to the drive for accuracy and reliability.

External Wiring Checks:

1. Verify that all external I/O wires are properly terminated in the terminal blocks. A full point – to – point continuity check should be performed on all I/O wiring connected to the drive.

2. Verify that the incoming power connections are properly connected and tight. Also verify that the power source is properly sized and protected for your particular drive.
3. Verify that the motor power connections are properly connected and tight. Motor Phasing should be checked, Motor Phase A should be connected to Drive output phase A, likewise Phase B and C should be properly terminated to their respective terminals. This phasing will be double checked later in this procedure.
4. Verify that the encoder feedback device is properly connected. The encoder should be a quadrature device with a 12V input power requirement and either 12V or 5V differential outputs. Jumpers J3 and J4 on the Main Control Board (Figure 2.7) must be set for the desired output. Phasing of the encoder should be checked in that A and /A, B and /B are properly terminated. This phasing will be double checked later in this procedure.
5. If your Drive is equipped with a Standard Adapter Board verify that the Pulse Input Voltage Selection jumper is set correctly for your application. Jumper J13 should be set across pins 1 and 2 for +5V DC input, and across pins 2 and 3 for +12V DC input voltage.
6. If your Drive is equipped with a PLC Comm Adapter Board, verify that the standard I/O inputs on the PLC Comm Board are configured for the proper input voltage level. The Standard I/O can be configured for operation at 24V DC or 120V AC. To select the proper voltage set the jumpers on J5, J6, J7 and J8 across pin 1 and 2 if the input voltage level is 120V AC, and across pins 2 and 3 if the input voltage level is 24V DC.

Power On

After all pre–power checks have been completed, the incoming power may be applied. The application of power for each system can be different. Make sure you know the safety controls associated with the system. Power should only be applied if you have a thorough understanding of the 1336 FORCE Drive and the associated system design.

- Measure the incoming line voltage between L1 and L2, L2 and L3, and L1 and L3. Use the DMM on AC Volts, highest range (1000 VAC). The input voltage should equal the drive rated input voltage present on the drive’s nameplate within +/–10%. If the voltage is out of tolerance, verify the drive rating is correct for the application, if it is, adjust the incoming line voltage to within +/–10%.

Startup Configuration Procedures

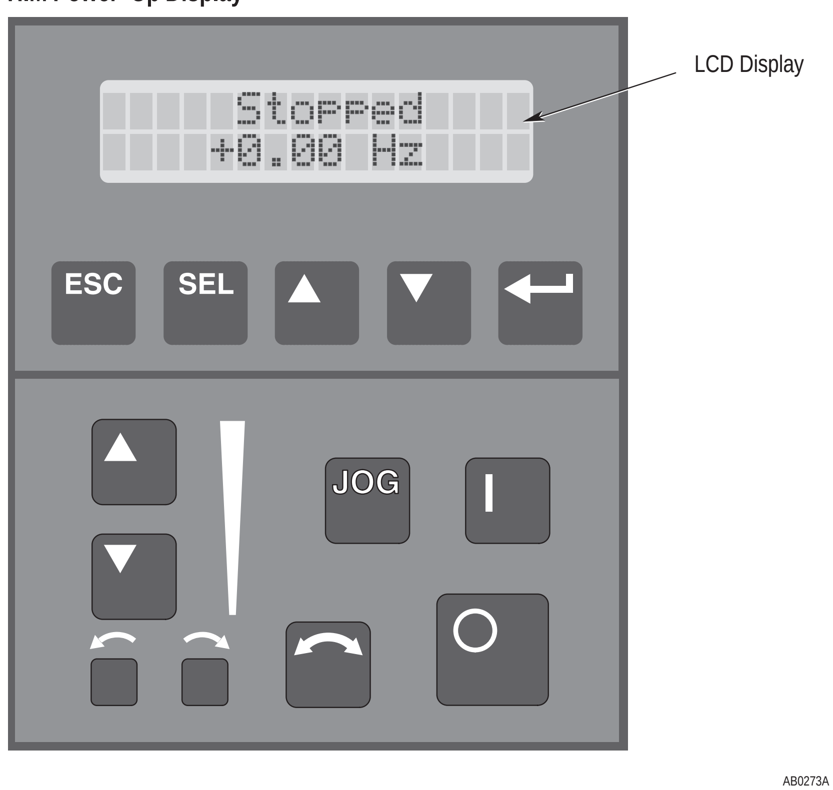
After you have completed all wiring and power up the drive, the parameter configuration procedure must be completed using one of the Startup Configuration Procedures (Quick, or Manual). The configuration procedures used here assumes you have a HIM programming terminal and a Standard Adapter Board in your Drive. If you are using a different programming method or a PLC Comm Adapter Board, the configuration procedure will have to be altered to match your particular setup.

ATTENTION: Failure to complete the parameter configuration could result in injury to personnel, or damage to the drive and the motor, when attempting to perform the remaining steps in the Configuration Procedure.

Apply power to the Drive. The HIM display will appear as shown in Figure 4.2.

ATTENTION: During some startup procedures the motor will rotate. Hazard of personal injury exists due to unexpected starts, rotation in the wrong direction or contact with the motor shaft. If possible, uncouple the motor from the load and place a guard around the motor shaft.

Figure 4.2
HIM Power–Up Display



Quick Start Procedure

1. An automated Quick Startup sequence is available on the HIM to lead you through all data entry, configuration and diagnostic tests that must be performed when starting up the 1336 FORCE drive.

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

```
Choose Mode
Display
```

Press the Increment (or Decrement) key until "Startup" is displayed. Press Enter.

```
Choose Mode
Startup
```

The "Setup Motor Nameplate" display will appear.

```
Setup Motor
Nameplate     N
```

If you have not previously entered the Motor Nameplate data toggle to the Yes (Y) selection in the Setup Motor Nameplate display and press Enter.

The first motor informational screen will appear. Use the Select key to access the second line and make any changes with the Increment and Decrement keys. In subsequent displays you will be asked to provide the following motor information:

```
Base Motor HP
30.0 HP
```

1. Base Motor Current
2. Base Motor Volts
3. Base Motor Frequency
4. Motor Poles
5. Base Motor Speed
6. Feedback Device Type

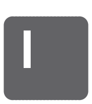
When all motor and feedback data have been entered, a display asking you if you wish to run the Motor Connect Diagnostics will appear. Press the Enter key to initiate the test sequence. In subsequent displays you will be asked if you wish to run the following tests:

1. Inverter Diagnostics
2. Motor Rotation Test

```
Motor Connect
Diagnostics?  Y
```

```
Transistor Diag
Press START!
```

```
Check Motor
Rotation?  Y
```



Press the green Start key to run the diagnostic test.
Press the red Stop key when the Motor Rotation Test has completed.

Quick Start Procedure cont.

1. After Inverter Diagnostics has concluded, or if you answer NO to the Motor Connect Diagnostics question, a display will appear asking if you wish to run the Autotune Torque & Velocity sequence.

```
Autotune Torque
 & Vel Loops   Y
```

Press the Enter key to initiate the test.

If you answer YES to the Autotune Torque & Velocity question, the following configuration options will appear in sequence as each configuration operation is completed.

1. Measure Parameters
2. Autotune The Velocity Loop?
3. Change Velocity Bandwidth & recalculate Gains?
4. Configure Analog Inputs?
5. Continue CH#3 & #4 configuration?
6. Configure Analog Outputs?
7. Configure SCANport?

```
 Measure Param's
  Press START!
```

```
Autotune The
Velocity Loop?
```

```
Change Vel. BW &
recalc. Gains ?
```

```
Configure
Analog Inputs?  Y
```

```
Continue CH #3 &
#4 config?    Y
```

```
Configure Analog
Outputs?      Y
```

```
Configure
SCANport?    Y
```

ATTENTION: Hazard of Personal Injury exists when running the Autotune Torque & Velocity sequence as motor rotation occurs with several of these tests.

SEL or

Use the SELect key to access the 2nd line in any configuration display, and the INC or DEC keys to make any changes. When an option or enable operation is complete, use the Enter key to save this change.

When all tests and enable operations have been completed, a Startup Complete display will appear. Press the Enter key to save all configuration data. A Startup Completed display will appear to indicate that the Quick Start Procedure has been successfully completed and saved.

```
Startup
Completed
```

Quick Start Procedure cont.

If you answer NO to the Autotune Torque & Velocity question, the following configuration options will appear in sequence as each configuration operation is completed

1. Configure I/O?
2. Configure Scanport?
3. Configure Input Mode?
4. Configure Pulse Input?
5. Configure MOP?
6. Configure Analog Input?
7. Configure Analog Output?

Use the SELect key to access the 2nd line in any configuration display, and the INC or DEC keys to make any changes. When an option or enable operation is complete, use the Enter key to save this change.

When all tests and enable operations have been completed, a Startup Complete display will appear. Press the Enter key to save all configuration data. A Startup Completed display will appear to indicate that the Quick Start Procedure has been successfully completed and saved.

SEL or

```
Configure I/O
              Y
```

```
Configure
Scanport?     Y
```

```
Configure
Input Mode?     Y
```

```
Configure
Pulse Input?   Y
```

```
Configure
MOP?        Y
```

```
Configure
Analog Input?
```

```
Configure
Analog Output? Y
```

```
Startup Complete
Press 'ENTER'
```

```
Startup
Completed
```

Startup Reset Sequence

or

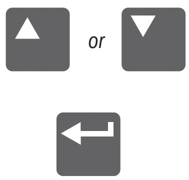
If you wish to return to the Startup sequence to make additional changes, this can be accomplished from the Startup Completed display. After pressing the Enter key, use the INC or DEC key to toggle to Reset Sequence. Press the Enter key again and you can now re–enter the Startup routine.

```
Startup
Completed
```

```
Reset
Sequence
```

Manual Startup Mode

Press the ESC key to access the Drive Mode Menu. The Choose Mode display should appear as shown below:



Use the INC/DEC keys to scroll thru the Drive Mode menu selections until the PROGRAM selection is reached.
Press the ENTER key to enter the Program Mode. The HIM display should appear as shown below:

Drive Mode Menu Selections:

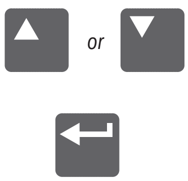
```
EEPROM
PASSWORD
DISPLAY
PROCESS
PROGRAM
LINK
SEARCH
CONTROL STATUS
STARTUP
```

Drive Mode Menu

```
Choose MODE
  Program
```

Use the INC/DEC keys to select the Startup File.

```
Choose File
Startup
```



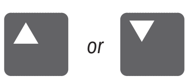
Press Enter. The Choose Group Display will appear. Press the INC or DEC key to reach LINEAR LIST.

```
Choose Group
LINEAR LIST
```

Press the ENTER key to access the Linear List menu.
The display should appear as shown below:

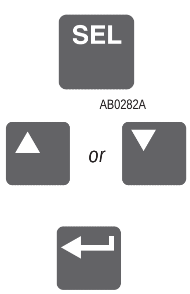
```
Drive SW Version
3.01           1
```

LINEAR LIST
Parameter Number 1



Use the INC/DEC keys to scroll to Parameter 150.
Parameter 150 is feedback device type;
1 = Encoder feedback
5 = Sensorless feedback (Similar to armature voltage feedback for a DC Drive.)

Note: If choosing sensorless feedback, the bandwidth of the velocity loop will be significantly reduced.



Press the SEL key to access the feedback device type selection and use the INC/DEC keys to toggle between the selections.

Note: If sensorless feedback is selected, the drive will fault on feedback loss. You must set bit 0 in parms 88 and 89 from 1 to 0 before clearing this fault and proceeding with the autotune.

The feedback device type can be accepted by pressing the ENTER key. The display should now appear as shown below:

Sensorless feedback

```
Fdbk Device Type
Vel Est wo/DB 150
```

LINEAR LIST
Parameter Number 150

NOTE: It is important that you retain a record of the feedback device that was selected, because the bandwidth of the velocity regulator will be significantly reduced when the drive is used without an encoder.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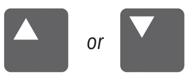
After the feedback device type has been selected and accepted, press the ESC key to return to the Startup Menu. The display should appear as shown below:

```
Linear List
Startup
```



Use the INC/DEC keys to scroll thru the Startup Mode menu selections until DRIVE DATA is reached.

```
Drive Data
Startup
```

STARTUP MENU:

DRIVE DATA
DRIVE TUNE
LIMITS
FAULT SETUP
MONITOR
LINEAR LIST

Press the ENTER key to access the Drive Data menu.

The HIM will allow you to toggle between the I/O Drive Data menu parameters using the INC/DEC keys. The definitions of the I/O Drive Data menu parameters is detailed below:

- Language Select – This parameter indicates whether English or an alternate language will be used for parameter and fault display text.
- Input Mode – Defines the function of the inputs on the "L" option board
- Encoder PPR – Number of pulses per revolution for encoder.
- Base Motor Speed – Motor Nameplate Speed
- Base Motor HP – Motor Nameplate Horsepower
- Base Motor Current – Motor Nameplate Current
- Base Motor Volts – Motor Nameplate Voltage
- Base Motor Frequency – Motor Nameplate Frequency

DRIVE DATA MENU:

Language Select #304
Input Mode #385
Encoder PPR #235
Base Motor Speed #229
Base Motor HP #228
Base Motor Current #280
Base Motor Volts #231
Base Motor Freq #232
Torq Mode Select #53
Undervoltage Setpoint #224*
Motor Poles #235

NOTE: These parameters are primarily motor/encoder specific parameters that are used for scaling Drive output to motor input requirements.

Not Used in Sensorless Mode

***If using a 230V drive, parameter 224 should be set to a value of 200V.**

- Motor Poles – Number of Motor Poles (Nameplate)
- Undervoltage Setpoint – Sets minimum threshold voltage for a Bus undervoltage condition. Should be set to a value of 200V for 230V AC drives, and 400V for a 460VAC drive.
- Torque Mode Select – This parameter is used to select the source for the drive torque reference. (Must be set to Speed Mode for auto commission ing!)

ATTENTION: The Motor Pole Entry is critical to all Autotune tests. Make certain you are entering the correct number of poles for your motor before proceeding with the Autotune sequence.

To change a value in any of 10 Drive Data menu parameters, the following sequence which shows you how to change motor base speed should be followed:

Blinking

```
Base Motor Speed
   1750 RPM
```

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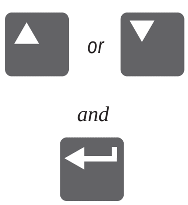
Press the SEL key to move from the Drive Data Menu parameter to the Drive Data Value. When this is successful, a blinking box will appear next to the Ram value as shown in the following figure:

Blinking
Box

```
Base Motor Speed
     1750 RPM
```



Use the INC/DEC keys to scroll to the desired value, then press the ENTER key to accept the new value.

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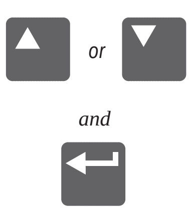
When you have entered all Drive Data menu parameters, press the ESC key to return to the Startup Menu. The display should now appear as shown in the following example:

```
DRIVE DATA
 STARTUP
```



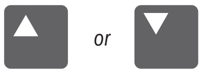
Use the INC/DEC keys to scroll thru the Startup menu until the Limits option is displayed. The HIM display should now appear as shown below. Press the ENTER key to move into the Limits menu.

```
 LIMITS
 STARTUP
```

```
Fwd Speed Limit
   1750 RPM
```

Limits Menu Selections:

```
Accel Rate 1 #389
Decel Rate 1 #391
Accel Rate 2 #390
Decel Rate 2 #391
Logic Options #59
Fwd Speed Limit #128
Rev Speed Limit #127
Pos Mtr Cur Lmt #179
Neg Mtr Cur Lmt #180
Pos Mtr Tor Lmt #175
Neg Mtr Tor Lmt #176
Motor Power Lmt #177
Regen Power Lmt #178
Di/Dt/ Limit #181
```

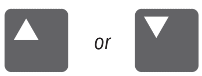


Use the INC/DEC keys to scroll through the Limits menu selections.

When you reach the Limit selection that you wish to change, press the SEL key to move the blinking cursor down to the value field.

Blinking First then Blinking

```
Fwd Speed Limit
   +1750 RPM
```



Once the cursor is in the value field, the INC/DEC keys can be used to scroll to the selected value. After the desired value is reached, the ENTER key must be pressed to accept the value. This process should be repeated for all of the the parameters in the Limit Menu selection.

After all of the parameters in the Limit Menu have been set–up, press the ESC key to take you back to the Startup Menu. The HIM Display should now appear as shown below:

```
Limits
Startup
```

You must now access the Drive Tuning option in the Startup menu. Use the INC/Dec keys to scroll through the Startup Menu until the Drive Tuning selection is reached. The HIM display should now appear as shown below

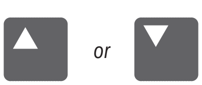
```
Drive Tune
Startup
```

Drive Tune Menu Selections:

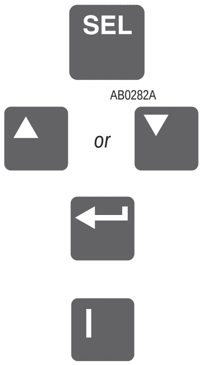
```
Autotune Diag Sel #256
Vel Feedback #146
Vel Desired BW #43
Auto Tune Status #44
Motor Inertia #234
Total Inertia #46
Ki Velocity Loop #139
Kp Velocity Loop #140
Kf Velocity Loop #141
Vel Damp Factor #45
Auto Tune Speed #41
Ph Rot Cur Ref #262
Ph Rot Freq Ref #263
```

When Drive Tune appears, press the ENTER key to access the Drive Tune Menu.

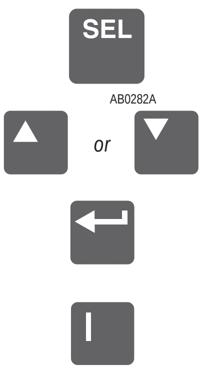
The Parameters you will need to set up in the Drive Tune sequence are detailed in the list located in the right column. For detailed descriptions of these parameters and their operation refer to Chapter 5 in this Manual under Group 1 “STARTUP FILE”.



The Drive Tune Parameters can be accessed by using the INC/DEC keys to scroll through the Drive Tune Menu. Using the default values for these parameters will work in most cases. If the default value does not work, refer to the parameter value ranges in Chap. 5 for possible alternate values.

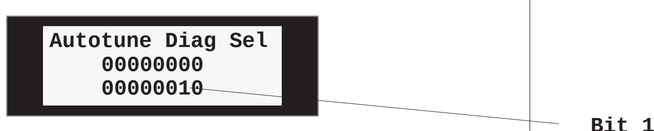


Scroll to the Autotune Diag Sel parameter. Set Bit 0 to a value of 1, and then press the ENTER key and the START button. This will execute the Inverter Transistor Diagnostics test which will take 300 mSec to run. Bit 0 will automatically be set back to 0 upon successful completion of the Inverter Transistor Diagnostics test. If the test fails (non–zero value with flashing CP or VP light), refer to the Startup troubleshooting section of this manual (Chap 6). While you are performing the Inverter Transistor Diagnostics Test the HIM display should appear as shown below:



The purpose of the Inverter Transistor Diagnostic Test is to help you find any problems that might exist in the installation, as well as taking care of setting offset in both the Id & Iq regulators (Parameters 260 & 261 in the linear list).

The next test you must run is the Phase Rotation Test. This is accomplished by setting bit 1 to a value of 1 in the Autotune Diag Sel parameter (Parm #256) and pressing the START key to execute the test. The HIM display should appear as shown below:



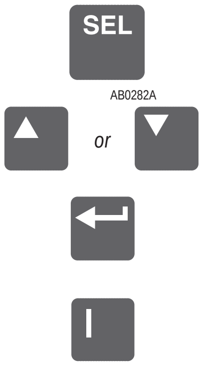
When the START key is pressed, the motor should rotate at a rate specified by both Phase Rotation Frequency Ref and a current output as specified by the Phase Rotation Currency Ref. Typically, default values for both Ph Rot Freq Ref and Ph Rot Cur Ref will work correctly.

Interpreting Phase Rotation Results:

1. In phase rotation, the motor should turn in the direction you define as positive velocity. If the motor turns in the wrong direction, shut the drive down, remove power and reverse any two motor leads.
2. If no motor rotation occurs, refer to the Startup troubleshooting section of this manual.
3. In phase rotation with the motor now turning in the positve direction, the sign of the velocity feedback (P146) should be positive. If it is negative, reverse the A and /A (NOT A) encoder leads or the B and /B (Not B) leads.

ATTENTION: During this portion of the Autotune Sequence reverse motor rotation is a possiblity. If your process equipment could be damaged by rotation in the wrong direction you must uncouple the motor from the load before running the Phase Rotation test.

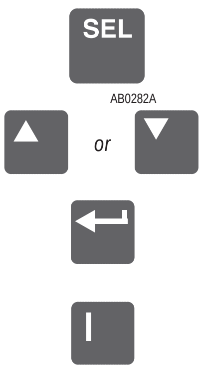
Note: Step 3 is skipped with a sensorless drive.



After the Phase Rotation test has been performed, and the motor rotates in the positive direction with positive encoder feedback, you are ready to tune both the Torq Loop and Velocity Loop of the Drive. Tuning both the Torq & Velocity loops requires setting bits 2 thru 8 to a value of 1 and then pressing ENTER followed by pressing the START key on the HIM. The HIM display should now appear as shown below:

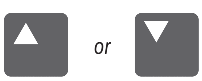
```
Autotune Diag Sel
    00000001
    11111100
```

Bits 2 thru 8



Performing both the Torq and Velocity Loop tests will take approximately 1 min 30 sec to complete. Shaft rotation will occur in the latter part of these tests. While the test is being executed, the green enable light on the Motor Control board will be on. Once these tests are complete, bits 2 through 8 in the Auto Tune Diag Sel parameter will be set back to a value of 0 and the green enable light will go out. If the Drive trips, a flashing or solid red VP or CP LED will be present on the Motor Control Board. When complete, save the parameters to EEPROM using the EEPROM–SAVE option under MENU.

The fault that caused the drive to trip will appear on the HIM display. Refer to the Startup Troubleshooting section of this manual for possible solutions to the displayed fault. Perform both the Torque and Velocity loop autotune tests again after the problem has been resolved.

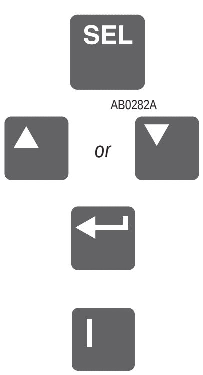


When you have successfully completed the Torque and Velocity Tune tests, scroll to the Vel Desired Band Width (Parm 43) in the Drive Tune Menu using the INC/DEC keys.

Blinking First then Blinking

```
 Vel Desired BW
 10.00 R/S
```

Enter desired BW here



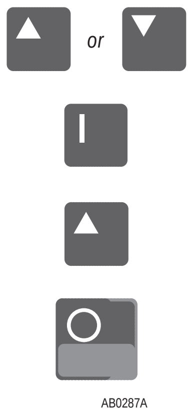
Enter the desired bandwidth by pressing the SEL key to cursor down to the value field. Use the INC and DEC keys to scroll to the desired BW. When the appropriate value is selected, the ENTER should be pressed to accept the entered value.

Note: When using a sensorless version, the values listed in Table 4.B must be used.

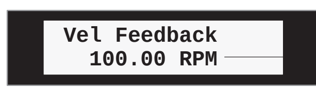
Based on the value entered in the Vel Desired BW, the Kp & Ki Velocity Loop Values will change when Bit 8 is set in the Autotune Diag Sel (Parm. 256) and the START Key is pressed. The HIM display should now appear as shown below:

```
Autotune Diag Sel
    00000001
    00000000
```

Bit 8 set to 1 to execute update of velocity regulator gains.



After the New Values for Kp & Ki have been calculated, you are now ready to start the Drive in Velocity mode. Before starting the Drive, use the INC/DEC keys to scroll to Vel Feedback in the Drive Tune Menu. Start the Drive by pressing the START key on the HIM. Press the SPEED INCREMENT key to slowly increment the velocity reference. Observe velocity feedback and motor shaft rotation making sure both are stable. If they are not (shaft produces a jittery, oscillating or juddering rotation), press the STOP key immediately and readjust the desired bandwidth. This will enter new values for both Kp & Ki. After these new values have been entered, you are now ready to restart the Drive in velocity mode and observe motor shaft rotation and velocity feedback for stability. If problems still occur, refer to the Velocity Loop Autotune troubleshooting section of this manual (Chap 6). The HIM display should now appear as shown below:



This Figure should be stable (no wandering of RPM value)

Additional Sensorless Drive Instructions:
If the sensorless mode is being used (Param 150 = 5–7) set Param 43, Param 141 and Param 142 based on the measured inertia expressed in Parameter 46 (Autotune) in Table 4.B. Select Bit 8 of Param 156 and then attempt a Start.

Table 4.B
Sensorless Setup Values

Param 46	Param 43	Param 141	Param 142
< 2 Sec	10 rad	.7	50 rad
2–5 Sec	5 rad	.7	25 rad
5–20 Sec	1 rad	.7	25 rad
>20 Sec	.5 rad	.7	25 rad

- If the motor won’t start; increase the bandwidth (Param 43), select bit 8 of Param 256 and attempt a restart.
- If the motor chatters, or velocity ripple is too high; decrease the bandwidth (Param 43), select bit 8 of Param 256 and restart.
- If the motor continues to chatter, set Param 142 to zero.

NOTE: For additional information on sensorless operation refer to Appendix A of this manual.

Communication Configuration

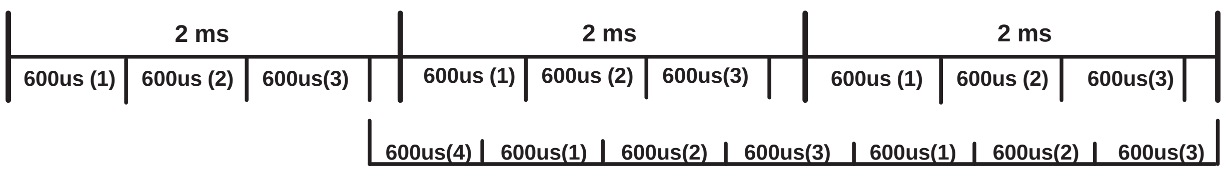
Drive to Drive Communication – Drive to Drive Communication (D2D) provides high speed communications between drives. D2D is capable of connecting up to 64 Drives together using three different transfer rates, 125K (64 nodes), 250K (64 nodes), and 500K (32 nodes) baud.

Hardware Setup – Refer to Chapter 2 Installation for Drive to Drive wiring, L Option wiring and Pulse Input Configuration.

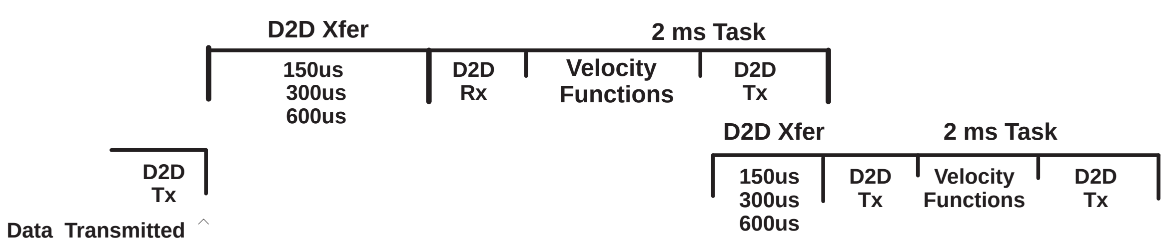
Data Transfer – The D2D which allows multiple transmitters to broadcast information based on priority to multiple receivers which choose the information they wish to receive. The D2D will operate at three different baud rates as shown in the following chart.

Baud Rate	Max. Distance (End to End)	Data Rate	Max. Transmitters (2ms task)
125k	330m	600us	3
250k	140m	300us	6
500k	50m	150us	13

The baud rate choices allow for different end to end distances and number of transmitters. The distance is based on the propagation delay of the signal through the wire and the maximum transmitters come from not exceeding the 2ms task. The propagation delay is based on CAN variables. The number of transmitters is based on the data rate.



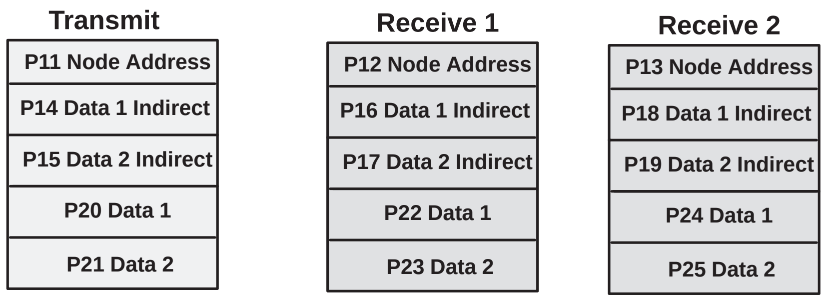
Shown above is the D2D set at 125k baud with 3 and 4 transmitters. With 3 transmitters, the data rate never exceeds 2ms and all the data is received within the 2ms task. In the case of 4 transmitters, the fourth transmitter does not always get transmitted due to the priority of the transmitters. The lower the node address the higher the priority. All the data is not seen every 2ms task. Data transfer errors also effect how much data is transferred. Errors in the transfer will cause retransmission of the data and may cause the data rate to exceed 2ms. Within the drive itself, the Velocity Processor (VP) will be running the D2D in its 2ms task. With the use of D2D indirects, data can be transferred within 2–3ms from one drive to another and 4–5ms from one drive to another and back.



The D2D receive and transmit are on both sides of the velocity functions. This is to improve the data rate.

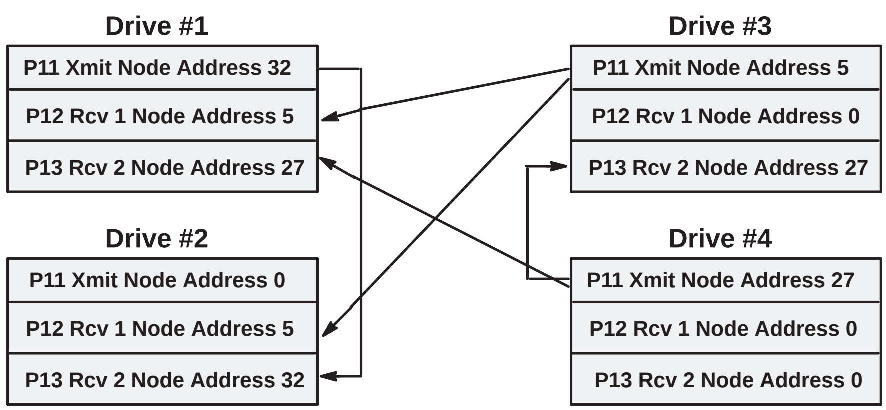
Message Transfer – The D2D allows each drive to transfer two words and receive two words from two different drives for a total words received of four (Figure 4.3).

Figure 4.3.
D2D Communication



Node Address – The node address for the transmit is the address at which the drive will transmit its two words of data. The node address for each of the receives is the address of the drive which you wish to receive two words of data from. If the node address is set to zero then the transmit or receive is disabled. It is up to you to make sure there are no duplicate transmit node addresses. If duplicate addresses exist, you must change one address. Refer to the example in Figure 4.4.

Figure 4.4.
Node Address Transmittal



Note that a drive cannot receive its own address and both receives cannot be set to the same address unless it is zero.

Data Indirect – The indirect function for the transmit indicates to the D2D transmit (TX) where it should obtain data. The receive it indicates to the D2D receive (RX) where it should put its data. Indirect parameters can have either VP or CP parameters entered into them, or they can have indirect data parameters entered into them as shown in the following examples.

Transmitter Example:
P14 Drive Transmit indirect 1 – Any VP/CP Parameter
or – P20 (Drive Xmit Data 1)
P20 would then have a value or be linked to a non VP/CP parm.

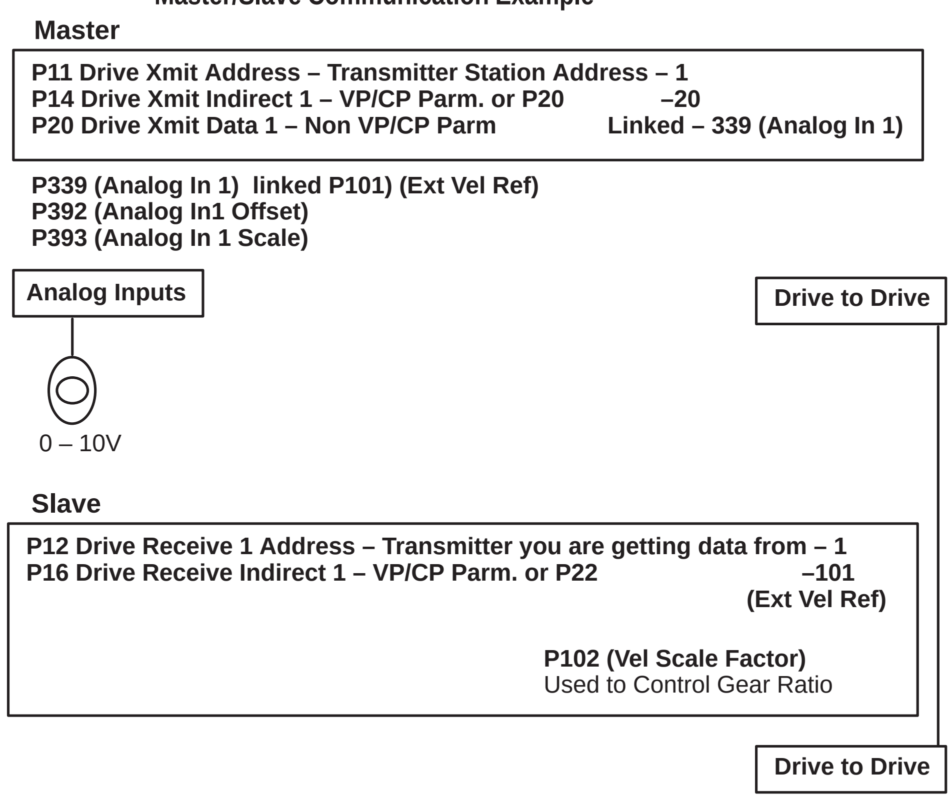
Receiver Example:
P16 Drive Receive Indirect 1 – Any VP/CP Parameter
or – P22 (Receive 1, Data 1)
P22 would then have a value or a non VP/CP parm linked to it.

Data – The D2D TX and RX data exists as non VP parameters in the parameter table. This allows data outside the Motor Control Board to get access to the D2D. Data parameter examples were shown in the previous transmitter and receiver examples.

Master/ Slave Drive to Drive Communication – Figure 4.5 illustrates an example of D2D applied to a master/slave drive set up. The master drive receives its speed reference from a speed pot wired to analog input 1 on a PLC Comm board. P339 (Analog In1) is linked to P101 (Ext Vel Ref) on the master drive. P392 (Analog In 1 Offset) and P393 (analog In1 Scale) are set accordingly. Analog Input 1 must be passed from the master drive to the slave drive and connected to the P101 (Ext Vel Ref) using the D2D protocol.

Setting up the Master drive requires that a transmit address be chosen. An address 1 is chosen in this example. P14 (Drive Xmit Indirect 1) will have a value of 20 entered into it (which means look to P20 (Drive Xmit Data 1)). P20 (Drive Xmit Data 1) must be **linked** to P339 (Analog In1). This is where the data comes from that will be transmitted.

Figure 4.5
Master/Slave Communication Example



The slave drive is set up by first setting P12 (Drive Receive 1 Address). P12 contains the address of the tranmitter that you wish to receive data from. In this example, a value of 1 is entered, indicating that data should be read from transmitter 1. P16 (Drive Receive Indirect 1) should be set to P101 (Ext Vel Ref). It should be noted that the typical transmission **time** from the master to the slave is between **4ms to 6ms** using links, otherwise using indirects it is only 2ms to 4ms.

I/O Communication Configuration:

The Standard I/O of the 1336 FORCE Drive must be checked to verify proper operation. The Standard I/O is used to interface control circuits into the drive. It is very important that this interface is functioning properly.

Standard Adapter Board Equipped Drives:

If a Control Interface option is installed, verify that the Stop, Enable and Ext Fault interlock inputs are present. Voltage level is dependent upon the Control Interface option installed. (Refer to Page 2.27 for Input Mode (Param 385) setting.

IMPORTANT: The Stop, Enable, and Ext Fault inputs must be present before the drive will start. Refer to LEDs D1 and D2 shown in Figure 2.13 to determine Drive Status.

If this option is not installed, verify that two jumpers are installed, one at pins 3& 4 and the other at pins 17 & 18 of J10. If an Ext Fault occurs, check the Fault Mask Programming In parameters 88 and 89, Bit 6 needs to be defined to mask the soft fault and warning indication.

PLC Comm Adapter Board Equipped Drives:

1. The DRIVE ENABLE (TB20 terminal 1) on the PLC Comm Board input allows the drive to honor a START command. D11 on the PLC Comm board, a green LED, reflects the present state of the DRIVE ENABLE. If D11 is illuminated, then the drive is enabled and the transistors will be allowed to turn on. Parameter 54 bit 1 also reflects the status of the DRIVE ENABLE input.
2. The EXTERNAL FAULT (TB20 terminal 4) PLC Comm input allows you to tie a signal into the 1336 FORCE that will be monitored by the Velocity Processor (VP). If the input voltage is removed, the VP will issue a fault or warning based on the configuration of that fault and the red LED D5 on the PLC Comm board will be illuminated. When Input voltage is applied, D5 will not be illuminated.
3. The MOTOR THERMOGUARD (TB20 terminal 2) input allows you to tie a signal from the thermo–switch in the motor into the 1336 FORCE that will be monitored by the Velocity Processor (VP). The red LED D9 will illuminate if an overtemp condition occurs.

4. The NORMAL STOP (TB20 terminal 3) input is stop command that will stop the drive according to the specified Stop Mode. The drive responds the same way it would if the STOP bit were set in any Logic Command. The red LED D7 reflects the present state of the STOP input. When a Stop is in effect the LED is illuminated and the Drive is not allowed to run.
5. The FAULT OUT (TB20 terminals 8,9,10) input is a Form C relay contact. Red LED D4 reflects the status of relay contact. If the LED is illuminated the contact is not energized.

External Control Link Configuration:

The 1336 FORCE AC Drive has been designed to accept control input through the use of Adapter Boards. A portion of the Drive Control has been designed to act as an interface from the point of view of external devices. In order to perform the control functions required by the specific application, it is necessary to configure various control and reference information such as logic commands, speed reference, and torque reference. Additionally, for the external control equipment to monitor operation conditions in the drive, (such as logic status, actual speed, actual torque) configuration provides a way for this information to be transferred to the external device.

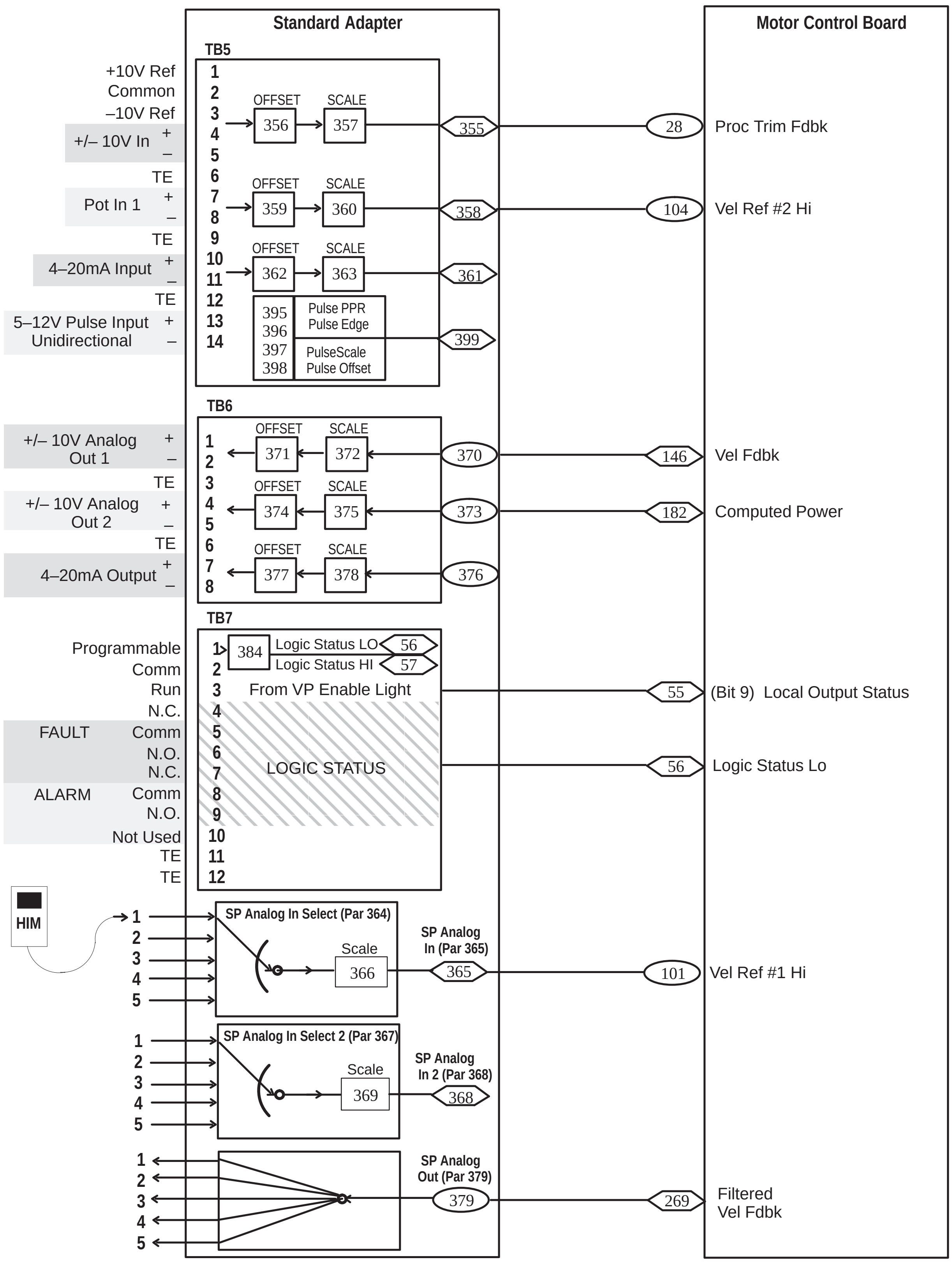
Configuration links must be made between sink and source parameters to allow this information to transfer. The source parameter provides the data to be sent to the receiving sink parameter.
For Example: To send the information from Analog Input #1 (Parameter #355) to External Velocity Reference #1 (Parameter #101) of the drive, then P101 must be linked to P355. All sink and source parameters in the 1336 FORCE AC Drive are available to provide information, and sink parameters can receive information from source parameters. The drive is shipped with pre–configured links between the Standard Adapter board or PLC Comm board and the Main Control board. The user has the flexibility to reconfigure the drive for a particular application. For more information on how to use a particular programming device to configure the 1336 FORCE AC Drive, refer to the instruction manual for that particular device.

Figure 4.6 shows the as shipped pre–configuration links for a 1336 FORCE AC Drive equipped with a Standard Adapter board. Refer to the PLC Communications Adapter User Manual (1336 FORCE 5.13) for information on pre–configured links for PLC Comm equipped drives.

PLC COMM Adapter Board Equipped Drives:

For PLC Comm Adapter Board Equipped Drives refer to the 1336 FORCE PLC Communication Adapter User Manual (1336 FORCE 5.13) for configuration information.

Figure 4.7.
Standard Adapter Links



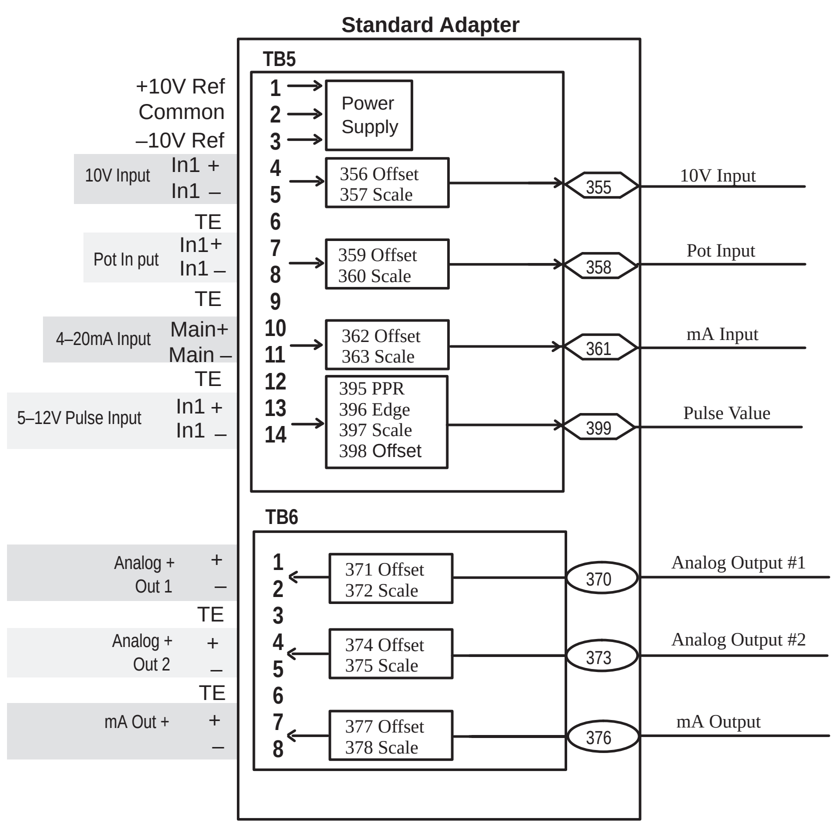
Analog I/O Parameter Configuration:

When you have accomplished the hard wiring of the Analog I/O to the Standard Adapter Board terminals as was detailed in Chapter 2, it is still necessary to set up the parameters in the Drive to allow for data flow between the Adapter Board and the Drive. Each Input/Output has parameters associated with it as shown in Figure 4.7. Set-Up parameters are used to program the Standard Adapter Board functions, such as Scale and Offset. Configuration parameters allow the Standard Adapter Board to communicate with the Drive, and must be linked to analog inputs and outputs.

Each analog input and output is associated with a scaling and offset set-up parameter. These parameters must be adjusted for each analog device.

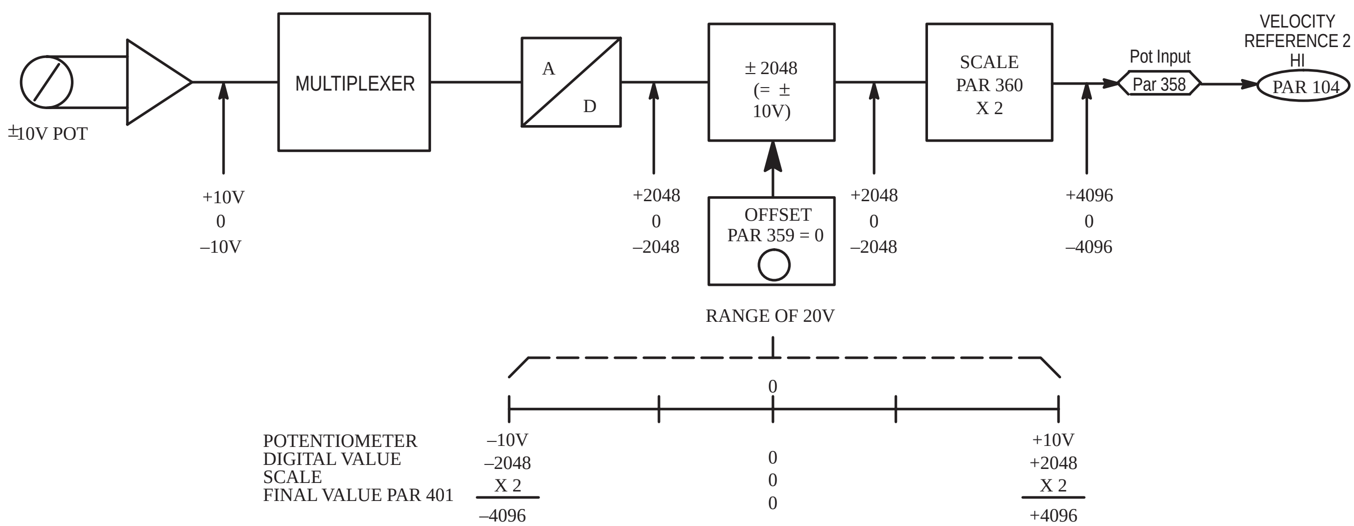
The Drive works with internal drive units. Each parameter is a 16 bit word, which allows a range of ± 32767 internal units. The Drive is scaled so that 4096 is equal to one unit of the quantity being regulated. A ± 10V DC signal applied to an analog input is converted to a digital value of ± 2048, providing a total range of 4096. When calibrating analog inputs, a scale factor is applied to this value, to provide an effective range of ± 32767 16 × 2048. The offset parameter determines the offset in volts, applied to the raw analog value before the scale factor is applied. This allows you to shift the range of the analog input by ± 4096 drive units (±20 volts).

Figure 4.7.
Analog I/O Links



A 10V Input and a Pot Input will be used in detailing the scaling and offset parameters. At Pot Input, between TB5 terminals 7 and 8, a potentiometer with a range of ±10V DC has been connected. Parameter 358 has been linked to Parameter 104 (Velocity Reference 2 HI) in the Drive, which gives the potentiometer control of the external velocity reference. To calibrate the pot to control 100% base speed in both directions, the scaling parameter must be adjusted. The default value of the scale parameters allows a total range of 4096, –2048 to +2048. This allows only 50% base speed in each direction. By setting a scale factor of 2 in Parameter 360 (An In 1 Scale) the digital input is multiplied by 2, providing a range of – 4096 to + 4096, or 100% base speed in both directions. If the user wanted a range of ± 2 times base speed, the scale factor would have to be 4 (Base Speed = 4096, 2 times Base Speed = 8192, 2048 times 4 = 8192). Parameter 359 (Offset) will remain at the default value of zero, allowing the input range to be –10V to +10V. The range of the offset parameter is ± 20V DC as shown in Figure 4.8.

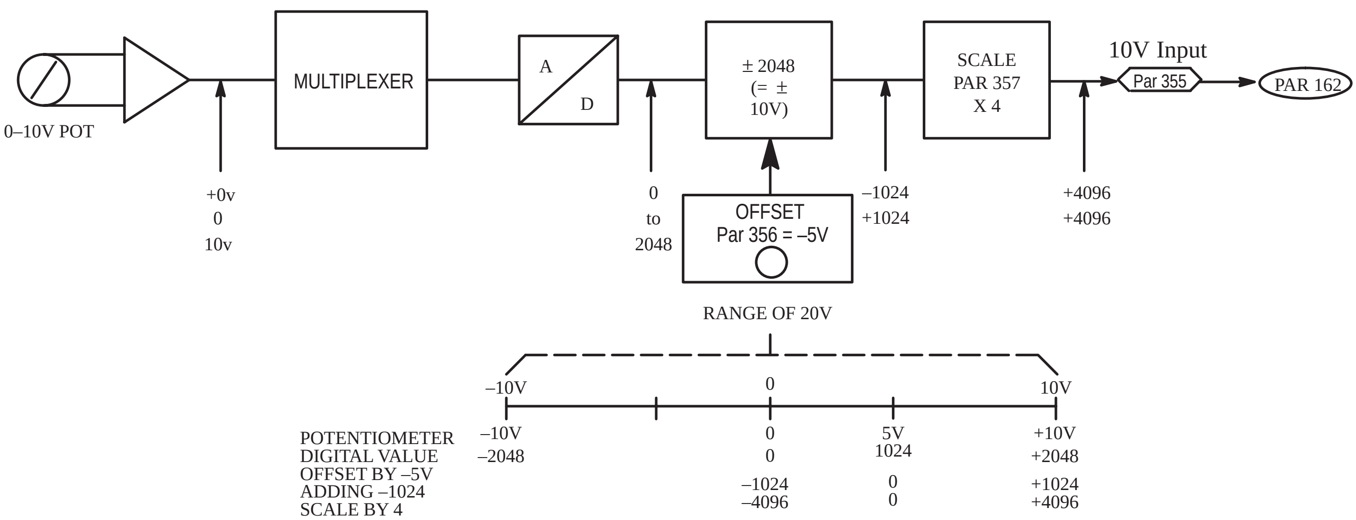
Figure 4.8.
Potentiometer with a +10V Range to Control 0 to +100% Base Speed



For 10V Input, a 0 to 10 volt potentiometer will be used to adjust the Torque Reference from –100% to +100%. To accomplish this, both the scale and offset parameters will need to be adjusted. By linking Parameter 355 to Parameter 162, Torque Reference, the potentiometer connected to Analog Input becomes the Torque Reference Signal. This signal must be scaled and offset in order to get the entire ± 100% in the 0-10 volt range. A digital range of 8192 (± 4096) must now be scaled for an analog range of 10 volts, and must be offset so 5 volts on the potentiometer will indicate 0% Torque.

As shown in Figure 4.9, the offset voltage adds the corresponding digital value to the range. In this case, an offset of –5 volts adds a digital value of –1024 to the range. This causes 0 volts on the potentiometer to register as –1024 digital internal to the drive and 10 volts on the potentiometer will be +1024 to the drive. This can then be scaled by a factor of 4 (8192 drive units) so that 0 volts sends a digital value of –4096 for –100% torque, and 10 volts sends a digital value of +4096 for +100% torque.

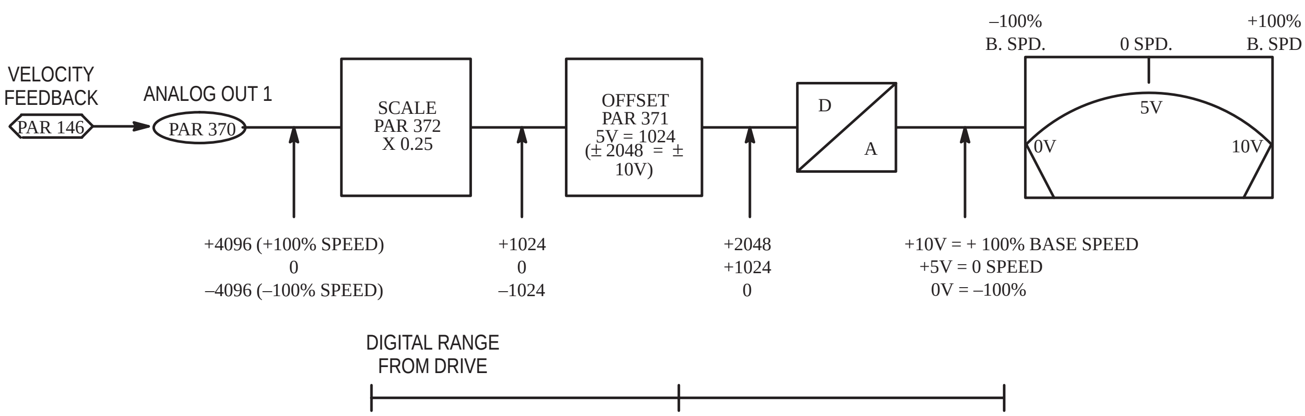
Figure 4.9.
Potentiometer 0–10V Range to Control +/– 100% Torque Reference



Analog outputs are set up similar to analog inputs. Each output has a scale and offset parameter, along with a specific variable parameter used for linking. Differences occur because of the direction of information flow. The drive sends a digital value in drive units, which must be matched to the voltage of the monitoring device. Similar to analog inputs, the analog output converts a ±2048 to ±10VDC. Thus, when the drive sends ±100% Base Speed (equal to ±4096) it must be scaled by 0.5 to be in the proper range (±4096 × 0.5 = ±2048). Offset can be ± 20VDC, even though the physical limit is ±10VDC. This allows you to offset the signal anywhere within the entire range.

In Figure 4.10 Analog Output 1 is used as an example to detail the scaling and offset parameters. At Analog Output 1 a meter with a range of 0-10 V DC has been connected. Parameter 370 has been linked to Parameter 146 (Velocity Feedback). In order for the meter to indicate speed in both directions, the scale and offset parameters must be adjusted as shown in Figure 4.10. Working in the opposite direction as the analog inputs, apply the scale factor first. The drive sends a ±4096 digital value to indicate ±100% velocity feedback for a total digital range of 8192. The meter, having an analog range of 0-10V DC, requires a digital range of 2048. This is accomplished by applying a scale factor of 0.25 (8192 × 0.25 = 2048).
In order to have the 0-10V DC meter indicate ±100% feedback, an offset must be applied. Offset parameters for analog outputs will again add the corresponding digital value to the range. In this case, an offset of 5 volts adds a digital value of 1024 to the range. This will allow full range deflection on the 0 to 10 volt meter, with 5 volts indicating zero speed.

Figure 4.10.
Analog Output 1 +/– 100% Speed Indication

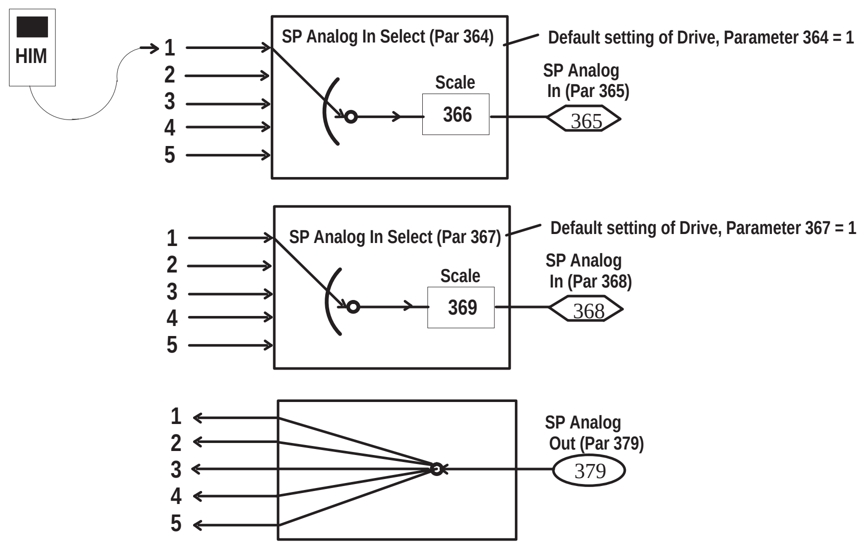


SCALED BY 0.25	– 1024	0	+ 1024
OFFSET BY 5V, ADDING 1024	+ 1024	+ 1024	+ 1024
DIGITAL VALUE	0	0	2048
METER VOLTAGE	0 VOLTS	5 VOLTS	10 VOLTS
% BASE SPEED	– 100%	0%	+ 100%

SCANport Analog I/O Parameter Configuration:

SCANport analog I/O is what is received from and sent to the SCANport devices.

Figure 4.11.
SCANport I/O Parameter Configuration



To receive analog input from a device, the SCANport Analog Input Select parameter 364 must be set to the SCANport device port number and the SCANport Analog Input parameter 365 must be linked to a sink. Set the scale as needed. For example; if the HIM is plugged into Port 1 and it is to control external velocity, you would then enter 1 for SCANport Analog Input Select (364) and link External Velocity (101) to SCANport Analog Input (365). You may scale the velocity through External Velocity Scale (102) or through SP Analog Scale (366).

The Drive sends SCANport Analog Output parameter 379 to all devices connected to SCANport. To send data out to the SCANport devices, you must link SCANport Analog Output (379) to a source. For example; If the HIM is to receive Velocity Feedback, you would link SCANport Analog Output (379) to Velocity Feedback (269).

Output Relay Configuration:

The outputs consist of three (3) permanently configured and one (1) programmable output.

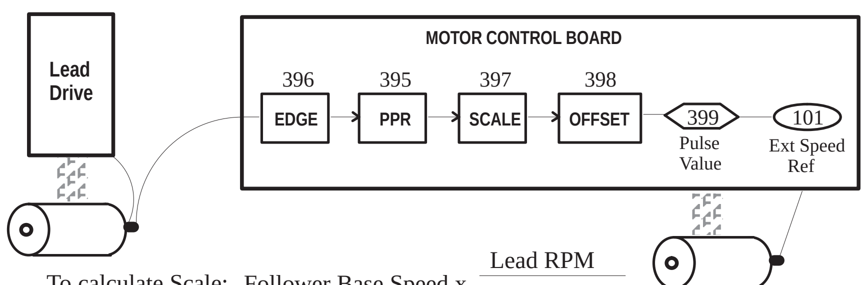
The three permanently configured relays are Run, Warning, and Fault. Run is a normally open contact that closes when current is applied to the motor. It follows the enable LED on the Motor Control Board. Warning has a normally open and close contact that energizes when there is no warnings and de–energizes when there is a warning. Fault has a normally open and close contact that energizes when there are no faults and de–energizes when there is a fault.

The programmable relay is a normally open contact and is configured through the Output Select parameter 384. It allows the relay to follow a single bit within the Logic Status parameters 56 and 57. The relay can be configured to follow the bit function or the not of the bit function. For Example; When the motor is at set speed and you wish the contact to close, you must enter AT SET SPEED (8). When the motor is at set speed and you wish to have the contact open, you must enter NOT AT SET SPEED (40) into Output Select (384).

Pulse Input Configuration:

The pulse input allows an external source to provide the drive with a digital reference or trim signal (Fig. 4.12). It is a differential input with a maximum frequency of 100khz. The pulse input parameters consist of PPR (395). Scale (397), Edges (396), and Offset (398). The PPR is the number of pulses per one revolution. The scale determines the RPM at 1 per unit (4096). The edges are either one edge – rising edge of the pulse, or two edges – the rising and falling edge of the pulse. Two edges provide better resolution. The offset sets the minimum speed. For example: You have a lead drive with a 1024 PPR encoder with a base speed of 1750. The follower uses the lead drive's encoder but runs at half the speed. The follower's ppr should be 1024, scale should be set to 3500, offset should be 0, and a link should be made from external reference (101) to Pulse Value (399).

Figure 4.12.
Pulse Input Configuration



To calculate Scale: Follower Base Speed x $\frac{\text{Lead RPM}}{\text{Follower RPM}}$

MOP Configuration:

The MOP function is controlled by the L Option I/O, modes 5, 9 and 15. The MOP up and MOP down, increment and decrement the MOP value parameter 394 based on the MOP increment parameter 393 which is in RPM per second.

SCANport Image Configuration:

The SCANport image is a mechanism for transferring data to and from SCANport devices. It operates the same way as a PLC image with its 1/4, 1/2, 3/4, and full racks. The SCANport image is setup by a SCANport device such as a GD1 module or a RIO to SCANport gateway.

SCANport Control Configuration:

The SCANport controls are the functions that control the motor, like start, stop, jog etc. The control can come from up to 6 SCANport devices and L Option Inputs at the same time. The control is based on a ownership mechanism which allows certain functions to have only one owner and other functions to have multiple owners. Speed reference, direction and local functions are the only one owner functions. The other functions like start, stop, jog etc. are considered multiple owner functions. Ownership is when a SCANport device or L option Input commands a function. As long as that function is commanded, that device will be the owner of that function. For Example: Device 1 is commanding a forward direction, this 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 a start, the drive will continue to run if another device is still commanding a start.

NOTE: A rising edge is required for start and jog functions. If jog is commanded and the drive has been stopped, Start and Jog functions will not operate from any device until the Jog command is stopped. The same holds true if a Start is commanded while the drive is stopped.

The parameters in the range from 340 to 350 indicate the owner of each function. The owner is identified by the bit in the parameter as follows:

Bit 0 – L Option Inputs
Bit 1 – SCANport device 1
Bit 2 – SCANport device 2
Bit 3 – SCANport device 3
Bit 4 – SCANport device 4
Bit 5 – SCANport device 5
Bit 6 – Internal Gateway
Bit 7 – Not Used

SCANport device number is determined by the SCANport connection.

This is very useful for determining who may own a function.

Masking of the control functions allows control functions to be enabled or disabled for all or some of the devices. The parameter bit configuration is the same as the example detailed above with 0 indicating disable and 1 indicating enable. The masking control starts with the port enable mask which enables or disables all of the devices control functions, then the local control mask which allows a device to take full control of the drive, to the individual masks like start, jog, direction, speed reference, clear faults and reset.

Control Interface Option

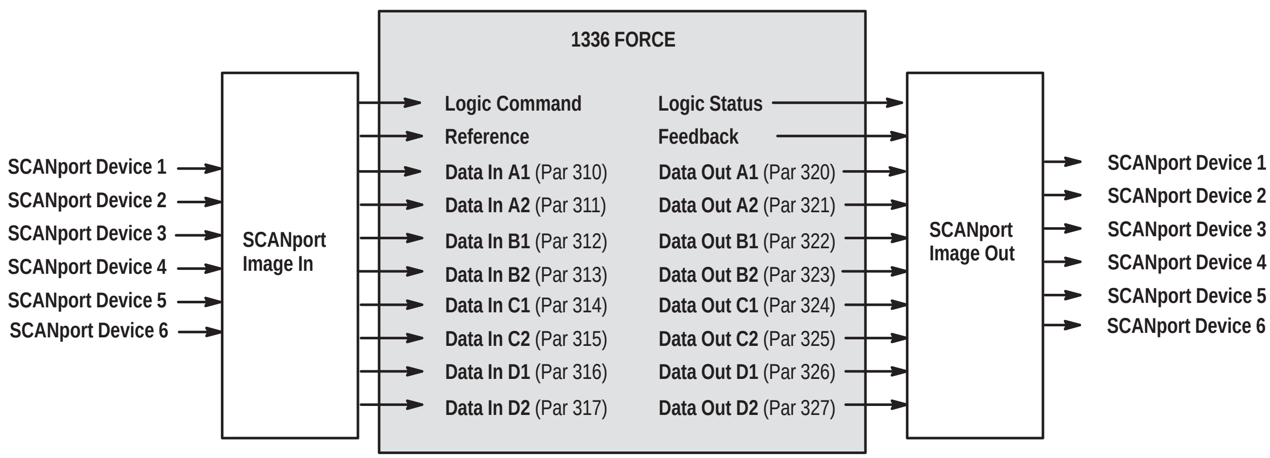
The Control Interface Option Modes configure the Control Interface Option. The different modes are explained in Chapter 2. The modes allow the user to setup the inputs to meet the requirements of their application. The Input Mode parameter 385 sets the mode and takes effect on a power cycle or reset. The Input Status parameter 386 indicates the status of the input except for the enable input which can be seen in parameter 54 bit 1. The Stop Select parameters 387 & 388 select the way the stop input will function on the L option only, based on the stop type in modes 3, 13 and 16. Stop from SCANport devices follow parameter 59 bits 4 & 5. The Accel Rates (389 & 390) and Decel Rates (391 & 392) are selected by modes 4, 11 and 14.

NOTE: Mode 2, 3, 4, 5 and 6 take permanent ownership of the direction function.

NOTE: If the Control Interface Option is other than 1, the Control Interface Option speed reference will take ownership of the speed reference. To allow other devices to control speed reference, disable the Control Interface Option speed reference with the speed reference mask (334).

Using the SCANport Image:

You can view the values in the SCANport image table by using parameters 310 through 317 for input and 320 through 327 for output.



SCANport gateways or adapters to RIO, DF1/DH485, DeviceNet, SLC, and Flex I/O are some of the devices that can transfer data between the SCANport I/O image and another device.

▶ Refer to the appropriate manual for your specific adapter.

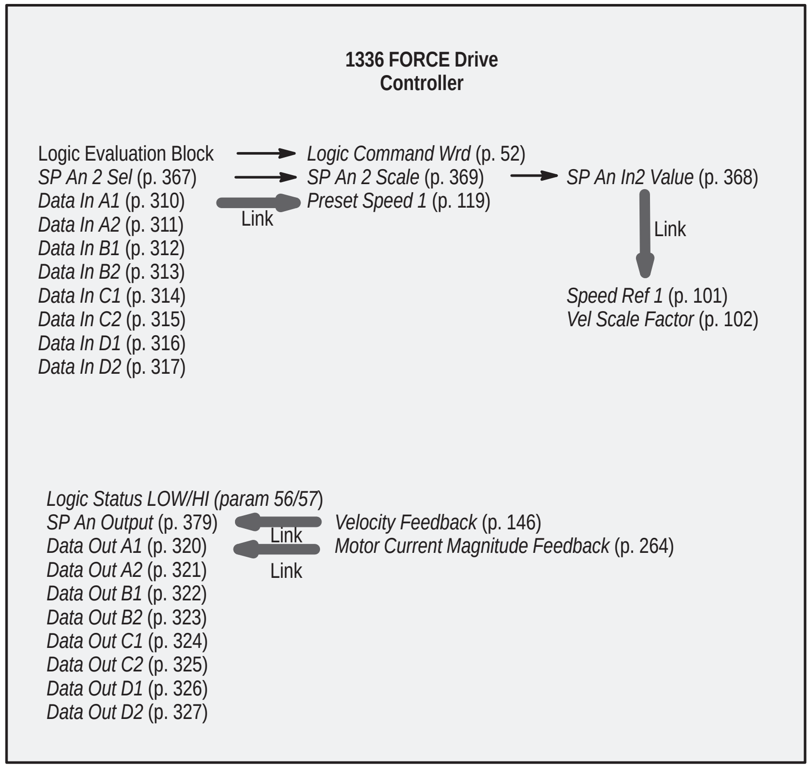
Within the 1336 FORCE drive, the I/O image table resembles the following:

Logic Command Word
(parameter 52)
Bit 0 Normal Stop
Bit 1 Start[1]
Bit 2 Jog 1[1]
Bit 3 Clear Fault
Bit 4 Forward
Bit 5 Reverse
Bit 6 Jog 2[1]
Bit 7 Cur Lim Stop
Bit 8 Coast Stop
Bit 9 Spd Ramp Dis
Bit 10 Flux Enable
Bit 11 Process Trim
Bit 12 Speed Ref A
Bit 13 Speed Ref B
Bit 14 Speed Ref C
Bit 15 Reset Drive

Logic Status LOW
(parameter 56)
Bit 0 Run Ready
Bit 1 Running
Bit 2 Command Dir
Bit 3 Rotating Dir
Bit 4 Accelerating
Bit 5 Decelerating
Bit 6 Warning
Bit 7 Faulted
Bit 8 At Set Speed
Bit 9 Local A
Bit 10 Local B
Bit 11 Local C
Bit 12 At Zero Spd
Bit 13 Speed Ref A
Bit 14 Speed Ref B
Bit 15 Speed Ref C

Logic Status HI
(parameter 57)
Bit 0 Flux Ready
Bit 1 Flux Up
Bit 2 Not Used
Bit 3 Not Used
Bit 4 Bus Ridethru
Bit 5 Jogging
Bit 6 Not Used
Bit 7 Not Used
Bit 8 At Limit
Bit 9 Not Used
Bit 10 At Setpoint 1
Bit 11 At Setpoint 2

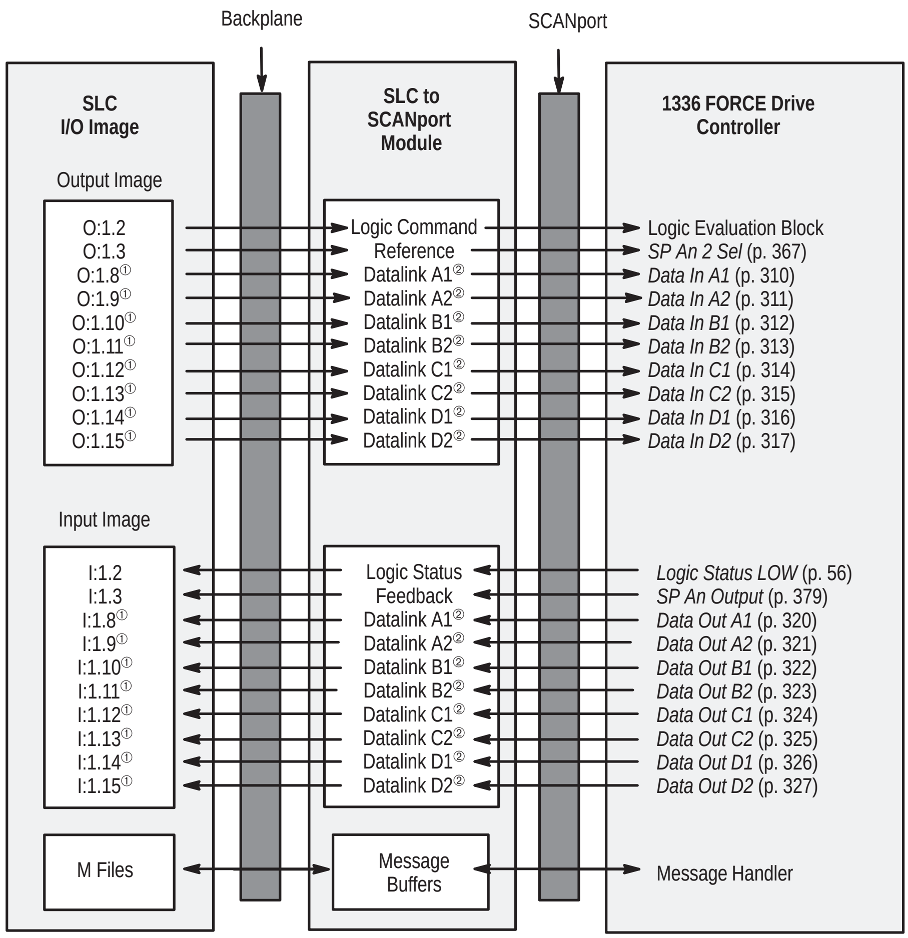
[1] These functions require an edge in order to take effect.



The following examples are provided to show how the 1336 FORCE 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:

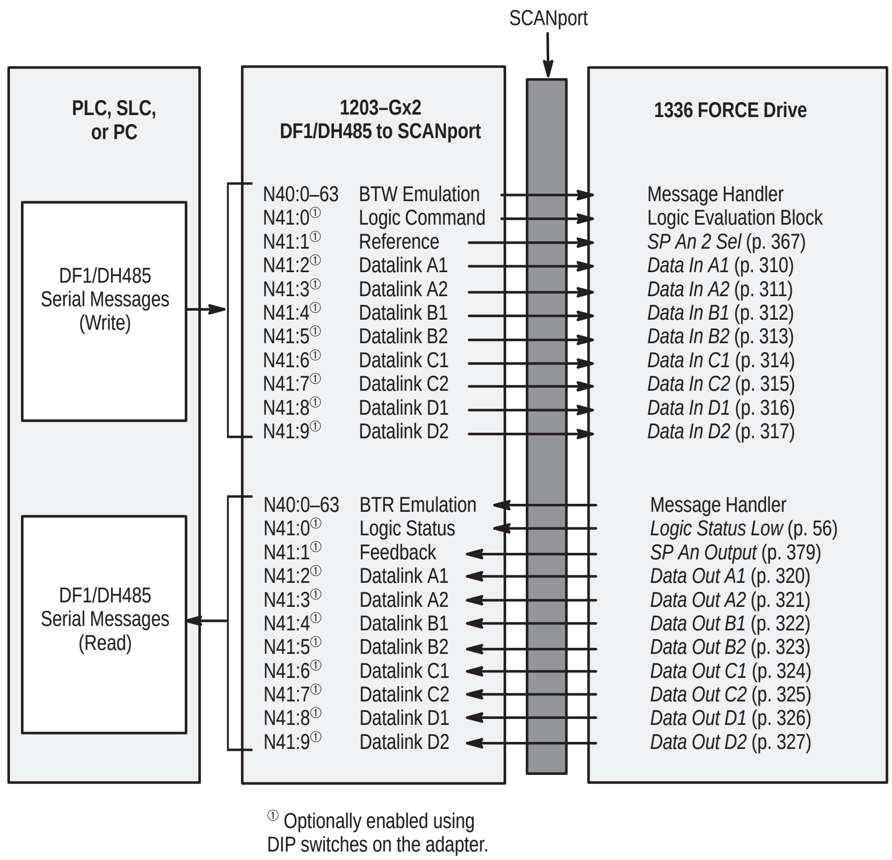
The following figure shows how the I/O image table for the SLC programmable controller relates to the 1336 FORCE drive. In this example, the drive is connected to channel 1 of the SLC module in enhanced mode. If this were an example of basic mode, only the O:1.2, O:1.3, I:1.2, and I:1.3 entries would be used.



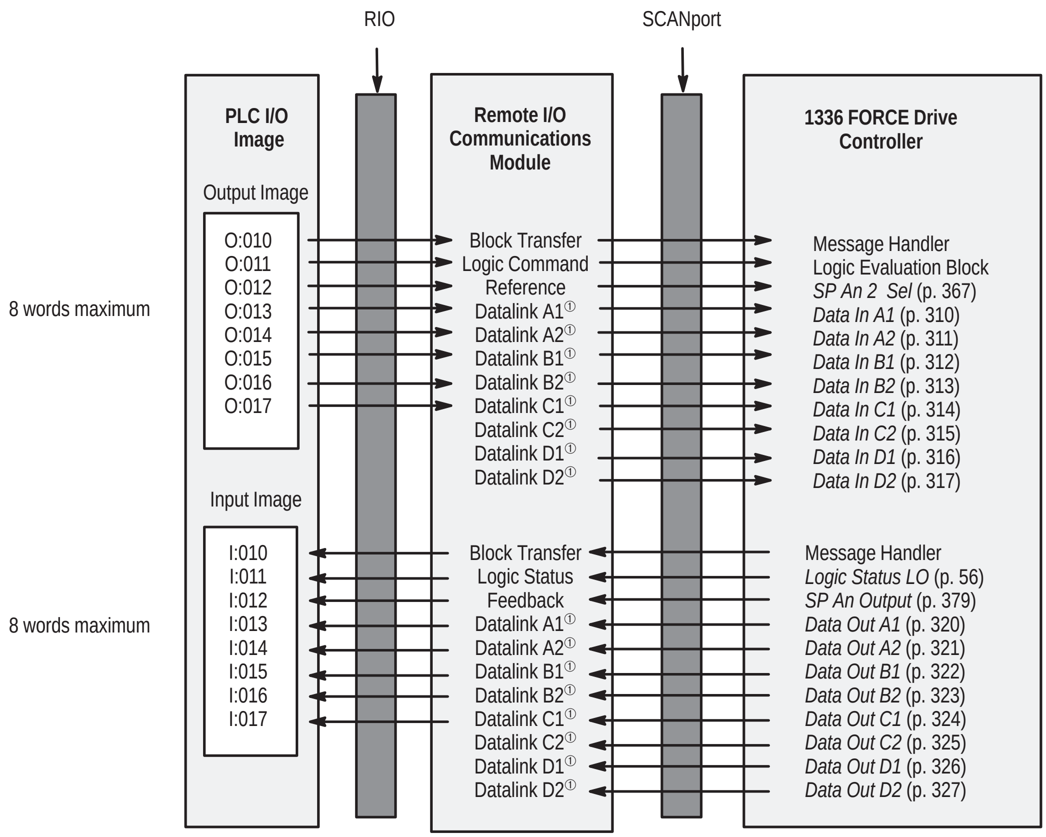
① Available only in enhanced mode.

② Optionally enabled via G file in SLC processor.

Serial Communications Module:
The following figure shows how the I/O image table for the programmable controller relates to the 1336 FORCE drive when a Serial Communications Module is used.

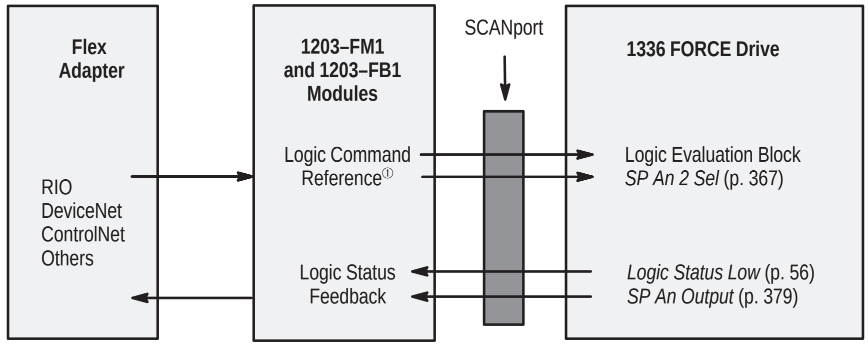


Remote I/O Communications Module:
The following figure shows how the I/O image table for the programmable controller relates to the 1336 FORCE drive when a Remote I/O Communications Module is used.



① Optionally enabled using DIP switches on the module.

Flex I/O Module:
The following figure shows how the I/O image table for the programmable controller relates to the 1336 FORCE drive when a Flex I/O Module is used.



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Programming Parameters

Introduction

This chapter contains the information required to assist you in programming the 1336 FORCE AC Drive for a specific application after initial start–up. Drives are shipped programmed with default values and are preconfigured for the options installed.

Parameters 0 thru 288 are the parameters for the 1336 FORCE Motor Control Board. Parameters 300 and above cover the Adapter Board of the 1336 FORCE DRIVE. The 1336 FORCE parameter table has been broken down into three different table types as follows:

Table 5.A lists parameters in numeric order with page references.
Table 5.B lists parameters alphabetically with page references
Figures 5.2 & 5.3 list Standard Adapter and PLC Comm Adapter parameters by file and group.

Parameters are divided into 4 Files to help ease programming and operator access as follows:

1. Startup File
2. Communications I/O File
3. Velocity Torque File
4. Diagnostics File

These four Files are then divided into Groups with each parameter making up an Element in a specific group. Parameters may be used as Elements in more than one group. Refer to Table 5A for a numerical breakdown of the File/Group/Element designations.

NOTE: Parameters that appear in more than one group in Table 5A are listed after the initial entry in italics.

Terminology

The definition of terms related to the parameter table include:

Configuration – The process of linking Sink to Source parameters.

Configuration Parameters – Parameters used to transfer data between the drive control and external devices. The Configuration Parameters are categorized into two types:

1. Source Parameters – Parameter used as a source of data.
2. Sink Parameters – Parameter used to receive data input.

All parameters in the 1336 FORCE AC Drive can be used for evaluation (sink or source) and some can be modified dynamically (sink only) to meet application requirements.

Drive Units – The actual value of the parameter as it is stored within the Drive parameter table. The drive units may be converted to engineering units or to hexidecimal for display using the Programming Terminal, or may be displayed directly in drive units. All internal values in the drive are in terms of Per Unit numbering.

Engineering Units – A label given to parameter data which specifies what units are to be used to display the parameter value on the Programming Terminal. Examples of engineering units include: RPM, % etc.

Non–Volatile Memory – Data memory in the drive which retains the values of all data even when power is disconnected from the drive control. BRAM (Battery Backed Random Access Memory) chips are used for the non–volatile memory to store some of the drive parameters.

Parameter Table – Table of parameter entries for all configuration and setup parameters used in the drive.

Parameter Entry – Information stored in the drive which contains the parameter number, parameter data and all other information related to the specific parameter.

Parameter – Memory location used to store drive data. Each parameter is given a number called the parameter number. The parameter value may be specified in decimal, or in hexadecimal. When specified in hexadecimal, the word "Hex" will appear after the parameter value.

Per Unit Numbering – Per Unit numbering is a numbering system which defines a specific numeric value as representing 100% of a particular quantity being measured. The number 4096 is used in many places in the drive to represent 1 Per Unit (100%) [pu].

Parameter Table Structure

All data used to perform the Drive functions is stored in the Parameter Table. Each parameter entry in the parameter table contains the following information:

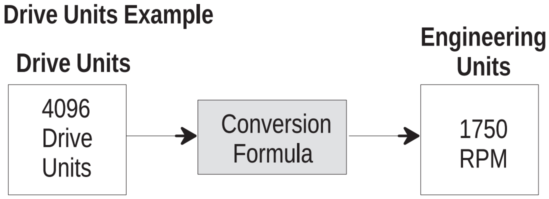
No. – The parameter number in decimal.

Name – Parameter text as it appears on the Programming Terminal.

Display Units – Specifies what engineering units will be used to display the parameter value on the Programming Terminal (RPM, % etc.). This is specified first in the Units column of the Parameter Table.

Drive Units – Specifies the Conversion Units as seen in the Drive.

Figure 5.1.
Drive Units Example



Factory Default – Parameter value as it will appear after the Drive Initialize (Init) command has been sent from the Programming Terminal. The Init values are the same as the default values listed in the Parameter Descriptions section of this chapter.

Min – Minimum allowable value for the parameter. If no min value is given, the parameter has not been assigned a minimum limit.

Max – Maximum allowable value for the parameter. If no max value is given, the parameter has not been assigned a maximum limit.

Enum – Allows numbers or bits to be represented by text.

Parameter Table (Standard Adapter Equipped Drives)

Note: For PLC Comm equipped drives refer to your PLC Comm User Manual for parameter descriptions. For ControlNet Adapter equipped drives, refer to your ControlNet Adapter Manual for parameter descriptions.

Table 5.A – 1336 FORCE Numerical Parameter Table

Param No.	Parameter Name (Element)	Group	File (File No.)	Param Descrpt.
01	Drive Software Version	Info	Diagnostics (4)	See Page 5–31
05	Drive Power Structure Type	Info	Diagnostics (4)	See Page 5–31
08	Motor Control Counter	Monitor	Startup (1)	See Page 5–31
09	Drive Comm Task Interval	Drive to Drive	Communications I/O (2)	See Page 5–31
10	Drive Comm Baud Rate	Drive to Drive	Communications I/O (2)	See Page 5–31
11	Drive Comm Transmit Addr	Drive to Drive	Communications I/O (2)	See Page 5–31
12	Drive Comm Receive 1 Address	Drive to Drive	Communications I/O (2)	See Page 5–31
13	Drive Comm Receive 2 Address	Drive to Drive	Communications I/O (2)	See Page 5–32
14	Drive Comm Transmit Indirect 1	Drive to Drive	Communications I/O (2)	See Page 5–32
15	Drive Comm Transmit Indirect 2	Drive to Drive	Communications I/O (2)	See Page 5–32
16	Drive Comm Receive 1, Indirect 1	Drive to Drive	Communications I/O (2)	See Page 5–32
17	Drive Comm Receive 1, Indirect 2	Drive to Drive	Communications I/O (2)	See Page 5–32
18	Drive Comm Receive 2, Indirect 1	Drive to Drive	Communications I/O (2)	See Page 5–32
19	Drive Comm Receive 2, Indirect 2	Drive to Drive	Communications I/O (2)	See Page 5–32
20	Drive Comm Transmit Data 1	Drive to Drive	Communications I/O (2)	See Page 5–33
21	Drive Comm Transmit Data 2	Drive to Drive	Communications I/O (2)	See Page 5–33
22	Drive Comm Receive 1, Data 1	Drive to Drive	Communications I/O (2)	See Page 5–33
23	Drive Comm Receive 1, Data 2	Drive to Drive	Communications I/O (2)	See Page 5–33
24	Drive Comm Receive 2, Data 1	Drive to Drive	Communications I/O (2)	See Page 5–33
25	Drive Comm Receive 2, Data 2	Drive to Drive	Communications I/O (2)	See Page 5–33
26	Process Trim Output	Process Trim	Velocity Torque (3)	See Page 5–33
27	Process Trim Reference	Process Trim	Velocity Torque (3)	See Page 5–34
28	Process Trim Feedback	Process Trim	Velocity Torque (3)	See Page 5–34
29	Process Trim Select	Process Trim	Velocity Torque (3)	See Page 5–34
30	Process Trim Filter Bandwidth	Process Trim	Velocity Torque (3)	See Page 5–34
31	Process Trim Data	Process Trim	Velocity Torque (3)	See Page 5–34
32	Process Trim KI Gain	Process Trim	Velocity Torque (3)	See Page 5–34
33	Process Trim KP Gain	Process Trim	Velocity Torque (3)	See Page 5–35
34	Process Trim Low Limit	Process Trim	Velocity Torque (3)	See Page 5–35
35	Process Trim High Limit	Process Trim	Velocity Torque (3)	See Page 5–35
36	Process Trim Output Gain	Process Trim	Velocity Torque (3)	See Page 5–35
37	Process Trim Testpoint	Process Trim	Velocity Torque (3)	See Page 5–35
38	Process Trim Setpoint Select	Process Trim	Velocity Torque (3)	See Page 5–35
40	Auto Tune Torque Limit	Velocity Autotune	Velocity Torque (3)	See Page 5–35
		Torque Autotune	*Velocity Torque (3)*	See Page 5–35
41	Auto Tune Speed	Velocity Autotune	Velocity Torque (3)	See Page 5–36
		Torque Autotune	*Velocity Torque (3)*	See Page 5–36
		Drive Tune	*Startup (1)*	See Page 5–36
43	VP Desired Bandwidth	Velocity Autotune	Velocity Torque (3)	See Page 5–36
		Drive Tune	*Startup (1)*	See Page 5–36
44	Autotune Status	Velocity Autotune	Velocity Torque (3)	See Page 5–36
		Drive Tune	*Startup (1)*	See Page 5–36
45	VP Damping Factor	Velocity Autotune	Velocity Torque (3)	See Page 5–36
		Drive Tune	*Startup (1)*	See Page 5–36
46	Total Inertia	Velocity Autotune	Velocity Torque (3)	See Page 5–36
		Drive Tune	*Startup (1)*	See Page 5–36
47	Auto Tune Testpoint Data	Velocity Autotune	Velocity Torque (3)	See Page 5–36
		Testpoints	*Diagnostics (4)*	See Page 5–36
48	Auto Tune Testpoint Select	Velocity Autotune	Velocity Torque (3)	See Page 5–37
		Testpoints	*Diagnostics (4)*	See Page 5–37
52	Logic Command Word	Logic	Velocity Torque (3)	See Page 5–37
		Logic	*Communications I/O (2)*	See Page 5–37

Table 5.A – 1336T Numerical Parameter Table (Cont.)

Param No.	Parameter Name (Element)	Group	File (File No.)	Param Descrpt.
53	Torque Mode Select	Torque Ref	Velocity Torque (3)	See Page 5–37
		Drive Data	*Startup File (1)*	See Page 5–37
54	Local Input Status	Logic	Velocity Torque (3)	See Page 5–38
		Logic	*Communications I/O (2)*	See Page 5–38
55	Local Output Status	Logic	Velocity Torque (3)	See Page 5–38
		Logic	*Communications I/O (2)*	See Page 5–38
56	Logic Status LOW	Logic	Velocity Torque (3)	See Page 5–38
		Logic	*Communications I/O (2)*	See Page 5–38
57	Logic Status HI	Logic	Velocity Torque (3)	See Page 5–38
		Logic	*Communications I/O (2)*	See Page 5–38
58	Torque Stop Configuration	Logic	Communications I/O (2)	See Page 5–39
		Logic	*Velocity Torque (3)*	See Page 5–39
59	Logic Options	Logic	Velocity Torque (3)	See Page 5–39
		Logic	*Communications I/O (2)*	See Page 5–39
		Transistor Diag	*Diagnostics (4)*	See Page 5–39
		Limits	*Startup (1)*	See Page 5–39
60	At Setpoint 1	Logic	Velocity Torque (3)	See Page 5–39
		Logic	*Communications I/O (2)*	See Page 5–39
61	At Setpoint 2	Logic	Velocity Torque (3)	See Page 5–39
		Logic	*Communications I/O (2)*	See Page 5–39
62	Over Setpoint 1	Logic	Velocity Torque (3)	See Page 5–39
		Logic	*Communications I/O (2)*	See Page 5–39
63	Over Setpoint 2	Logic	Velocity Torque (3)	See Page 5–39
		Logic	*Communications I/O (2)*	See Page 5–39
64	Over Setpoint 3	Logic	Velocity Torque (3)	See Page 5–40
		Logic	*Communications I/O (2)*	See Page 5–40
65	Over Setpoint 4	Logic	Velocity Torque (3)	See Page 5–40
		Logic	*Communications I/O (2)*	See Page 5–40
66	Setpoint Select	Logic	Velocity Torque (3)	See Page 5–40
		Logic	*Communications I/O (2)*	See Page 5–40
67	Speed Setpoint Tolerance	Logic	Velocity Torque (3)	See Page 5–40
		Logic	*Communications I/O (2)*	See Page 5–40
68	Current Setpoint Tolerance	Logic	Velocity Torque (3)	See Page 5–40
		Logic	*Communications I/O (2)*	See Page 5–40
69	Zero Speed Tolerance	Logic	Velocity Torque (3)	See Page 5–40
		Logic	*Comm I/O (2)*	See Page 5–40
70	Logic Testpoint Data	Logic	Velocity Torque (3)	See Page 5–40
		Logic	*Communications I/O (2)*	See Page 5–40
		Testpoints	*Diagnostics (4)*	See Page 5–40
71	Logic Testpoint Select	Logic	Velocity Torque (3)	See Page 5–41
		Logic	*Communications I/O (2)*	See Page 5–41
		Testpoints	*Diagnostics (4)*	See Page 5–41
72	Stop Dwell	Logic	Velocity Torque (3)	See Page 5–41
		Logic	*Communications I/O (2)*	See Page 5–41
77	Maximum Dynamic Brake Power	Fault Select/Status	Diagnostics (4)	See Page 5–41
78	Maximum Dynamic Brake Temp	Fault Select/Status	Diagnostics (4)	See Page 5–41
79	Dynamic Brake Time Constant	Fault Select/Status	Diagnostics (4)	See Page 5–41
80	Powerup/Diagnostic Fault Status	Fault Select/Status	Communications I/O (2)	See Page 5–42
		Fault Select/Status	*Diagnostics (4)*	See Page 5–42
81	Non–Configurable Fault Status	Fault Select/Status	Communications I/O (2)	See Page 5–42
		Fault Select/Status	*Diagnostics (4)*	See Page 5–42
82	CP Configurable Fault Status	Fault Select/Status	Communications I/O (2)	See Page 5–42
		Fault Select/Status	*Diagnostics (4)*	See Page 5–42
83	VP Configurable Fault Status	Fault Select/Status	Communications I/O (2)	See Page 5–42
		Fault Select/Status	*Diagnostics (4)*	See Page 5–42
84	CP Configurable Warning Status	Fault Select/Status	Communications I/O (2)	See Page 5–43
		Fault Select/Status	*Diagnostics (4)*	See Page 5–43

Table 5.A – 1336T Numerical Parameter Table (Cont.)

Param No.	Parameter Name (Element)	Group	**File** (File No.)	Param Descrpt.
85	VP Configurable Warning Status	Fault Select/Status	Communications I/O (2)	See Page 5–43
		Fault Select/Status	*Diagnostics (4)*	See Page 5–43
86	CP Fault Configuration	Fault Select/Status	Communications I/O (2)	See Page 5–43
		Fault Setup	*Startup (1)*	See Page 5–43
		Fault Select/Status	*Diagnostics (4)*	See Page 5–43
87	CP Warning Configuration Select	Fault Select/Status	Communications I/O (2)	See Page 5–44
		Fault Setup	*Startup (1)*	See Page 5–44
		Fault Select/Status	*Diagnostics (4)*	See Page 5–44
88	VP Fault Configuration Select	Fault Select/Status	Communications I/O (2)	See Page 5–44
		Fault Setup	*Startup (1)*	See Page 5–44
		Fault Select/Status	*Diagnostics (4)*	See Page 5–44
89	VP Warning Configuration Select	Fault Select/Status	Communications I/O (2)	See Page 5–44
		Fault Setup	*Startup (1)*	See Page 5–44
		Fault Select/Status	*Diagnostics (4)*	See Page 5–44
90	Absolute Overspeed Threshold	Fault Setup	Startup (1)	See Page 5–45
91	Stall Delay	Fault Setup	Startup (1)	See Page 5–45
92	Motor Overload Limit	Fault Setup	Startup (1)	See Page 5–45
		Motor Overload	*Diagnostics (4)*	See Page 5–45
94	Service Factor	Motor Overload	Diagnostics (4)	See Page 5–45
		Limits	*Startup (1)*	See Page 5–45
95	Motor Overload Speed 1	Fault Setup	Startup (1)	See Page 5–45
		Motor Overload	*Diagnostics (4)*	See Page 5–45
96	Motor Overload Speed 2	Fault Setup	Startup (1)	See Page 5–45
		Motor Overload	*Diagnostics (4)*	See Page 5–45
97	Minimum Overload Limit	Fault Setup	Startup (1)	See Page 5–45
		Motor Overload	*Diagnostics (4)*	See Page 5–45
98	Fault Testpoint Data	Testpoints	Diagnostics (4)	See Page 5–46
99	Fault Testpoint Select	Testpoints	Diagnostics (4)	See Page 5–46
100	Velocity Reference 1 LOW (FRACTION)	Velocity Ref	Velocity Torque (3)	See Page 5–46
101	Velocity Reference 1 HI (WHOLE, 32 bit)	Velocity Ref	Velocity Torque (3)	See Page 5–46
102	Velocity Scale Factor 1	Velocity Ref	Velocity Torque (3)	See Page 5–46
103	Velocity Reference 2 LOW (FRACTION)	Velocity Ref	Velocity Torque (3)	See Page 5–47
104	Velocity Reference 2 HI (WHOLE, 32 bit)	Velocity Ref	Velocity Torque (3)	See Page 5–47
105	Velocity Scale Factor 2	Velocity Ref	Velocity Torque (3)	See Page 5–47
106	Velocity Trim LOW	Velocity Ref	Velocity Torque (3)	See Page 5–47
107	Velocity Trim HI (32 bit)	Velocity Ref	Velocity Torque (3)	See Page 5–47
108	Velocity Reference Testpoint Data LOW	Velocity Ref	Velocity Torque (3)	See Page 5–47
		Testpoints	*Diagnostics (4)*	See Page 5–47
109	Velocity Reference Testpoint Data HI	Velocity Ref	Velocity Torque (3)	See Page 5–47
		Testpoints	*Diagnostics (4)*	See Page 5–47
110	Velocity Reference Testpoint Select	Velocity Ref	Velocity Torque (3)	See Page 5–48
		Testpoints	*Diagnostics (4)*	See Page 5–48
117	Jog Speed 1	Velocity Ref	Velocity Torque (3)	See Page 5–48
118	Jog Speed 2	Velocity Ref	Velocity Torque (3)	See Page 5–48
119	Preset Speed 1	Velocity Ref	Velocity Torque (3)	See Page 5–48
120	Preset Speed 2	Velocity Ref	Velocity Torque (3)	See Page 5–48
121	Preset Speed 3	Velocity Ref	Velocity Torque (3)	See Page 5–48
122	Preset Speed 4	Velocity Ref	Velocity Torque (3)	See Page 5–49
123	Preset Speed 5	Velocity Ref	Velocity Torque (3)	See Page 5–49
125	Accel Time	*	*	See Page 5–49
126	Decel Time	*	*	See Page 5–49
127	Reverse Motor Speed Limit	Velocity Ref	Velocity Torque (3)	See Page 5–49
		Limits	*Startup (1)*	See Page 5–49
128	Forward Motor Speed Limit	Velocity Ref	Velocity Torque (3)	See Page 5–49
129	Maximum Reverse Speed Trim	Velocity Ref	Velocity Torque (3)	See Page 5–49

* Can be viewed only with PLC Comm Board installed

Table 5.A – 1336T Numerical Parameter Table (Cont.)

Param No.	Parameter Name (Element)	Group	File (File No.)	Param Descrpt.
130	Maximum Forward Speed Trim	Velocity Ref	Velocity Torque (3)	See Page 5–50
131	Droop Percent	Velocity Ref	Velocity Torque (3)	See Page 5–50
132	Velocity Reference Output LOW	Velocity Ref	Velocity Torque (3)	See Page 5–50
133	Velocity Reference Output HI (32 bit)	Velocity Ref	Velocity Torque (3)	See Page 5–50
134	Velocity Regulator Output	Velocity Reg	Velocity Torque (3)	See Page 5–50
135	Velocity Regulator Testpoint Data LOW	Velocity Reg	Velocity Torque (3)	See Page 5–50
		Testpoints	*Diagnostics (4)*	See Page 5–50
136	Velocity Regulator Testpoint Data HI	Velocity Reg	Velocity Torque (3)	See Page 5–50
		Testpoints	*Diagnostics (4)*	See Page 5–50
137	Velocity Regulator Testpoint Select	Velocity Reg.	Velocity Torque (3)	See Page 5–51
		Testpoints	*Diagnostics (4)*	See Page 5–51
138	Velocity Error	Velocity Reg.	Velocity Torque (3)	See Page 5–51
139	KI – Velocity Loop	Velocity Reg	Velocity Torque (3)	See Page 5–51
		Drive Tune	*Startup (1)*	See Page 5–51
		Velocity Autotune	*Velocity Torque (3)*	See Page 5–51
140	KP – Velocity Loop	Velocity Reg	Velocity Torque (3)	See Page 5–51
		Drive Tune	*Startup (1)*	See Page 5–51
		Velocity Autotune	*Velocity Torque (3)*	See Page 5–51
141	KF – Velocity Loop	Velocity Reg	Velocity Torque (3)	See Page 5–51
		Drive Tune	*Startup (1)*	See Page 5–51
		Velocity Autotune	*Velocity Torque (3)*	See Page 5–51
142	KF Error Filter Bandwidth	Velocity Fdbk	Velocity Torque (3)	See Page 5–51
143	Velocity Feedback Testpoint Data LOW	Velocity Fdbk	Velocity Torque (3)	See Page 5–46
		Testpoints	*Diagnostics (4)*	See Page 5–46
144	Velocity Feedback Testpoint Data HI	Velocity Fdbk	Velocity Torque (3)	See Page 5–46
		Testpoints	*Diagnostics (4)*	See Page 5–46
145	Velocity Feedback Testpoint Select	Velocity Fdbk	Velocity Torque (3)	See Page 5–46
		Testpoints	*Diagnostics (4)*	See Page 5–46
146	Velocity Feedback	Velocity Fdbk	Velocity Torque (3)	See Page 5–46
		Drive Tune	*Startup (1)*	See Page 5–46
147	Scaled Velocity Feedback	Velocity Fdbk	Velocity Torque (3)	See Page 5–46
		Monitor	*Diagnostics (4)*	See Page 5–46
148	Encoder Position Feedback LOW	Velocity Fdbk	Velocity Torque (3)	See Page 5–53
		Monitor	*Startup (1)*	See Page 5–53
		Monitor	*Diagnostics (4)*	See Page 5–53
149	Encoder Position Feedback HI	Velocity Fdbk	Velocity Torque	See Page 5–53
		Monitor	*Startup (1)*	See Page 5–53
		Monitor	*Diagnostics (4)*	See Page 5–53
150	Fdbk Device Type	Velocity Fdbk	Velocity Torque (3)	See Page 5–53
151	Fdbk Tracker Gain	Velocity Fdbk	Velocity Torque (3)	See Page 5–53
152	Fdbk Filter Select	Velocity Fdbk	Velocity Torque (3)	See Page 5–53
153	Kn–Fdbk Filter Gain	Velocity Fdbk	Velocity Torque (3)	See Page 5–53
154	Wn–Fdbk Filter BW	Velocity Fdbk	Velocity Torque (3)	See Page 5–53
155	Tach Velocity	Velocity Fdbk	Velocity Torque (3)	See Page 5–54
156	Notch Filter Freq	Torque Ref	Velocity Torque (3)	See Page 5–54
157	Notch Filter Q	Torque Ref	Velocity Torque (3)	See Page 5–54
161	External Iq Reference	Torque Ref	Velocity Torque (3)	See Page 5–54
162	External Torque Reference 1	Torque Ref	Velocity Torque (3)	See Page 5–54
163	Slave Torque Percent 1	Torque Ref	Velocity Torque (3)	See Page 5–54
164	External Torque Reference 2	Torque Ref	Velocity Torque (3)	See Page 5–54
165	Slave Torque Percent 2	Torque Ref	Velocity Torque (3)	See Page 5–54
166	External Torque Step	Torque Ref	Velocity Torque (3)	See Page 5–55
167	Internal Torque Reference	Torque Ref	Velocity Torque (3)	See Page 5–55
		Monitor	*Diagnostics (4)*	See Page 5–55
168	Internal Iq Reference	Torque Ref	Velocity Torque (3)	See Page 5–55
		Monitor	*Diagnostics (4)*	See Page 5–55

Table 5.A – 1336T Numerical Parameter Table (Cont.)

Param No.	Parameter Name (Element)	Group	**File** (File No.)	Param Descrpt.
172	Torque Reference Testpoint Data	Torque Ref	Velocity Torque (3)	See Page 5–55
		Testpoints	*Diagnostics (4)*	See Page 5–55
173	Torque Reference Testpoint Select	Torque Ref	Velocity Torque (3)	See Page 5–55
		Testpoints	*Diagnostics (4)*	See Page 5–55
174	Minimum Flux Level	Torque Ref	Velocity Torque (3)	See Page 5–56
		Limit	*Startup (1)*	See Page 5–56
175	Pos Torque Reference Limit	Torque Ref	Velocity Torque (3)	See Page 5–56
		Limits	*Startup (1)*	See Page 5–56
176	Neg Torque Reference Limit	Torque Ref	Velocity Torque (3)	See Page 5–56
		Limits	*Startup (1)*	See Page 5–56
177	Motoring Power Limit	Torque Ref	Velocity Torque (3)	See Page 5–56
		Limits	*Startup (1)*	See Page 5–56
178	Regen. Power Limit	Torque Ref	Velocity Torque (3)	See Page 5–56
		Limits	*Startup (1)*	See Page 5–56
179	Positive Motor Current Reference Limit	Torque Ref	Velocity Torque (3)	See Page 5–56
		Limits	*Startup (1)*	See Page 5–56
180	Negative Motor Current Reference Limit	Torque Ref	Velocity Torque (3)	See Page 5–56
		Limits	*Startup (1)*	See Page 5–56
181	DI/DT Limit	Torque Ref	Velocity Torque (3)	See Page 5–57
		Limits	*Startup (1)*	See Page 5–57
182	Computed Power	Torque Ref	Velocity Torque (3)	See Page 5–57
		Monitor	*Startup (1)*	See Page 5–57
		Monitor	*Diagnostics (4)*	See Page 5–57
183	Torque Limit Status	Torque Ref	Velocity Torque (3)	See Page 5–57
184	Torque Mode Status	Torque Ref	Velocity Torque (3)	See Page 5–57
185	Perunit Motor Current	Monitor	Startup (1)	See Page 5–57
		Monitor	*Diagnostics (4)*	See Page 5–57
186	Perunit Motor Voltage	Monitor	*Startup (1)*	See Page 5–58
		Monitor	Diagnostics	See Page 5–58
220	Rated Inverter Output Amps	Info	Diagnostics (4)	See Page 5–58
221	Rated Inverter Input Voltage	Info	Diagnostics (4)	See Page 5–58
222	Inverter Carrier Frequency	Torque Block	Velocity Torque (3)	See Page 5–58
223	Precharge/Ridethru Selection	Torque Block	Velocity Torque (3)	See Page 5–59
224	Undervoltage Setpoint	Torque Block	Velocity Torque (3)	See Page 5–59
225	Bus Precharge Timeout	Torque Block	Velocity Torque (3)	See Page 5–59
226	Bus Ridethru Timeout	Torque Block	Velocity Torque (3)	See Page 5–59
227	CP Operating Options	Torque Block	Velocity Torque (3)	See Page 5–60
228	Base Motor Horsepower	Drive Data	Startup (1)	See Page 5–60
229	Base Motor Speed	Drive Data	Startup (1)	See Page 5–60
230	Base Motor Current	Drive Data	Startup (1)	See Page 5–60
231	Base Motor Volts	Drive Data	Startup (1)	See Page 5–60
232	Base Motor Frequency	Drive Data	Startup (1)	See Page 5–60
233	Motor Poles	Drive Data	Startup (1)	See Page 5–60
234	Motor Inertia	Drive Tune	Startup (1)	See Page 5–60
		Velocity Autotune	*Velocity Torque (3)*	See Page 5–61
235	Encoder PPR	Drive Data	Startup (1)	See Page 5–61
236	Rs Tune (Stator Resistance)	Torque Autotune	Velocity Torque (3)	See Page 5–61
237	Leakage Inductance	Torque Autotune	Velocity Torque (3)	See Page 5–61
238	Id Tune (Base Flux Current)	Torque Autotune	Velocity Torque (3)	See Page 5–61
240	Iq Tune (Base Torque Current)	Torque Autotune	Velocity Torque (3)	See Page 5–61
241	Vde Tune (Base Torque Voltage)	Torque Autotune	Velocity Torque (3)	See Page 5–61
242	Vqe Tune (Base Flux Voltage)	Torque Autotune	Velocity Torque (3)	See Page 5–61
243	Vde Maximum (Peak HP)	Torque Autotune	Velocity Torque (3)	See Page 5–61
244	Vqe Maximum (Constant HP)	Torque Autotune	Velocity Torque (3)	See Page 5–62
245	Vde Minimum	Torque Autotune	Velocity Torque (3)	See Page 5–62
246	K Slip (Base Slip Frequency)	Torque Autotune	Velocity Torque (3)	See Page 5–62

Table 5.A – 1336T Numerical Parameter Table (Cont.)

Param No.	Parameter Name (Element)	Group	**File** (File No.)	Param Descrpt.
246	Base Slip Frequency	Torque Autotune	Velocity Torque (3)	See Page 5–62
247	Base Slip Freq Max	Torque Autotune	Velocity Torque (3)	See Page 5–62
248	Base Slip Freq Min	Torque Autotune	Velocity Torque (3)	See Page 5–62
249	Kp – Slip Regulator	Torque Autotune	Velocity Torque (3)	See Page 5–62
250	Ki – Slip Regulator	Torque Autotune	Velocity Torque (3)	See Page 5–62
251	Kp – Flux Regulator	Torque Autotune	Velocity Torque (3)	See Page 5–62
252	Ki – Flux Regulator	Torque Autotune	Velocity Torque (3)	See Page 5–62
256	Autotune/Diagnostics Selection	Drive Tune	Startup (1)	See Page 5–63
		Torque Autotune	*Velocity Torque (3)*	See Page 5–63
		Velocity Autotune	*Velocity Torque (3)*	See Page 5–63
		Transistor Diag.	*Diagnostics (4)*	See Page 5–63
257	Transistor Diagnostics Configuration	Transistor Diag	Diagnostics (4)	See Page 5–63
258	Inverter Diagnostics Result #1	Transistor Diag	Diagnostics (4)	See Page 5–63
259	Inverter Diagnostics Result #2	Transistor Diag	Diagnostics (4)	See Page 5–64
260	Iq Offset	Transistor Diag	Diagnostics (4)	See Page 5–64
261	Id Offset	Transistor Diag	Diagnostics (1)	See Page 5–64
262	Phase Rotation Current Reference	Torque Autotune	Velocity Torque (3)	See Page 5–64
		Drive Tune	*Startup (1)*	See Page 5–64
263	Phase Rotation Frequency Reference	Torque Autotune	Velocity Torque (3)	See Page 5–64
		Drivetune	*Startup (1)*	See Page 5–64
264	Motor Current Magnitude Feedback	Monitor	Startup (1)	See Page 5–64
		Monitor	*Diagnostics (4)*	See Page 5–64
265	Motor Voltage Magnitude	Monitor	Startup (1)	See Page 5–64
		Monitor	*Diagnostics (4)*	See Page 5–64
266	Stator Frequency	Monitor	Startup (1)	See Page 5–65
		Monitor	*Diagnostics (4)*	See Page 5–65
267	Calculated Torque			See Page 5–65
268	DC Bus Voltage	Monitor	Startup (1)	See Page 5–65
		Monitor	*Diagnostics (4)*	See Page 5–65
269	Filtered Motor Velocity Feedback	Monitor	Diagnostics (4)	See Page 5–65
		Monitor	*Startup (1)*	See Page 5–65
		Velocity Fdbk	*Velocity Torque (3)*	See Page 5–65
270	Inverter Temperature Feedback	Monitor	Startup (1)	See Page 5–65
		Monitor	*Diagnostics* (4)	See Page 5–65
271	Limited Motor Flux	Monitor	Startup (1)	See Page 5–65
		Monitor	*Diagnostics* (4)	See Page 5–65
273	Testpoint Selection	Testpoints	Diagnostics (4)	See Page 5–65
		Torque Autotune	*Velocity Torque (4)*	See Page 5–65
274	Testpoint Data	Testpoints	Diagnostics (4)	See Page 5–66
		Torque Autotune	*Velocity Torque (4)*	See Page 5–66
275	Testpoint Selection #2	*Factory Use Only*	*DO NOT USE*	See Page 5–66
276	Testpoint Data #2	*Factory Use Only*	*DO NOT USE*	See Page 5–66
277	Testpoint Selection #3	*Factory Use Only*	*DO NOT USE*	See Page 5–66
278	Testpoint Data #3	*Factory Use Only*	*DO NOT USE*	See Page 5–66
279	Testpoint Selection #4	*Factory Use Only*	*DO NOT USE*	See Page 5–66
280	Testpoint Data #4	*Factory Use Only*	*DO NOT USE*	See Page 5–66
281	Testpoint Selection #5	*Factory Use Only*	*DO NOT USE*	See Page 5–67
282	Testpoint Data #5	*Factory Use Only*	*DO NOT USE*	See Page 5–67
283	Testpoint Selection #6	*Factory Use Only*	*DO NOT USE*	See Page 5–67
284	Testpoint Data #6	*Factory Use Only*	*DO NOT USE*	See Page 5–67
285	Selection for Test DAC 1	*Factory Use Only*	*DO NOT USE*	See Page 5–67
286	Selection for Test DAC 2	*Factory Use Only*	*DO NOT USE*	See Page 5–67
287	Ki Frequency Regulator	Torque Block	Velocity Torque (3)	See Page 5–67
288	Kp Frequency Regulator	Torque Block	Velocity Torque (3)	See Page 5–68
289	Kff Frequency Regulator	Torque Block	Velocity Torque (3)	See Page 5–68
290	Ksel Frequency Regulator	Torque Block	Velocity Torque (3)	See Page 5–68

Table 5.A – 1336T Numerical Parameter Table (Cont.)

Param No.	Parameter Name (Element)	Group	File (File No.)	Param Descrpt.
291	Frequency Tracking Filter	Torque Block	Velocity Torque (3)	See Page 5–68
292	Tracking Filter Type	Torque Block	Velocity Torque (3)	See Page 5–68
293	Freq Trim Filter	Torque Block	Velocity Torque (3)	See Page 5–68
294	Motor Phase Rot Errors	Torque Autotune	Velocity Torque (3)	See Page 5–68
295	Motor Inductance Test Errors	Torque Autotune	Velocity Torque (3)	See Page 5–69
296	Stator Resistance Test Errors	Torque Autotune	Velocity Torque (3)	See Page 5–69
297	Motor Flux (Id) Test Errors	Torque Autotune	Velocity Torque (3)	See Page 5–69
298	Torq Block Calc Errors	Torque Autotune	Velocity Torque (3)	See Page 5–69
300	Adapter ID	Info	Diagnostics (4)	See Page 5–70
301	Adapter Version	Info	Diagnostics (4)	See Page 5–70
302	Adapter Config	Info	Diagnostics (4)	See Page 5–70
304	Language Select	Info	Diagnostics (4)	See Page 5–70
		Drive Data	*Startup (1)*	See Page 5–70
310	Data In A1	SCANport I/O	Communications I/O (2)	See Page 5–70
311	Data In A2	SCANport I/O	Communications I/O (2)	See Page 5–70
312	Data In B1	SCANport I/O	Communications I/O (2)	See Page 5–70
313	Data In B2	SCANport I/O	Communications I/O (2)	See Page 5–71
314	Data In C1	SCANport I/O	Communications I/O (2)	See Page 5–71
315	Data In C2	SCANport I/O	Communications I/O (2)	See Page 5–71
316	Data In D1	SCANport I/O	Communications I/O (2)	See Page 5–71
317	Data In D2	SCANport I/O	Communications I/O (2)	See Page 5–71
320	Data Out A1	SCANport I/O	Communications I/O (2)	See Page 5–71
321	Data Out A2	SCANport I/O	Communications I/O (2)	See Page 5–71
322	Data Out B1	SCANport I/O	Communications I/O (2)	See Page 5–71
323	Data Out B2	SCANport I/O	Communications I/O (2)	See Page 5–72
324	Data Out C1	SCANport I/O	Communications I/O (2)	See Page 5–72
325	Data Out C2	SCANport I/O	Communications I/O (2)	See Page 5–72
326	Data Out D1	SCANport I/O	Communications I/O (2)	See Page 5–72
327	Data Out D2	SCANport I/O	Communications I/O (2)	See Page 5–72
330	Port Enable Mask	SCANport Masks	Communications I/O (2)	See Page 5–72
331	Direction Mask	SCANport Masks	Communications I/O (2)	See Page 5–73
332	Start Mask	SCANport Masks	Communications I/O (2)	See Page 5–73
333	Jog Mask	SCANport Masks	Communications I/O (2)	See Page 5–73
334	Reference Mask	SCANport Masks	Communications I/O (2)	See Page 5–73
335	Clear Fault Mask	SCANport Masks	Communications I/O (2)	See Page 5–73
336	Reset Drv Mask	SCANport Masks	Communications I/O (2)	See Page 5–74
337	Local Mask	SCANport Masks	Communications I/O (2)	See Page 5–74
340	Stop Owner	SCANport Owners	Communications I/O (2)	See Page 5–74
341	Dir. Owner	SCANport Owners	Communications I/O (2)	See Page 5–74
342	Start Owner	SCANport Owners	Communications I/O (2)	See Page 5–74
343	Jog 1 Owner	SCANport Owners	Communications I/O (2)	See Page 5–75
344	Jog 2 Owner	SCANport Owners	Communications I/O (2)	See Page 5–75
345	Set Ref Owner	SCANport Owners	Communications I/O (2)	See Page 5–75
346	Local Owner	SCANport Owners	Communications I/O (2)	See Page 5–75
347	Flux Owner	SCANport Owners	Communications I/O (2)	See Page 5–75
348	Trim Owner	SCANport Owners	Communications I/O (2)	See Page 5–76
349	Ramp Owner	SCANport Owners	Communications I/O (2)	See Page 5–76
350	Clr Flt Owner	SCANport Owners	Communications I/O (2)	See Page 5–76
352	10 Volt In Fltr	Analog Input	Communications I/O (2)	See Page 5–76
353	Pot In Filtr	Analog Input	Communications I/O (2)	See Page 5–76
354	mA In Filtr	Analog Input	Communications I/O (2)	See Page 5–76
355	10 Volt Input	Analog Input	Communication I/O (2)	See Page 5–77
356	10 Volt Offset	Analog Input	Communication I/O (2)	See Page 5–77
357	10 Volt Scale	Analog Input	Communication I/O (2)	See Page 5–77
358	Pot Input	Analog Input	Communication I/O (2)	See Page 5–77
359	Pot Offset	Analog Input	Communication I/O (2)	See Page 5–77

Table 5.A – 1336T Numerical Parameter Table (Standard Adapter Parameters)

Param No.	Parameter Name (Element)	Group	**File** (File No.)	Param Descrpt.
360	Pot Scale	Analog Input	Communications I/O (2)	See Page 5–77
361	Milli Amp Input	Analog Input	Communications I/O (2)	See Page 5–77
362	Milli Amp Input Offset	Analog Input	Communications I/O (2)	See Page 5–78
363	Milli Amp Input Scale	Analog Input	Communications I/O (2)	See Page 5–78
364	SP Analog Sel	Analog Input	Communications I/O (2)	See Page 5–78
365	SP Analog In	Analog Input	Communications I/O (2)	See Page 5–78
366	SP Analog 1 Scale	Analog Input	Communications I/O (2)	See Page 5–78
367	SP Analog 2 Select	Analog Input	Communications I/O (2)	See Page 5–78
368	SP Analog 2 In	Analog Input	Communications I/O (2)	See Page 5–79
369	SP Analog 2 Scale	Analog Input	Communications I/O (2)	See Page 5–79
370	Analog Output 1	Analog Output	Communications I/O (2)	See Page 5–79
371	Analog Output 1 Offset	Analog Output	Communications I/O (2)	See Page 5–79
372	Analog Output 1 Scale	Analog Output	Communications I/O (2)	See Page 5–80
373	Analog Output 2	Analog Output	Communications I/O (2)	See Page 5–80
374	Analog Output 2 Offset	Analog Output	Communications I/O (2)	See Page 5–80
375	Analog Output 2 Scale	Analog Output	Communications I/O (2)	See Page 5–80
376	mA Output	Analog Output	Communications I/O (2)	See Page 5–80
377	mA Output Offset	Analog Output	Communications I/O (2)	See Page 5–80
378	mA Output Scale	Analog Output	Communications I/O (2)	See Page 5–81
379	SB Analog Out	Analog Output	Communications I/O (2)	See Page 5–81
384	Output Select	Logic	Communication I/O (2)	See Page 5–81
		Logic	Velocity Torque (3)	See Page 5–81
385	Input Mode	Logic	Communications I/O (2)	See Page 5–82
		Logic	*Velocity Torque (3)*	See Page 5–82
		Drive Data	*Startup (1)*	See Page 5–82
386	Input Status	Monitor	Startup (1)	See Page 5–82
		Monitor	*Diagnostics (4)*	See Page 5–82
387	Stop Select 1	Logic	Velocity Torque (3)	See Page 5–82
		Logic	*Communications I/O (2)*	See Page 5–82
388	Stop Select 2	Logic	Velocity Torque (3)	See Page 5–83
		Logic	*Communications I/O (2)*	See Page 5–83
389	Accel Rate 1	Velocity Ref	Velocity Torque (3)	See Page 5–83
		Limits	*Startup (1)*	See Page 5–83
390	Accel Rate 2	Velocity Ref	Velocity Torque (3)	See Page 5–83
		Limits	*Startup (1)*	See Page 5–83
391	Decel Rate 1	Velocity Ref	Velocity Torque (3)	See Page 5–83
		Limits	*Startup (1)*	See Page 5–83
392	Decel Rate 2	Velocity Ref	*Velocity Torque (3)*	See Page 5–83
		Limits	*Startup (1)*	See Page 5–83
393	Mop Increment	Velocity Ref	Velocity Torque (3)	See Page 5–83
394	Mop Value	Monitor	Startup (1)	See Page 5–83
		Monitor	*Diagnostics (4)*	See Page 5–83
395	Pulse PPR	Velocity Fdbk	Velocity Torque (3)	See Page 5–84
396	Pulse Edge	Velocity Fdbk	Velocity Torque (3)	See Page 5–84
397	Pulse Scale	Velocity Fdbk	Velocity Torque (3)	See Page 5–84
398	Pulse Offset	Velocity Fdbk	Velocity Torque (3)	See Page 5–84
399	Pulse Value	Monitor	Startup (1)	See Page 5–84
		Monitor	*Diagnostics (4)*	See Page 5–84
404	SP Comm Retries	Info	Diagnostics	See Page 5–84
405	Fault Select	Fault Select/Status	Diagnostics File	See Page 5–85
		Fault Select/Status	*Communications I/O (2)*	See Page 5–85
406	Warning Select	Fault Select/Status	Diagnostics File	See Page 5–85
		Fault Select/Status	*Communications I/O (2)*	See Page 5–85
407	Fault Status	Fault Select/Status	Diagnostics File	See Page 5–85
		Fault Select/Status	*Communications I/O (2)*	See Page 5–85
408	Warning Status	Fault Select/Status	Diagnostics File	See Page 5–85
		Fault Select/Status	*Communications I/O (2)*	See Page 5–85

Table 5.B – 1336T Alphabetical Parameter Table

Parameter Name (Element)	Param No.	Page Ref.
Absolute Overspeed Threshold	90	5–45
Accel Rate 1	389	5–83
Accel Rate 2	390	5–83
Accel Time	125	5–49
Adapter Config.	302	5–70
Adapter ID	300	5–70
Adapter Version	301	5–70
Analog Output 1	370	5–79
Analog Output 1 Offset	371	5–79
Analog Output 1 Scale	372	5–80
Analog Output 2	373	5–80
Analog Output 2 Offset	374	5–80
Analog Output 2 Scale	375	5–80
At Setpoint 1	60	5–39
At Setpoint 2	61	5–39
Autotune Diagnostics Selection	256	5–63
Autotune Speed	41	5–36
Autotune Status	44	5–36
Autotune Testpoint Data	47	5–36
Autotune Testpoint Select	48	5–37
Autotune Torque Limit	40	5–35
Base Motor Speed	229	5–38
Base Slip Freq. Max	247	5–38
Base Slip Freq. Min	248	5–38
Bus Precharge Timeout	225	5–59
Bus Ridethru Timeout	226	5–59
Clear Fault Mask	335	5–73
Clear Fault Owner	350	5–76
Computed Power	182	5–57
CP Configurable Fault Status	82	5–42
CP Configurable Warning Status	84	5–43
CP Fault Configuration Select	86	5–43
CP Operating Options	227	5–60
CP Warning Configuration Select	87	5–44
Current Setpoint Tolerance	68	5–40
Data In A1	310	5–70
Data In A2	311	5–70
Data In B1	312	5–70
Data In B2	313	5–71
Data In C1	314	5–71
Data In C2	315	5–71
Data In D1	316	5–71
Data In D2	317	5–71
Data Out A1	320	5–71
Data Out A2	321	5–71
Data Out B1	322	5–71
Data Out B2	323	5–71
Data Out C1	324	5–71
Data Out C2	325	5–71
Data Out D1	326	5–71
Data Out D2	327	5–72
DC Bus Voltage	268	5–65
Decel Rate 1	391	5–83
Decel Rate 2	392	5–83
Decel Time	126	5–49
Direction Owner	341	5–74

Table 5.B – 1336T Alphabetical Parameter Table

Parameter Name (Element)	Param No.	Page Ref.
Drive Comm Baud Rate	10	5–31
Drive Comm Receive 1, Data 1	22	5–33
Drive Comm Receive 1, Data 2	23	5–33
Drive Comm Receive 2, Data 1	24	5–33
Drive Comm Receive 2, Data 2	25	5–33
Drive Comm Receive 1 Address	12	5–31
Drive Comm Receive 2 Address	13	5–31
Drive Comm Task Interval	09	5–31
Drive Comm Transmit Address	11	5–31
Drive Comm Transmit Data 1	20	5–34
Drive Comm Transmit Data 2	21	5–34
Drive Comm Transmit Indirect 1	14	5–33
Drive Comm Transmit Indirect 2	15	5–33
Drive Power Structure Type	05	5–33
Drive Software Version	01	5–50
Droop Percent	131	5–50
Encoder Position Feedback LOW	148	5–50
Encoder Position Feedback HI	149	5–50
Encoder PPR	235	5–38
External IQ Reference	161	5–54
External Torque Reference 1	162	5–54
External Torque Reference 2	164	5–54
External Torque Step	165	5–54
Fault Status	407	5–42
Fault Select	405	5–42
Fault Testpoint Data	98	5–46
Fault Testpoint Select	99	5–46
Feedback Device Type	150	5–53
Feedback Filter Select	152	5–53
Feedback Tracker Gain	151	5–53
Filtered Vel Fdbk	269	5–65
Flux Owner	347	5–75
Forward Motor Speed Limit	128	5–49
Frequency Tracker Filter	291	5–68
Frequency Trim Filter	293	5–68
Id OFFSET	261	5–64
Id Tune (Base Flux Current)	238	5–61
Input Mode	385	5–82
Input Status	386	5–82
Internal Torque Reference	167	5–55
Internal Iq Reference	168	5–55
Inverter Carrier Frequency	222	5–58
Iq Offset	260	5–64
Iq Tune (Base Torque Current)	240	5–61
Jog Mask	333	5–73
Jog 1 Owner	343	5–75
Jog 2 Owner	344	5–75
Jog Speed 1	117	5–48
Jog Speed 2	118	5–48
Kf Velocity Loop	141	5–51
Kff Freq Regulator	289	5–68
Ki Flux Regulator	252	5–62
Ki Frequency Regulator	287	5–67
Ki Slip Regulator	250	5–62
Ki Velocity Loop	139	5–51
Kn Feedback Filter Gain	153	5–53
KP Flux Regulator	251	5–62

Table 5.B – 1336T Alphabetical Parameter Table

Parameter Name (Element)	Param No.	Page Ref.
Kp Frequency Regulator	288	5–68
Kp Slip Regulator	249	5–62
Kp Velocity Loop	140	5–51
Ksel Freq. Regulator	290	5–68
K Slip	246	5–62
Language Select	304	5–70
Leakage Inductance	237	5–61
Lo Test Errors	295	5–69
Local Owner	346	5–75
Local Mask	337	5–74
Local Input Status	54	5–38
Local Output Status	56	5–38
Logic Command Word	52	5–37
Logic Options	59	5–39
Logic Status Low	56	5–38
Logic Status Hi	57	5–38
Logic Testpoint Data	70	5–40
Logic Testpoint Select	71	5–41
mA In Filtr	354	5–76
Maximum Dynamic Brake Power	77	5–41
Maximum Dynamic Brake Temp	78	5–41
Maximum Forward Speed Trim	130	5–50
Maximum Reverse Speed Trim	129	5–49
Milli Amp Input	361	5–77
Milli Amp Input Offset	362	5–78
Milli Amp Input Scale	363	5–78
MilliAmp Output	376	5–80
MilliAmp Output Scale	378	5–81
Minimum Flux Level	174	5–56
Minimum Overload Limit	97	5–45
Motor Current Magnitude Feedback	264	5–64
Motor Control Counter	08	5–31
Motor Flux (Id) Test Errors	297	5–69
Motor Inertia	234	5–60
Motor Nameplate Amps	230	5–60
Motor Nameplate Frequency	232	5–60
Motor Nameplate Poles	233	5–60
Motor Nameplate Volts	231	5–60
Motor Overload Limit	92	5–45
Motor Overload Speed 2	95	5–45
Motoring Power Limit	177	5–56
Motor Voltage Magnitude	265	5–64
Negative Motor Current Reference Limit	179	5–56
Non–Configurable Fault Status	81	5–42
Notch Filter Freq.	156	5–54
Notch Filter Q	157	5–54
Over Setpoint 1	62	5–39
Over Setpoint 2	63	5–39
Over Setpoint 3	64	5–40
Over Setpoint 4	65	5–40
Perunit Motor Current	185	5–57
Perunit Motor Voltage	186	5–57
Phase Rotation Errors	294	5–68
Phase Rotation Frequency Reference	263	5–64
Pot Input	358	5–77
Pot In Filtr	353	5–76

Table 5.B – 1336T Alphabetical Parameter Table

Parameter Name (Element)	Param No.	Page Ref.
Pot Offset	359	5–77
Pot Scale	360	5–77
Powerup/Diagnostic Fault Status	80	5–42
Positive Motor Current Reference Limit	179	5–56
Positive Torque Ref Limit	175	5–56
Precharge/Ridethru Selection	223	5–59
Preset Speed 1	119	5–48
Preset Speed 2	120	5–48
Preset Speed 3	121	5–48
Preset Speed 4	122	5–49
Preset Speed 5	123	5–49
Process Trim Data	31	5–34
Process Trim Feedback	28	5–34
Process Trim Filter Bandwidth	30	5–34
Process Trim KI Gain	32	5–34
Process Trim KP Gain	33	5–35
Process Trim High Limit	35	5–35
Process Trim Low Limit	34	5–35
Process Trim Output	26	5–34
Process Trim Output Gain	36	5–34
Process Trim Select	29	5–34
Process Trim Setpoint Select	38	5–35
Process Trim Testpoint	37	5–35
Process Trim Reference	27	5–34
Pulse Edge	396	5–84
Pulse PPR	395	5–84
Pulse Offset	398	5–84
Pulse Scale	397	5–84
Pulse Value	399	5–84
Ramp Owner	349	5–76
Rated Inverter Output Amps	220	5–58
Rated Torque Voltage	241	5–61
Reference Mask	334	5–73
Regen Power Limit	178	5–56
Reset Drive Mask	336	5–74
Reverse Motor Speed Limit	127	5–49
SP Analog 1 In	365	5–78
SP Analog Out	379	5–81
SP Analog 1 Select	364	5–78
SP Analog 1 Scale	366	5–78
SP Analog 2 In	368	5–79
SP Analog 2 Select	367	5–79
SP Analog 2 Scale	369	5–79
SP Comm Retries	404	5–84
Set Ref Owner	345	5–75
Scaled Velocity Feedback	147	5–52
Setpoint Select	66	5–40
Selection for Test DAC 1	285	5–67
Selection for Test DAC 2	286	5–67
Slave Torque Percent 1	163	5–54
Slave Torque Percent 2	165	5–54
Speed Setpoint Tolerance	67	5–40
Stop Dwell	72	5–41
Stall Delay	91	5–45
Start Mask	332	5–73
Start Owner	342	5–74
Stator Resistance	236	5–61

Table 5.B – 1336T Alphabetical Parameter Table

Parameter Name (Element)	Param No.	Page Ref.
Stop Owner	340	5–74
Stop Select 1	387	5–82
Stop Select 2	388	5–83
Tach Velocity	155	5–54
Testpoint Data	274	5–66
Testpoint Data #2	276	5–66
Testpoint Data #3	278	5–66
Testpoint Data #4	280	5–66
Testpoint Data #5	284	5–61
Testpoint Data #6	286	5–67
Testpoint Selection	273	5–65
Testpoint Selection #2	275	5–65
Testpoint Selection #3	277	5–66
Testpoint Selection #4	279	5–66
Testpoint Selection #5	281	5–67
Testpoint Selection #6	283	5–67
Torque Calc Errors	298	5–69
Torque Limit Status	183	5–57
Torque Mode Status	184	5–57
Torque Reference Testpoint Data	172	5–55
Torque Reference Testpoint Select	173	5–55
Transistor Diagnostics Configuration	257	5–63
Trim Owner	348	5–76
Undervoltage Setpoint	224	5–59
Vde Minimum	245	5–62
Vde Tune (Base Torque Voltage)	241	5–61
Velocity Error	138	5–51
Velocity Feedback	146	5–52
Velocity Feedback Testpoint Data HI	144	5–52
Velocity Feedback Testpoint Data LOW	143	5–52
Velocity Feedback Testpoint Select	145	5–52
Velocity Reference Testpoint Data HI	109	5–47
Velocity Reference Testpoint Data LOW	108	5–47
Velocity Reference Testpoint Select	110	5–48
Velocity Reference 1 HI	101	5–46
Velocity Reference 1 LOW	100	5–46
Velocity Reference 2 HI	104	5–47
Velocity Reference 2 LOW	103	5–47
Velocity Reference Output HI	133	5–50
Velocity Reference Output LOW	132	5–50
Velocity Regulator Output	134	5–50
Velocity Regulator Testpoint Data HI	136	5–50
Velocity Regulator Testpoint Data LOW	135	5–50
Velocity Regulator Testpoint Select	137	5–51
Velocity Regulator Output	134	5–50
Velocity Regulator Testpoint Data HI	136	5–50
Velocity Regulator Testpoint Data LOW	135	5–50
Velocity Regulator Testpoint Select	137	5–51
Velocity Scale Factor 1	102	5–46
Velocity Scale Factor 2	105	5–47
Velocity Trim HI	107	5–47
Velocity Trim LOW	106	5–47
VP Configurable Fault Status	83	5–42
VP Configurable Warning Status	85	5–43
VP Damping Factor	45	5–36
VP Desired Bandwidth	43	5–36
VP Fault Configuration Select	88	5–44
VP Warning Configuration Select	89	5–44

Table 5.B – 1336T Alphabetical Parameter Table

Parameter Name (Element)	Param No.	Page Ref.
Warning Select	406	5–85
Wn–Feedback Filter Bandwidth	154	5–54
Zero Speed Tolerance	69	5–40
10 Volt In Filtr	352	5–76
10 Volt Input	355	5–77
10 Volt Offset	356	5–77
10 Volt Scale	357	5–77

Standard Adapter Parameters

If your 1336 FORCE Drive is equipped with a Standard Adapter Board, the parameters in the range from 300 to 500 are dedicated exclusively to the the Standard Adapter Board. Standard Adapter Parameters are divided into four files. The complete parameter table for a Standard Adapter equipped 1336 Force is detailed in Figure 5.2. The table has been divided into Files, Groups and Elements for ease of reference.

Figure 5.2. 1336 FORCE Drive Equipped with Standard Adapter Board

FILE 1 – Startup

Drive Data		Drive Tune		Limits Group	
53	Torque Mode Sel	41	Auto Tune Speed	59	Logic Options
228	Base Motor HP	43	Vel Desired BW	94*	Service Factor
229	Base Motor Speed	44	Auto Tune Status	127	Rev Speed Limit
230	Base Motor Curr	45	Vel Damp Factor	128	Fwd Speed Limit
231	Base Motor Volt	46	Total Inertia	174	Min Flux Level
232	Base Motor Freq	139	Ki Velocity Loop	175	Pos Mtr Tor Lmt
233	Motor Poles	140	Kp Velocity Loop	176	Neg Mtr Tor Lmt
235	Encoder PPR	141	Kf Velocity Loop	177	Motor Power Lmt
267*	Calc Torque	146	Vel Feedback	178	Regen Power Lmt
275*	Torq TP Sel 2	234	Motor Inertia	179	Pos Mtr Cur Lmt
276*	Torq TP Data 2	256	Autotune Diag Sel	180	Neg Motor Cur Limit
277*	Torq TP Sel 3	262	Ph Rot Cur Ref	181	D1/Dt Limit
278*	Torq TP Data 3	263	Phas Rot Freq Ref	389	Accel Rate 1
279*	Torq TP Sel 4			390	Accel Rate 2
280*	Torq TP Data 4			391	Decel Rate 1
281*	Torq TP Sel 5			392	Decel Rate 2
282*	Torq TP Data 5				
283*	Torq TP Sel 6				
284*	Torq TP Data 6				
285*	Test DAC 1 Se1				
286*	Test DAC 2 Sel				
304	Language Select				
385	Input Mode				

Fault Setup Group		Monitor			
86	CP Faukt Select	8	MCB Counter	268*	DC Bus Voltage
87	VP Fault Select	148	Enc Pos Fdbk Low	269*	Filt Vel Fdbk
88	CP Warn Select	149	Enc Pos Fdbk Hi	270*	Inv Temp Fdbk
89	VP Warn Select	182	Computed Power	271*	Lim Motor Flux
90*	Absolute Overspd	184	Perunit Motor Current	386*	Input Status
91*	Stall Delay	185	Perunit Motor Voltage	394*	Mop Value
92*	Mtr Overload Lim	186	Torque Mode Status	399*	Pulse Value
95*	Mtr Overload Spd 1	264*	Motor Cur Fdbk		
96*	Motor Overload Spd 2	265*	Motor Volt Magn		
97*	Min Overload Lmt	266*	Freq Command		

* Accessible only while using Drive Tools

Figure 5.2. Standard Adapter Parameters (cont.)

FILE 2 – Communications I/O

SCANport I/O		Logic		Analog Input		Analog Output	
310	Data In A1	**52**	Logic Command	**352***	10 Volt in F1ltr	**370**	Analog Out 1
311	Data In A2	**54**	Local In Status	**353***	Pot In Filtr	**371**	An Out 1 Offset
312	Data In B1	**55**	Local Out Status	**354***	mA In Filtr	**372**	An Out 1 Scale
313	Data In B2	**56**	Logic Status Low	**355**	10 Volt Input	**373**	Analog Out 2
314	Data In C1	**57**	Logic Status Hi	**356**	10 Volt Offset	**374**	An Out 2 Offset
315	Data In C2	**58**	Torq Stop Config	**357**	10 Volt Scale	**375**	An Out 2 Scale
316	Data In D1	**59**	Logic Options	**358**	Pot Input	**376**	mA Output
317	Data In D2	**60**	At Setpoint 1	**359**	Pot Offset	**377**	mA Output Offset
320	Data Out A1	**61**	At Setpoint 2	**360**	Pot Scale	**378**	mA Output Scale
321	Data Out A2	**62**	Over Setpoint 1	**361**	mA Input	**379**	SP Analog Out
322	Data Out B1	**63**	Over Setpoint 2	**362**	mA Input Offset		
323	Data Out B2	**64**	Over Setpoint 3	**363**	mA Input Scale		
324	Data Out C1	**65**	Over Setpoint 4	**364**	SB Analog Sel		
325	Data Out C2	**66**	Over Setpoint 5	**365**	SB Analog In		
326	Data Out D1	**67**	Speed Setpoint Tol	**366***	SP Analog 1 Scale		
327	Data Out D2	**68**	Cur Setpoint Tol	**367***	SP Analog 2 Set		
		69	Zero Speed Tol	**368***	SP Analog 2 In		
		70	Logic Tstpt Data	**369***	SP Analog 2 Scale		
		71	Logic Testpt Sel				
		72	Stop Dwell				
		384	Output Select				
		385	Input Mode	* Std Adapter 4.xx equipped			
		387	Stop Select 1				
		388	Stop Select 2				

Drive to Drive		Fault Select/Status		SCANport Owners		SCANport Masks	
9	D2D Tsk Interval	**80**	Pwrup Flt Status	**340**	Stop Owner	**330**	Port Enable Mask
10	D2D Baud Rate	**81**	Ncfg Flt Status	**341**	Direction Owner	**331**	Direction Mask
11	D2D Xmit Addr	**82**	CP Flt Status	**342**	Start Owner	**332**	Start Mask
12	D2D Rcv1 Addr	**83**	VP Flt Status	**343**	Jog1 Owner	**333**	Jog Mask
13	D2D Rcv2 Addr	**84**	CP Warn Status	**344**	Jog2 Owner	**334**	Reference Mask
14	D2D Xmit Ind 1	**85**	VP Warn Status	**345**	Reference Owner	**335**	Clear Fault Mask
15	D2D Xmit Ind 2	**86**	CP Fault Select	**346**	Local Owner	**336**	Reset Drive Mask
16	D2D Rcv1 Ind1	**87**	CP Warn Select	**347**	Flux Owner	**337**	Local Mask
17	D2D Rcv1 Ind2	**88**	VP Fault Select	**348**	Trim Owner		
18	D2D Rcv2 Ind1	**89**	VP Warn Select	**349**	Ramp Owner		
19	D2D Rcv2 Ind2	**405**	SA Fault Select	**350**	Clr Fault Owner		
20	D2D Xmit Data 1	**406**	SA Warn Select				
21	D2D Xmit Data 2	**407**	SA Fault Status				
22	D2D Rcv1 Data 1	**408**	SA Warn Status				
23	D2D Rcv1 Data 2						
24	D2D Rcv2 Data 1						
25	D2D Rcv2 Data 2						

Figure 5.2. Standard Adapter Parameters (cont.)

FILE 3 – Velocity Torque

Velocity Ref	Logic	Velocity Fdbk	Torque Autotune	Process Trim
100 Vel Ref 1 Low	**52** Logic Command	**142** Error Filter BW	**40** Auto Tune Torque	**26** Proc Trim Output
101 Vel Ref 1 Hi	**54** Local In Status	**143** Vel Fdbk TP Low	**41** Auto Tune Speed	**27** Proc Trim Ref
102 Vel Scale Fctr 1	**55** Local Out Status	**144** Vel Fdbk TP Hi	**236** Stator Res	**28** Proc Trim Fdbk
103 Vel Ref 2 Low	**56** Logic Status Low	**145** Vel Fdbk TP Sel	**237** Leakage Ind	**29** Proc Trim Select
104 Vel Ref 2 Hi	**57** Logic Status Hi	**146** Vel Feedback	**238** Base Flux Cur	**30** Proc Trim Filtr W
105 Vel Scale Fctr 2	**58** Torq Stop Config	**147** Scaled Vel Fdbk	**240** Base Torque Cur	**31** Proc Trim Data
106 Vel Trim Low	**59** Logic Options	**148** Enc Pos Fdbk Low	**241** Base Torque Volt	**32** Proc Trim Ki
107 Vel Trim Hi	**60** At Setpoint 1	**149** Enc Pos Fdbk Hi	**242** Base Flux Volt	**33** Proc Trim Kp
108 Vel Ref TP Lo	**61** At Setpoint 2	**150** Fdbk Device Type	**243** Vde Max	**34** Proc Trim Lo Lmt
109 Vel Ref TP Hi	**62** Over Setpoint 1	**151** Fdbk Track Gain	**244** Vqe Max	**35** Proc Trim Hi Lmt
110 Vel Ref TP Sel	**63** Over Setpoint 2	**152** Fdbk Filter Sel	**245** Vde Min	**36** Proc Trim Out K
117 Jog Speed 1	**64** Over Setpoint 3	**153** Fdbk Filter Gain	**246** Base Slip Freq	**37** Proc Trim TP
118 Jog Speed 2	**65** Over Setpoint 4	**154** Fdbk Filter BW	**247** Base Slip Fr Max	**38** Proc Trim TP Sel
119 Preset Speed 1	**66** Setpoint Select	**155** Tach Velocity	**248** Base Slip Fr Min	
120 Preset Speed 2	**67** Speed Setpnt Tol	**269** Filt Vel Fdbk	**249** Kp Slip	
121 Preset Speed 3	**68** Cur Setpt Tol	**395** Pulse PPR	**250** Ki Slip	
122 Preset Speed 4	**69** Zero Speed Tol	**396** Pulse Edge	**251** Kp Flux	
123 Preset Speed 5	**70** Logic Tstpt Data	**397** Pulse Scale	**252** Ki Flux	
127 Rev Speed Limit	**71** Logic Tstpt Sel	**398** Pulse Offset	**256** Autotun Diag Sel	
128 Fwd Speed Limit	**72** Stop Dwell		**262** Ph Rot Cur Ref	
129 Max Rev Spd Trim	**384** Output Select		**263** Ph Rot Freq Ref	
130 Max Fwd Spd Trim	**385** Input Mode		**273** Torq TP Sel 1	
131 Droop Percent	**387** Stop Select 1		**274** Torq TP Data 1	
132 Vel Ref Out Low	**388** Stop Select 2		**294** Phs Test Rot Err	
133 Vel Ref Out Hi			**295** Lo Test Error	
389 Accel Rate 1			**296** Rs Test Error	
390 Accel Rate 2			**297** Id Test Error	
391 Decel Rate 1			**298** Torq Calc Error	
392 Decel Rate 2				
393 Mop Increment				

Velocity Reg	Torque Ref	Torque Block	Vel Autotune
134 Vel Reg Output	**53** Torque Mode Sel	**222** PWM Frequency	**40** Auto Tune Torque
135 Vel Reg TP Low	**156** Notch Filt Freq	**223** Prech/Rdthru Sel	**41** Auto Tune Speed
136 Vel Reg TP Hi	**157** Notch Filt Q	**224** Undervoltage Setpt	**43** Vel Desired BW
137 Vel Reg TP Sel	**161** External Iq Ref	**225** Bus Precharge Timeout	**44** Auto Tune Status
138 Velocity Error	**162** Ext. Torq Ref 1	**226** Bus Ridethru Timeout	**45** Vel Damp Factor
139 Ki Velocity Loop	**163** Slave Torque % 1	**227** CP Options	**46** Total Inertia
140 Kp Velocity Loop	**164** Ext Torq Ref 2	**287** Ki Freq Reg	**47** Auto Tune TP
141 Kf Velocity Loop	**165** Slave Torque % 2	**288** Kp Freq Reg	**48** Auto Tune TP Sel
	166 Ext Torque Step	**289** Kff Freq Reg	**139** Ki Velocity Loop
	167 Int Torque Ref	**290** Ksel Freq Reg	**140** Kp Velocity Loop
	168 Internal Ig Ref	**291** Freq Track Filt	**141** Kf Velocity Loop
	172 Torque Ref TP	**292** Track Filt Type	**234** Motor Inertia
	173 Torq Ref TP Sel	**293** Freq Trim Filt	**256** Autotun Diag Select
	174 Min Flux Level		
	175 Pos Mtr Tor Lmt		
	176 Neg Mtr Tor Lmt		
	177 Motor Power Lmt		
	178 Regen Power Lmt		
	179 Pos Mtr Cur Lmt		
	180 Neg Mtr Cur Lmt		
	181 Di/Dt Limit		
	182 Computed Power		
	183 Torq Lmt Stat		
	184 Torq Mode Stat		

Figure 5.2. Standard Adapter Parameters (cont.)

FILE 4 – Diagnostics

Monitor		Testpoints		Fault Sel/Sts	
147	Scaled Vel Fdbk	**47**	Auto Tune TP	**77**	Max DB Power
148	Enc Pos Fdbk Low	**48**	Auto Tune TP Sel	**78**	Max DB Temp
149	Enc Pos Fdbk Hi	**70**	Logic Tstpt Data	**79**	DB Time Const
167	Int Torque Ref	**71**	Logic Tstpt Sel	**80**	Pwrup Flt Status
168	Internal Iq Ref	**98**	Fault TP	**81**	Ncfg Flt Status
182	Computed Power	**99**	Fault TP Sel	**82**	CP Flt Status
185	Perunit Motor Current	**108**	Vel Ref TP Low	**83**	VP Flt Status
186	Perunit Motor Voltage	**109**	Vel Ref TP Hi	**84**	CP Warn Status
264	Motor Cur Fdbk	**110**	Vel Ref TP Sel	**85**	VP Warn Status
265	Motor Volt Fdbk	**135**	Vel Reg TP Lo	**86**	CP Fault Select
266	Freq Command	**136**	Vel Reg TP Hi	**87**	CP Warn Select
268	DC Bus Voltage	**137**	Vel Reg TP Sel	**88**	VP Fault Select
269	Filt Vel Fdbk	**143**	Vel Fdbk TP Low	**89**	VP Warn Select
270	Inv Temp Fdbk	**144**	Vel Fdbk TP Hi	**405**	SA Fault Select
271	Lim Motor Flux	**145**	Vel Fdbk TP Sel	**406**	SA Warn Select
386	Input Status	**172**	Torq Ref TP Sel	**407**	SA Fault Status
394	Mop Value	**173**	Torque Ref TP	**408**	SA Warn Status
399	Pulse Value	**273**	Torque TP Sel 1		
		274	Torque TP Data 1		

Transistor Diag		Info		Motor Overload	
59	Logic Options	**1**	Drive SW Version	**92**	Mtr Overload Lim
256	Autotune Diag Sel	**5**	Drive Type	**94**	Service Factor
257	Trans Diag Disable	**220**	Base Drive Curr	**95**	Mtr Overld Spd 1
258	Inverter Diag 1	**221**	Base Line Volt	**96**	Mtr Overld Spd 2
259	Inverter Diag 2	**300**	Adapter ID	**97**	Min Overload Lmt
260	Iq Offset	**301**	Adapter Version		
261	Id Offset	**302**	Adapter Config		
		304	Language Select		
		404	SP Comm Retries		

PLC Comm Adapter Parameters

If your 1336 FORCE Drive is equipped with a PLC Comm Adapter Board, the parameters in the range from 300 to 500 are dedicated exclusively to the PLC Comm Adapter Board rather than the Standard Adapter Board. PLC Comm Adapter Parameters are divided into four files as they are with a Standard Adapter Board equipped Drive. The complete parameter table for a PLC Comm Adapter equipped 1336 Force is detailed in Figure 5.3. The table has been divided into Files, Groups and Elements for ease of reference. For a detailed description of PLC Comm Adapter parameters refer to the PLC Comm Adapter Reference Manual.

Figure 5.3. 1336 FORCE equipped with a PLC Comm Adapter Board

FILE 1 – Startup

Drive Data Group		Drive Tune Group		Limits Group	
53	Torque Mode Sel	**41**	Auto Tune Speed	**59**	Logic Options
228	Base Motor HP	**43**	Vel Desired BW	**125**	Accel Time
229	Base Motor Speed	**44**	Auto Tune Status	**126**	Decel Time
230	Base Motor Curr	**45**	Vel Damp Factor	**127**	Rev Speed Limit
231	Base Motor Volt	**46**	Total Inertia	**128**	Fwd Speed Limit
232	Base Motor Freq	**139**	KI Vel Loop	**174**	Min Flux Level
233	Motor Poles	**140**	KP Vel Loop	**175**	Pos Motor Tor Limit
235	Encoder PPR	**141**	KF Vel Loop	**176**	Neg Motor Tor Limit
309	Language Select	**146**	Velocity Feedback	**177**	Motoring Power Limit
		234	Motor Inertia	**178**	Regen Power Limit
		256	AT Diag Sel	**179**	Pos Motor Cur Lim
		262	Phase Rot I Ref	**180**	Neg Motor Cur Limit
		263	Phas Rot Req Ref	**181**	dI/dT Limit

Fault Setup Group		Monitor Group		
86	CP/Flt/Warn Config	**8**	Motor Control Cntr	
87	VP/Flt/Warn Config	**147***	Scaled Velocity Feedback	
88	CP Warn Config	**148**	Enc Pos Fdbk Lo	
89	VP Warn Config	**149**	Enc Pos Fdbk Hi	
90	Absolute Overspeed	**167***	Internal Torque Fdbk	
91	Stall Delay	**168***	Internal Iq Ref	
92	Motor Ovload Lim	**182**	Computed Power	
94*	Service Factor	**184**	Torq Mode Stat	
95	Motor Ovload Speed 1	**185**	Perunit Motor Current	
96	Motor Ovload Speed 2	**186**	Perunit Motor Voltage	
97	Min Overload Lim	**264**	Motor I Magn. Fdbk	
		265	Motor Volt Fdbk	
		266	Stator Frequency	
		268	DC Bus Voltage	
		269	Filtered Velocity Fdbk	
		270	Inverter Temp Fdbk	
		271	Limited Motor Flux	

Figure 5.3. PLC Comm Adapter Parameters (cont.)

FILE 2 – Communications I/O

Channel A Group	
322	ChA RIO In 0
323	ChA RIO In 1
324	ChA RIO In 2
325	ChA RIO In 3
326	ChA RIO In 4
327	ChA RIO In 5
328	ChA RIO In 6
329	ChA RIO In 7
351	ChA RIO Out 0
352	ChA RIO Out 1
353	ChA RIO Out 2
354	ChA RIO Out 3
355	ChA RIO Out 4
356	ChA RIO Out 5
357	ChA RIO Out 6
358	ChA RIO Out 7
427	Redund Chan

Channel B Group	
330	ChB RIO In 0
331	ChB RIO In 1
332	ChB RIO In 2
333	ChB RIO In 3
334	ChB RIO In 4
335	ChB RIO In 5
336	ChB RIO In 6
337	ChB RIO In 7
359	ChB RIO Out 0
360	ChB RIO Out 1
361	ChB RIO Out 2
362	ChB RIO Out 3
363	ChB RIO Out 4
364	ChB RIO Out 5
365	ChB RIO Out 6
366	ChB RIO Out 7
432	ChB RIO

Logic Group	
52	Logic Cmd
56	Logic Sts Lo
57	Logic Sts Hi
59	Logic Options
367	chA Logic Cmd
368	chB Logic Cmd

Analog Input Group	
338	SB Analog In
339	Analog In 1
340	Analog In 2
341	Analog In 3
342	Analog In 4
392	Analog In 1 Off
393	Analog In 1 Scale
394	Analog In 2 Off
395	Analog In 2 Scale
396	Analog In 3 Off
397	Analog In 3 Scale
398	Analog In 4 Off
399	Analog In 4 Scale

Analog Output Group	
386	SP Analog Out
387	Analog Out 1
388	Analog Out 2
389	Analog Out 3
390	Analog Out 4
400	Analog Out 1
401	Analog Out 1 Off
402	Analog Out 1 Scale
403	Analog Out 2 Scale
404	Analog Out 3 Off
405	Analog Out 3 Scale
406	Analog Out 4 Off
407	Analog Out 4 Scale

Fault Select/Status Group	
77	Max Dyn Brake Pwr
78	Max Dyn Brake Temp
79	Max Dyn Time Const
80	Pwrup Flt Status
81	Non–config sts
82	CP Flt Status
83	VP Flt Status
84	CP Warn Status
85	CP Flt Status
86	CP Flt Select
87	CP Warn Select
88	VP Flt Select
89	VP Warn Select
425	ChA Flt Sel
426	ChA Warn Sel
430	ChB Flt Sel
431	ChB Warn Sel
436	ChA Flt Status
437	ChA Warn Status
438	ChB Flt Status
439	ChB Warn Sts
440	SP Flt Select
441	SP Warn Sel
442	SP Flt Status
443	SP Warn Sts

SCANport Owners Group	
369	Stop Owner
370	Dir. Owner
371	Start Owner
372	Jog 1 Owner
373	Jog 2 Owner
374	Set Ref Owner
375	Local Owner
376	Flux Owner
377	Trim Owner
378	Ramp Owner
379	Clr Flt Owner

SCANport Masks	
408	Port Enable Mask
409	Direction Mask
410	Start Mask
411	Jog Mask
412	Reference Mask
413	Clear Fault Mask
414	Reset Drv Mask
415	Local Mask

SCANport I/O	
314	Data In A1
315	Data In A2
316	Data In B1
317	Data In B2
318	Data In C1
319	Data In C2
320	Data In D1
321	Data In D2
343	Data Out A1
344	Data Out A2
345	Data Out B1
346	Data Out B2
347	Data Out C1
348	Data Out C2
349	Data Out D1
350	Data Out D2

Drive To Drive	
9	D2D Tsk Interval
10	D2D Baud Rate
11	D2D Xmit Addr
12	D2D Rcv 1 Addr
13	D2D Rcv 2 Addr
14	D2D Xmit Ind 1
15	D2D Xmit Ind 2
16	D2D Rcv 1 Ind 1
17	D2D Rcv 1 Ind 2
18	D2D Rcv 2 Ind 1
19	D2D Rcv 2 Ind 2
20	D2D Xmit Data 1
21	D2D Xmit Data 2
22	D2D Rcv 1 Data 1
23	D2D Rcv 1 Data 2
24	D2D Rcv 2 Data 1
25	D2D Rcv 2 Data 2

Figure 5.3. PLC Comm Adapter Parameters (cont.)

FILE 3 – Velocity Torque

Velocity Ref	
100	Vel Ref 1 Lo
101	VeL Ref 2 Hi
102	Vel Scale Factor 1
103	Vel Ref 2 Lo
104	Vel Ref 2 Hi
105	Vel Scale Factor 2
106	Vel Trim Lo
107	Vel Trim Hi
108	Vel Ref Testpt Lo
109	Vel Ref Testpt Hi
110	Vel Ref Testpt Sel
117	Jog Speed 1
118	Jog Speed 2
119	Preset Speed 1
120	Preset Speed 2
121	Preset Speed 3
122	Preset Speed 4
123	Preset Speed 5
125	Accel Time
126	Decel Time
127	Rev Speed Limit
128	Fwd Speed Limit
129	Max Rev Speed Trim
130	Max Fwd Speed Trim
131	Droop Percent
132	Vel Ref Out Lo
133	Vel Ref Out Hi

Logic	
52	Logic Cmd
54	Local Input Sts
55	Local Output Sts
56	Local Sts Lo
57	Local Sts Hi
58	Torq Stop Config.
59	Logic Options
60	At Setpt 1
61	At Setpt 2
62	Over Setpt 1
63	Over Setpt 2
64	Over Setpt 3
65	Over Setpt 4
66	Setpt Select
67	Speed Stpt Tol
68	Cur Setpt Tol
69	Zero Speed Tol
70	Logic Testpt Data
71	Logic Testpt Sel
72	Stop Dwell
367	Pt6 Logic Cmd
368	Pt7 Logic Cmd

Velocity Fdbk	
142	KF Err Filt BW
143	Vel Fdbk Testpt Lo
144	Vel Fdbk Testpt Hi
145	Vel Fdbk Tesetpt Sel
146	Velocity Fdbk
147	Scaled Vel Fdbk
148	Enc. Pos Fdbk Lo
149	Enc. Pos Fdbk Hi
150	Fdbk Device Type
151	Fdbk Tracker Gain
152	Fdbk Filter Sel
153	Kn–Fdbk Filter Gain
154	Wn–Fdbk Filter BW
155	Tach Velocity
269	Filtered Vel Fdbk

Torque Autotune	
40	AT Torque Limit
41	AT Speed
236	Stator Resistance
237	Leakage Inductance
238	Rated Flux Current
240	Rated Torque Current
241	Rated Torque Volt
242	Rated Flux Voltage
243	Vde Max
244	Vqe Max
245	Vde Minimum
246	Base Slip Freq
247	Base Slip Freq Max
248	Base Slip Freq Min
249	Kp Slip Regulator
250	Ki Slip Regulator
251	Kp Flux Regulator
252	Ki Flux Regulator
256	AT Diag Select
262	Phase Rot Cur Ref
263	Phase Rot Freq Ref
273	Torque Testpoint Sel
274	Torque Testpoint Data
294	Phase Rot Errors
295	Lo Test Errors
296	Rs Test Errors
297	Id Test Errors
298	Torque Calc Errors

Process Trim	
26	Process Trim Output
27	Process Trim Ref
28	Proc Trim Fdbk
29	Proc Trim Select
30	Proc Trim Filt BW
31	Proc Trim Data
32	Proc Trim KI
33	Proc Trim KP
34	Proc Trim Lo Lim
35	Proc Trim Hi Lim
36	Proc Trim Out Gain
37	Proc Trim Testpt
38	Proc Trim Testpt Sel

Velocity Reg	
134	Vel Regulator Out
135	Velocity Reg Testpt Lo
136	Velocity Reg Testpt Hi
137	Velocity Reg Testpt Sel
138	Velocity Error
139	KI Vel Loop
140	KP Vel Loop
141	KF Vel Loop

Torque Ref	
53	Torque Mode Sel
156	Notch Filter Freq
157	Notch Filter Que
161	External Iq Ref
162	Ext. Torque Ref 1
163	Slave Torque Percent 1
164	Ext. Torque Ref 2
165	Slave Torque Percent 2
166	External Torque Step
167	Int. Torque Ref
168	Int. Iq Ref
172	Torque Ref Testpoint Data
173	Torque Ref Testpnt Sel
174	Min Flux Level
175	Pos Torque Ref Limit
176	Neg Torque Ref Limit
177	Motor Power Limit
178	Regen Power Limit
179	Pos Motor Cur Limit
180	Neg Motor Cur Limit
181	dI/dT Limit
182	Computed Pwr
183	Torque Limit Status
184	Torque Mode Status

Torque Block	
222	Inverter Carrier Freq.
223	Precharge Ridethru Sel
224	Undervoltage Setpt
225	Bus Precharge Timeout
226	Bus Ridethru Timeout
227	CP Operating Options
287	Ki Frequency Regulator
288	Kp Frequency Regulator
289	Kff Frequency Regulator
290	Ksel Frequency Regulator
291	Frequency Track Filter
292	Track Filter Type
293	Frequency Trim Filter

Velocity Autotune	
40	AT Torque Lim
41	AT Speed
43	VP Desired BW
44	Auto Tune Status
45	VP Damping Factor
46	Total Inertia
47	AT Testpt Data
48	AT Tespt Sel
139	KI Vel Loop
140	KP Vel Loop
141	KF Vel Loop
234	Motor Inertia
256	AT Diag Select

Figure 5.3. PLC Comm Adapter Parameters (cont.)

FILE 4 – Diagnostics

Monitor		Testpoints		Fault Select/Status		Trend Setup*	
8	Motor Control Counter	**47**	AT Testpt Data	**77**	Max Dyn Brake Pwr	**455**	Trend 1 Operand X
147	Scaled Velocity Fdbk	**48**	AT Testpt Sel	**78**	Max Dyn Brake Temp	**456**	Trend 1 Operand Y
148	Enc Pos Fdbk Lo	**70**	Logic Testpt Data	**79**	Max Dyn Time Const	**457**	Trend 1 Operator
149	Enc Pos Fdbk Hi	**71**	Logic Testpt Sel	**80**	Pwrup Flt sts	**458**	Trend 1 Rate
167	Internal Torque Fdbk	**98**	Fault Testpt Data	**81**	Non–config sts	**459**	Trend 1 Post Samples
168	Internal Iq Ref	**99**	Fault Testpt Sel	**82**	CP Flt Status	**460**	Trend 1 Continuous Trig
182	Computed Power	**108**	Velocity Ref Testpt Lo	**83**	VP Flt Status	**461**	Trend 1 Select
185	Perunit Motor Current	**109**	Velocity Ref Testpt Hi	**84**	CP Warn Status	**465**	Trend 2 Operand X
186	Perunit Motor Voltage	**110**	Velocity Ref Testpt Sel	**85**	VP Warn Status	**466**	Trend 2 Operand Y
264	Motor I Magn. Fdbk	**135**	Velocity Reg Testpnt Lo	**86**	CP Flt Select	**467**	Trend 2 Operator
265	Motor Volt Magn.	**136**	Velocity Reg Testpnt Hi	**87**	CP Warn Select	**468**	Trend 2 Rate
266	Stator Frequency	**137**	Velocity Reg Testpt Sel	**88**	VP Flt Select	**469**	Trend 2 Post Samples
268	DC Bus Voltage	**143**	Vel Fdbk Testpt Lo	**89**	VP Warn Select	**470**	Tr2 Cont Trigger
269	Filtered Vel Fdbk	**144**	Vel Fdbk Testpt Hi	**425**	ChA Flt Sel	**471**	Trend 2 Select
270	Inverter Temp Fdbk	**145**	Vel Fdbk Testpt Sel	**426**	ChA Warn Sel	**475**	Trend 3 Operand X
271	Limited Motor Flux	**172**	Torque Ref Tespt Data	**430**	ChB Flt Sel	**476**	Trend 3 Operand Parm Y
		173	Torque Ref Testpt Sel	**431**	ChB Warn Sel	**477**	Trend 3 Operator
		273	Torque Testpt Select	**436**	ChA Flt Status	**478**	Trend 3 Rate
		274	Torque Testpt Data	**437**	ChA Warn Status	**479**	Trend 3 Post Samples
				438	ChB Flt Status	**480**	Trend 3 Continuous Trig
				439	ChB Warn Status	**481**	Trend 3 Select
				440	SP Flt Select	**485**	Trend 4 Operand X
				441	SP Warn Select	**486**	Trend 4 Operand Y
				442	SP Warn Sts	**487**	Trend 4 Operator
				443	SP Warn Sts	**488**	Trend 4 Rate
						489	Trend 4 Post Samples
						490	Trend 4 Continuous Trig
						491	Trend 4 Select

Transistor Diag		Info		Trend I/O*			
59	Logic Options	**1**	Drive Software Ver	**454**	Trend In 1		
256	AT Diag Select	**5**	Power Structure Type	**462**	Trend In 1 Status		
257	Trans Diag Config	**220**	Rated Inverter Out Amps	**463**	Trend Out 1		
258	Inv. Dig. Result 1	**221**	Rated Inverter In Volts	**464**	Trend In 2		
259	Inv. Diag. Result2	**300**	Adapter ID	**472**	Trend In 2 Status		
260	Iq Offset	**301**	Adapter Version	**473**	Trend Out 2 Status		
261	Id Offset	**302**	Adapter Config	**474**	Trend In 3		
		303	ChA Dip Switch	**482**	Trend In 3 Status		
		304	ChB Dip Switch	**483**	Trend Out 3		
		305	ChA LED State	**484**	Trend In 4		
		306	CHB LED State	**492**	Trend In 4 Status		
		307	PLC Comm Bd Sts	**493**	Trend Out 4		
		309	Language Select				

***Note:** Trending Functions are NOT implemented in Version 2.xx software.

ControlNet Parameters

The complete parameter table for a ControlNet Adapter Board equipped 1336 FORCE is detailed in Figure 5.4. The table has been divided into Files, Groups & Elements for ease of reference. For a detailed description of ControlNet parameters, refer to the ControlNet Adapter Reference Manual.

Figure 5.4 1336 FORCE equipped with a ControlNet Adapter Board

File 1 – Startup①

Drive Data Group		Drive Tune Group		Limits Group	
Language Sel	309	Autotun Diag Sel	256	Accel Time	125
Encoder PPR	235	Vel Feedback	146	Decel Time	126
Base Motor Speed	229	Vel Desired BW	43	Logic Options	59
Base Motor HP	228	Auto Tune Status	44	Fwd Speed Limit	128
Base Motor Curr	230	Motor Inertia	234	Rev Speed Limit	127
Base Motor Volt	231	Total Inertia	46	Pos Mtr Cur Lmt	179
Base Motor Freq	232	Ki Velocity Loop	139	Neg Mtr Cur Lmt	180
Motor Poles	233	Kp Velocity Loop	140	Pos Mtr Tor Lmt	175
Torque Mode Sel	53	Kf Velocity Loop	141	Neg Mtr Tor Lmt	176
		Vel Damp Factor	45	Motor Power Lmt	177
		Auto Tune Speed	41	Regen Power Lmt	178
		Ph Rot Cur Ref	262	Di/Dt Limit	181
		Ph Rot Freq Ref	263	Min Flux Level	174

Fault Setup Group		Monitor Group		
CP Flt/Warn Cfg	86	Filt Vel Fdbk	269	
CP Warn/None Cfg	88	Scaled Vel Fdbk	147	
VP Flt/Warn Cfg	87	Int Torque Ref	167	
VP Warn/None Cfg	89	Internal Iq Ref	168	
Absolute Overspd	90	Computed Power	182	
Stall Delay	91	DC Bus Voltage	268	
Mtr Overload Lim	92	Motor Volt Fdbk	265	
Mtr Overload Spd1	95	Motor Curr Fdbk	264	
Mtr Overload Spd2	96	Freq Command	266	
Min Overload Lmt	97	Inv Temp Fdbk	270	
Service Factor	94	Torque Mode Stat	184	
		Lim Motor Flux	271	
		Enc Pos Fdbk Low	148	
		Enc Pos Fdbk Hi	149	
		MCB Counter	8	

① Shaded parameters are Standard 1336 FORCE parameters.

File 2 – Communications I/O

Channel A Group				Logic Group		Analog Input Group		Analog Output Group	
CntrlNet In 0	322			ChA Logic Cmd In	367	Analog In 1	339	Analog Out 1	387
CntrlNet In 1	323			Logic Command	52	An In 1 Offset	392	An Out 1 Offset	400
CntrlNet In 2	324			Logic Status Low	56	An In 1 Scale	393	An Out 1 Scale	401
CntrlNet In 3	325			Logic Status Hi	57	Analog In 2	340	Analog Out 2	388
CntrlNet In 4	326			Logic Options	59	An In 2 Offset	394	An Out 2 Offset	402
CntrlNet In 5	327					An In 2 Scale	395	An Out 2 Scale	403
CntrlNet In 6	328					Analog In 3	341	Analog Out 3	389
CntrlNet In 7	329					An In 3 Offset	396	An Out 3 Offset	404
CntrlNet Out 0	351					An In 3 Scale	397	An Out 3 Scale	405
CntrlNet Out 1	352					Analog In 4	342	Analog Out 4	390
CntrlNet Out 2	353					An In 4 Offset	398	An Out 4 Offset	406
CntrlNet Out 3	354					An In 4 Scale	399	An Out 4 Scale	407
CntrlNet Out 4	355					SP Analog In	338	SP Analog Out	386
CntrlNet Out 5	356					SP Analog Sel	391		
CntrlNet Out 6	357								
CntrlNet Out 7	358								

Drv – Drv		Fault Sel/Sts[3]		SCANport Owners		SCANport Masks		SCANport I/O	
D2D Tsk Interval	9	SP Fault Sts	442	Stop Owner	369	Port Enable Mask	408	Data In A1	314
D2D Baud Rate	10	SP Warn Sts	443	Start Owner	371	Start Mask	410	Data In A2	315
D2D Xmit Addr	11	SP Fault Sel	440	Jog1 Owner	372	Jog Mask	411	Data In B1	316
D2D Xmit Ind 1	14	SP Warn Sel	441	Jog2 Owner	373	Direction Mask	409	Data In B2	317
D2D Xmit Data 1	20	ICN Fault Sel	425	Direction Owner	370	Reference Mask	412	Data In C1	318
D2D Xmit Ind 2	15	ICN Warn Sel	426	Set Ref Owner	374	Local Mask	415	Data In C2	319
D2D Xmit Data 2	21	CP Flt Status	82	Local Owner	375	Clear Fault Mask	413	Data In D1	320
D2D Rcv 1 Addr	12	VP Flt Status	83	Flux Owner	376	Reset Drive Mask	414	Data In D2	321
D2D Rcv 1 Ind 1	16	CP Warn Status	84	Trim Owner	377			Data Out A1	343
D2D Rcv 1 Data 1	22	VP Warn Status	85	Ramp Owner	378			Data Out A2	344
D2D Rcv 1 Ind 2	17	CP Fault Select	86	Clr Fault Owner	379			Data Out B1	345
D2D Rcv 2 Data 2	23	CP Warn Select	87					Data Out B2	346
D2D Rcv 2 Addr	13	VP Fault Select	88					Data Out C1	347
D2D Rcv 2 Ind 1	18	VP Warn Select	89					Data Out C2	348
D2D Rcv 2 Data 1	24	Ncfg Flt Status	81					Data Out D1	349
D2D Rcv 2 Ind 2	19	PwrUp Flt Status	80					Data Out D2	350
D2D Rcv 2 Data 2	25	Max DB Power	77						
		Max DB Temp	78						
		DB Time Const	79						

[1] Shaded parameters are Standard 1336 FORCE parameters.

File 3 – Velocity Torque①

Velocity Ref		Logic		Velocity Fdbk		Velocity Reg		Torque Ref	
Preset Speed 1	119	ChA Logic Cmd In	367	Filt Vel Fdbk	269	Vel Reg Output	134	Torque Mode Sel	53
Preset Speed 2	120	Logic Command	52	Vel Feedback	146	Ki Velocity Loop	139	Torq Mode Stat	184
Preset Speed 3	121	Torq Stop Confg	58	Scaled Vel Fdbk	147	Kp Velocity Loop	140	Pos Mtr Cur Lmt	179
Preset Speed 4	122	Logic Options	59	Enc Pos Fdbk Low	148	Kf Velocity Loop	141	Neg Mtr Cur Lmt	180
Preset Speed 5	123	Logic Status Low	56	Enc Pos Fdbk Hi	149	Velocity Error	138	Int Torque Ref	167
Jog Speed 1	117	Logic Status Hi	57	Fdbk Track Gain	151	Vel Reg TP Sel	137	Internal Iq Ref	168
Jog Speed 2	118	At Setpoint 1	60	Fdbk Filter Gain	153	Vel Reg TP Low	135	Computed Power	182
Vel Ref 1 Low	100	At Setpoint 2	61	Fdbk Filter BW	154	Vel Reg TP Hi	136	Torq Lmt Stat	183
Vel Ref 1 Hi	101	Over Setpoint 1	62	Fdbk Device Type	150			External Iq Ref	161
Vel Ref 2 Low	103	Over Setpoint 2	63	Fdbk Filter Sel	152			Ext Torq Ref 1	162
Vel Ref 2 Hi	104	Over Setpoint 3	64	Tach Velocity	155			Ext Torq Ref 2	164
Vel Scale Fctr 1	102	Over Setpoint 4	65	Error Filter BW	142			Slave Torque % 1	163
Vel Scale Fctr 2	105	Setpoint Select	66	Vel Fdbk TP Sel	145			Slave Torque % 2	165
Vel Trim Low	106	Speed Setpnt Tol	67	Vel Fdbk TP Low	143			Ext Torque Step	166
Vel Trim Hi	107	Cur Setpoint Tol	68	Vel Fdbk TP Hi	144			Notch Filter Freq	156
Vel Ref Out Low	132	Zero Speed Tol	69					Notch Filter Q	157
Vel Ref Out Hi	133	Local In Status	54					Min Flux Level	174
Accel Time	125	Stop Dwell	72					Pos Mtr Tor Lmt	175
Decel Time	126	Local Out Status	55					Neg Mtr Tor Lmt	176
Fwd Speed Limit	128	Logic Tstpt Sel	71					Motor Power Lmt	177
Rev Speed Limit	127							Regen Power Lmt	178
Max Rev Spd Trim	129							Di/Dt Limit	181
Max Fwd Spd Trim	130							Torq Ref TP Sel	173
Droop Percent	131							Torque Ref TP	172
Vel Ref TP Sel	110								
Vel Ref TP Low	108								
Vel Ref TP Hi	109								
SP Default Ref	416								

① Shaded parameters are Standard 1336 FORCE parameters.

Torque Block[1]		Process Trim		Torque Autotune		Velocity Autotune	
PWM Frequency	222	Proc Trim Ref	27	Autotun Diag Sel	256	Autotun Diag Sel	256
Prech Rdthru Sel	223	Proc Trim Fdbk	28	Ph Rot Cur Ref	262	Auto Tune Torque	40
Under Volt Stpnt	224	Proc Trim Output	26	Auto Tune Torque	40	Auto Tune Speed	41
Prechrg Timeout	225	Proc Trim Select	29	Auto Tune Speed	41	Total Inertia	46
Ridethru Timeout	226	Proc Trim Ki	32	Ph Rot Freq Ref	263	Motor Inertia	234
CP Options	227	Proc Trim Kp	33	Phs Test Rot Error	294	Auto Tune Status	44
Ki Freq Reg	287	Proc Trim Lo Lmt	34	Lo Test Error	295	Vel Desired BW	43
Kp Freq Reg	288	Proc Trim Hi Lmt	35	Rs Test Error	296	Vel Damp Factor	45
Kff Freq Reg	289	Proc Trim Fltr W	30	Id Test Error	297	Ki Velocity Loop	139
Ksel Freq Reg	290	Proc Trim Data	31	Torq Calc Error	298	Kp Velocity Loop	140
Freq Track Filt	291	Proc Trim Out K	36	Stator Res	236	Kf Velocity Loop	141
Track Filt Type	292	Proc Trim TP Sel	38	Leakage Ind	237	Auto Tune TP Sel	48
Freq Trim Filter	293	Proc Trim TP	37	Base Flux Cur	238	Auto Tune TP	47
				Base Torque Cur	240		
				Base Torque Volt	241		
				Base Flux Volt	242		
				Vde Max	243		
				Vqe Max	244		
				Vde Min	245		
				Base Slip Freq	246		
				Base Slip Fr Max	247		
				Base Slip Fr Min	248		
				Kp Slip	249		
				Ki Slip	250		
				Kp Flux	251		
				Ki Flux	252		
				Torq TP Sel 1	273		
				Torq TP Data 1	274		

[1] Shaded parameters are Standard 1336 FORCE parameters.

File 4 – Diagnostics①

Monitor		Testpoints		Fault Sel/Sts		Motor Overload	
Filt Vel Fdbk	269	Vel Fdbk TP Sel	145	SP Fault Sts	442	Mtr Overload Lim	92
Scaled Vel Fdbk	147	Vel Fdbk TP Low	143	SP Warn Sts	443	Mtr Overld Spd 1	95
Int Torque Ref	167	Vel Fdbk TP Hi	144	SP Fault Sel	440	Mtr Overld Spd 2	96
Internal Iq Ref	168	Vel Reg TP Sel	137	SP Warn Sel	441	Min Overload Lmt	97
Computed Power	182	Vel Reg TP Low	135	ICN Flt Sel	425	Service Factor	94
DC Bus Voltage	268	Vel Reg TP Hi	136	ICN Warn Sel	426		
Motor Volt Fdbk	265	Vel Ref TP Sel	110	CP Flt Status	82		
Motor Curr Fdbk	264	Vel Ref TP Low	108	VP Flt Status	83		
Freq Command	266	Vel Ref TP Hi	109	CP Warn Status	84		
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① Shaded parameters are Standard 1336 FORCE parameters.

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① Shaded parameters are Standard 1336 FORCE parameters.

Parameter Descriptions

A detailed description of each 1336 FORCE Parameter is contained in the following listing. The parameters are listed in numerical order.

Take note that some parameters are used more than once in the 1336 FORCE, and may be located in more than one File and Group. To determine if a parameter is used in more than one application, refer to the numerical list which begins on Page 5-3.

NOTE: The following parameter descriptions in the range from 300 to 500 cover the Standard Adapter Only! If you have a PLC Comm Adapter equipped drive, and wish to refer to PLC Comm parameter descriptions, refer to the PLC Comm User Manual. If you have a ControlNet Adapter equipped drive, parameter descriptions are provided at the end of this chapter.

NOTE: If you wish to record parameter values and links that have been set for your particular application, a User Parameter Sheet is provided in Appendix C.

Drive Software Version
[Drive SIO Version]

This parameter stores the present software revision for the firmware product.
The firmware value represents the software version in the range 00.0 to 99.9.

Parameter Number	**01**
Parameter Type	Source
Display Units	x.xx
Drive Units	Display units x 100
Factory Default	1.01
Minimum Value	0.00
Maximum Value	9.99

Power Structure Type
[Drive Type]

This number is a unique code that identifies the drive's current and voltage ratings. This number originates from a serial EE memory located on the Drive's Base Drive Board.

Parameter Number	**05**
Parameter Type	Source
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	65635

Motor Control Counter
[MCB Counter]

This parameter contains a counter that increments by 1 every 0.1 seconds. It is intended to be a monitor parameter to indicate that the Motor Control Board Velocity Processor firmware is executing.

Parameter Number	**08**
Parameter Type	Source
Display Units	x.x sec
Drive Units	None
Factory Default	x 10 sec
Minimum Value	0.0 sec
Maximum Value	65535.5 sec

Drive Link Task Interval
[D2D Tsk Interval]

This parameter specifies the interval at which drive to drive data will be transmitted and received. The intervals are 2 ms intervals up to 20 ms.

Parameter Number	**09**
Parameter Type	Sink
Display Units	x ms
Drive Units	x/2
Factory Default	2
Minimum Value	1
Maximum Value	10

1 = 2 ms scan
2 = 4 ms scan
3 = 6 ms scan
4 = 8 ms scan
5 = 10 ms scan
6 = 12 ms scan
7 = 14 ms scan
8 = 16 ms scan
9 = 18 ms scan
10 = 20 ms scan

Drive Link Baud Rate
[D2D Baud Rate]

This word parameter specifies the baud rate used on the drive-to-drive link (CAN) communication interface as follows:
00H = 125K baud
01H = 250K baud
02H = 500K baud

Parameter Number	**10**
Parameter Type	Sink
Display Units	Kbaud
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	2

Refer to Document Update

Drive Link Transmit Address
[D2D Xmit Addr]

This parameter specifies the node address at which two words of data will be transmitted. A value of zero disables the transmit function.

Parameter Number	**11**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	64

Drive Link Receive 1 Address
[D2D Rcv 1 Addr]

This parameter specifies the node address at which two words of data will be received. A value of zero disables the receive function.

Parameter Number	**12**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	64

Drive Link Receive 2 Address [D2D Rcv 2 Addr] This parameter specifies the node address at which two words of data will be received. A value of zero disables the receive function.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**13** Sink x None 0 0 64
Drive Link Transmit Indirect 1 [D2D Xmit Ind 1] This is a word parameter defining the parameter number which data will be fetched from to be transmitted in the high speed communication network (CAN) for the first word location of the transmitted message.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**14** Sink x None 20 1 219
Drive Link Transmit Indirect 2 [D2D Xmit Ind 2] This is a word parameter defining the parameter number which data will be fetched from to be transmitted in the high speed communication network (CAN) for the 2nd word location of the transmitted message.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**15** Sink x None 21 1 219
Drive Link Receive 1, Indirect 1 [D2D Rcv 1, Ind 1] This parameter specifies the parameter number where the first word of data will be put after it has been received from the drive to drive communication.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**16** Sink x None 22 1 219
Drive Link Receive 1, Indirect 2 [D2D Rcv 1, Ind 2] This parameter specifies the parameter number where the second word of data will be put after it has been received from the drive to drive communication.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**17** Sink x None 23 1 219
Drive Link Receive 2, Indirect 1 [D2D Rcv 2, Ind 1] This parameter specifies the parameter number where the first word of data will be put after it has been received from the drive to drive communication.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**18** Sink x None 24 1 219
Drive Link Receive 2, Indirect 2 [D2D Rcv 2, Ind 2] This parameter specifies the parameter number where the second word of data will be put after it has been received from the drive to drive communication.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**19** Sink x None 25 1 219

Drive Link Transmit Data 1
[D2D Xmit Data1]
This parameter is the default data location of the first word of data for transmit.

Parameter Number	**20**
Parameter Type	Sink
Display Units	+/– x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Drive Link Transmit Data 2
[D2D Xmit Data2]
This parameter is the default data location of the second word of data for transmit.

Parameter Number	**21**
Parameter Type	Sink
Display Units	+/– x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	32767

Drive Link Receive 1, Data 1
[D2D Rcv 1, Data1]
This parameter is the default data location of the first word of data for receive 1

Parameter Number	**22**
Parameter Type	Source
Display Units	+/– x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	32767

Drive Link Receive 1, Data 2
[D2D Rcv 1, Data 2]
This parameter is the default data location of the second word of data for receive 1

Parameter Number	**23**
Parameter Type	Source
Display Units	+/– x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	32767

Drive Link Receive 2, Data 1
[D2D Rcv 2, Data 1]
This parameter is the default data location of the first word of data for receive 2

Parameter Number	**24**
Parameter Type	Source
Display Units	+/– x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	32767

Drive Link Receive 2, Data 2
[D2D Rcv 2, Data 2]
This parameter is the default data location of the second word of data for receive 2

Parameter Number	**25**
Parameter Type	Source
Display Units	+/– x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	32767

Process Trim Output
[Proc Trim Output]
This parameter represents the scaled and limited output of the process trim function. Process Trim consists of a general purpose PI regulator that uses unspecified reference and feedback inputs.

Parameter Number	**26**
Parameter Type	Source
Display Units	+/– x.x%
Drive Units	4096 = 100% trim
Factory Default	+ 0.0%
Minimum Value	– 800.0%
Maximum Value	+ 800.0%

Process Trim Reference [Proc Trim Ref] This is the reference input value for process trim. The Process Trim Output is updated based on the value of this input.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**27** Sink +/– x.x% 4096 = 100% trim +0.0% –800.0% +800.0%
Process Trim Feedback [Proc Trim Fdbk] This is the feedback input value for process trim. The Process Trim Output parameter is updated based on the value of this input.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**28** Sink +/– x.x% 4096 = 100% trim + 0.0% – 800.0% + 800.0%
Process Trim Select [Proc Trim Sel] This is a bit coded word of data containing several selection options for the process trim regulator as follows: Bit 0 Trim the Velocity Reference Bit 1 Trim the Torque Reference Bit 2 Select Velocity Inputs Bit 3 Set Output Option Bit 4 Preset Integrator Option Bit 5 Force ON Trim Limit option	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value** **Enums:**	**29** Sink Bits None 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0011 1111
Process Trim Filter Bandwidth [Proc Trim Fltr W] This parameter determines the bandwidth of a single pole filter used with the error input for process trim. The output of this filter is used as the input to the process trim regulator.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**30** Sink x radians/sec 1 = radians/sec 0 radians/sec 0 radians/sec 240 radians/sec
Process Trim Data [Proc Trim Data] This parameter is used to preset the output of the process trim regulator when either the “Set Output Option” or “Preset Integrator Option” is selected in parameter 29.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**31** Sink +/– x.x% 4096 = 100.0% preload +0.0% –800.0% +800.0%
Process Trim KI Gain [Proc Trim Ki] This parameter controls the integral gain of the process trim regulator. If process trim equals 1.0, then the process trim PI regulator output will equal 1 pu in 1 second, for 1 pu process trim error.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**32** Sink x.xxx 4096 = 1.000 Ki gain 1.000 0.000 16.000

Process Trim KP Gain
[Proc Trim Kp]

This parameter controls the proportional gain of the process trim regulator. If the KP process trim is equal to 1.0, then the process trim PI regulator output will equal 1 pu for 1 pu process trim error.

Parameter Number	**33**
Parameter Type	Sink
Display Units	x.xxx
Drive Units	4096 = 1.0000 Kp gain
Factory Default	1.000
Minimum Value	0.000
Maximum Value	16.000

Process Trim Low Limit
[Proc Trim Lo Lmt]

The output of the process trim regulator is limited by adjustable high and low limits. This parameter specifies the low limit of the process trim output value.

Parameter Number	**34**
Parameter Type	Sink
Display Units	+/– x.x%
Drive Units	4096 = 100% trim
Factory Default	–100.0%
Minimum Value	–800.0%
Maximum Value	+800.0%

Process Trim High Limit
[Proc Trim Hi Lmt]

The output of the process trim regulator is limited by adjustable high and low limits. This parameter specifies the high limit of the process trim output value.

Parameter Number	**35**
Parameter Type	Sink
Display Units	+/– x.x%
Drive Units	4096 = 100% trim
Factory Default	– 100%
Minimum Value	– 800%
Maximum Value	+ 800%

Process Trim Output Gain
[Proc Trim Out K]

The output of the process trim regulator is scaled by a gain factor. This occurs just before the upper and lower limit. This parameter specifies the gain value to use.

Parameter Number	**36**
Parameter Type	Sink
Display Units	+/– x.xx
Drive Units	2048 = +1.00 gain
Factory Default	+ 1.00
Minimum Value	– 16.00
Maximum Value	+ 16.00

Process Trim Testpoint
[Proc Trim TP]

This parameter indicates the value of the internal location selected by the Process Trim Testpoint Select parameter.

Parameter Number	**37**
Parameter Type	Source
Display Units	+/– x
Drive Units	None
Factory Default	+0
Minimum Value	–32767
Maximum Value	+32767

Process Trim Testpoint Select
[Proc Trim TP Sel]

This parameter selects which location of the Process Trim Controller will become the testpoint value as follows:

Value	Process Trim Access Point
0	Zero
1	Process Trim Error
2	Process Trim Filter Output
3	Process Trim Control Word

Parameter Number	**38**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	3
Enums:	

Auto Tune Torque Limit
[Auto Tune Torque]

This parameter specifies the motor torque that is applied to the motor during the Velocity motor test and the Velocity system test. 4096 = 100% rated motor torque.

Parameter Number	**40**
Parameter Type	Sink
Display Units	x.x %
Drive Units	4096 @ rated motor torque
Factory Default	50.0 %
Minimum Value	25.0 %
Maximum Value	100.0 %

Auto Tune Speed
[Auto Tune Speed]

This parameter is the speed of the motor during an auto tune velocity motor test, system test, and system ID measure. 4096 is base speed

Parameter Number	**41**
Parameter Type	Sink
Display Units	+/– x.x rpm
Drive Units	4096 @ Base Motor Speed
Factory Default	0.85 x Base Motor Speed
Minimum Value	0.3 x Base Motor Speed
Maximum Value	Base Motor Speed

VP Desired Bandwidth
[Vel Desired BW]

This parameter specifies the velocity loop bandwidth requested by the User and determines the dynamic behavior of the velocity loop. The maximum value for this parameter is changed by the drive when a request is made to update the the velocity loop gains. The vel loop becomes more responsive and is able to track a faster changing vel ref as bandwidth is increased. System and noise limitations will establish a practical upper limit however.

Parameter Number	**43**
Parameter Type	Sink
Display Units	x.xx rad/sec
Drive Units	Display units x 100
Factory Default	5.00 rad/sec
Minimum Value	0.01 rad/sec
Maximum Value	100.00 rad/sec

Autotune Status
[Auto Tune Status]

This parameter indicates the status of certain conditions related to the autotune function. This is a bit–coded parameter that is not changeable by the user.

Parameter Number	**44**
Parameter Type	Source
Display Units	bits
Drive Units	value (of bits)
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	001100000.11111111
Enums:	

Bit 0 = Executing
Bit 1 = Complete
Bit 2 = Fail
Bit 3 = Abort
Bit 4 = Flux Active
Bit 5 = Not Ready
Bit 6 = Not Zero Spd
Bit 7 = Running
Bit 8 – 11 = Not Used
Bit 12 = Timeout
Bit 13 = No Trq Lim

VP Damping Factor
[Vel Damp Factor]

This parameter determines the dynamic behavior of the velocity loop. The damping factor influences the amount of overshoot the velocity loop will exhibit during a transient.

Parameter Number	**45**
Parameter Type	Sink
Display Units	x.x
Drive Units	2048 = 1.0 damping
Factory Default	1.0
Minimum Value	0.5
Maximum Value	3.0

Total Inertia
[Total Inertia]

This parameter represents the time, in seconds, for a motor coupled to a load to accelerate from zero to base speed, at rated motor torque. This parameter is calculated by the Autotune System Inverter Test.

Parameter Number	**46**
Parameter Type	Sink
Display Units	x.xx sec
Drive Units	Display units x 100
Factory Default	2.00 sec
Minimum Value	0.01 sec
Maximum Value	655.00 sec

Autotune Testpoint Data
[Auto Tune TP]

This parameter indicates the value of the internal location selected by the Autotune TP Sel parameter, 48.

Parameter Number	**47**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111

Auto Tune Testpoint Select
[Auto Tune TP Sel]

This parameter selects what internal location of the Velocity Auto Tune Controller will become the testpoint value shown in P47. The internal locations available are:

Parameter Number	**48**
Parameter Type	Sink
Display Units	None
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	10
Enums:	

Select Value	Autotune Access Point	Select Value	Autotune Access Point
0	Zero	5	Torque Limit for autotune
1	Autotune Status Bits	6	Autotune State Word 1
2	Autotune Inhibit Word (all zero = OK)	7	Autotune State Word 2
3	Autotune Error Word (all zero = OK)	8	Autotune Control Bits
4	Calculated Friction (4096 @ 1 pu)	9	Minimum Limit for di/dt to acheive requested bandwidth
		10	Minimum error filter bandwidth

Logic Command Word
[Logic Command]

This word parameter contains data used to Control Drive logic operation. If a bit is set the function is enabled, otherwise it is disabled (inactive).

Parameter Number	**52**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111

BITS

Bit	Function
0	– Ramp Stop
1	– Start
2	– Jog 1
3	– Clear Fault
4	– Forward
5	– Reverse
6	– Jog 2
7	– Current Limit Stop
8	– Coast Stop
9	– Ramp Disable
10	– Flux Enable
11	– Process Trim Enable
12	– Velocity Ref Select A
13	– Velocity Ref Select B
14	– Velocity Ref Select C
15	– Reset Drive

C	B	A	
0	**0**	**0**	– Zero
0	**0**	**1**	– External Ref
0	**1**	**0**	– Preset Speed 1
0	**1**	**1**	– Preset Speed 2
1	**0**	**0**	– Preset Speed 3
1	**0**	**1**	– Preset Speed 4
1	**1**	**0**	– Preset Speed 5
1	**1**	**1**	– External Ref. 2

Torque Mode Select
[Torque Mode Sel]

This is a word parameter used to select the source for the drive torque reference. The operation of this parameter functions as a selector switch. The position of the selector determines the torque reference selection as follows:

Parameter Number	**53**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	1
Minimum Value	0
Maximum Value	5

Value	Description	Value	Description
0	Zero Torque	3	Min Select Speed/Torque (Selects the smallest value when the torque reference and the torque generated from the speed are compared.)
1	Velocity Regulate	4	Max Select Speed/Torque (Selects the largest value when the torque reference and the torque generated from the speed are compared.
2	External Torque	5	Sum Speed and Torque (selects the sum of the torque reference and the torque generated from the speed.)

Local Input Status
[Local In Status]

This parameter indicates boolean input status conditions for the Velocity Processor. When a bit is set to 1, the corresponding input signal is true.

Parameter Number	**54**
Parameter Type	Source
Display Units	Bits
Drive Units	Bits
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

Value	Description	Value	Description	Value	Description	Value	Description
0	Brake Request	4	External Fault	8	Test Diag	12	Not Used
1	Drive Enable	5	RMS Fault	9	Inverter Status	13	Not Used
2	Motor Overtemp Thermoguard	6	0 = Parall Inv	10	Contactor Verify	14	Not Used
3	Discrete Stop	7	Single Lang	11	Not Used	15	Not Used

Local Output Status
[Local Out Status]

This parameter indicates boolean output status conditions for the Velocity Processor. When a bit is set to 1, the corresponding input signal is true.

Parameter Number	**55**
Parameter Type	Source
Display Units	Bits
Drive Units	Bits
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

Value	Description	Value	Description	Value	Description	Value	Description
0	Brake Enable	4	Not Used	8	Not Used	12	VP Green LED
1	Turn On Delay Select	5	Not Used	9	VP Enable	13	VP Red LED
2	Not Used	6	Not Used	10	Pilot Relay	14	Not Used
3	Not Used	7	Not Used	11	Not Used	15	Not Used

Logic Status Low
[Logic Status Low]

This parameter is the Low part of a double word that indicates boolean logic conditions within the Drive. When a bit is set to 1, the corresponding condition in the Drive is true.

Parameter Number	**56**
Parameter Type	Source
Display Units	Bits
Drive Units	Bits
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111

Value	Description	Value	Description	Value	Description	Value	Description
0	Ready to Run	4	Accelerating (1=Accel)	8	At Set Speed	12	At Zero Speed
1	Drive Running	5	Decelerating (1=Decel)	9	Local A	13	Reference A
2	Cmd Direction (1=FWD, 0=Rev)	6	Warning	10	Local B	14	Reference B
3	Rotation Direction (1=FWD, 0=Rev)	7	Faulted	11	Local C	15	Reference C

C B A	
0 0 0	No Change
0 0 1	Ref 1
0 1 0	Ref 2
0 1 1	Ref 3
1 0 0	Ref 4
1 0 1	Ref 5
1 1 0	Ref 6
1 1 1	Ref 7

Logic Status Hi
[Logic Status Hi]

This parameter is the Hi part of a double word that indicates boolean logic conditions within the Drive. When a bit is set to 1, the corresponding condition in the Drive is true.

Parameter Number	**57**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 11111 1111
Enums:	

Value	Description	Value	Description	Value	Description	Value	Description
0	Flux Ready	4	Bus Ridethru	8	At Limit	12	Over Setpoint 1
1	Flux Up	5	Jogging	9	Not Used	13	Over Setpoint 2
2	Not Used	6	Not Used	10	At Setpoint 1	14	Over Setpoint 3
3	Not Used	7	Not Used	11	At Setpoint 2	15	Over Setpoint 4

Torque Stop Configuration
[Torq Stop Config]

This parameter selects how the drive will react to a stop command when it occurs in a non–speed mode (ex. torque mode). Possible selections are:
0 = Normal Mode – Switch to speed mode. then perform a controlled stop.
1 = Stay in selected torque mode until zero speed is reached.
2 = Stay in selected torque mode until zero torque is reached.

Parameter Number	**58**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	2
Enums:	

[1]NOTE: Coast indicates that the Inverter power has been disabled, but actual rotational stoppage of the motor is dependent on the friction of the connected load.

This parameter has no effect if the drive is already in speed mode when a stop command occurs. Coast stop[1] commands are also unaffected by this parameter.

Logic Options
[Logic Options]

This parameter selects the options for logic operation of the drive as follows:

bit#	Option
0	Start Type A*
1	Start Type B*
2	Jog Ramp Enable
3	= 1 / Jog Coast = 0 / Regen Stop
4	STOP Input Type A**
5	STOP Input Type B**
6	Do Power Up Diag.
7	Do Flux Up Diag
8	Do Start Diag
9	Not Used
10	Not Used
11	= 1 / AC Motor Contactor Present
12	= 1 / Bipolar Ref +ref value = Forward Dir. – ref value = Reverse Dir. = 0 / Unipolar Bit 4 of P52 = 1, Forward Direction Bit 5 of P52 = 1 , Reverse Direction

Parameter Number	**59**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0001 0010
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

* Start Type

B	A	
0	0	Maint. Start, Rgen Stop
0	1	Maint. Start, Coast Stop
1	0	Momentary Start
1	1	Maint. Start, Rgen Stop

** Stop Type

B	A	
0	0	Coast
0	1	Normal (Ramp–Regen)
1	0	I - Limit
1	1	Coast

At Setpoint 1
[At Setpoint 1]

This parameter is used to specify the setpoint threshold for the At Setpoint 1 bit in Logic Status Hi.

Parameter Number	**60**
Parameter Type	Sink
Display Units	+/– x.x %
Drive Units	4096 = 100.0% setpoint
Factory Default	+0.0%
Minimum Value	– 800.0%
Maximum Value	+ 800.0%

At Setpoint 2
[At Setpoint 2]

This parameter is used to specify the setpoint threshold for the At Setpoint 2 bit in Logic Status Hi.

Parameter Number	**61**
Parameter Type	Sink
Display Units	+/– x.x%
Drive Units	4096 = 100.0% setpoint
Factory Default	+0.0%
Minimum Value	–800.0%
Maximum Value	+800.0%

Over Setpoint 1
[Over Setpoint 1]

This parameter is used to specify the setpoint threshold for the Over Setpoint 1 bit in Logic Status Hi.

Parameter Number	**62**
Parameter Type	Sink
Display Units	+/– x.x%
Drive Units	4096 = 100% setpoint
Factory Default	+0%
Minimum Value	–800.0%
Maximum Value	+800.0%

Over Setpoint 2
[Over Setpoint 2]

This parameter is used to specify the setpoint threshold for the Over Setpoint 2 bit in Logic Status Hi.

Parameter Number	**63**
Parameter Type	Sink
Display Units	+/– x.x%
Drive Units	4096 = 100% setpoint
Factory Default	+ 0.0%
Minimum Value	–800.0%
Maximum Value	+800.0%

Over Setpoint 3
[Over Setpoint 3]

This parameter is used to specify the setpoint threshold for the Over Setpoint 3 bit in Logic Status Hi.

Parameter Number	**64**
Parameter Type	Sink
Display Units	+/– x.x%
Drive Units	4096 = 100.0% setpoint
Factory Default	+0.0 %
Minimum Value	–800.0%
Maximum Value	+800.0%

Over Setpoint 4
[Over Setpoint 4]

This parameter is used to specify the setpoint threshold for the Over Setpoint 4 bit in Logic Status Hi.

Parameter Number	**65**
Parameter Type	Sink
Display Units	+/– x.x %
Drive Units	4096 = 100% setpoint
Factory Default	+0.0 %
Minimum Value	–800%
Maximum Value	+800%

Setpoint Select
[Setpoint Select]

This parameter makes a selection between actual speed or internal Iq current reference for the At/Over Setpoint parameters. Each Setpoint Status bit can be set for either option (0 = Actual Speed; 1 = Iq Reference).

Parameter Number	**66**
Parameter Type	Sink
Display Units	Bits
Drive Units	bit clear = speed, set = current
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	0000 0000 1111 1111
Enums:	

Bit 0 = At Setpoint 1
Bit 1 = At Setpoint 2
Bit 2 = Over Setpoint 1
Bit 3 = Over Setpoint 2
Bit 4 = Over Setpoint 3
Bit 5 = Over Setpoint 4

Speed Setpoint Tolerance
[Speed Setpnt Tol]

This parameter establishes a hysteresis band around the At Setpoints. It will be used to determine when to update the Setpoint Bits in the Logic Status Hi (P57), when configured for actual speed option.

Parameter Number	**67**
Parameter Type	Sink
Display Units	x.x rpm
Drive Units	4096 = base speed
Factory Default	base sp / 100
Minimum Value	0.0 rpm
Maximum Value	base speed /10

Current Setpoint Tolerance
[Cur Setpoint Tol]

This parameter establishes a hysteresis band around the Setpoints. It will be used to determine when to update the Setpoint Bits in Logic Status Hi (P57), when configured for commanded current option.

Parameter Number	**68**
Parameter Type	Sink
Display Units	x.x%
Drive Units	4096 = 100.0% Iq
Factory Default	2.0%
Minimum Value	0.0%
Maximum Value	20.0%

Zero Speed Tolerance
[Zero Speed Tol]

This parameter establishes a band around zero speed that will be used to determine when to update the At Zero Speed bit in the Logic Status Low (P56).

Parameter Number	**69**
Parameter Type	Sink
Display Units	+/– x%
Drive Units	4096 = base speed
Factory Default	base speed / 100
Minimum Value	0.0 rpm
Maximum Value	8 x base speed

Logic Testpoint Data
[Logic Tstpt Data]

This parameter contains the logic control testpoint data that has been selected by the Logic Tstpt Sel parameter, P71.

Parameter Number	**70**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111

Logic Testpoint Select
[Logic Tstpt Sel]

This parameter selects which internal location in the logic control software will become the testpoint value shown in P70. The value based upon the select will be stored in the Logic Tstpnt Data parameter. The internal locations of the logic control software accessible based on the select value are:

Parameter Number	**71**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	30
Enums:	

Select Value	Logic Access Point	Select Value	Logic Access Point
0	Zero	16	Diagnostic Inhibit bits
1	Logic State	17	Common Bus Precharge States
2	Edge Filtered Logic Command	18	Contactor Trip Condition
3	Logic Control Word	19	Adapter handshake counter
4	Flux Inhibit Conditions	20	Longest handshake count
5	Run Inhibit Conditions	21	Stop event – LED state
6	Current Processor Command Word	22	Stop event – System mode register
7	Current Processor Status Word	23	Stop event – Fault stop command
8	Diagnostic Request Flag	24	Stop event – Powerup diagnostic status
9	Requested Torque Mode	25	Stop event – Nonconfigurable fault status
10	Contactor Fault Flag	26	Stop event – Current Processor Config Fault Status
11	Monitor Sample	27	Stop event – Velocity Processor Config Fault Status
12	Sys Status	28	Stop event – Adapter fault status
13	Loss of CP Enable Acknowledge	29	Stop event – Logic Command (parameter 52)
14	Last Stop	30	Stop event – Local Inputs (parameter 54)
15	Stop Event		

Stop Dwell
[Stop Dwell]

This sets an adjustable dwell time before the drive disables speed and torque regulators when a stop has occurred.

Parameter Number	**72**
Parameter Type	Sink
Display Units	x.x sec
Drive Units	Display units x 10
Factory Default	0.0 sec
Minimum Value	0.0 sec
Maximum Value	10.0 sec

NOTE: Caution should be used when changing the dwell time from the factory setting. Extended dwell times may not be desirable from a safety standpoint in some applications.

Maximum Dynamic Brake Power
[Max DB Power]

This parameter defines the power rating for the optional Dynamic Brake resistor. This value is used to calculate the per unit R theta for the resistor.

Parameter Number	**77**
Parameter Type	Sink
Display Units	x Watts
Drive Units	None
Factory Default	0 Watts
Minimum Value	0 Watts
Maximum Value	30,000 Watts

Maximum Dynamic Brake Temperature
[Max DB Temp]

This parameter defines the Maximum Temperature Rating for the optional Dynamic Brake resistor. This value is used to establish setpoints for setting and clearing a Brake Overtemperature fault condition.

Parameter Number	**78**
Parameter Type	Sink
Display Units	x deg
Drive Units	None
Factory Default	50 deg
Minimum Value	50 deg
Maximum Value	700 deg

Dynamic Brake Time Constant
[DB Time Const]

This parameter defines the thermal time constant for the Optional Dynamic Brake resistor. This value is used in the brake resistor thermal model to predict brake temperature as a function of regenerative power.

Parameter Number	**79**
Parameter Type	Sink
Display Units	x Sec
Drive Units	None
Factory Default	10 sec
Minimum Value	10 sec
Maximum Value	600 sec

Powerup/Diagnostic Fault Status
[PwrUp Flt Status]

This word parameter indicates a fault condition which has been detected during power up or reset of the drive. When a bit is "1", the condition is true, otherwise the condition is false.

Parameter Number	**80**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

Bit	Condition	Bit	Condition
0	CP PROM Failure	9	VP Internal RAM Failure
1	CP Internal RAM Failure	10	VP External RAM Failure
2	CP External RAM Failure	11	VP Stack RAM Failure
3	CP Stack RAM Failure	12	CP Dualport RAM Failure detected by VP
4	VP Dualport RAM Failure detected by CP	13	AP Dualport Ram Failure detected by VP
5	Not Used	14	Base Drive EE Failure
6	Not Used	15	Reserved, Leave Zero
7	Not Used		
8	VP EPROM Failure		

Non–configurable Fault Status
[Ncfg Flt Status]

This word parameter indicates fault conditions in the drive that Cannot be configured as warnings. When a bit is "1", the condition is true, otherwise the condition is false. Bits 0 – 3 are detected by hardware. Bits 4–15 are detected by software.

Parameter Number	**81**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

Bit	Condition	Bit	Condition	Bit	Condition
0	DC Bus Overvoltage Trip	6	Master/Slave Enable Timeout	10	Analog Power Supply Tolerance
1	Transistor Desaturation	7	Not Used	11	Autocommisioning or Transistor Diagnostic Failure
2	Ground Fault	8	Handshake Timeout VP	12	Inverter Temperature Trip
3	Instantaneous Overcurrent	9	Absolute Overspeed	13	Software Malfunction detected by VP
4	Adapter Comm Loss detected by CP			14	Not Used
5	Master/Slave Cable Loss			15	Reserved, Leave Zero

CP Configurable Fault Status
[CP Flt Status]

This word parameter indicates conditions detected by the Current Processor (CP) that has been configured to report as a Drive fault condition. Each configuration bit matches the bit definitions of Parameter 84, 86 and 87. When a bit is "1" the condition is true, otherwise the condition is false.

Parameter Number	**82**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

Bit	Condition	Bit	Condition
0	Bus Ridethrough Timeout	3	Bus Undervoltage
1	Bus Precharge Timeout	4	Bus Drop Cycles > 5
2	Bus Drop (150 volts)	5	Fast Fluxup Current < 50%

VP Configurable Fault Status
[VP Flt Status]

This word parameter indicates conditions detected by the Velocity Processor (VP) that have been configured to report as fault conditions. Each configuration bit matches the definitions of Parameter 85, 88 and 89. When a bit is "1" the condition is true, otherwise the condition is false.

Parameter Number	**83**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

Bit	Condition	Bit	Condition	Bit	Condition
0	Feedback Loss	5	Motor stalled	10	Math Limit
1	Inverter Overtemp Pending	6	External Fault	11	Dynamic Brake Overtemperature
2	Motor Overtemperature Tripped	7	RMS Fault	12	AC Motor Contactor Failure
3	Motor Overload Pending	8	Not Used	13	Inverter Overload Pending (IT)
4	Motor Overload Trip	9	Parameter Limit	14	Drive to Drive Communication Fault
				15	Inverter Overload Trip (IT)

CP Configurable Warning Status
[CP Warn Status]

This word parameter indicates conditions detected by the current processor (CP) that have been configured to report as a Drive Warning condition. Each configuration bit matches the bit definitions of parameters 82, 86 and 87. When a bit is set to "1" the corresponding condition in the Drive is true, otherwise it is false.

Parameter Number	**84**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

Bit	Condition
0	Bus Ridethrough Timeout
1	Bus Precharge Timeout
2	Bus Drop
3	Bus Undervoltage
4	Bus Drop Cycles > 5
5	Fast Flux Up Current < 50%

VP Configurable Warning Status (bits)
[VP Warn Status]

This word parameter indicates conditions detected by the Velocity Processor (VP) that have been configured to report as a Drive warning condition. Each configuration bit matches the bit definitions of parameters 83, 88 and 89. When a bit is set to "1", the corresponding condition in the Drive is true, otherwise it is false.

Parameter Number	**85**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

Bit	Condition
0	Encoder Feedback Loss
1	Inverter Overtemp Pending
2	Motor Overtemperature Tripped
3	Motor Overload Pending (I^2T)
4	Motor Overload Trip (I^2T)
5	Motor Stalled
6	External Fault
7	RMS Fault
8	Not Used
9	Parameter Limit
10	Math Limit
11	Dynamic Brake Resistor Overtemperature
12	Motor Contactor Failure
13	Inverter Overload Pending (IT)
14	Drive to Drive Communication Fault
15	Inverter Overload Foldback

CP Fault/Warning Configuration Select
[CP Fault Select]

This word parameter determines conditions detected by the Current Processor (CP) that will be reported as either a drive fault or drive warning condition. Each configuration bit matches the bit definitions of parameters 82, 84 and 87. When a bit is set to "1", the corresponding condition in the Drive will be reported as a FAULT, otherwise it will be reported as a WARNING.

Parameter Number	**86**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0010 0011
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

Bit	Condition
0	Bus Ridethrough Timeout
1	Bus Precharge Timeout
2	Bus Drop
3	Bus Undervoltage
4	Bus Drop Cycles > 5
5	Fast Flux Up Current < 50%

CP Warning/None Configuration Select
[CP Warn Select]

This word parameter determines conditions detected by the Current Processor (CP) that will be reported as either a drive fault or drive warning condition. Each configuration bit matches the bit definition of Parameter 82, 84 and 86. When a bit is set to "1", the corresponding condition in the Drive will be reported as a FAULT, otherwise the condition is reported as a WARNING.

Parameter Number	**87**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0001 1111
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

Bit	Condition
0	Bus Ridethrough Timeout
1	Bus Precharge Timeout
2	Bus Drop (150 volts)
3	Bus Undervoltage
4	Bus Drop Cycles
5	Fast Flux Up Current < 50%

VP Fault/Warning Configuration Select
[VP Fault Select]

This word parameter determines conditions detected by the Velocity Processor (VP) that will be reported as either a drive FAULT or drive WARNING condition. Each configuration bit matches the bit definitions of Parameters 83, 85 and 89. When a bit is set to "1" the corresponding condition in the Drive will be reported as a FAULT, otherwise the condition is reported as a WARNING.

Parameter Number	**88**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	1111 1111 1111 1111
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

Bit	Condition
0	Encoder Feedback Loss
1	Inverter Overemp Pending
2	Motor Overtemperature Tripped
3	Motor Overload Pending (I^2T)
4	Motor Overload Trip (I^2T)
5	Motor Stalled
6	External Fault
7	RMS Fault
8	Reserved, Leave Zero
9	Parameter Limit
10	Math Limit
11	Dynamic brake overtemp
12	AC Motor Contactor Failure
13	Inverter Overload Pending (IT)
14	Drive to Drive Fault
15	Inverter Overload Trip (IT)

VP Warning/None Configuration Select
[VP Warn Select]

This parameter determines conditions detected by the Velocity Processor (VP) that will be reported as either a drive FAULT or WARNING or not reported (ignored). Each configuration bit matches the bit definitions of Parameters 83, 85 and 88. When a bit is set to "1", the corresponding condition in the Drive will be reported as configured by parameter 88. If the bit is set to "0", the condition is not reported.

Parameter Number	**89**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	1111 1111 1111 1111
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enum:	

Bit	Condition
0	Encoder Feedback Loss
1	Inverter Overtemp Pending
2	Motor Overtemperature Tripped
3	Motor Overload Pending (I^2T)
4	Motor Overload Trip (I^2T)
5	Motor Stalled
6	External Fault
7	RMS Fault
8	Not Used
9	Parameter Limit
10	Math Limit
11	Dynamic brake overtemp
12	AC Motor Contactor Failure
13	Inverter Overload Pending (IT)
14	Drive to Drive Fault
15	Inverter Overload Foldback (IT)

Absolute Overspeed Threshold
[Absolute Overspd]

This parameter indicates the incremental speed above Forward Speed Limit or below Reverse Speed Limit that is allowable before an Absolute Overspeed Fault is indicated.

Parameter Number	**90**
Parameter Type	Sink
Display Units	x.x rpm
Drive Units	4096 = 100.0% overspeed
Factory Default	0.1 x base speed
Minimum Value	0.0 rpm
Maximum Value	base speed

Stall Delay
[Stall Delay]

This parameter specifies the amount of time that the Drive must be in current limit and at zero speed before a Stall Fault will be indicated.

Parameter Number	**91**
Parameter Type	Sink
Display Units	x.x sec.
Drive Units	sec. x 10.0
Factory Default	1.0 sec
Minimum Value	0.1 sec
Maximum Value	3276.7 sec

Motor Overload Limit
[Mtr Overload Lim]

This parameter specifies the level of Iq current that will cause a Motor Overload Trip after 60 seconds.

Parameter Number	**92**
Parameter Type	Sink
Display Units	xx.x%
Drive Units	4096 = 100% Iq for 60 sec.
Factory Default	200.0%
Minimum Value	110.0%
Maximum Value	400.0%

Service Factor
[Service Factor]

This parameter specifies the minimum level of Iq current that will cause a motor overload (IIT) trip under continuous operation. Current levels below this value will never result in an overload trip.
Example – a service factor of 1.15 implies continuous operation up to 115% of nameplate motor current.

Parameter Number	**94**
Parameter Type	Sink
Display Units	x.xx
Drive Units	4096 = 1.00
Factory Default	1.00
Minimum Value	1.00
Maximum Value	2.00

Overload Speed 1
[Mtr Overld Spd 1]

If the absolute value of motor speed is at or below the speed specified in this parameter, the motor overload will use the Min Overload Lmt (parameter #97) as its minimum current trip level.

Parameter Number	**95**
Parameter Type	Sink
Display Units	+/– x.x rpm
Drive Units	4096 = Base Motor Speed
Factory Default	0.8 x Base Speed
Minimum Value	0.0 rpm
Maximum Value	2 x Base Speed

Motor Overload Speed 2
[Mtr Overld Spd 2]

If the absolute value of motor speed is at or below the speed specified in this parameter, the motor overload will use 100% as its minimum current trip level.

Parameter Number	**96**
Parameter Type	Sink
Display Units	+/– x.x rpm
Drive Units	4096 = Base Motor Speed
Factory Default	0.8 x Base Speed
Minimum Value	0.0 rpm
Maximum Value	2 x Base Speed

Minimum Overload Limit
[Min Overload Lmt]

This is the minimum motor overload trip level that will be in effect when the motor speed is at or below Mtr Overld Spd 2 (P96)

Parameter Number	**97**
Parameter Type	Sink
Display Units	x.x%
Drive Units	4096 = 100.0% current
Factory Default	100.0%
Minimum Value	0.0 %
Maximum Value	100.0%

Fault Testpoint Data
[Fault TP]

This parameter contains the fault control testpoint data that has been selected by the Fault TP Sel parameter(P99). See the description for the Fault TP Sel parameter 99 for a list of possible testpoints.

Parameter Number	**98**
Parameter Type	Source
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	65535

Fault Testpoint Select
[Fault TP Sel]

This parameter selects which internal location in the fault control software will become the testpoint value. The value based upon the selection will be stored in the Fault TP parameter 98. The internal locations of the logic control software that are accessible based on the selected value are listed below:

Parameter Number	**99**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	32
Enums:	

Select Value	Velocity Reference Access Point
0	Zero
1	Adapter Processor Faulted
2	Actual Velocity when Overspeed occurred
3	Motor Overload Calibration Constant (K)
4	Heatsink NTC Analog Input Voltage
5	Heatsink NTC Foldback Current Limit
6	Negative Analog Supply and/or input voltage
7	Positive Analog Supply and/or input Voltage
8	Zero
9	Motor Overload Integrator(I^2T) level
10	Dynamic Brake Resistor Temperature, Degrees C.
11	Parameter Limit Status, Word 1
12	Parameter Limit Status, Word 2
13	Velocity Reference Math Overflow Status
14	Velocity Feedback Math Overflow Status
15	Velocity Regulator Math Overflow Status
16	Torque Reference Math Overflow Status
17	Process Trim Math Overflow Status

VELOCITY Feedback Error Conditions:

18	Acceleration Error
19	Illegal State Edge Samples
20	Illegal State Level
21	Encoder Loss Edge Samples

Select Value	Velocity Ref Access Point
22	Encoder Loss Level
23	Iq Reference in per unit Inverter Units
24	Motor Overload Integrator Output Level (IT)
25	Motor Temperature, Degrees C.
26	Drive to Drive fault status
27	Base Drive EE fault status
28	Base Drive EE drive type address
29	Base Drive EE drive type data
30	Heatsink Warn Temp, deg C.
31	Heatsink Trip Temp, deg. C.
32	Zero

Velocity Reference 1 LOW (Fraction)
[Vel Ref 1 Low]

This word supplies the fractional part of the external velocity reference 1 when external velocity control has been selected in Logic Command (P52).

Parameter Number	**100**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	65535

Velocity Reference 1 HI (Whole 32 bit)
[Velocity Ref 1 Hi]

This word supplies the whole number part of external velocity reference 1 when the external velocity control has been selected in Logic Command (P52).

Parameter Number	**101**
Parameter Type	Sink
Display Units	+/– x.x rpm
Drive Units	4096 = Base Motor Speed
Factory Default	+ 0.0 rpm
Minimum Value	– 8 x Base Speed
Maximum Value	+8 x Base Speed

Velocity Scale Factor 1
[Vel Scale Fctr 1]

This parameter sets the gain multiplier that will be used to scale velocity reference 1.

Parameter Number	**102**
Parameter Type	Sink
Display Units	+/– x.xxxx
Drive Units	8192 = 1.0000 gain
Factory Default	+ 1.0000
Minimum Value	– 4.0000
Maximum Value	+ 4.0000

Velocity Reference 2 LOW (Fraction)
[Vel Ref 2 Low]

This word supplies the fractional part of the external velocity reference 2 when the external velocity control has been selected in Logic Command (P52).

Parameter Number	**103**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	65535

Velocity Reference 2 HI (Whole 32 bit)
[Vel Ref 2 Hi]

This word supplies the whole number reference 2 when the external velocity control has been selected in Logic Command (P52).

Parameter Number	**104**
Parameter Type	Sink
Display Units	+/– x.x rpm
Drive Units	4096 = Base Motor Speed
Factory Default	+ 0.0 rpm
Minimum Value	– 8 x Base Speed
Maximum Value	+ 8 x Base Speed

Velocity Scale Factor 2
[Vel Scale Fctr 2]

This parameter sets the gain multiplier that will be used to scale velocity reference 2.

Parameter Number	**105**
Parameter Type	Sink
Display Units	+/– x.xxxx
Drive Units	8192 = 1.000 gain
Factory Default	+1.0000
Minimum Value	–4.0000
Maximum Value	+4.0000

Velocity Trim LOW
[Vel Trim Low]

This word supplies the fractional number part of a 32 bit velocity reference trim.

Parameter Number	**106**
Parameter Type	Sink
Display Units	x Sec.
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	65535

Velocity Trim Hi (32 bit)
[Vel Trim Hi]

This word supplies the whole number part of a 32 bit velocity reference trim.

Parameter Number	**107**
Parameter Type	Sink
Display Units	+/– x.x rpm
Drive Units	4096 = Base Motor Speed
Factory Default	0.0 rpm
Minimum Value	– 8 x Base Speed
Maximum Value	+ 8 x Base Speed

Velocity Reference Testpoint Data LOW
[Vel Ref TP Low]

This parameter indicates the LOW of the 32 bit value of the internal location selected by the Vel Ref TP Sel, (P110).

Parameter Number	**108**
Parameter Type	Source
Display Units	x
Drive Units	1 = 2 $^{1}/_{28}$ Base Motor Speed
Factory Default	0
Minimum Value	0
Maximum Value	65535

Velocity Reference Testpoint Data HI (32 bit)
[Vel Ref TP Hi]

This parameter indicates the HI 32 bit value of the internal location selected by the Vel Ref TP Sel, (P110).

Parameter Number	**109**
Parameter Type	Source
Display Units	+/– x.x rpm
Drive Units	4096 = Base Motor Speed
Factory Default	+0.0 rpm
Minimum Value	–8 x Base Speed
Maximum Value	+8 x Base Speed

Velocity Reference Testpoint Select
[Vel Ref TP Sel]

This parameter selects which internal location of the velocity reference will become the testpoint value shown in P108 and 109. The following are the internal locations based upon the select value:

Parameter Number	**110**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	12
Enums:	

Select Value	Velocity Reference Access Point	Select Value	Velocity Reference Access Point
0	Zero	9	Internal Velocity Trim (HI, LOW)
1	Limit Status (HI)	10	Trimmed Velocity Reference (HI, LOW)
	Reference Selection (LOW)	11	Maximum Frequency Limit (HI); Zero (LOW)
2	Selected Reference (HI, LOW)	12	Reference after Trim Limit (HI, LOW)
3	Limited Reference (HI, LOW)	13	Deadband In (HI, LOW)
4	Direction Selected Ref (HI, LOW)	14	Encoderless On Freq (Low)
5	Fwd Speed Limit (HI)		Encoderless Off Freq (High)
	Rev Speed Limit (LOW)	15	Encoderless Status (Low)
6	Ramp Input (HI, LOW)	16	Zero
7	Ramp Output (HI, LOW)		
8	Velocity Trim Sum (HI, LOW)		

Jog Speed 1
[Jog Speed 1]

This will be the velocity reference used by the Drive when Jog 1 has been selected in the Logic Command (P52).

Parameter Number	**117**
Parameter Type	Sink
Display Units	+/– x.x rpm
Drive Units	4096 = Base Motor Speed
Factory Default	+0.0 rpm
Minimum Value	–8 x rpm
Maximum Value	+8 x rpm

Jog Speed 2
[Jog Speed 2]

This will be the velocity reference used by the Drive when Jog 2 has been selected in the Logic Command (P52).

Parameter Number	**118**
Parameter Type	Sink
Display Units	+/– x%
Drive Units	4096 = Base Motor Speed
Factory Default	+ 0.0 rpm
Minimum Value	–8 x rpm
Maximum Value	+8 x rpm

Preset Speed 1
[Preset Speed 1]

This will be the velocity reference used by the Drive when preset 1 has been selected in Logic Command (P52).

Parameter Number	**119**
Parameter Type	Sink
Display Units	+/– x.x rpm
Drive Units	4096 = Base Motor Speed
Factory Default	+0.0 rpm
Minimum Value	–8 x Base Speed
Maximum Value	+8 x Base Speed

Preset Speed 2
[Preset Speed 2]

This will be the velocity reference used by the Drive when preset 2 has been selected in Logic Command (P52).

Parameter Number	**120**
Parameter Type	Sink
Display Units	+/– x.x rpm
Drive Units	4096 = Base Motor Speed
Factory Default	+0.0 rpm
Minimum Value	–8 x Base Speed
Maximum Value	+8 x Base Speed

Preset Speed 3
[Preset Speed 3]

This will be the velocity reference used by the Drive when preset 3 has been selected in Logic Command (P52).

Parameter Number	**121**
Parameter Type	Sink
Display Units	+/– x.x rpm
Drive Units	4096 = Base Motor Speed
Factory Default	+0.0 rpm
Minimum Value	–8 x Base Speed
Maximum Value	+8 x Base Speed

Preset Speed 4
[Preset Speed 4]

This will be the velocity reference used by the Drive when preset 4 has been selected in the Logic Command (P52).

Parameter Number	**122**
Parameter Type	Sink
Display Units	+/– x.x rpm
Drive Units	4096 = Base Motor Speed
Factory Default	+0.0 rpm
Minimum Value	–8 x Base Speed
Maximum Value	+8 x Base Speed

Preset Speed 5
[Preset Speed 5]

This will be the velocity reference used by the Drive when preset 5 has been selected in Logic Command (P52).

Parameter Number	**123**
Parameter Type	Sink
Display Units	+/– x.x rpm
Drive Units	4096 = Base Motor Speed
Factory Default	+0.0 rpm
Minimum Value	–8 x Base Speed
Maximum Value	+8 x Base Speed

Accel Time
[Accel Time]

This parameter displays the ramp rate time for the velocity reference ramp. Time is seconds from zero to base motor speed. Zero will disable accel ramp. See Param 389 & 390 to set this rate.
Note: This parameter not used with a Standard Adapter Board Equipped Drive.

Parameter Number	**125**
Parameter Type	Sink
Display Units	x.x Sec
Drive Units	display units x 10
Factory Default	10.0 seconds
Minimum Value	0.0 seconds
Maximum Value	6,553.5 seconds

Decel Time
[Decel Time]

This parameter displays the deceleration ramp time. Similar to the parameter above, zero will disable the decel ramp. See param 391 & 392 to set this rate.
Note: This parameter not used with a Standard Adapter Board Equipped Drive.

Parameter Number	**126**
Parameter Type	Sink
Display Units	x.x Sec
Drive Units	display units x 10
Factory Default	10.0 seconds
Minimum Value	0.0 seconds
Maximum Value	6,553.5 seconds

Reverse Motor Speed Limit
[Rev Speed Limit]

This parameter sets a limit on velocity in the negative direction. The value entered must be Negative or Zero. The numeric range of this parameter is 0 to – 6 times base motor speed.

Parameter Number	**127**
Parameter Type	Sink
Display Units	– x.x rpm
Drive Units	– 4096 @ Base Motor Speed
Factory Default	– Base Motor Speed
Minimum Value	– 8 x Base Motor Speed
Maximum Value	+ 0.0 rpm

Forward Motor Speed Limit
[Fwd Speed Limit]

This parameter sets a limit on velocity in the positive direction. The value entered must be Positive or Zero. The numeric range of this parameter is +6 x base speed rpm.

Parameter Number	**128**
Parameter Type	Sink
Display Units	x.x rpm
Drive Units	+ 4096 @ Base Motor Speed
Factory Default	Base Motor Speed
Minimum Value	+ 0.0 rpm
Maximum Value	8 x Base Motor Speed

Maximum Reverse Speed Trim
[Max Rev Spd Trim]

This parameter limits the minimum value of the velocity reference after the process trim output and the external velocity trim has been added.

Parameter Number	**129**
Parameter Type	Sink
Display Units	+/– x.x rpm
Drive Units	–4096 = Base Motor Speed
Factory Default	– Base Speed
Minimum Value	– 6 x Base Speed
Maximum Value	+ 6 x Base Speed

Maximum Forward Speed Trim
[Max Fwd Spd Trim]

This parameter limits the maximum value of the velocity reference after the process trim.

Parameter Number	**130**
Parameter Type	Sink
Display Units	+/– x.x rpm
Drive Units	4096 = Base Motor Speed
Factory Default	+ Base Speed
Minimum Value	+ 0.0 rpm
Maximum Value	+ 6 x Base Speed

Droop Percent
[Droop Percent]

This parameter specifies the percent of base speed that the velocity reference will be reduced when at full load torque. This feature can be used to cause motor velocity to droop with an increase in load.

Parameter Number	**131**
Parameter Type	Sink
Display Units	x.x%
Drive Units	Display units x 10
Factory Default	0%
Minimum Value	0%
Maximum Value	25.5%

Velocity Reference Output LOW
[Vel Ref Out Low]

This is the low word portion of a 32 bit velocity reference quantity. It is the input term for the Velocity PI Regulator.

Parameter Number	**132**
Parameter Type	Source
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	65535

Velocity Reference Output HI (32 bit)
[Vel Ref Out High]

This is the high word portion of a 32 bit velocity reference quantity. It is the input term for the Velocity PI Regulator.

Parameter Number	**133**
Parameter Type	Source
Display Units	+/– x.x rpm
Drive Units	4096 = Base Motor Speed
Factory Default	+0.0 rpm
Minimum Value	– 8 x Base Speed
Maximum Value	+ 8 x Base Speed

Velocity Regulator Output
[Vel Reg Output]

This parameter represents the torque reference value that appears at the output of the Velocity PI Regulator. It is the input to the torque mode selector and is used as the drive's torque reference value when in torque mode 1.

Parameter Number	**134**
Parameter Type	Source
Display Units	+/– x.x %
Drive Units	4096 = 100.0% Iq motor
Factory Default	+ 0.0 %
Minimum Value	– 300.0%
Maximum Value	+300.0%

Velocity Regulator Testpoint Data LOW
[Vel Reg TP Low]

This parameter indicates the value of the internal location selected by the Velocity Regulator Testpoint Select parameter, P137. The select allows this parameter to be used as a testpoint for the velocity regulator.

Parameter Number	**135**
Parameter Type	Source
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	65535

Velocity Regulator Testpoint Data HI (32 bit)
[Vel Reg TP Hi]

This parameter indicates the value of the internal location selected by the Vel Reg TP Sel parameter, P137. The select allows this parameter to be used as a testpoint for the velocity regulator.

Parameter Number	**136**
Parameter Type	Source
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Velocity Regulator Testpoint Select
[Vel Reg TP Sel]
This parameter selects which internal location of the velocity reference will become the testpoint value shown in Vel Reg TP Low P135 & Vel Reg TP Hi P136. The following are the internal locations based upon the select value:

Parameter Number	**137**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	15

Select Value	Velocity Reference Access Point
0	Zero
1	Droop Speed Offset (32bit)
2	Drooped Velocity Reference (32 bit)
3	Kf Term (Low), Kf Err (High)
4	Kf Error Filter Output 1 (Low), Kf Error Filter Output 2 (High)
5	Kp Term (32 bit)
6	Or – 1st 16 bit (Low), 2nd 16 bit (High)
7	Or – 3rd 16 bit (Low), 4th 16 bit (High)
8	Of – 1st 16 bit (Low), 2nd 16 bit (High)
9	Of – 3rd 16 bit (Low), 4th 16 bit (High)
10	Oe – 1st 16 bit (Low), 2nd 16 bit (High)
11	Oe – 3rd 16 bit (Low), Not Used (High)
12	Oec1 – 1st 16 bit (Low), 2nd 16 bit (High)
13	Oec1 – 3rd 16 bit (Low), 4th 16 bit (High)
14	Ki Term (32 bit)
15	Logic Control Word (LOW) Integrator Enable Flag (HIGH)

Velocity Error
[Velocity Error]

This parameter contains a value that is the difference between the whole number portion of the velocity regulator's reference input and the velocity feedback.

Parameter Number	**138**
Parameter Type	Source
Display Units	+/– x.x rpm
Drive Units	4096 = Base Motor Speed
Factory Default	+0.0 rpm
Minimum Value	– 8 x Base Speed rpm
Maximum Value	+8 x Base Speed rpm

KI – Velocity Loop
[Ki – Velocity Loop]

This parameter controls the integral error gain of the velocity regulator. Gain has a resolution of 1/8, therefore a Ki gain of 1.0 is converted to internal drive units as a value of 8.

Parameter Number	**139**
Parameter Type	Sink
Display Units	x.x
Drive Units	Display units x 8
Factory Default	32.0
Minimum Value	0.0
Maximum Value	4096.0

KP – Velocity Loop
[Kp – Velocity Loop]

This parameter controls the proportional error gain of the velocity regulator. Gain has a resolution of 1/8, therefore a gain of 1.0 is converted to internal drive units as a value of 8.

Parameter Number	**140**
Parameter Type	Sink
Display Units	x.x
Drive Units	Display units x 8
Factory Default	8.0
Minimum Value	0.0
Maximum Value	200.0

KF – Velocity Loop
[Kf – Velocity Loop]

This parameter controls the feed forward gain of the velocity regulator. Setting the Kf gain to less than one reduces velocity feedback overshoot in response to a step change in velocity reference.

Parameter Number	**141**
Parameter Type	Sink
Display Units	x.xx
Drive Units	Display units x 65535
Factory Default	1.00
Minimum Value	0.50
Maximum Value	1.00

KF Error Filter Bandwidth
[Error Filter BW]

This parameter sets the bandwidths of two cascaded low pass filters in the Kf error path of the Velocity PI Regulator. Bandwidth is entered in units of radians per second.

Parameter Number	**142**
Parameter Type	Sink
Display Units	x Radian/Seconds
Drive Units	None
Factory Default	500 Radian/Seconds
Minimum Value	0
Maximum Value	1500 Radian/Seconds

Velocity Feedback Testpoint Data LOW
[Vel Fdbk TP Low]

This parameter contains the LOW part of the 32 bit value of the internal location selected by the Vel Fdbk TP Sel Parameter, P145.

Parameter Number	**143**
Parameter Type	Source
Display Units	+/– x
Drive Units	None
Factory Default	0u
Minimum Value	0u
Maximum Value	65535u

Velocity Feedback Testpoint Data HI (32 bit)
[Vel Fdbk TP Hi]

This parameter contains the HIGH part of the 32 bit value of the internal location selected by the Vel Fdbk TP Sel Parameter, P145.

Parameter Number	**144**
Parameter Type	Source
Display Units	+/– x
Drive Units	None
Factory Default	+0
Minimum Value	–32767
Maximum Value	+32767

Velocity Feedback Testpoint Select
[Vel Fdbk TP Sel]

This parameter selects which internal location of the velocity reference will become the testpoint value shown in P143 & P144. The value based upon the select will be stored in the Vel Fdbk TP Low & Vel Fdbk TP Hi parameter.

Parameter Number	**145**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	16
Enums:	

Select Value	**Feedback Access Point**
0	Zero
1	Encoder Velocity edge (Hi), Diff (Low)
2	Selected Velocity (Low), Difference Velocity (High)
3	2 msec Scan Interval (Low), Zero (High)
4	Edge Pulse Count (Low), Zero (High)
5	Acceleration (Low), Acceleration Error (High)
6	Edges Moved Count (Low), Zero (High)
7	Delta Theta (32 bit)
8	Count Direction (Low), Status Bits (High)
9	Edge to Edge Time (Low), Zero (High)
10	Equal Area Intervals (Low), Zero (High)
11	Empty Intervals (Low), Zero (High)
12	Active Feedback Device
13	Limit Status (Low), Zero (High)
14	Qf – 1st 16 bit (Low), 2nd 16 bit (High)
15	Qf – 3rd 16 bit (Low), Not Used (High)
16	Zero

Velocity Feedback
[Vel Feedback]

This parameter indicates the latest measured motor velocity information from a feedback device (Tach, encoder etc.) The value is taken at the output of the selectable feedback filters.

Parameter Number	**146**
Parameter Type	Source
Display Units	+/– x.x rpm
Drive Units	4096 @ Base Motor Speed
Factory Default	+0.0 rpm
Minimum Value	– 8 x Base Motor Speed
Maximum Value	+ 8 x Base Motor Speed

Scaled Velocity Feedback
[Scaled Vel Fdbk]

This parameter is a rescaled version of velocity feedback from parameter 146. The inverse of either Velocity Scale Factor 1 or 2 is used.

Parameter Number	**147**
Parameter Type	Source
Display Units	+/– x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Encoder Position Feedback LOW
[Enc Pos Fdbk Low]

This is the LOW word portion of a 32 bit encoder pulse accumulator. Each encoder quadrature edge will be counted, resulting in a 4X multiplication. As a result, this parameter will be scaled such that the position change per motor revolution is equal to 4 times the encoder PPR.

Parameter Number	**148**
Parameter Type	Source
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	65535

Encoder Position Feedback HI
[Enc Pos Fdbk HI]

This is the HI word portion of a 32 bit encoder pulse accumulator that was described for the previous parameter. This word will change by 1 count for every change in low count of 65,536 4X encoder pulses.

Parameter Number	**149**
Parameter Type	Source
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	65535

Feedback Device Type
[Fdbk Device Type]

This parameter selects the source for motor velocity feedback:
0 – Encoder Feedback
1 – Encoder Feedback
2 – Encoder Feedback w/tracker filter
3 – Motor Simulator
4 – External Feedback
5 – Encoderless velocity estimate with deadband
6 – Encoderless velocity estimate without deadband
7 – Encoderless without deadband and low bandwidth

Parameter Number	**150**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	Encoder
Minimum Value	0
Maximum Value	7

Feedback Tracker Gain
[Fdbk Track Gain]

Affects gain of the alpha–beta tracker filter used when Fdbk Device Type = 2.
Smaller gains result in increased filtering.
Typical Value: = 0.15 to 0.7
Use 1.0 to disable.

Parameter Number	**151**
Parameter Type	Sink
Display Units	x.xxx
Drive Units	1024 @ 1.000 gain
Factory Default	1.000
Minimum Value	0.043
Maximum Value	1.000

Feedback Filter Select
[Fdbk Filt Sel]

0 = No Filter
1 = “light” 35/49 radian feedback filter
2 = “heavy” 20/40 radian feedback filter
3 = Single pole Lead Lag feedback filter
4 = Notch

Parameter Number	**152**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	4

Kn – Feedback Filter Gain
[Fdbk Filt Gain]

This is the Kn term of the single pole lead/lag feedback filter. Kn greater than 1.0 will produce a lead filter, and less than 1.0 a lag filter. Kn equal to 1.0 will disable the feedback filter.

Parameter Number	**153**
Parameter Type	Sink
Display Units	±x.xx
Drive Units	256 = 1.00 gain
Factory Default	+ 1.00
Minimum Value	– 5.00
Maximum Value	+5.00

Wn – Feedback Filter Bandwidth
[Fdbk Filt BW]

This parameter establishes the breakpoint radian frequency for the velocity feedback lead-lag filter.

Parameter Number	**154**
Parameter Type	Sink
Display Units	x Radian/Seconds
Drive Units	None
Factory Default	100 Radian/Seconds
Minimum Value	1 Radian/Seconds
Maximum Value	900 Radian/Seconds

Tach Velocity
[Tach Velocity]

This word supplies a motor velocity feedback signal when a source other than an encoder is used. This input will typically be linked to an analog input parameter from the adapter board.

Parameter Number	**155**
Parameter Type	Sink
Display Units	+/– x.xx rpm
Drive Units	4096 = Base Motor Speed
Factory Default	0.000 rpm
Minimum Value	– 8 x base speed
Maximum Value	+ 8 x base speed

Notch Filter Frequency
[Notch Filt Freq]

This parameter sets the center frequency for an optional 2–pole notch filter. Thenotch filter is enabled by selecting a value of ‘4’ in parameter 152.

Parameter Number	**156**
Parameter Type	Sink
Display Units	x.x Hz
Drive Units	8 = 1.0Hz
Factory Default	135 Hz
Minimum Value	5 Hz
Maximum Value	135 Hz

Notch Filter Q
[Notch Filter Q]

This parameter sets the Quality Factor or Q for the 2–pole notch filter described in parameter 156.

Parameter Number	**157**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	50
Minimum Value	2
Maximum Value	500

External Iq Reference
[External Iq Ref]

This parameter supplies an external Iq reference to the Drive. The external Iq reference is summed with the internal Iq reference just prior to the current limiter.

Parameter Number	**161**
Parameter Type	Sink
Display Units	+/– x.x %
Drive Units	4096 = 100% Iq motor
Factory Default	+0.0%
Minimum Value	– 800.0%
Maximum Value	+ 800.0%

External Torque Reference 1
[External Torque Ref 1]

This word supplies an external motor torque reference to the Drive. The external torque reference can be selected by setting the Torque Mode Select parameter (Parm 53) to a value of “2”.

Parameter Number	**162**
Parameter Type	Sink
Display Units	x%
Drive Units	None
Factory Default	+ 0.0%
Minimum Value	– 800%
Maximum Value	+ 800%

Slave Torque Percent 1
[Slave Torque % 1]

Ext Torq Ref 1 (P162) is multiplied by a gain that is specified by this parameter. This multiplier is scaled so that 4096 represents a gain of 1.0 (100%)

Parameter Number	**163**
Parameter Type	Sink
Display Units	+/– x.xx%
Drive Units	4096 = 1.0 gain
Factory Default	+ 100%
Minimum Value	– 200%
Maximum Value	+ 200%

External Torque Reference 2
[Ext Torq Ref 2]

This word supplies an external motor torque reference to the Drive. The External Torque Reference can be selected by setting the Torque Mode Select parameter (Parm 53) to a value of “2”.

Parameter Number	**164**
Parameter Type	Sink
Display Units	+/– x.x%
Drive Units	4096 = rated torque
Factory Default	+ 0.0%
Minimum Value	–800.0%
Maximum Value	+800.0%

Slave Torque Percent 2
[Slave Torque % 2]

Ext Torq Ref 2 (P164) is multiplied by a gain that is specified by this parameter. This multiplier is scaled so that 4096 represents a gain of 1.0 (100%)

Parameter Number	**165**
Parameter Type	Sink
Display Units	+/– x.x %
Drive Units	4096 = 1.0 gain
Factory Default	+100%
Minimum Value	– 200.0%
Maximum Value	+ 200.0%

External Torque Step
[Ext Torque Step]

This parameter supplies an external torque offset to the Drive. The Ext Torque Step is summed with the Torque Mode Sel (P53) output prior to the Torque Limiter.

Parameter Number	**166**
Parameter Type	Sink
Display Units	x.x %
Drive Units	4096 @ rated motor torque
Factory Default	0.0%
Minimum Value	– 800.0%
Maximum Value	+ 800.0%

Internal Torque Reference
[Int Torque Ref]

This parameter shows the value of torque reference that is present at the output of the torque limiter.

Parameter Number	**167**
Parameter Type	Source
Display Units	+/– x.x %
Drive Units	4096 = rated torque
Factory Default	+0.0 %
Minimum Value	–800.0%
Maximum Value	+800.0%

Internal Iq Reference
[Internal Iq Ref]

This parameter shows the value of the Iq reference that is present at the output of the Iq rate limiter. 4096 is 100% Iq motor current.

Parameter Number	**168**
Parameter Type	Source
Display Units	+/– x.x%
Drive Units	4096 = rated torque
Factory Default	+0.0 %
Minimum Value	– 800.0%
Maximum Value	+ 800.0%

Torque Reference Testpoint Data
[Torque Ref TP]

This parameter indicates the value of the internal location selected by the Torq Ref TP Sel parameter, P173. The select will allow this parameter to be used as a test-point for the torque
reference input.

Parameter Number	**172**
Parameter Type	Source
Display Units	+/– x.x%
Drive Units	4096 = 100% (1.0 pu)
Factory Default	+ 0.0%
Minimum Value	– 800.0%
Maximum Value	+ 800.0%

Torque Reference Testpoint Select
[Torq Ref TP Sel]

This parameter selects which internal location of the torque reference will become the testpoint value. The value based on the select will be stored in the Torque Ref TP (P172).

Parameter Number	**173**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	31
Enums:	

Select Value	Torque Reference Access Point	Select Value	Torque Reference Access Point
0	Zero	17	Torque Reference Status
1	NTC Limit	18	Torque Reference Math Overflow Status
2	Inverter Current Limit	19	Active Torque Mode
3	Overload Current Limit	20	Positive Torque Power Limit
4	Positive IQ Limit	21	Negative Torque Power Limit
5	Negative Iq Limit	22	Rated Inverter Current
6	Zero (Not Used)	23	Averaged Motor Flux
7	Torque Limit (Low)	24	Iq Current Reference Adjusted for Motor Range
8	Torque Limit (High)	25	Iq Sum
9	Scaled External Torque Reference 1	26	Torque Mode Select Iq Ref
10	Scaled External Torque Reference 2	27	Inverter Gain
11	Torque Sum	28	Motor Range
12	Torque Command	29	Motor to Inverter Current Ratio
13	Filtered Torque Reference	30	DC Bus Ride-Thru Latch
14	Unlimited Iq Reference	31	Current Processor Regulation Active Flag
15	Current Limited Iq Reference		
16	Filtered Iq Reference		

Minimum Flux Level
[Min Flux Level]

This parameter sets the smallest level of flux that will be used to convert a torque to a current reference. Setting the parameter to 4096 will prevent flux reduction and bypass the torque to current conversion.

Parameter Number	**174**
Parameter Type	Sink
Display Units	x.x%
Drive Units	4096 = 100.0% Flux
Factory Default	100.0%
Minimum Value	12.5%
Maximum Value	100.0%

Pos Torque Reference Limit
[Pos Mtr Tor Lmt]

This parameter provides a user settable torque limit for positive torque reference values. Positive motor torque reference will not be allowed to exceed this value.

Parameter Number	**175**
Parameter Type	Sink
Display Units	x.x%
Drive Units	4096 @ rated motor torque
Factory Default	200.0%
Minimum Value	0.0%
Maximum Value	800.0%

Neg Torque Reference Limit
[Neg Mtr Tor Lmt]

This parameter provides a user settable torque limit for negative torque reference values. Negative motor torque reference will not be allowed to exceed this value.

Parameter Number	**176**
Parameter Type	Sink
Display Units	– x.x%
Drive Units	– 4096 @ rated motor torque
Factory Default	– 200.0%
Minimum Value	– 800.0%
Maximum Value	0.0 %

Motoring Power Limit
[Motoring Power Lmt]

This parameter provides for a user entry of the maximum power level that will be supplied to the motor from the DC bus. The motoring power limit is used in a calculation that results in an internal torque limit.

Parameter Number	**177**
Parameter Type	Sink
Display Units	x.x%
Drive Units	4096 @ rated motoring power
Factory Default	200.0%
Minimum Value	0.0 %
Maximum Value	800.0%

Regen Power Limit
[Regen. Power Lmt]

This parameter provides a user entry for the maximum power level that will be transferred from the motor to the DC bus.

Parameter Number	**178**
Parameter Type	Sink
Display Units	– x.x%
Drive Units	4096 @ rated regen power
Factory Default	– 200.0%
Minimum Value	– 800.0%
Maximum Value	0.0%

Positive Motor Current Reference Limit
[Pos Mtr Cur Lmt]

This parameter specifies the largest allowable positive motor Iq axis current that will be commanded. Bit 0 in Parm 183 indicates when this parameter is actively restricting Iq current.

Parameter Number	**179**
Parameter Type	Sink
Display Units	x.x %
Drive Units	4096 @ 100% Motor Current (I_2)
Factory Default	100.0%
Minimum Value	0.0 %
Maximum Value	200.0%

Negative Motor Current Reference Limit
[Neg Mtr Cur Lmt]

This parameter determines the largest allowable negative motor Iq axis current that will be commanded. Bit 8 in Parm 183 indicates when this parameter is actively restricting Iq current.

Parameter Number	**180**
Parameter Type	Sink
Display Units	– x.x %
Drive Units	4096 @ 100% Motor Current (I_2)
Factory Default	– 100.0%
Minimum Value	– 200.0%
Maximum Value	+ 0.0%

Di/DT Limit
[Di/Dt Limit]

This parameter determines the largest allowable rate of change for the Iq reference signal. This number is scaled in units of maximum per unit Iq every 2 msec.

Parameter Number	**181**
Parameter Type	Sink
Display Units	x.x%
Drive Units	4096 = 100.0% Iq per 2msec
Factory Default	20.0%
Minimum Value	0.0%
Maximum Value	30.0%

Computed Power
[Computed Power]

Calculated product of Torque Reference time motor velocity feedback. A 125 msec filter is applied to this result. Positive values indicate motoring power, negative regenerative power.

Parameter Number	**182**
Parameter Type	Source
Display Units	+/–x.x%
Drive Units	4096 @ 100.0% power
Factory Default	+0.0%
Minimum Value	–800.0%
Maximum Value	+800.0%

Torque Limit Status
[Torq Lmt Stat]

This parameter provides a bit coded summary of any condition that may be limiting either the IQ current or torque reference.

Parameter Number	**183**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

0 = Positive Motor IQ Limit
1 = Positive NTC Inverter Foldback
2 = Positive IT Inverter Foldback
3 = Positive Maximum Inverter Current
4 = Positive Torque Limit
5 = Positive Torque Power Limit
6 = Positive Autotune Torque
7 = Not Used
8 = Negative Motor Iq Limit
9 = Negative NTC Inverter Protection Foldback
10 = Negative IT Inverter Protection Foldback
11 = Negative Maximum Inverter Current
12 = Negative Torque Limit
13 = Negative Torque Power Limit
14 = Negative Autotune Torque Limit
15 = Reserved, Leave Zero

Torque Mode Status
[Torq Mode Stat]

This parameter provides a bit coded indication of the currently active torque mode. If the drive is running, this parameter reflects the Torque Mode selected in Torque Mode Sel (P 53). If the drive is coasting or stopped this parameter will indicate the active torque mode is zero. If in min or max mode, then the corresponding min/max bit will be set along with the appropriate speed or torque mode bit, as determined by the outcome of the min/max selector.
Bits are defined as:

Bit 0 – Zero Torque (Iq = 0)
Bit 1 – Speed Mode
Bit 2 – Torque Mode
Bit 3 – Minimum Speed/Torque
Bit 4 – Maximum Speed/Torque
Bit 5 – Sum Speed + Torque
Bit 6 to Bit 15 – Reserved, Leave Zero

Parameter Number	**184**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

Perunit Motor Current
[Motor Cur Fdbk]

Displays the perunit value of motor current as determined from the LEM current sensors. This data is scaled to read 1.0 pu at rated motor current. This is a version of parameter 264 that has been scaled to be compatible with analog outputs. This data is averaged and updated on a 50 millisecond basis.

Parameter Number	**185**
Parameter Type	Source
Display Units	x.x%
Drive Units	4096 = 100% motor current
Factory Default	0.0%
Minimum Value	0.0%
Maximum Value	800.0%

Perunit Motor Voltage
[Motor Volt Fdbk]

Displays the perunit value of motor voltage as determined from an analog–to–digital converter input. This data is scaled to read 1.0 pu at rated motor voltage. This is a version of parameter 265 that has been scaled to perunit to be compatible with analog outputs. This data is averaged and updated on a 50 millisecond basis.

Parameter Number	**186**
Parameter Type	Source
Display Units	x.x%
Drive Units	4096 = 100.0% motor voltage
Factory Default	0.0%
Minimum Value	0.0%
Maximum Value	800.0%

Rated Inverter Output Amps
[Base Drive Curr]

Current rating of inverter.
Automatically set by drive at powerup as a function of Power Structure Type. Used for current ref scaling and current processor feedback scaling.

Parameter Number	**220**
Parameter Type	Source
Display Units	x.x amps
Drive Units	Display units x 10
Factory Default	20.0 amps
Minimum Value	0.1 amps
Maximum Value	3,276.7 amps

Rated Inverter Input Voltage
[Base Line Volt]

Drive Nameplate Voltage rating of inverter. Automatically set by drive at powerup as a function of Power Structure Type.

Parameter Number	**221**
Parameter Type	Source
Display Units	x volt
Drive Units	Non
Factory Default	460 volt
Minimum Value	75 volt
Maximum Value	575 volt

Inverter Carrier Frequency
[PWM Frequency]

This parameter defines the drive carrier frequency in Hz.

Parameter Number	**222**
Parameter Type	Sink
Display Units	x Hz
Drive Units	None
Factory Default	4,000 Hz
Minimum Value	1,000 Hz
Maximum Value	12,000 Hz

Precharge/Ridethru Selection
[Prech/Rdethru Sel]

Parameter Number	**223**
File:group	Application:Bus Reg/Control
Parameter Type	linkable destination
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Conversion:	**1 = 1**

Parameter 223 lets you choose options for the bus filter reference, precharge/ride-through conditions, and braking.
Use bits 0 through 4 to set the slew rate for the bus voltage tracker. The bus voltage tracker slowly tracks changes in the actual bus voltage. If none of the bits (0 through 4) are set, the slew rate is 0.05V/second.

The precharge function of the drive limits the current to the bus capacitors when power is initially applied to the drive. The precharge function is completed after a minimum 300 millisecond time delay and bus voltage at least 30 volts greater than the undervoltage setpoint and a stable bus voltage. Ridethrough provides extended logic operating time if the power lines drop out while the drive is running. If the pre-charge function is enabled, ridethrough also provides inrush current protection by starting a precharge, in case the incoming power returns.

The bits are defined as follows:

Bit	Description
0	**Slew Rate 1** Set to choose a slew rate of 10V/second Bit
1	**Slew Rate 2** Set to choose a slew rate of 5V/second
2	**Slew Rate 3** Set to choose a slew rate of 0.5V/second
3	**Slew Rate 4** Set to choose a slew rate of 0.05V/second
4	**Slew Rate 5** Set to choose a slew rate of 0.005V/second
5	**Reserved** Leave 0

For additional information about Precharge/Ridethrough Selection, refer to Chapter 12, Troubleshooting

Bit	Description
6	**Reserved** Leave 0
7	**Reserved** Leave 0
8	**Fast Fluxup** Set to enable fast flux up
9	**Reserved** Leave 0
10	**Reserved** Leave 0
11	**Prech Exit** Set to force an exit from precharge after the precharge timeout.
12	**En Comm Bus** Set to enable common bus precharge. External fault input is used as precharge enable.
13	**Dis Prech Tm** Set to disable bus precharge and undervoltage faults while the drive is disabled.
14	**Dis Mult Pre** Set to disable all precharges after the first power up.
15	**Dis Ridethru** Set to disable all ridethroughs.

Undervoltage Setpoint
[Under Volt Stpnt]

This sets the minimum threshold voltage as a percent of line voltage that will be compared with the DC Bus Voltage as a check for a Bus Undervoltage condition.

Parameter Number	**224**
Parameter Type	Sink
Display Units	x.x%
Drive Units	None
Factory Default	61.5%
Minimum Value	10.0%
Maximum Value	90.0%

Bus Precharge Timeout
[Prechrg Timeout]

This parameter establishes a time delay period for DC Bus Precharge. If the Drive fails to finish a DC Bus Precharge in this time, a Precharge Timeout will occur.

Parameter Number	**225**
Parameter Type	Sink
Display Units	x.x Sec
Drive Units	Display units x 10
Factory Default	30.0 Sec
Minimum Value	10.0 Sec
Maximum Value	6553.5 Sec

Bus Ridethru Timeout
[Ridethru Timeout]

This parameter establishes a time delay period for DC Bus Ridethrough. If the bus remains in a low bus ridethru condition longer than this time, a Bus ridethru timeout condition will occur.

Parameter Number	**226**
Parameter Type	Sink
Display Units	x.xxx Sec.
Drive Units	Display units x 1000
Factory Default	2.000 Sec.
Minimum Value	0.000 Sec.
Maximum Value	65.535 Sec.

CP Operating Options [CP Options] For proper operation, bits 0 to 6 must be left at zero. If bit 7 = 0, this allows the motor to coast to a stop after the flux test is completed. If bit 7 = 1, this brings the motor to a controlled stop after the flux test is completed.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**227** Sink Bits None 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0011 0000
Motor Nameplate Horsepower [Base Motor HP] User entered value of nameplate motor horsepower. The drive uses this information in the Dynamic Brake Resistor temperature calculation.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**228** Sink x.x HP Display units x 10 30.0 HP 1.0 HP HP
Base Motor Speed [Base Motor Speed] User entered value of nameplate motor speed in RPM. The drive uses this information to convert motor velocity RPM to/from drive per unit.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**229** Sink x RPM x 1,750 RPM 1 RPM 15,000 RPM
Motor Nameplate AMPS [Base Motor Curr] Drive nameplate current rating of the motor. Used for current reference scaling and current processor feedback scaling.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**230** Sink x.x amps Display units x 10 0.2 amps 0.1 amps Based on parameter 220
Motor Nameplate VOLTS [Base Motor Volt] Drive nameplate voltage rating of the motor.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**231** Sink x Volt None 460 volt 75 volt 575 volt
Motor Nameplate Frequency [Base Motor Freq] Drive nameplate frequency rating of the motor.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**232** Sink x.x Hz display units x 10 60 Hz 1 Hz 250 Hz
Motor Nameplate Poles [Motor Poles] Total number of motor poles in motor.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**233** Sink x poles None 4 poles 2 poles 40 poles
Motor Inertia [Motor Inertia] Time taken to accelerate an uncoupled motor from zero to base speed at rated torque.	**Parameter Number** **Parameter Type** **Display Units** **Drive Units** **Factory Default** **Minimum Value** **Maximum Value**	**234** Sink x.xx Sec Display units x 100 0.60 Sec 0.01 Sec 655 Sec

Encoder PPR
[Encoder PPR]

User entered pulse per revolution rating of the feedback device when using an encoder to determine motor velocity.

Parameter Number	**235**
Parameter Type	Sink
Display Units	x PPR
Drive Units	None
Factory Default	1,024 ppr
Minimum Value	500 ppr
Maximum Value	20,000 ppr

RS Tune
[Stator Res]

Sum of the stator and cable resistances of the motor in a per unit (percent representation) This parameter is determined by the autocommissioning routine.

Parameter Number	**236**
Parameter Type	Sink
Display Units	x.xx %
Drive Units	4096 = 100.00% Stator Res
Factory Default	1.50%
Minimum Value	0.00%
Maximum Value	100.00%

Lsigma Tune [Leakage Inductance]
[Leakage Ind]

Sum of the motor stator and rotor leakage inductances and the motor cable inductance in a per unit base impedance. This parameter is determined by the autocommissioning routine.

Parameter Number	**237**
Parameter Type	Sink
Display Units	x.xx%
Drive Units	4096 = 100% Leakage Ind.
Factory Default	18.00%
Minimum Value	0.00%
Maximum Value	100.00%

Id Tune [Base Flux Current]
[Base Flux Cur]

Magnetizing current which produces rated flux in the motor in a per unit (percent) representation. This parameter is determined by the autocommissioning routine but can be entered manually.

Parameter Number	**238**
Parameter Type	Sink
Display Units	x.x%
Drive Units	4096 = 100.0% motor amps
Factory Default	30.0%
Minimum Value	0.0%
Maximum Value	75.0%

Iq Tune (Rated Torque Current)
[Base Torque Cur]

Current which produces rated torque in the motor in a per unit (percent) representation. This parameter is determined by the autocommissioning routine but can be entered manually.

Parameter Number	**240**
Parameter Type	Sink
Display Units	x.xx%
Drive Units	1024 = 100.00% Iq Motor
Factory Default	95.40 %
Minimum Value	0.00%
Maximum Value	100.00%

Vde Tune (Base Torque Voltage)
[Base Torque Volt]

D axis voltage command to the motor at rated speed and rated current. Parameter calculated by autocommissioning routine and MUST NOT BE CHANGED. Data represented as X.X volts

Parameter Number	**241**
Parameter Type	Sink
Display Units	x.x volts
Drive Units	16 = 1 volt (L–N)
Factory Default	–75.0 volts
Minimum Value	–468.0 volts
Maximum Value	0.0 volts

Vqe Tune (Rated Flux Voltage)
[Base Flux Volt]

Q axis voltage command to the motor at rated speed and rated current if motor is not in field weakening. Parameter calculated by autocommissioning routine and MUST NOT BE CHANGED. Data represented as X.X volts.

Parameter Number	**242**
Parameter Type	Sink
Display Units	x.x volts
Drive Units	16 = 1 volt (L–N)
Factory Default	367.0 volts
Minimum Value	0.0 volts
Maximum Value	468.0 volts

Vde Maximum (Peak HP)
[Vde Max]

Maximum D axis voltage allowed on the motor. Parameter calculated by autocommissioning routine and MUST NOT BE CHANGED. Data represented as X.X volts.

Parameter Number	**243**
Parameter Type	Sink
Display Units	x.x volts
Drive Units	16 = 1 volt line to neutral peak
Factory Default	112.5 volts
Minimum Value	0.0 volts
Maximum Value	468.0 volts

Vqe Maximum (Constant HP)
[Vqe Max]

Q axis voltage at which the motor enters field weakening. Parameter calculated by autocommissioning routine and MUST NOT BE CHANGED. Data represented as x.x volts

Parameter Number	**244**
Parameter Type	Sink
Display Units	x.x volts
Drive Units	16 = 1 volt (L–N)
Factory Default	367.0 volts
Minimum Value	0.0 volts
Maximum Value	468.8 volts

Vde Minimum (Constant HP)
[Vde Min]

D axis voltage below which the adaption to motor changes in the torque control is disabled. Parameter calculated by autocommissioning routine and MUST NOT BE CHANGED. Data represented as x.x volts

Parameter Number	**245**
Parameter Type	Sink
Display Units	x.x Volts
Drive Units	16 = 1 volt line to neutral peak
Factory Default	3.0 volts
Minimum Value	0.0 volts
Maximum Value	50.0 volts

Kslip (Base Slip Frequency)
[Base Slip Freq]

Base slip frequency of the motor. Parameter calculated by autocommissioning routine. Data represented as x.x Hz.

Parameter Number	**246**
Parameter Type	Sink
Display Units	x.xx Hz
Drive Units	256 = 1Hz/unit torque
Factory Default	0.832 Hz
Minimum Value	0.000 Hz
Maximum Value	10.000 Hz

Kslip Maximum
[Base Slip Fr Max]

Maximum slip frequency allowed on the motor. Parameter calculated by autocommissioning routine and MUST NOT BE CHANGED. Data represented as x.x Hz.

Parameter Number	**247**
Parameter Type	Sink
Display Units	x.xx Hz
Drive Units	256 = 1Hz/unit torque
Factory Default	2.00 Hz
Minimum Value	0.00 Hz
Maximum Value	30.00 Hz

Kslip Minimum
[Base Slip Fr Min]

Minimum slip frequency allowed on the motor. Calculated by autocommissioning routine and MUST NOT BE CHANGED. Data represented as x.x Hz.

Parameter Number	**248**
Parameter Type	Sink
Display Units	x.xx Hz
Drive Units	256 = 1Hz / unit torque
Factory Default	0.50 Hz
Minimum Value	0.00 Hz
Maximum Value	10.00 Hz

Kp – Slip Regulator
[Kp Slip]

Proportional Gain of the slip regulator. This parameter MUST NOT BE CHANGED.
Data represented as x.

Parameter Number	**249**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	153
Minimum Value	0
Maximum Value	32767

Ki – Slip Regulator
[Ki Slip]

Integral Gain of the slip regulator. This parameter MUST NOT BE CHANGED. Data represented as x.

Parameter Number	**250**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	306
Minimum Value	0
Maximum Value	32767

Kp – Flux Regulator
[Kp Flux]

Proportional Gain of the Flux regulator. This parameter MUST NOT BE CHANGED.
Data represented as x.

Parameter Number	**251**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	300
Minimum Value	0
Maximum Value	32767

Ki – Regulator
[Ki Flux]

Integral gain of the slip regulator This parameter MUST NOT BE CHANGED. Data represented as x.

Parameter Number	**252**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	125
Minimum Value	0
Maximum Value	32767

Autotune/Diagnostics Selection
[Autotun Diag Sel]

This parameter allows selection of drive diagnostic and commisioning tests by setting individual bits in this parameter:

Parameter Number	**256**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	0000 0001 1111 1111
Enums:	

Bit 0 = Inverter transistor Diagnostics
Bit 1 = Motor Phase Rotation Test
Bit 2 = Lsigma Measure Test
Bit 3 = Rs Measure Test
Bit 4 = Id Measure Test
Bit 5 = Torque Block Calc Test
Bit 6 = Motor Inertia Test
Bit 7 = System Inertia Test
Bit 8 = Velocity Loop Gain

Transistor Diagnostics Configuration
[Tran Diag Disabl]

This parameter provides a means of disabling certain transistor diagnostic tests by setting the following bits:

Parameter Number	**257**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

Bit 0 = Disable I feedback phase U offset
Bit 1 = Disable I feedback phase W offset
Bit 2 = Disable Shorted Transistor Tests
Bit 3 = Disable Ground Fault Tests
Bit 4 = Disable Open device tests
Bit 5 = Not Used
Bit 6 = Disable Power Trans U Upper, for all tests
Bit 7 = Disable Power Trans U Lower, for all tests
Bit 8 = Disable Power Trans V Upper, for all tests
Bit 9 = Disable Power Trans V Lower, for all tests
Bit 10 = Disable Power Trans W Upper, for all tests
Bit 11 = Disable Power Trans W Lower, for all tests
Bit 12 = High Induct*
Bit 13 = Reserved (Always leave 0)
Bit 14 = Reserved (Always leave 0)
Bit 15 = Reserved (Always leave 0)
**High Inductance motors may need extended test time to determine opens. Setting bit 12 increases the test time.*

Inverter Diagnostics Result #1
[Inverter Diag 1]

The results of the Transistor Diagnostic Tests are given in parameter 258 & 259.

Parameter Number	**258**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

Bit 0 = Software Fault
Bit 1 = No motor connected, or open bus fuse
Bit 2 = Phase U and W Shorted
Bit 3 = Phase U and V shorted
Bit 4 = Phase V and W shorted
Bit 5 = Shorted modules
Bit 6 = Ground fault
Bit 7 = Fault before shorted module ran
Bit 8 = Hardware overvoltage fault occurred
Bit 9 = Hardware desaturation fault occurred
Bit 10 = Hardware ground fault occurred
Bit 11 = Hardware phase overcurrent fault occurred
Bit 12 = Open power transistor(s) *See bit 12 in parameter 257*
Bit 13 = Current feedback fault(s)
Bit 14 = Reserved. Leave Zero
Bit 15 = Reserved, Leave Zero

Inverter Diagnostics Result #2
[Inverter Diag 2]

The results of the Transistor Diagnostic Tests are given in parameters 258 & 259. If any of the bits shown below are set, then a problem with the associated test is indicated.

Parameter Number	**259**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

0 = Transistor U upper shorted
1 = Transistor U lower shorted
2 = Transistor V upper shorted
3 = Transistor V lower shorted
4 = Transistor W upper shorted
5 = Transistor W lower shorted
6 = Current fdbk ph U offset too big
7 = Current fdbk ph W offset too big
8 = Transistor U upper open*
9 = Transistor U lower open*
10 = Transistor V upper open*
11 = Transistor V lower open*
12 = Transistor W upper open*
13 = Transistor W lower open*
14 = Current feedback phase U open*
15 = Current feedback phase W open*

**See Parameter 257, bit 12*

Iq OFFSET
[Iq Offset]

This parameter contains the LEM U offset required to null the current error. (no motor current flowing) This offset is set automatically by running the transistor diagnostics.

Parameter Number	**260**
Parameter Type	Sink
Display Units	+/– x
Drive Units	None
Factory Default	+0
Minimum Value	–100
Maximum Value	+100

Id OFFSET
[Id Offset]

This parameter contains the LEM W offset required to null the current error. (no motor current flowing) This offset is set automatically by running the transistor diagnostics.

Parameter Number	**261**
Parameter Type	Sink
Display Units	+/– x
Drive Units	None
Factory Default	+0
Minimum Value	–100
Maximum Value	+100

Phase Rotation Current Reference
[Ph Rot Curr Ref]

This parameter sets the current reference that will be used when the Phase Rotation test is run (Parm 256, bit 1)

Parameter Number	**262**
Parameter Type	Sink
Display Units	x.x%
Drive Units	4096 = 100.0% Motor Current
Factory Default	50.0%
Minimum Value	0.0%
Maximum Value	100.0%

Phase Rotation Frequency Reference
[Phase Rot Freq Ref]

This parameter sets the frequency reference that will be used when the Phase Rotation test is run (Parm 256, bit 1)

Parameter Number	**263**
Parameter Type	Sink
Display Units	x.x Hz
Drive Units	128 @ 1 Hz
Factory Default	3.0 Hz
Minimum Value	– 30.0 Hz
Maximum Value	+30.0 Hz

Motor Current Magnitude Feedback
[Motor Cur Fdbk]

Displays the actual RMS value of the motor current as determined from the LEM current sensors. This data is averaged and updated on a 50 millisecond basis.

Parameter Number	**264**
Parameter Type	Source
Display Units	x.x Amp
Drive Units	Display units x 10
Factory Default	0.0 amps
Minimum Value	0.0 amps
Maximum Value	6,553.5 amps

Motor Voltage Magnitude
[Motor Volt Fdbk]

Displays the actual Line–to–Line RMS value of motor voltage. This data is averaged and updated on a 50 millisecond basis.

Parameter Number	**265**
Parameter Type	Source
Display Units	x Volt
Drive Units	None
Factory Default	+ 0 Volt
Minimum Value	– 3,000 Volt
Maximum Value	+3,000 Volt

Stator Frequency
[Freq Command]

Displays the actual value of motor stator frequency. Units are in Hz times 128 (128 @ 1 Hz)

Parameter Number	**266**
Parameter Type	Source
Display Units	x .xxx Hz
Drive Units	128 @ 1Hz
Factory Default	0 .000 Hz
Minimum Value	–255.992 Hz
Maximum Value	+255.922 Hz

Calculated Torque
[Calc Torque]

This parameter will display the calculated value of motor torque as determined by the Velocity Processor. The actual value of motor torque will be within 5% of this value. Scaling is 4096 at rated motor torque. This data is updated on a 2 millisecond basis.

Parameter Number	**267**
Parameter Type	Source
Display Units	+/– x.x%
Drive Units	4096 = 100.0 %
Factory Default	0.0
Minimum Value	–800.0%
Maximum Value	+800.0%

DC Bus Voltage
[DC Bus Voltage]

This is the actual Bus Voltage as read by the software from an analog input port. Units are in volts.

Parameter Number	**268**
Parameter Type	Source
Display Units	x Vlt
Drive Units	None
Factory Default	0 volts
Minimum Value	0 volts
Maximum Value	1,000 volts

Filtered Velocity Feedback
[Filt Vel Fdbk]

This parameter contains a filtered version of velocity feedback. The value contained in this parameter is not meant to be used for control, only for display and monitoring purposes.

Parameter Number	**269**
Parameter Type	Source
Display Units	x.x rpm
Drive Units	4096 = base motor speed
Factory Default	0.0 rpm
Minimum Value	– 8 x Base Speed
Maximum Value	+8 x Base Speed

Inverter Temperature Feedback
[Inv Temp Fdbk]

Inverter temperature determined by NTC device on heatsink power structure.
Can be configured to generate either a warning or fault when heatsink reaches 80 degrees C.

Parameter Number	**270**
Parameter Type	Source
Display Units	+/– x deg
Drive Units	None
Factory Default	0 deg
Minimum Value	– 50 deg
Maximum Value	+255 deg

Limited Motor Flux
[Lim Motor Flux]

This parameter displays the level of motor field flux calculated by the current processor and limited by the Min Flux Level parameter (Param 174).

Parameter Number	**271**
Parameter Type	Source
Display Units	x.x%
Drive Units	4096 = 100% flux
Factory Default	100%
Minimum Value	12.5%
Maximum Value	100%

Testpoint Selection #1
[Torq TP Sel 1]

This parameter selects a torque block test point. The value of that test point can be read from Torq TP Data 1 (Parm 274).

Parameter Number	**273**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	100

Testpoint Data #1 [Torq TP Sel 1] This parameter contains the data selected by Testpoint Selection #1 (param 273).	**Parameter Number**	**274**
	Parameter Type	Source
	Display Units	+/– x
	Drive Units	None
	Factory Default	0
	Minimum Value	–32767
	Maximum Value	32767

Testpoint Selection #2 [Torq TP Sel 2] This parameter selects a torque block test point. The value of that test point can be read from Testpoint Data #2 (Parm 276).	**Parameter Number**	**275**
	Parameter Type	Sink
	Display Units	x
	Drive Units	None
	Factory Default	0
	Minimum Value	0
	Maximum Value	100

Testpoint Data #2 [Torq TP Data 2] This parameter contains the data selected by Testpoint Selection #1 (param 275).	**Parameter Number**	**276**
	Parameter Type	Source
	Display Units	+/– x
	Drive Units	None
	Factory Default	0
	Minimum Value	–32767
	Maximum Value	32767

Testpoint Selection #3 [Torq TP Sel 3] This parameter selects a torque block test point. The value of that test point can be read from Testpoint Data #3 (Parm 278).	**Parameter Number**	**277**
	Parameter Type	Sink
	Display Units	x
	Drive Units	None
	Factory Default	0
	Minimum Value	0
	Maximum Value	100

Testpoint Data #3 [Torq TP Data 3] This parameter contains the data selected by Testpoint Selection #3 (param 277).	**Parameter Number**	**278**
	Parameter Type	Source
	Display Units	+/– x
	Drive Units	None
	Factory Default	0
	Minimum Value	–32767
	Maximum Value	32767

Testpoint Selection #4 [Torq TP Select 4] This parameter selects a torque block test point. The value of that test point can be read from Testpoint Data #4 (Parm 280).	**Parameter Number**	**279**
	Parameter Type	Sink
	Display Units	x
	Drive Units	None
	Factory Default	0
	Minimum Value	0
	Maximum Value	100

Testpoint Data #4 [Torq TP Data 4] This parameter contains the data selected by Testpoint Selection #4 (param 279).	**Parameter Number**	**280**
	Parameter Type	Source
	Display Units	+/– x
	Drive Units	None
	Factory Default	0
	Minimum Value	–32767
	Maximum Value	32767

Testpoint Selection #5
[Torq TP Sel 5]
This parameter selects a torque block test point. The value of that test point can be read from Testpoint Data #5 (Parm 282).

Parameter Number	**281**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	100

Testpoint Data #5
[Torq TP Data 5]
This parameter contains the data selected by Testpoint Selection #5 (param 281).

Parameter Number	**282**
Parameter Type	Source
Display Units	+/– x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	32767

Testpoint Selection #6
[Torq TP Sel 6]
This parameter selects a torque block test point. The value of that test point can be read from Testpoint Data #6 (Parm 284).

Parameter Number	**283**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	100

Testpoint Data #6
[Torq TP Data 6]
This parameter contains the data selected by Testpoint Selection #6 (param 283).

Parameter Number	**284**
Parameter Type	Source
Display Units	+/– x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	32767

Selection for Test DAC 1
[Test DAC1 Sel]
This parameter is for factory use only! DO NOT ATTEMPT TO USE.

Parameter Number	**285**
Parameter Type	
Display Units	
Drive Units	
Factory Default	1
Minimum Value	0
Maximum Value	256

Selection for Test DAC 2
[Test DAC2 Sel]
This parameter is for factory use only! DO NOT ATTEMPT TO USE.

Parameter Number	**286**
Parameter Type	
Display Units	
Drive Units	
Factory Default	4
Minimum Value	0
Maximum Value	256

Ki Frequency Regulator
[Ki Freq Reg]
Integral gain of the frequency regulator in sensorless mode. This parameter must not be changed.

Parameter Number	**287**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	300
Minimum Value	0
Maximum Value	32767

Kp Frequency Regulator
[Kp Freq Reg]

Proportional gain of the frequency regulator in sensorless mode. This parameter must not be changed.

Parameter Number	**288**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	800
Minimum Value	0
Maximum Value	32767

Kff Freq Regulator
[Kff Freq Reg]

Feedforward gain of the frequency regulator in sensorless mode. This parameter must not be changed.

Parameter Number	**289**
Parameter Type	Sink
Display Units	x
Drive Units	1 = 256
Factory Default	1
Minimum Value	0
Maximum Value	128

Ksel Freq Regulator
[Ksel Freq Reg]

Low frequency gain boost of the frequency regulator in sensorless mode. This parameter must not be changed.

Parameter Number	**290**
Parameter Type	Sink
Display Units	x.x
Drive Units	None
Factory Default	67
Minimum Value	0.0
Maximum Value	32767

Frequency Tracker Filter
[Freq Track Filt]

Rotor frequency regulator filter in sensorless mode. This parameter must not be changed.

Parameter Number	**291**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	5000
Minimum Value	0
Maximum Value	32767

Tracking Filter Type
[Track Filt Type]

Low frequency filter select of the frequency regulator in sensorless mode. This parameter must not be changed by non–factory personnel.

Parameter Number	**292**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	1 (Self Adjust)
Minimum Value	0 (Fixed)
Maximum Value	128

Frequency Trim Filter
[Freq Trim Filt]

Slip frequency regulator filter in sensorless mode. This parameter must not be changed.

Parameter Number	**293**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	5000
Minimum Value	0
Maximum Value	32767

Motor Phase Rotation Errors
[Phs Test Rot Err]

This parameter indicates an error condition detected during the motor phase rotation test.
1 = Drive condition true
0 = Drive condition false

Parameter Number	**294**
Parameter Type	Source
Display Units	Bit
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

Bits are defined as:

Bit	**Condition**
0	Enable Drop Out
1 to 15	Reserved

Motor Inductance Test Errors
[Lo Test Error]

This parameter indicates an error condition detected during the motor inductance test.
1 = Drive condition true
0 = Drive condition false

Bits are defined as follows:

Bit	Condition
0	Motor Not at Zero Speed
1	Sign Error
2	Zero Current
3	A/D Overflow at min gain
4	Enable drop out
5	Sign error/Overflow
6 to 15	Reserved

Parameter Number	**295**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111

Motor Stator Resistance Test Errors
[Rs Test Error]

Low frequency gain boost of the frequency regulator in sensorless mode. This parameter must not be changed.

Bits are defined as follows:

Bit	Condition
0	Motor Not at Zero Speed
1	Sign Error
2	Not Used
3	Zero Current
4	Not Used
5	Software Error
6	Not Used
7	Enable Drop Out
8–15	Reserved

Parameter Number	**296**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111

Motor Flux (Id) Test Errors
[Id Test Error]

This parameter indicates an error condition detected during the motor flux (Id) test. If a bit is set to "1" the Drive condition is true, otherwise the condition is false.

Bits are defined as follows:

Bit	Condition
0	Autotune Speed Low (30% min)
1	Identified Id < zero
2	Identified Id > 100% motor current
3	Enable drop out
4–15	Reserved

Parameter Number	**297**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111

Torque Block Calculation Errors
[Torq Calc. Error]

This word parameter indicates an error condition which has been detected during the torque block calculations. If a bit is set to "1" the Drive condition is true, otherwise the condition is false.

Bits are defined as:

Bit	Condition
0	Negative or Zero Slip
1 to 15	Reserved

Parameter Number	**298**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
Enums:	

NOTE: The Parameters shown here in the range from 300 to 500 are Standard Adapter Parameters Only!
Parameter descriptions for PLC Comm Adapter Parameters are covered in the PLC Comm Adapter User Manual.

Adapter Identification Number
[Adapter ID]

This parameter displays the Standard Adapter ID.

Parameter Number	**300**
Parameter Type	Source
Display Units	x
Drive Units	None
Factory Default	2
Minimum Value	2
Maximum Value	2

Adapter Software Version
[Adapter Version]

This parameter displays the software version number.

Parameter Number	**301**
Parameter Type	Source
Display Units	x.xx
Drive Units	None
Factory Default	x.xx
Minimum Value	0.00
Maximum Value	9.99

Adapter Config
[Adapter Config]

(Not Used In Present Release)

Parameter Number	**302**
Parameter Type	Source
Display Units	
Drive Units	
Factory Default	
Minimum Value	
Maximum Value	

Language Select
[Language Select]

This parameter makes the selection between two languages:
0 – Primary Language
1 – Alternate Language

Parameter Number	**304**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	1

Data In A1
[Data In A1]

This parameter displays the SCANport to drive image which is received from some device on SCANport.

Parameter Number	**310**
Parameter Type	Source
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Data In A2
[Data In A2]

This parameter displays the SCANport to drive image which is received from some device on SCANport.

Parameter Number	**311**
Parameter Type	Source
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Data In B1
[Data In B1]

This parameter displays the SCANport to drive image which is received from some device on SCANport.

Parameter Number	**312**
Parameter Type	Source
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Data In B2
[Data In B2]
This parameter displays the SCANport to drive image which is received from some device on SCANport.

Parameter Number	**313**
Parameter Type	Source
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Data In C1
[Data In C1]
This parameter displays the SCANport to drive image which is received from some device on SCANport.

Parameter Number	**314**
Parameter Type	Source
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Data In C2
[Data In C2]
This parameter displays the SCANport to drive image which is received from some device on SCANport.

Parameter Number	**315**
Parameter Type	Source
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Data In D1
[Data In D2]
This parameter displays the SCANport to drive image which is received from some device on SCANport.

Parameter Number	**316**
Parameter Type	Source
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Data In D2
[Data In D2]
This parameter displays the SCANport to drive image which is received from some device on SCANport.

Parameter Number	**317**
Parameter Type	Source
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Data Out A1
[Data Out A1]
This parameter displays the drive to SCANport image which is sent to some device on SCANport

Parameter Number	**320**
Parameter Type	Sink
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Data Out A2
[Data Out A2]
This parameter displays the drive to SCANport image which is sent to some device on SCANport

Parameter Number	**321**
Parameter Type	Source
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Data Out B1
[Data Out B1]
This parameter displays the drive to SCANport image which is sent to some device on SCANport

Parameter Number	**322**
Parameter Type	Sink
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Data Out B2
[Data Out B2**]**
This parameter displays the drive to SCANport image which is sent to some device on SCANport

Parameter Number	**323**
Parameter Type	Sink
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Data Out C1
[Data Out C1]
This parameter displays the drive to SCANport image which is sent to some device on SCANport

Parameter Number	**324**
Parameter Type	Sink
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Data Out C2
[Data Out C2]
This parameter displays the drive to SCANport image which is sent to some device on SCANport

Parameter Number	**325**
Parameter Type	Sink
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Data Out D1
[Data Out D1]
This parameter displays the drive to SCANport image which is sent to some device on SCANport

Parameter Number	**326**
Parameter Type	Sink
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Data Out D2
[Data Out D2]
This parameter displays the drive to SCANport image which is sent to some device on SCANport

Parameter Number	**327**
Parameter Type	Sink
Display Units	–/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

SCANport Port Enable Mask
[Port Enable Mask]
This parameter selects which SCANport devices can control the Drive.
1 = Permit Control
0 = Deny Control

Parameter Number	**330**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	0111 1111
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3
Bit 1 – SCANport Device 1
Bit 2 – SCANport Device 2
Bit 3 – SCANport Device 3
Bit 4 – SCANport Device 4
Bit 5 – SCANport Device 5
Bit 6 – SCANport Device 6 (Int Gateway)
Bit 7 – Reserved

SCANport Direction Mask
[Direction Mask]

This parameter selects which SCANport devices can issue a forward/reverse command.
1 = Permit Control
0 = Deny Control

Parameter Number	**331**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	0111 1111
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3	Bit 3 – SCANport Device 3	Bit 6 – SCANport Device 6 (Int Gateway)
Bit 1 – SCANport Device 1	Bit 4 – SCANport Device 4	Bit 7 – Reserved
Bit 2 – SCANport Device 2	Bit 5 – SCANport Device 5	

SCANport Start Mask
[Start Mask]

This parameter selects which SCANport devices can issue a start command.
1 = Permit Control
0 = Deny Control

Parameter Number	**332**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	0111 1111
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3	Bit 3 – SCANport Device 3	Bit 6 – SCANport Device 6 (Int Gateway)
Bit 1 – SCANport Device 1	Bit 4 – SCANport Device 4	Bit 7 – Reserved
Bit 2 – SCANport Device 2	Bit 5 – SCANport Device 5	

SCANport Jog Mask
[Jog Mask]

This parameter selects which SCANport devices can issue a Jog command.
1 = Permit Control
0 = Deny Control

Parameter Number	**333**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	0111 1111
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3	Bit 3 – SCANport Device 3	Bit 6 – SCANport Device 6 (Int Gateway)
Bit 1 – SCANport Device 1	Bit 4 – SCANport Device 4	Bit 7 – Reserved
Bit 2 – SCANport Device 2	Bit 5 – SCANport Device 5	

SCANport Reference Mask
[Reference Mask]

This parameter selects which SCANport device can issue a reference command.
1 = Permit Control
0 = Deny Control

Parameter Number	**334**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	0111 1111
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3	Bit 3 – SCANport Device 3	Bit 6 – SCANport Device 6 (Int Gateway)
Bit 1 – SCANport Device 1	Bit 4 – SCANport Device 4	Bit 7 – Reserved
Bit 2 – SCANport Device 2	Bit 5 – SCANport Device 5	

SCANport Clear Fault Mask
[Clear Fault Mask]

This parameter selects which SCANport devices can issue a Clear Faults command.
1 = Permit Control
0 = Deny Control

Parameter Number	**335**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	0111 1111
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3	Bit 3 – SCANport Device 3	Bit 6 – SCANport Device 6 (Int Gateway)
Bit 1 – SCANport Device 1	Bit 4 – SCANport Device 4	Bit 7 – Reserved
Bit 2 – SCANport Device 2	Bit 5 – SCANport Device 5	

SCANport Reset Drive Mask
[Reset Drive Mask]

This parameter selects which SCANport devices can issue a Reset Drive command.
1 = Permit Control
0 = Deny Control

Parameter Number	**336**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	0111 1111
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3
Bit 1 – SCANport Device 1
Bit 2 – SCANport Device 2
Bit 3 – SCANport Device 3
Bit 4 – SCANport Device 4
Bit 5 – SCANport Device 5
Bit 6 – SCANport Device 6 (Int Gateway)
Bit 7 – Reserved, Leave Zero

SCANport Local Control Mask
[Local Mask]

This parameter selects which SCANport devices can take local control.
1 = Permit Control
0 = Deny Control

Parameter Number	**337**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	0111 1111
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3
Bit 1 – SCANport Device 1
Bit 2 – SCANport Device 2
Bit 3 – SCANport Device 3
Bit 4 – SCANport Device 4
Bit 5 – SCANport Device 5
Bit 6 – SCANport Device 6 (Int Gateway)
Bit 7 – Reserved, Leave Zero

SCANport Stop Owner
[Stop Owner]

This parameter displays which SCANport devices are presently issuing a valid stop command.
1 = Stop Input Present
0 = Stop Input Not Present

Parameter Number	**340**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3
Bit 1 – SCANport Device 1
Bit 2 – SCANport Device 2
Bit 3 – SCANport Device 3
Bit 4 – SCANport Device 4
Bit 5 – SCANport Device 5
Bit 6 – SCANport Device 6 (Int Gateway)
Bit 7 – Reserved, Leave Zero

SCANport Direction Owner
[Direction Owner]

This parameter displays which SCANport device currently has exclusive control of direction changes.
1 = Current Owner
0 = Non Owner

Parameter Number	**341**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3
Bit 1 – SCANport Device 1
Bit 2 – SCANport Device 2
Bit 3 – SCANport Device 3
Bit 4 – SCANport Device 4
Bit 5 – SCANport Device 5
Bit 6 – SCANport Device 6 (Int Gateway)
Bit 7 – Reserved, Leave Zero

SCANport Start Owner
[Start Owner]

This parameter displays which SCANport devices are presently issuing a valid start command.
1 – Start Input Present
0 – Start Input Not Present

Parameter Number	**342**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3
Bit 1 – SCANport Device 1
Bit 2 – SCANport Device 2
Bit 3 – SCANport Device 3
Bit 4 – SCANport Device 4
Bit 5 – SCANport Device 5
Bit 6 – SCANport Device 6 (Int Gateway)
Bit 7 – Reserved, Leave Zero

SCANport Jog 1 Owner
[Jog 1 Owner]

This parameter displays which SCANport devices are presently issuing a valid jog 1 command.
1 = Jog 1 Input present
0 = Jog 1 Input Not Present

Parameter Number	**343**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3
Bit 1 – SCANport Device 1
Bit 2 – SCANport Device 2
Bit 3 – SCANport Device 3
Bit 4 – SCANport Device 4
Bit 5 – SCANport Device 5
Bit 6 – SCANport Device 6 (Int Gateway)
Bit 7 – Reserved, Leave Zero

SCANport Jog 2 Owner
[Jog 2 Owner]

This parameter displays which SCANport devices are presently issuing a valid jog 2 command.
1 = Jog 2 Input Present
0 = Jog 2 Input Not Present

Parameter Number	**344**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3
Bit 1 – SCANport Device 1
Bit 2 – SCANport Device 2
Bit 3 – SCANport Device 3
Bit 4 – SCANport Device 4
Bit 5 – SCANport Device 5
Bit 6 – SCANport Device 6 (Int Gateway)
Bit 7 – Reserved, Leave Zero

SCANport Reference Owner
[Reference Owner]

This parameter displays which SCANport device currently has exclusive control of the reference changes.
1 = Current Owner
0 = Non Owner

Parameter Number	**345**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3
Bit 1 – SCANport Device 1
Bit 2 – SCANport Device 2
Bit 3 – SCANport Device 3
Bit 4 – SCANport Device 4
Bit 5 – SCANport Device 5
Bit 6 – SCANport Device 6 (Int Gateway)
Bit 7 – Reserved, Leavc Zero

SCANport Local Control Owner
[Local Owner]

This parameter displays which SCANport device currently has exclusive control of the drive.
1 = Current Owner
0 = Non Owner

Parameter Number	**346**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3
Bit 1 – SCANport Device 1
Bit 2 – SCANport Device 2
Bit 3 – SCANport Device 3
Bit 4 – SCANport Device 4
Bit 5 – SCANport Device 5
Bit 6 – SCANport Device 6 (Int Gateway)
Bit 7 – Reserved, Leave Zero

SCANport Flux Owner
[Flux Owner]

This parameter displays which SCANport devices are presently issuing a valid flux command.
1 = Flux Input Present
0 = Flux Input Not Present

Parameter Number	**347**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3
Bit 1 – SCANport Device 1
Bit 2 – SCANport Device 2
Bit 3 – SCANport Device 3
Bit 4 – SCANport Device 4
Bit 5 – SCANport Device 5
Bit 6 – SCANport Device 6 (Int Gateway)
Bit 7 – Reserved, Leave Zero

SCANport Process Trim Owner
[Trim Owner]

This parameter displays which SCANport devices are currently issuing a valid process trim command.
1 = Process Trim Input Present
0 = Process Trim Input Not Present

Parameter Number	**348**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3	Bit 3 – SCANport Device 3	Bit 6 – SCANport Device 6 (Int Gateway)
Bit 1 – SCANport Device 1	Bit 4 – SCANport Device 4	Bit 7 – Reserved, Leave Zero
Bit 2 – SCANport Device 2	Bit 5 – SCANport Device 5	

SCANport Ramp Owner
[Ramp Owner]

This parameter displays which SCANport devices are presently issuing a valid ramp command.
1 = Ramp Input Present
0 = Ramp Input Not Present

Parameter Number	**349**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3	Bit 3 – SCANport Device 3	Bit 6 – SCANport Device 6 (Int Gateway)
Bit 1 – SCANport Device 1	Bit 4 – SCANport Device 4	Bit 7 – Reserved, Leave Zero
Bit 2 – SCANport Device 2	Bit 5 – SCANport Device 5	

SCANport Clear Fault Owner
[Clr Fault Owner]

This parameter displays which SCANport devices are presently issuing a valid Clear Fault Command.
1 = Clear Fault Input Present
0 = Clear Fault Input Not Present

Parameter Number	**350**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000
Minimum Value	0000 0000
Maximum Value	0111 1111
Enums:	

Bit 0 – TB3	Bit 3 – SCANport Device 3	Bit 6 – SCANport Device 6 (Int Gateway)
Bit 1 – SCANport Device 1	Bit 4 – SCANport Device 4	Bit 7 – Reserved, Leave Zero
Bit 2 – SCANport Device 2	Bit 5 – SCANport Device 5	

10 Volt In Filtr
[10 Volt In Filtr]

This parameter establishes the breakpoint radian frequency for the 10 Volt Input.

Parameter Number	**352**
Parameter Type	
Display Units	x.x r/s
Drive Units	eng x 10 radian/sec.
Factory Default	0.0 r/s
Minimum Value	0.0 r/s
Maximum Value	200.0 r/s

Pot In Filtr
[Pot In Filter]

This parameter establishes the breakpoint radian frequecy for the Pot Input.

Parameter Number	**353**
Parameter Type	
Display Units	x.x r/s
Drive Units	eng. x 10 radian/sec
Factory Default	0.0 r/s
Minimum Value	0.0 r/s
Maximum Value	200.0 r/s

mA In Filtr
[mA In Filter]

This parameter establishes the breakpoint for the mA Input.

Parameter Number	**354**
Parameter Type	
Display Units	x.x r/s
Drive Units	eng. x 10 radian/sec
Factory Default	0.0 r/s
Minimum Value	0.0 r/s
Maximum Value	200.0 r/s

10 Volt Input
[10 Volt Input]

This parameter displays the converted analog value of the +/– 10 volt input.

Parameter Number	**355**
Parameter Type	Source
Display Units	+/– x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

10 Volt Offset
[10 Volt Offset]

This parameter determines the offset applied to the raw analog value of the +/– 10 volt input before the scale factor is applied. This allows the user to shift the range of the analog input.

Parameter Number	**356**
Parameter Type	Sink
Display Units	+/– x.xx volt
Drive Units	205 = 1 volt
Factory Default	+0.00 volt
Minimum Value	–20.00 volt
Maximum Value	+20.00 volt

10 Volt Scale
[10 Volt Scale]

This parameter determines the scale factor or gain for the +/– 10 volt input. The +/– 10 volt input is converted to +/– 2048 and then the scale is applied which allows an effective digital range of +/– 32767.

Parameter Number	**357**
Parameter Type	Sink
Display Units	+/– x.xxx
Drive Units	2048 = 1
Factory Default	+2.000
Minimum Value	–16.000
Maximum Value	+16.000

Pot Input
[Pot Input]

This parameter displays the converted analog value of the pot input.

Parameter Number	**358**
Parameter Type	Source
Display Units	+/– x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Pot Offset
[Pot Offset]

This parameter determines the offset applied to the raw analog value of the pot input before the scale factor is applied. This allows the user to shift the range of the of the analog input.

Parameter Number	**359**
Parameter Type	Sink
Display Units	+/– x.xx volts
Drive Units	205 = 1 volt
Factory Default	+0.000 volt
Minimum Value	–20.000 volt
Maximum Value	+20.000 volt

Pot Scale
[Pot Scale]

This parameter determines the scale factor or gain for the pot input. The pot input is converted to a +/– 2048 and then the scale is applied allowing an effective digital range of +/– 32767

Parameter Number	**360**
Parameter Type	Sink
Display Units	+/– x.xxx
Drive Units	2048 = 1
Factory Default	+1.000
Minimum Value	–16.000
Maximum Value	+16.000

Milli Amp Input
[mA Input]

This parameter displays the converted analog value of the milli amp input.

Parameter Number	**361**
Parameter Type	Source
Display Units	x
Drive Units	None
Factory Default	+0
Minimum Value	0
Maximum Value	+32767

Milli Amp Input Offset
[mA Input Offset]

This parameter determines the offset applied to the raw analog value of the milli amp input before the scale factor is applied. This allows the user to shift the range of the analog input.

Parameter Number	**362**
Parameter Type	Sink
Display Units	+ x.xxx mA
Drive Units	128 = 1mA
Factory Default	+0.000 mA
Minimum Value	–32.000 mA
Maximum Value	+32.000 mA

Milli Amp Input Scale
[mA Input Scale]

This parameter determines the scale factor or gain for the milli amp input. The milli amp input is converted to a +/– 2048 and then the scale is applied which allows an effective digital range of +/– 32767.

Parameter Number	**363**
Parameter Type	Sink
Display Units	+/– x.xxx
Drive Units	2048 = 1
Factory Default	+2.000
Minimum Value	–16.000
Maximum Value	+16.000

SCANport Analog1 Select
[SB Analog Sel]

This parameter selects which SCANport analog device is used in parameter 365 ‘SP Analog In’.

Parameter Number	**364**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	1
Minimum Value	1
Maximum Value	6
Enums:	

1	SCANport 1	4	SCANport 4
2	SCANport 2	5	SCANport 5
3	SCANport 3	6	SCANport 6

SCANport Analog1 In
[SB Analog1 In]

This parameter displays the analog value of the SCANport device selected in parameter 364 ‘SP Analog Sel’.

Parameter Number	**365**
Parameter Type	Source
Display Units	+/– x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

SP Analog1 Scale
[SB Analog1 Scale]

This parameter can be used to scale the value in Parameter 365.

Parameter Number	**366**
Parameter Type	Sink
Display Units	+/–x
Drive Units	+/– 1, 1 = 32767
Factory Default	1 (32767)
Minimum Value	–1 (–32767)
Maximum Value	1 (32767)

SCANport Analog2 Select
[SB Analog2 Sel]

This parameter selects which SCANport analog device is used in parameter 368 'SB Analog In 2'.

Parameter Number	**367**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	1
Minimum Value	1
Maximum Value	6
Enums:	

1	Scanport 1	4	Scanport 4
2	Scanport 2	5	Scanport 5
3	Scanport 3	6	Scanport 6

SCANport Analog2 In
[SB Analog2 In]

This parameter displays the analog value of the SCANport device selected in parameter 367 'SP Analog2 Sel'.

Parameter Number	**368**
Parameter Type	Source
Display Units	+/– x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

SP Analog2 Scale
[SB Analog2 Scale]

This parameter can be used to scale the value in Parameter 368.

Parameter Number	**369**
Parameter Type	Sink
Display Units	+/–x
Drive Units	+/– 1, 1 = 32767
Factory Default	1 (32767)
Minimum Value	–1 (–32767)
Maximum Value	1 (32767)

Analog Output 1
[Analog Out 1]

This parameter converts a +/– 32767 digital value to a +/– 10 volt output.

Parameter Number	**370**
Parameter Type	Sink
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Analog Output 1 Offset
[An Out 1 Offset]

This parameter determines the offset applied to the raw analog output 1. The offset is applied after the scale factor.

Parameter Number	**371**
Parameter Type	Sink
Display Units	+/– x.xxx volt
Drive Units	205 = 1 volt
Factory Default	+0.000 volt
Minimum Value	–20.000 volt
Maximum Value	+20.000 volt

Analog Output 1 Scale
[An Out 1 Scale]

This parameter determines the scale factor or gain for Analog Output 1. A +/– 32767 digital value is converted by the scale factor which allows an effective digital range of +/– 2048 which is then offset to provide a +/– 10 volt range.

Parameter Number	**372**
Parameter Type	Sink
Display Units	+/– x.xxx
Drive Units	32767 = 1
Factory Default	+0.500
Minimum Value	–1.000
Maximum Value	+1.000

Analog Output 2
[Analog Out 2]
This parameter converts a +/– 32767 digital value to a +/– 10 volt output.

Parameter Number	**373**
Parameter Type	Sink
Display Units	+/– x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Analog Output 2 Offset
[An Out 2 Offset]
This parameter determines the offset applied to the raw analog output 2. The offset is applied after the scale factor.

Parameter Number	**374**
Parameter Type	Sink
Display Units	+/– x.xxx volt
Drive Units	205 = 1 volt
Factory Default	+0.000
Minimum Value	–20.000
Maximum Value	+20.000

Analog Output 2 Scale
[An Out 2 Scale]
This parameter determines the scale factor or gain for Analog Output 2. A +/– 32767 digital value is converted by the scale factor which allows abn effective digital range of +/– 2048 which is then offset to provide a +/– 10 volt range.

Parameter Number	**375**
Parameter Type	Sink
Display Units	+/– x.xxx
Drive Units	32767 = 1
Factory Default	+0.500
Minimum Value	–1.000
Maximum Value	+1.000

Milli Amp Output
[mA Output]

This parameter converts a +/– 32767 digital value to a 4–20 mA output.

Parameter Number	**376**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	+32767

Milli Amp Output Offset
[mA Output Offset]

This parameter determines the offset applied to the raw milli amp output. The offset is applied after the scale factor.

Parameter Number	**377**
Parameter Type	Sink
Display Units	+/– x.xxx mA
Drive Units	128 = 1mA
Factory Default	0.000 mA
Minimum Value	–32.000 mA
Maximum Value	+32.000 mA

Milli Amp Output Scale
[mA Output Scale]

This parameter determines the scale factor or gain for milli amp output. A +/– 32767 digital value is converted by the scale factor which allows an effective digital range of +/– 2048 which is then offset to provide a +/– 20 mA range.

Parameter Number	**378**
Parameter Type	Sink
Display Units	+/– x.xxx
Drive Units	32767 = 1
Factory Default	+0.500
Minimum Value	–1.000
Maximum Value	1.000

SCANport Analog Output
[SP Analog Out]

This parameter displays the analog value that is sent to all SCANports

Parameter Number	**379**
Parameter Type	Sink
Display Units	+/–x
Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767

Programmable Output Select
[Output Select]

This parameter selects the function of TB7–1 Output. The NOT column in the following table indicates the value for the inverse condition. For example: Entering a value of 0 will result in a Run Ready condition, while a value of 32 results in a NOT Run Ready condition.

Parameter Number	**384**
Parameter Type	Sink,
Display Units	x
Drive Units	None
Factory Default	8
Minimum Value	0
Maximum Value	63

NOT	EN	
32	0	RUN READY
33	1	RUNNING
34	2	COMMAND DIRECTION
35	3	ROTATING DIRECTION
36	4	ACCELERATING
37	5	DECELERATING
38	6	WARNING
39	7	FAULTED
40	8	AT SET SPEED
41	9	LOCAL A
42	10	LOCAL B
43	11	LOCAL C
44	12	AT ZERO SPEED
45	13	REF A
46	14	REF B
47	15	REF C

NOT	EN	
48	16	FLUX READY
49	17	FLUX UP
50	18	DIAGNOSTIC COMPLETED
51	19	DIAGNOSTIC ABORTED
52	20	BUS RIDETHRU
53	21	JOGGING
54	22	AUTOTUNE STAT A
55	23	AUTOTUNE STAT B
56	24	AT LIMIT
57	25	NOT USED
58	26	AT SETPOINT 1
59	27	AT SETPOINT 2
60	28	OVER SETPOINT 1
61	29	OVER SETPOINT 2
62	30	OVER SETPOINT 3
63	31	OVER SETPOINT 4

Set P66 to the type of Set Point desired, Current or Speed.
Then set the appropriate parameter (P60 – P65) to monitor your desired SetPoint.

Input Mode
[Input Mode]

This parameter selects the functions of the inputs 1-9 at TB3.

Parameter Number	**385**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	1
Minimum Value	1
Maximum Value	30
Enums:	

Mode	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 7	Input 8
1	Status	Stop	Status	Status	Status	Status	Status	Status
2	Start	Stop	Rev/Fwd	Jog	Ext Fault	Spd 3	Spd 2	Spd 1
3	Start	Stop	Rev/Fwd	Stop Type	Ext Fault	Spd 3	Spd 2	Spd 1
4	Start	Stop	Rev/Fwd	1/2 Acc	Ext Fault	1/2 Dec	Spd 2	Spd 1
5, 27	Start	Stop	Rev/Fwd	Pot Up	Ext Fault	Pot Dn	Spd 2	Spd 1
6	Start	Stop	Rev/Fwd	Jog	Ext Fault	Loc/Rem	Spd 2	Spd 1
7	Start	Stop	Rev	Fwd	Ext Fault	Jog	Spd 2	Spd 1
8	Start	Stop	Rev	Fwd	Ext Fault	Spd 3	Spd 2	Spd 1
9, 28	Start	Stop	Pot Up	Pot On	Ext Fault	Spd 3	Spd 2	Spd 1
10, 29	Start	Stop	Rev	Fwd	Ext Fault	Pot Up	Pot Dn	Spd 1
11	Start	Stop	1st Acc	2nd Acc	Ext Fault	1st Dec	2nd Dec	Spd 1
12	Run Fwd	Stop	Run Rev	Loc/Rem	Ext Fault	Spd 3	Spd 2	Spd 1
13	Run Fwd	Stop	Run Rev	Stop Type	Ext Fault	Spd 3	Spd 2	Spd 1
14	Run Fwd	Stop	Run Rev	1/2 Acc	Ext Fault	1/2 Dec	Spd 2	Spd 1
15, 30	Run Fwd	Stop	Run Rev	Pot up	Ext Fault	Pot Dn	Spd 2	Spd 1
16	Run Fwd	Stop	Run Rev	Loc/Rem	Ext Fault	Stop Type	Spd 2	Spd 1
17	Start	Stop	Rev/Fwd	Proc Trim	Ext Fault	Ramp	Spd 2	Spd 1
18	Start	Stop	Rev/Fwd	Flux En	Ext Fault	Reset	Spd 2	Spd 1
19	Start	Stop	Spd/Trq3	Spd/Trq2	Ext Fault	Spd/Trq1	Proc Trim	Spd 1
20	Start	Stop	Spd/Trq3	Spd/Trq2	Ext Fault	Spd/Trq2	Flux En	Spd 1
21	Start	Stop	Rev	Fwd	Ext Fault	Ramp	Reset	Spd 1
22	Start	Stop	Spd/Trq3	Spd/Trq2	Ext Fault	Spd/Trq1	Spd 2	Spd 1
23	Run Fwd	Stop	Run Rev	Proc Trim	Ext Fault	Reset	Spd 2	Spd 1
24	Run Fwd	Stop	Run Rev	Flux En	Ext Fault	Reset	Spd 2	Spd 1
25	Run Fwd	Stop	Run Rev	Proc Trim	Ext Fault	Ramp	Spd 2	Spd 1
26	Run Fwd	Stop	Run Rev	Jog	Ext Fault	Spd 3	Spd 2	Spd 1

Input Status
[Input Status]

This parameter displays the on/off status of inputs 1-8 at TB3.
1 = ON
0 = Off

Parameter Number	**386**
Parameter Type	Source
Display Units	Bit
Drive Units	None
Factory Default	0000 0000
Minimum Value	0000 0000
Maximum Value	1111 1111
Enums:	

Bit	Condition	Bit	Condition	Bit	Condition
0	Input 1	3	Input 4	6	Input 7
1	Input 2	4	Input 5	7	Input 8
2	Input 3	5	Input 6		

I/O Stop Select 1
[Stop Select 1]

This parameter selects the stopping mode for a valid stop command.
3 = Param 59 Bits 4 or 5
2 = Current limit stop
1 = Ramp Stop
0 = Coast Stop

Parameter Number	**387**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	3

I/O Stop Select 2
[Stop Select 2]

This parameter selects the stopping mode for a valid stop command.
3 = Param 59 Bits 4 or 5
2 = Current limit stop
1 = Ramp Stop
0 = Coast Stop

Parameter Number	**388**
Parameter Type	Sink
Display Units	x
Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	3

I/O Acceleration Rate 1
[Accel Rate 1]

This parameter determines the 0 rpm to base speed ramp rate.

Parameter Number	**389**
Parameter Type	Sink
Display Units	x.x Sec
Drive Units	10 = 1 sec
Factory Default	10 sec
Minimum Value	0.0 sec
Maximum Value	6553.5 sec

I/O Acceleration Rate 2
[Accel Rate 2]

This parameter determines the 0 rpm to base speed ramp rate.

Parameter Number	**390**
Parameter Type	Sink
Display Units	x.x sec
Drive Units	10 = 1 sec
Factory Default	10.0 sec
Minimum Value	0.0 sec
Maximum Value	6553.5 sec

I/O Deceleration Rate 1
[Decel Rate 1]

This parameter determines the base speed to 0 rpm ramp rate.

Parameter Number	**391**
Parameter Type	Sink
Display Units	x.x sec.
Drive Units	10 = 1 sec
Factory Default	10.0 sec
Minimum Value	0.0 sec
Maximum Value	6553.5 sec

I/O Deceleration Rate 2
[Decel Rate 2]

This parameter determines the base speed to 0 rpm ramp rate.

Parameter Number	**392**
Parameter Type	Sink
Display Units	x.x sec
Drive Units	10 = 1 sec
Factory Default	10.0 sec
Minimum Value	0.0 sec
Maximum Value	6553.5 sec

Mop Increment
[Mop Increment]

This parameter determines the rate of increase or decrease to the MOP value per time.

Parameter Number	**393**
Parameter Type	Sink
Display Units	x.x RPM (RPM per sec)
Drive Units	4096= Base Speed
Factory Default	10% of base speed
Minimum Value	0.0 RPM
Maximum Value	Base Speed

MOP Value
[Mop Value]

This parameter displays the MOP value.

Parameter Number	**394**
Parameter Type	Source
Display Units	x RPM
Drive Units	4096 = Base Speed
Factory Default	0.0
Minimum Value	Negative Speed Limit
Maximum Value	Positive Speed Limit

Pulse PPR
[Pulse PPR]

This parameter determines the pulse input pulses per revolution.

Parameter Number	**395**
Parameter Type	Sink
Display Units	x PPR
Drive Units	None
Factory Default	1024
Minimum Value	500
Maximum Value	20000

Pulse Single or Double Edge
[Pulse Edge]

This parameter determines if rising (single) or rising and falling (double) edges are counted for the pulse input.

Parameter Number	**396**
Parameter Type	Sink
Display Units	None
Drive Units	None
Factory Default	1
Minimum Value	1
Maximum Value	2

Enums:
1 = 1 Edge
2 = 2 Edges

Pulse Scale
[Pulse Scale]

This parameter determines the pulse input speed that is equal to 4096 drive units.

Parameter Number	**397**
Parameter Type	Sink
Display Units	x RPM
Drive Units	4096
Factory Default	1750
Minimum Value	–6000
Maximum Value	+6000

Pulse Offset
[Pulse Offset]

This parameter determines the minimum speed the pulse input will go to.

Parameter Number	**398**
Parameter Type	Sink
Display Units	x.x RPM
Drive Units	None
Factory Default	0.0
Minimum Value	– Pulse Scale
Maximum Value	+ Pulse Scale

Pulse Value
[Pulse Value]

This parameter displays the pulse input value.

Parameter Number	**399**
Parameter Type	Source
Display Units	x.x RPM
Drive Units	4096 = Pulse Scale
Factory Default	0.0
Minimum Value	–8 x Pulse Scale
Maximum Value	+8 x Pulse Scale

SP Comm Retries
[SP Comm Retries]

This parameter monitors the amount of SCANport communications errors that have occurred since power up.

Parameter Number	**404**
Parameter Type	Source
Display Units	x.
Drive Units	
Factory Default	0.0
Minimum Value	0
Maximum Value	65535

Fault Select
[SA Fault Select]

This parameter chooses whether a SCANport device causes a drive fault, a warning based on 'SA Warn Sel' (P406) or does nothing.
1 = Fault
0 = Warning/Nothing

Parameter Number	**405**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0111 1111
Minimum Value	0000 0000 0000 0000
Maximum Value	0000 0001 0111 1111
Enums:	

Bit 0 – Not Used
Bit 1 – SCANport Device 1
Bit 2 – SCANport Device 2
Bit 3 – SCANport Device 3
Bit 4 – SCANport Device 4
Bit 5 – SCANport Device 5
Bit 6 – SCANport Device 6
Bit 7 – Not Used
Bit 8 – 4–20 mA Loss
Bit 9–15 – Not Used

Warning Select
[SA Warn Select]

This parameter selects whether a SCANport device timeout causes a warning or does nothing.
1 = Warning
0 = Does Nothing

Parameter Number	**406**
Parameter Type	Sink
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0111 1111
Minimum Value	0000 0000 0000 0000
Maximum Value	0000 0001 0111 1111
Enums:	

Bit 0 – Not Used
Bit 1 – SCANport Device 1
Bit 2 – SCANport Device 2
Bit 3 – SCANport Device 3
Bit 4 – SCANport Device 4
Bit 5 – SCANport Device 5
Bit 6 – SCANport Device 6
Bit 7 – Not Used
Bit 8 – 4–20 mA Loss
Bit 9–15 – Not Used

Fault Status
[SA Fault Status]

This parameter displays the fault status of the SCANport device.
1 = Fault
0 = No Fault

Parameter Number	**407**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1110 0001 0111 1111
Enums:	

Bit 0 – Not Used
Bit 1 – SCANport Device 1
Bit 2 – SCANport Device 2
Bit 3 – SCANport Device 3
Bit 4 – SCANport Device 4
Bit 5 – SCANport Device 5
Bit 6 – SCANport Device 6
Bit 7 – Not Used
Bit 8 – 4 – 20 mA Loss
Bit 9 – Not Used
Bit 10 – Not Used
Bit 11 – Not Used
Bit 12 – Not Used
Bit 13 – Illegal Drive Type (Not Configurable)
Bit 14 – Diff Drive Type (Not Configurable)
Bit 15 – SCANport error (Not configurable)

Warning Status
[SA Warn Status]

This parameter displays the warning status of the SCANport device timeouts.
1 = Warning
0 = No Warning

Parameter Number	**408**
Parameter Type	Source
Display Units	Bits
Drive Units	None
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	0000 0001 0111 1111
Enums:	

Bit 0 – Not Used
Bit 1 – SCANport Device 1
Bit 2 – SCANport Device 2
Bit 3 – SCANport Device 3
Bit 4 – SCANport Device 4
Bit 5 – SCANport Device 5
Bit 6 – SCANport Device 6
Bit 8 – 4–20 mA Loss
Bit 9–15 – Not Used

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Chapter 6

Troubleshooting

General

Chapter 6 provides information to guide you in troubleshooting. The 1336 FORCE Drive employs extensive diagnostics to aid in correcting many malfunctions that may occur in the system. This guide is designed to help you interpret the diagnostic response of the Drive when a malfunction occurs. Possible corrective measures will be explained to help you get the Drive repaired or functional as quickly as possible for most types of malfunctions.

⚠ **ATTENTION:** Only qualified personnel familiar with the 1336 FORCE drive system and the associated machinery should perform troubleshooting or maintenance functions on the Drive. Failure to comply may result in personal injury and/or equipment damage.

During Start-up you should have recorded board jumper settings for each board, board software version numbers, and the drive and motor name plate data in Table 4.A. If it was not, record it at this time before beginning any troubleshooting sequences.

Required Equipment

For initial troubleshooting, a programming device is required to read fault codes. In addition to a programming device, the following should be available 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 1336 FORCE AC Drive.
- ❑ Dual trace oscilliscope with differential capability, digital storage, two X10 and one X100 calibrated probes (optional but recommended).

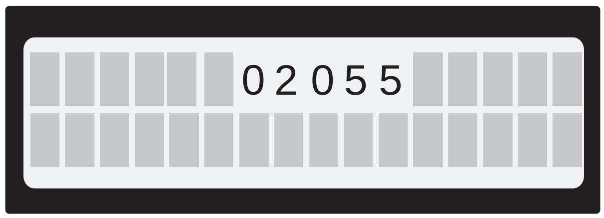
⚠ **ATTENTION:** Potentially fatal voltages may result from improper useage of an oscilliscope and other test equipment. The oscilliscope chassis may be at potentially fatal voltage if not properly grounded. Allen–Bradley does not recommend use of an oscilliscope to directly measure high voltages. Use an isolated measuring device with a high voltage probe. Contact Allen–Bradley for recommendations.

- ❑ Hand tachometer used to monitor motor velocities.
- ❑ Programming Device Instruction Manual and Adapter Board Reference Manuals.

Fault Descriptions

Fault Display – Faults are indicated by showing a decimal number of up to 5 characters relating to the fault (Figure 6.1) or by flashing LED sequences on the Main Control Board. The fault will be displayed until a Drive reset or Clear Faults is initiated. A Drive Reset will clear all faults, but a Clear Faults Command will only clear soft and warning faults. Refer to Tables 6.A & 6.B for a listing and description of the various faults. When applicable, a possible solution will also be provided.

Figure 6.1
Typical Fault Description Display



Fault Code Definition – The fault code is a 5 character decimal number that is defined as follows:

SAXXX S = Source Designator
A = Area Designator
XXX = Internal Fault Code (0 thru 999)

The Source Designator (S) is the 1st digit of the number:
0 = Main Board Velocity Processor (VP)
1 = Main Board Current Processor (CP)
2 = Adapter Processor (PLC Comm, Standard Adapter etc.)
3 = Domino Processor (DP)
4 = Reserved

Area Designator (A) is the 2nd digit of a number:
0 = General
1 = Motor
2 = Inverter
3 = Mtr Control
4 = Adapter
5 = External Device
6 = Communications
7 = Reserved
8 = Reserved
9 = Converter/Brake

Internal Fault Code (XXX)
The internal fault codes (last three digits of number) are identified in Table 6.A thru 6.C.

Table 6.A
1336 FORCE Main Control Fault Descriptions

Fault #	LED	Fault Type	Fault Text	Parameter #	Bit #
13000	CP, Red 1 blink	Soft	CP EPROM Flt	80	00
13001	CP, Red 2 blink	Soft	CP Int RAM Flt	80	01
13002	CP, Red 3 blink	Soft	CP Ext RAM Flt	80	02
13003	CP, Red 4 blink	Soft	CP Stack RAM Flt	80	03
13004	CP, Red 5 blink	Soft	VP MBI Failure (Dual Port)	80	04
03008	VP, Red 1 blink	Soft	VP EPROM Flt	80	08
03009	VP, Red 2 blink	Soft	VP Int RAM Flt	80	09
03010	VP, Red 3 blink	Soft	VP Ext RAM Flt	80	10
03011	VP, Red 4 blink	Soft	VP Stack RAM Flt	80	11
03012	VP, Red 5 blink	Soft	CP MBI Failure	80	12
03013	VP, Red 6 blink	Soft	AP MBI Failure	80	13
02014	VP, Red Flashing	Hard	Power EEPROM Flt	80	14
12016	CP, Solid Red	Hard	Bus Overvoltage	81	00
12017	CP, Solid Red	Hard	Transistor Desat	81	01
12018	CP, Solid Red	Hard	Ground Fault	81	02
12019	CP, Solid Red	Hard	IOC Fault	81	03
14020	CP, Solid Red	Hard	SW Malfunction	81	04
16021	CP, Solid Red	Hard	M/S Cable Loss	81	05
16022	CP, Solid Red	Hard	M/S Ena Timeout	81	06
04024	VP, Solid Red	Hard	AP Handshake Error	81	08
03025	VP, Flashing Red	Soft	Absolute Overspd	81	09
03026	VP, Flashing Red	Soft	Analog Spply Tol	81	10
12027	CP, VP, Flash Red	Soft	Atune/Diag Fail	81	11
02028	VP, Solid Red	Hard	Inv Temperature	81	12
03029	VP, Solid Red	Hard	VP – SW Error	81	13
12032	CP, Flashing Red	Soft	Ridethrough Time	82	00
12033	CP, Flashing Red	Soft	Precharge Time	82	01
12034	CP, Flashing Red	Soft	Bus Drop	82	02
12035	CP, Flashing Red	Soft	Bus Undervolt	82	03
12036	CP, Flashing Red	Soft	Bus Drop Cycles >5	82	04
12037	CP, Flashing Red	Soft	Open Circuit	82	05
05048	VP, Flashing Red	Soft	Vel FB Loss	83	00
02049	VP, Flashing Red	Soft	Inv Overtemp Pnd	83	01
01050	VP, Flashing Red	Soft	Mtr Temperature	83	02
01051	VP, Flashing Red	Soft	Motor Overld Pnd	83	03
01052	VP, Flashing Red	Soft	Motor Overld Trp	83	04
01053	VP, Flashing Red	Soft	Motor Stalled	83	05
05054	VP, Flashing Red	Soft	External Flt In	83	06
02055	VP, Flashing Red	Soft	RMS Fault	83	07
03057	VP, Flashing Red	Soft	Parameter Limit	83	09
03058	VP, Flashing Red	Soft	Math Limit	83	10
09059	VP, Flashing Red	Soft	DB Overtemp	83	11
02060	VP, Solid Red	Hard	AC Contactor	83	12
02061	VP, Flashing Red	Soft	Inv Overld Pnd	83	13
06062	VP, Flashing Red	Soft	Drv to Drv Error	83	14
02063	VP Flashing Red	Soft	Inverter Overload	83	15

The first digit in the 5 character fault number for Standard Adapter Board faults is always 2, indicating the source is an Adapter Processor:

0 = Velocity Processor (VP)
1 = Current Processor (CP)
2 = Adapter Processor (Standard Adapter or PLC Comm)
3 = Domino Processor (DP)

The Area Designator (2nd digit) and internal fault codes (last three digits) remain the same as described under the Fault Code Definition on page 6–2. Listed below are the fault codes for the Standard Adapter Board. For a PLC Comm Adapter fault codes refer to the PLC Comm Adapter manual.

Table 6.B
1336 FORCE Standard Adapter Fault Descriptions

Fault #	Description	Fault Text	Type
24001	MBI Failure	HW Malfunction	Hard Fault
24002	BRAM Failure	HW Malfunction	Hard Fault
24003	VP Handshake Failure	SW Malfunction	Hard Fault
24004	CP Handshake Failure	SW Malfunction	Hard Fault
24005	VP Mode Failure	SW Malfunction	Hard Fault
24006	CP Mode Failure	SW Malfunction	Hard Fault
24007	SA Language Failure	HW Malfunction	Hard Fault
24017	SP Port 1 Failure	SP PT1 Timeout	Fault/Warning/None
24018	SP Port 2 Failure	SP PT2 Timeout	Fault/Warning/None
24019	SP Port 3 Failure	SP PT3 Timeout	Fault/Warning/None
24020	SP Port 4 Failure	SP PT4 Timeout	Fault/Warning/None
24021	SP Port 5 Failure	SP PT5 Timeout	Fault/Warning/None
24022	SP Port 6 Failure	SP PT6 Timeout	Fault/Warning/None
24024	4 – 20Ma Loss	4 – 20Ma Loss	Fault/Warning/None
24029	Drive Type Difference	Diff Drv Type	Soft Fault
24030	Illegal Drive Type	Illegal Drv Type	Hard Fault
24031	SP Internal Failure	SW Malfunction	Soft Fault

Fault/Warning Handling

The lights on the motor control board indicate the status of the Current and Velocity processors. Both the Current and Velocity processors have both Green and Red LED's associated with their status. Table 6.C explains the meaning of the CP and VP status lights.

Table 6.C
CP and VP Status

VP LED	CP LED	Status	Meaning
D2	D4	Solid Green	No Fault
D2	D4	Flashing Green	Drive Warning
D3	D5	Flashing Red	Drive Soft Fault
D3	D5	Solid Red	Drive Hard Fault

Hard Fault – A Drive hard fault is a fault that trips the Drive causing it to come to a stop. This type of fault requires the user to perform a Drive Reset to remove the fault.

Soft Fault – A Drive soft fault will also cause the drive to trip and come to a stop. This type of fault can be removed by doing a Clear Faults command after the condition that caused the Drive to trip has been removed.

Drive Warning – A Drive Warning is simply an undesirable condition that exists within the Drive. It will not cause the Drive to trip. A Clear Faults command after the warning condition has been alleviated, will remove the warning.
Everytime the Drive has any of the faults or warnings decribed above, a fault/warning message is logged in either the fault or warning queue. This is designed to aid in troubleshooting.

Motor Control Board Faults & Warnings – There are two types of fault and warning queues for the Main Control Board, configurable and nonconfigurable.

Configurable Faults & Warnings – The configurable fault queue contains faults that can be set up to either trip the drive or provide only a visual warning while the drive continues to operate.

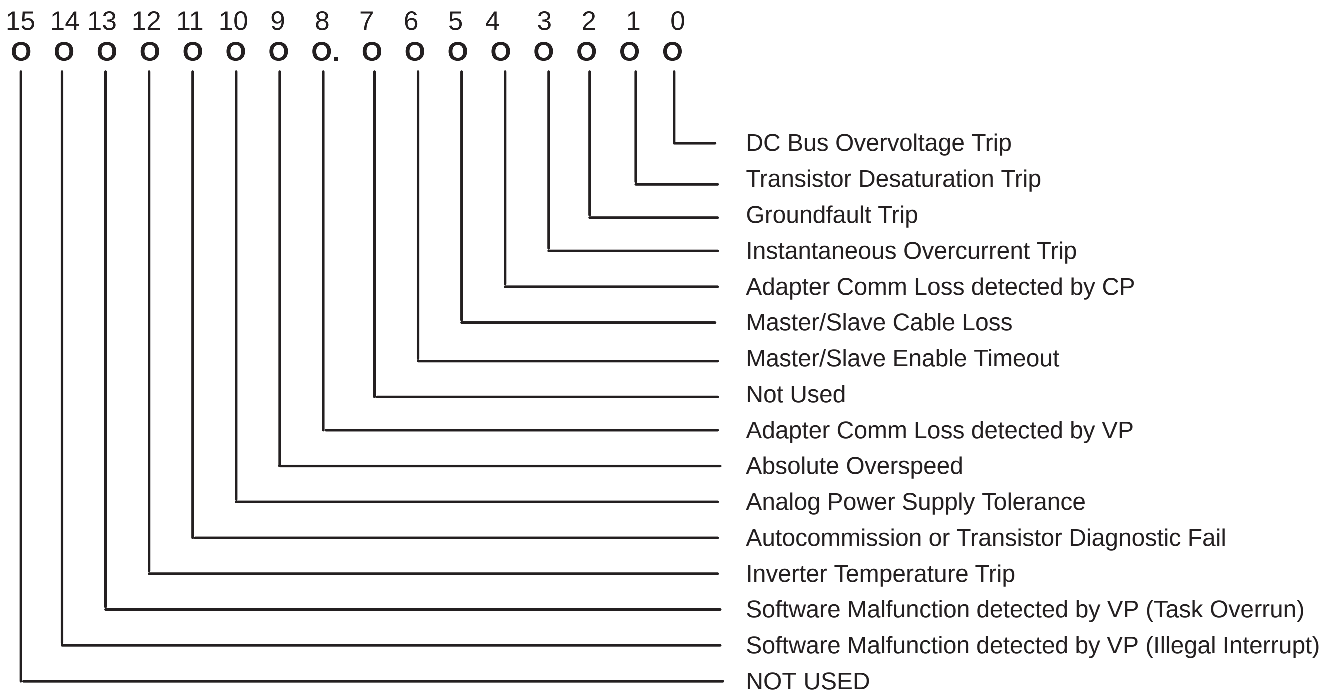
Nonconfigurable Faults & Warnings – The nonconfigurable fault queue contains faults that you can't disable. These faults are the result of a condition that could damage the Drive if allowed to persist. The non – configurable fault queue faults can be viewed in parameter 81 (Fig. 6.2).

In addition to configurable & non–configurable faults, there are the "powerup faults".

Powerup Faults – The powerup faults appear in parameter 80 (Fig. 6.3). These faults primarily consist of problems that could occur with powerup of both the current and velocity processors.

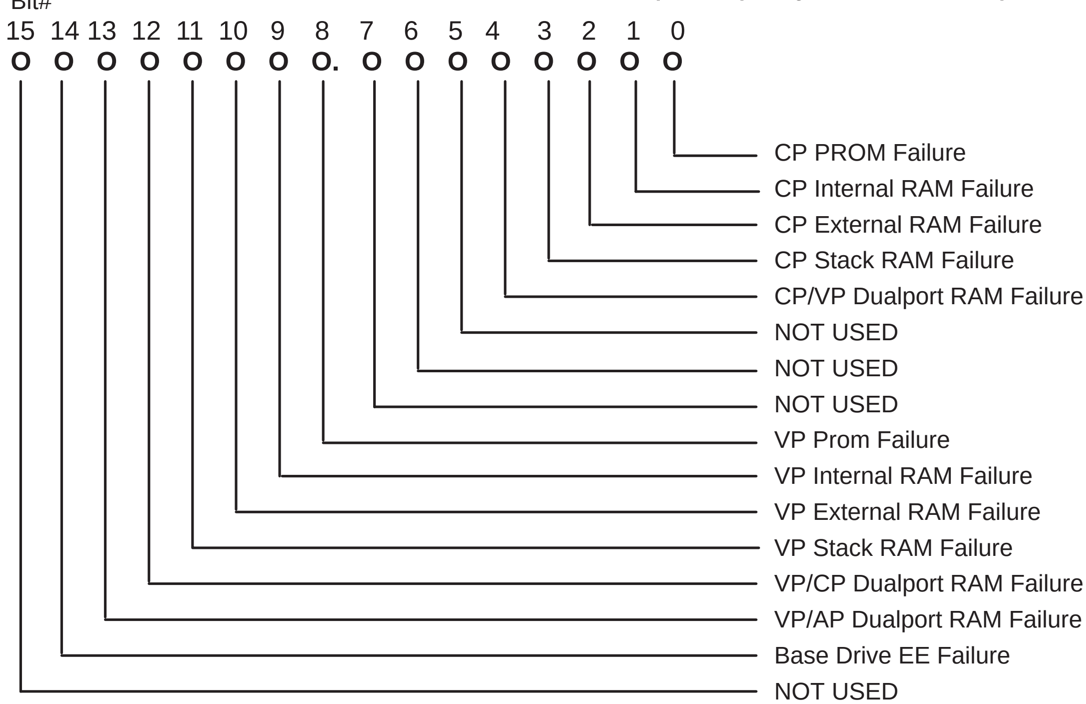
Adapter Board Faults – Adapter board faults are setup and displayed in separate parameters from the Main Control Board.

Figure 6.2
Parameter 81 (Non–configurable Fault Status)



This word parameter indicates fault conditions in the Drive that CANNOT be configured as warnings. When a bit is set to “1”, the corresponding condition in the Drive is true, otherwise the condition is false. Bit 0–3 are detected by hardware and 4–15 are detected by software.

Figure 6.3
Parameter 80 (Powerup/Diagnostic Fault Status)



This word parameter indicates a fault condition which has been detected during power up or reset of the drive. Where the bit is set to “1”, the corresponding condition in the Drive is true, otherwise the condition is false.

Current Processor Faults & Warnings – Both the fault and warning queues are configurable for either the Current or the Velocity processor. You can configure which Current processor faults you want to trip the Drive by setting Parameter 86. When the Drive trips on one of the faults set in parameter 86, the CP light on the Main Control board will turn red. When the drive trips, it will coast the motor to a stop. Parameter 87 has the same bit definitions as parameter 86, but instead of tripping, the Drive will display a warning fault, which in turn causes the CP light to flash green, indicating a warning. The Drive will continue to run when there is a CP warning. Parameter 82 displays which CP fault caused the Drive to trip, while parameter 84 displays any CP warnings that have occurred.

Most of the setup for the current processor Fault/Warning configuration deals with DC Bus conditions. These Bus conditions deal with the Bus precharge and any type of ride through conditions.

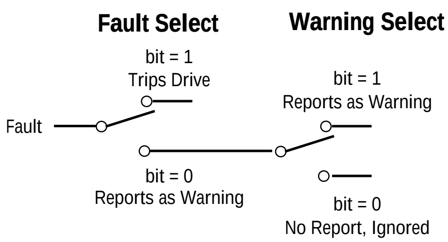
Configuring CP Faults and Warnings – You can configure which of the following faults you want to trip the drive by using *CP Fault/Warning Configuration Select* (parameter 86) and *CP Warning/None Configuration Select* (parameter 87). Parameters 86 and 87 both have the following bit definitions:

This bit:	With this text:	Is defined as:
0	**RidethruTime**	A bus ridethrough timeout occurred.
1	**Prechrg Time**	A precharge timeout occurred.
2	**Bus Drop**	A bus voltage drop of 150V below the bus tracker voltage. This is covered in detail later in this chapter.
3	**Bus Undervlt**	A bus voltage drop to a level below the value set in *Undervoltage Setpoint* (parameter 224).
4	**Bus Cycles>5**	More than 5 ridethroughs occurred within a 20 second period.
5	**Open Circuit**	The fast flux up current is less than 50% of commanded.
6–15		RESERVED, Always leave zero.

For each condition that you want the drive to fault on, set the corresponding bit in *Fault Select 1*. When the drive trips on a condition that you set to fault the drive, how the drive reacts depends on which condition occurred.

For bits 0 through 5:

- The red CP light turns on.
- The motor coasts to a stop.



For each condition that you want the drive to display a warning fault on, you need to:

1. Set the corresponding bit in *CP Warning / None Configuration Select*
2. Make sure the corresponding bit in *CP Fault / Warning Configuration Select* is set to 0.

When the drive trips on a condition that you set to display a warning:

- The CP light flashes green.
- The drive continues to run.

If a particular bit is not set in either *CP Fault / Warning Configuration Select* or *CP Warning / None Configuration Select*, the drive ignores the condition when it occurs.

Most of the fault/warning configuration options deal with DC bus conditions. These bus conditions deal with the bus precharge and any type of ridethrough conditions. The bus precharge and ridethrough conditions are covered later in this chapter.

Understanding Precharge and Ridethrough Faults

To understand the precharge and ridethrough faults, you need a basic understanding of how these functions work, as well as the options that you can use to alter the way precharge and ridethrough operate in the 1336 FORCE drive.

Understanding Precharge

The precharge of the drive has different circuits depending on drive size. For the precharge operation for large horsepower (40 hp and larger) standalone drives, the precharge starts the SCR phase advance and completes precharge when the bus is stable. For all other drive types, precharge is completed after a stable bus voltage is achieved and the precharge device (SCR or relay) by–passes the precharge resistor. For common bus operation, set bit 12 in *Precharge / Ridethrough Selection* (parameter 223). The drive current and voltage ratings stored in EEProm determine the standalone operation.

With the default configuration, the following conditions are needed to complete precharge:

- a stable bus voltage for a minimum of 300 milliseconds
- a bus voltage greater than the value set in *Undervoltage Setpoint* (parameter 224)
- a valid control status from the precharge board, if present

You can modify the default configuration for common bus drives by using the external fault (input) and the precharge exit option:

- You can use the external fault input with a cabinet disconnect switch to force precharge when the disconnect is opened and the drive is disabled. This may reduce current stress when the disconnect is closed again.
- You can use the exit precharge option to let the precharge complete after the precharge timeout period (30 seconds) when the bus voltage is not stable. All other conditions must be met. This is often used in the case of common or shared bus configurations where other drive(s) may be causing bus voltage variations. Only use this option where needed otherwise excessive inrush current could open or weaken the line fuses.
  NOTE: The precharge timeout fault (Parameter 86) must be disabled to use this option.

Before you can enable the inverter, all drive types must complete a first time precharge. This is required even if you have set the disable precharge function by setting bit 14 of *Precharge/Ridethrough Selection* (parameter 223).

A filtered, or slow, average of the bus voltage is developed as a reference, or bus voltage tracker, to determine if a line drop out has occurred. If a 150 volt (or greater) drop in present bus voltage compared to the filtered bus voltage occurs, the drive can start a ridethrough. The ridethrough function:

- disables the drive
- restarts a precharge
- waits for the bus to return to within 75 volts of the bus voltage tracker's voltage value before starting again.

You can use bits 0–4 of *Bus/Brake Opts* to control the slew rate of the bus voltage tracker. Refer to the section on the bus voltage tracker later in this chapter for additional information.

Understanding Ridethrough

Ridethrough provides current inrush protection and extended logic operating time if the power lines drop out while the drive is running. The drive is immediately disabled when it senses that the incoming power lines dropped out (bus capacitor voltage drop). The energy stored in the bus capacitors keeps the logic supplies running for an extended time. If the power lines return before the logic power supplies lose power, you can configure the drive to resume operation without system intervention (default). The ridethrough timeout is set for two seconds. This means that the drive is configured to fault (default setting) and not auto–restart if the dropout lasts more than two seconds.

ATTENTION: You must determine safe auto–restart and fault configurations at the system and user level. Incorrect selection(s) may result in safety concerns and/or drive damage.

CP Fault / Warning Configuration Select 1 (parameter 86) and *CP Warning / None Configuration Select* (parameter 87) let you specify how you want the drive to report specific precharge and ridethrough information.

Ridethrough also protects the drive from excessive inrush current when the power returns by entering a precharge mode when ridethrough is initiated. After precharge has finished, the drive can complete ridethrough and resume normal drive operation. The drive is enabled again after the bus rises to within 75 volts of the bus voltage tracker value.

ATTENTION: If you are using an external logic power supply, the drive may be able to stay in an indefinite ridethrough state. If the power returns to the drive (much later), the drive automatically restarts. You must therefore handle the control of enable, faults, time–outs, drive configuration, and safety issues at the system level.

Use the following parameters to configure the precharge and ridethrough functions:

- *CP Fault / Warning Configuration Select* (parameter 86)
- *CP Warning / None Configuration Select* (parameter 87)
- *Precharge / Ridethrough Selection* (parameter 223)
- *Undervoltage Setpoint* (parameter 224)

In addition, *Test Select 1* (parameter 93) and *Test Data 1* (parameter 92) contain software testpoints that provide additional precharge information.

Configuring the Faults and Warnings for Precharge

You can use *CP Fault / Warning Configuration Select* and *CP Warning / None Configuration Select* to enable fault/warning conditions when the appropriate bit is set (1). If a bit is clear (0) in *CP Fault/ Warning Configuration Select*, you can choose to have the condition reported as a warning by setting the bit in *CP Warning / None Configuration Select*. The following are the bits that pertain to precharge:

This bit:	With this text:	When set, generates a fault when:
0	**RidethruTime**	The ridethrough time exceeds 2 seconds (default see P226).
1	**Prechrg Time**	The precharge time exceeds 30 seconds (default see P225).
2	**Bus Drop**	The bus voltage drops 150 volts below the bus tracker voltage. This is the level where the drive would normally enter ridethrough.
3	**Bus Undervlt**	The bus voltage drops below the level set in *Undervoltage Setpoint* (parameter 224). This is the level where the drive would enter ridethrough if it occurs before a 150 volt drop in bus voltage.
4	**Bus Cycles>5**	At least 5 ridethrough cycles have occurred within a 20 second period. This indicates a converter problem or a problem with incoming power. Consider checking the incoming power for a phase loss.

Using Precharge / Ridethrough Selection to Change Precharge/Ridethrough Options

You can use *Precharge / Ridethrough Selection* (parameter 223) to change how precharge and ridethrough work. *Precharge / Ridethrough Selection* is a bit encoded word that disables the following functions when the appropriate bit is set (1):

This bit:	Has this definition:
0	Sets the bus voltage tracker slew rate to 10 volts/second.
1	Sets the bus voltage tracker slew rate to 5 volts/second.
2	Sets the bus voltage tracker slew rate to 0.5 volts/second.
3	Sets the bus voltage tracker slew rate to 0.05 volts/second.
4	Sets the bus voltage tracker slew rate to 0.005 volts/second.
5	Reserved. Leave zero.
6	Reserved. Leave zero
7	Setting this bit selects the slave drive of a Master–Slave combination to use the master drive analog frequency reference in place of the slave encoder input.
8	Enables fast flux up. This is covered in more detail later in this chapter.
9	Reserved, Leave zero.
10	Reserved, Leave zero.
11	Forces an exit from precharge after the precharge timeout.
12	Identifies the drive as a common bus converter.
13	Disables faults or warnings while the drive is disabled. This allows power up and down the bus for a common bus system without faulting even if the faults or warnings are enabled. For example, faults or warnings only occur if the drive is running. This may be desirable when external power supplies are used.
14	Disables the precharge function after initial power up. Any bus drop or undervoltage will not result in precharge. This may destroy the drive if power returns to the system. This should be used where you control the input impedance or with a front end converter that is current limited.
15	Disables the ridethrough and precharge functions. If the power lines drop out, the drive attempts to continue operation as long as any power is available. This may destroy the drive if power returns to the system. This should be used only where you control the system's incoming power.

Using Undervoltage Setpoint

You can use *Undervoltage Setpoint* (parameter 224) to set the level of bus voltage that must be present to complete precharge and a level where ridethrough can be initiated. If configured as a fault/warning, *Undervoltage Setpoint* sets the bus voltage level that faults/warns the drive. The bus voltage level that is used is determined as follows:

Undervoltage Setpoint * *Rated Inverter Input Voltage* (parameter 221) * sqrt(2) = bus voltage level for ridethroughs, faults, or warnings

Using Testpoint Select 1 and Testpoint Data 1 to View Software Testpoints

Additional information concerning precharges and ridethroughs is available through *Testpoint Select #1* (parameter 273) and *Testpoint Data #1* (parameter 274).

Viewing the Calculated Undervoltage Value of Bus Voltage

To view the value of the calculated undervoltage:

1. Enter a value of 24 into *Testpoint Select #1*.

2. Monitor *Testpoint Data #1*.

You can use this to check the actual bus voltage that causes an undervoltage condition.

Checking the Status of the Precharge

To view the precharge status, enter a value of 12 into *Testpoint Select #1*, and then monitor *Test Data #1* for the precharge status. The precharge status is bit encoded as follows:

This bit:	When set, indicates that:
0	The precharge function has been completed and the precharge device should be on. The drive can be enabled only after this bit is set.
1	The drive is in ridethrough. Precharge must be completed and the bus must return to within 75 volts of the bus voltage tracker before normal drive operation can resume.
2	A precharge–initiated condition is in ridethrough.
3	A precharge has been requested due to an external fault (input). *Common Bus Configuration only*
4	The converter is ready for precharge and the controller may start its precharge function. The external precharge board is ok, if present.

5	The measured bus voltage is not stable (there is a variation of greater than ±25 volts) and the precharge cannot finish.
6	The DC bus voltage is less than line undervolts.
7	The precharge function cannot complete because the measured bus voltage is less than 75 volts below the bus voltage tracker. This only applies to precharging after a ridethrough.
8	The precharge device has been commanded ON.
9	Not used.
10	An exit from precharge was requested.
11	Precharge was skipped due to an enable dropout.
12	An initial (first) precharge is executed.
13	A high horsepower drive type is being used.

Enabling Fast Flux Up

You can use fast flux up to achieve rated flux conditions and consequently high torque as fast as possible after an enable. Under default conditions (no fast flux up), the drive brings the motor to rated flux conditions in a time proportional to the rotor time constant of the motor. These times range from 50 milliseconds for small motors to several seconds for large motors. If a high load is attempting to be started, no acceleration occurs until that time has elapsed. Enabling fast flux up can decrease that time by a factor of 5 to 10.

You can enable the fast flux up function of the drive by setting bit 8 of *Precharge / Ridethrough Selection* (parameter 223). In this case:

Use *Testpoint Select #1* (parameter 273) to check the approximate fluxing time. Enter a value of 86 into *Testpoint Select #1* to display the fluxing time in *Testpoint Data #1* (parameter 274). The time delay is given in seconds x 0.000977. If the flux time is 0, no fast flux up occurs and the drive starts normally. If at least 50% of the commanded current is not measured, you can configure the drive to fault at this time using *CP Fault Warning Configuration Select* (P86).

Forcing the Drive to Complete a Precharge

In some cases, the precharge may not complete due to external bus disturbances. Setting bit 11 in *Bus/Brake Opts* forces the precharge to complete at the precharge interval (default 30 seconds). This may cause precharge damage and should only be used when large inrush currents cannot occur.

Understanding the Bus Voltage Tracker

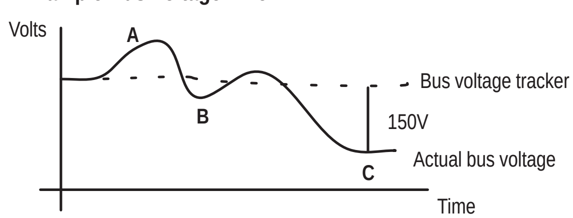
Precharge/Ridethrough Selection (parameter 223) also lets you select a rate, called a slew rate, for the bus voltage tracker. The bus voltage tracker slowly tracks changes in the actual bus voltage. If the actual bus voltage drops 150 volts or greater below the current value of the bus voltage tracker, the drive automatically disables modulation and enters precharge.

Important: You should only use the bus voltage tracker if you are having ridethrough problems. The bus voltage tracker adjusts the bus sensitivity to ridethrough for cases where there is an unstable bus.

By changing the rate used for the bus voltage tracker, you can make your system more or less sensitive to changes in the actual bus voltage. For example, if your drive currently enters precharge after the motor exits regeneration, you may need to change your slew rate.

Figure 6.4 shows an example of the filtered bus voltage reference.

Figure 6.4
Example Bus Voltage Line



At point **A**, the motor was in regeneration, so the value of the bus voltage tracker slowly increased.

At point **B**, the motor was no longer in regeneration and the bus voltage had dipped below the nominal range. If the drive compared point B with point A, the drive would have seen a bus drop of 150V and entered precharge. However, because the drive compared point B with the bus voltage tracker, the bus drop was less than 150V and the drive continued operating.

At point **C**, the bus voltage had dropped 150V and the drive entered a precharge state.

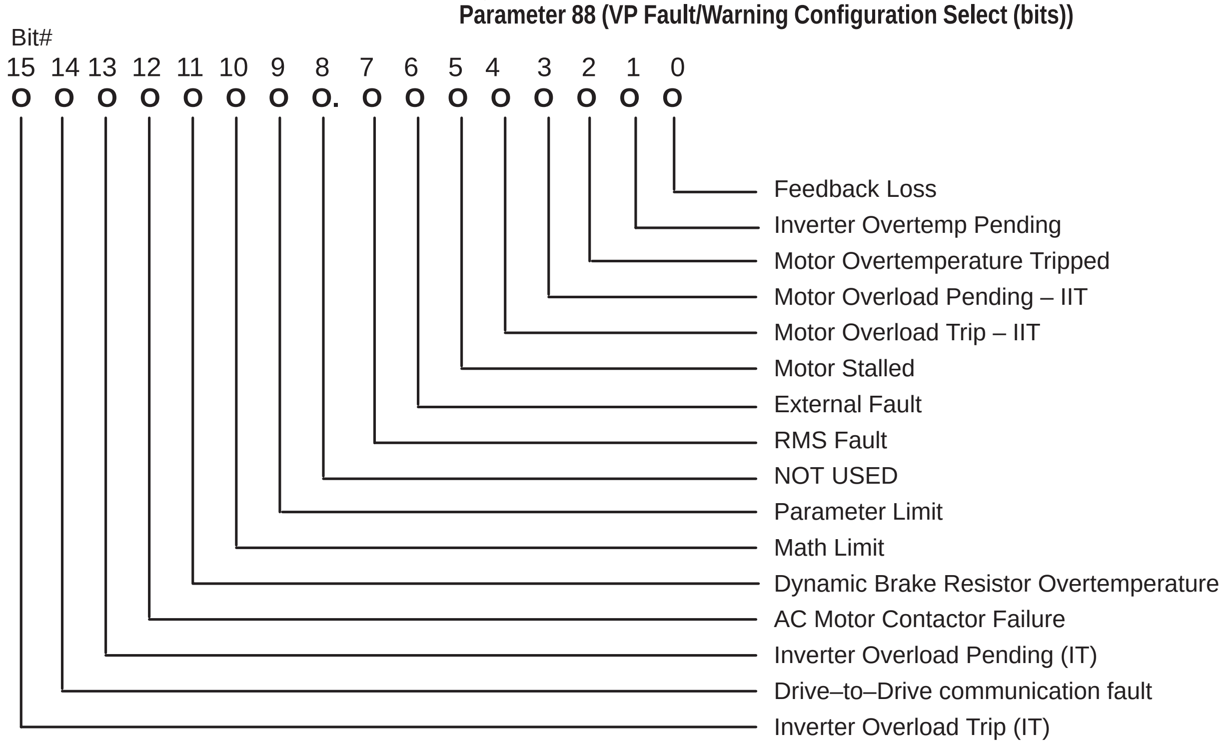
Precharge / Ridethrough Selection provides the following options for changing the slew rate:

This bit:	With this text:	Sets the slew rate to:
0	**Slew Rate 1**	10V/second. This option is the most sensitive to changes in the actual bus voltage.
1	**Slew Rate 2**	5V/second.
2	**Slew Rate 3**	0.5V/second.
3	**Slew Rate 4**	0.05V/second.
4	**Slew Rate 5**	0.005V/second. This option is the least sensitive to changes in the actual bus voltage.

If all bits are clear (0), the slew rate is 0.05V/second. If more than one bit is set, the first bit that is set is used for the slew rate. For most applications, the default slew rate of 0.05V/second, which is 1 volt in 20 seconds, should be appropriate.

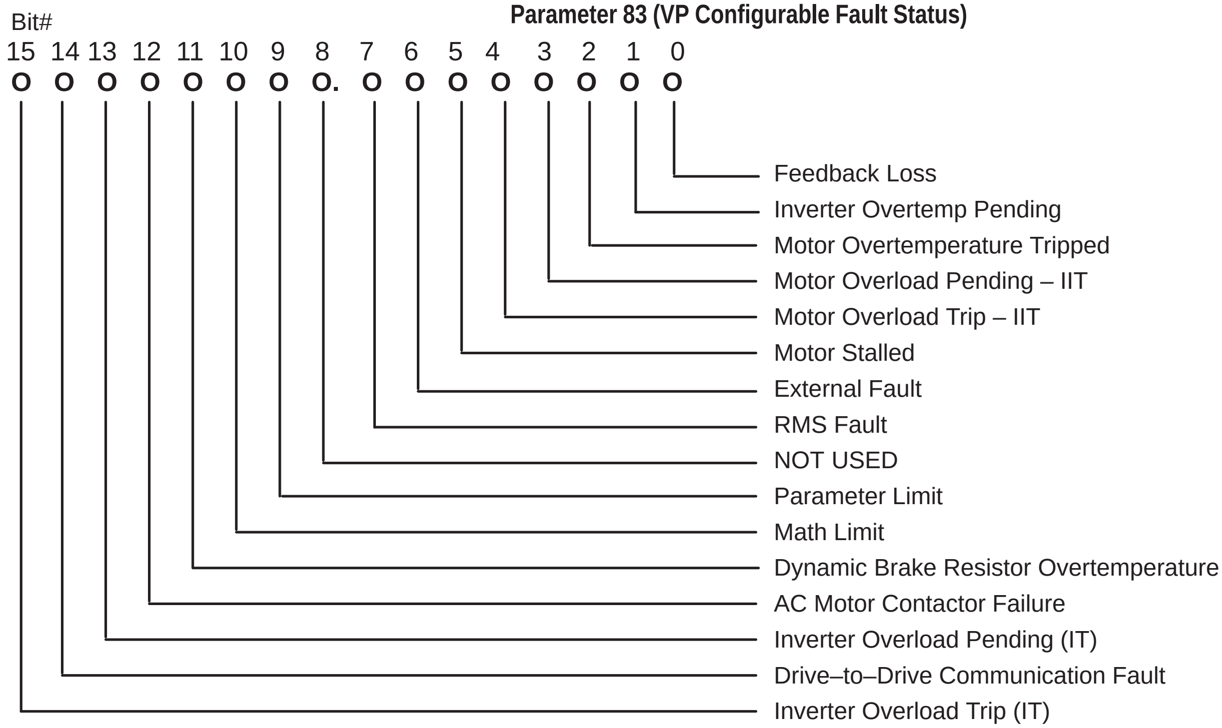
Velocity Processor Faults & Warnings – You can configure which velocity processor faults you want to trip the drive by setting Parameter 88 (Figure 6.5). When there is a velocity processor fault, the VP light on the Main Control board will blink red (soft fault) for configurable VP faults. When this happens, the drive will shut off and coast the motor to a stop. VP faults can be viewed in parameter 83 (Figure 6.6). Configurable VP warnings can be setup in Parameter 89 (Figure 6.7) and viewed in parameter 85. When a configurable VP warning exists, the VP light will be flashing green, but the drive will continue to run. Velocity processor warning faults can be viewed in parameter 85 (Figure 6.8).

Figure 6.5
Parameter 88 (VP Fault/Warning Configuration Select (bits))



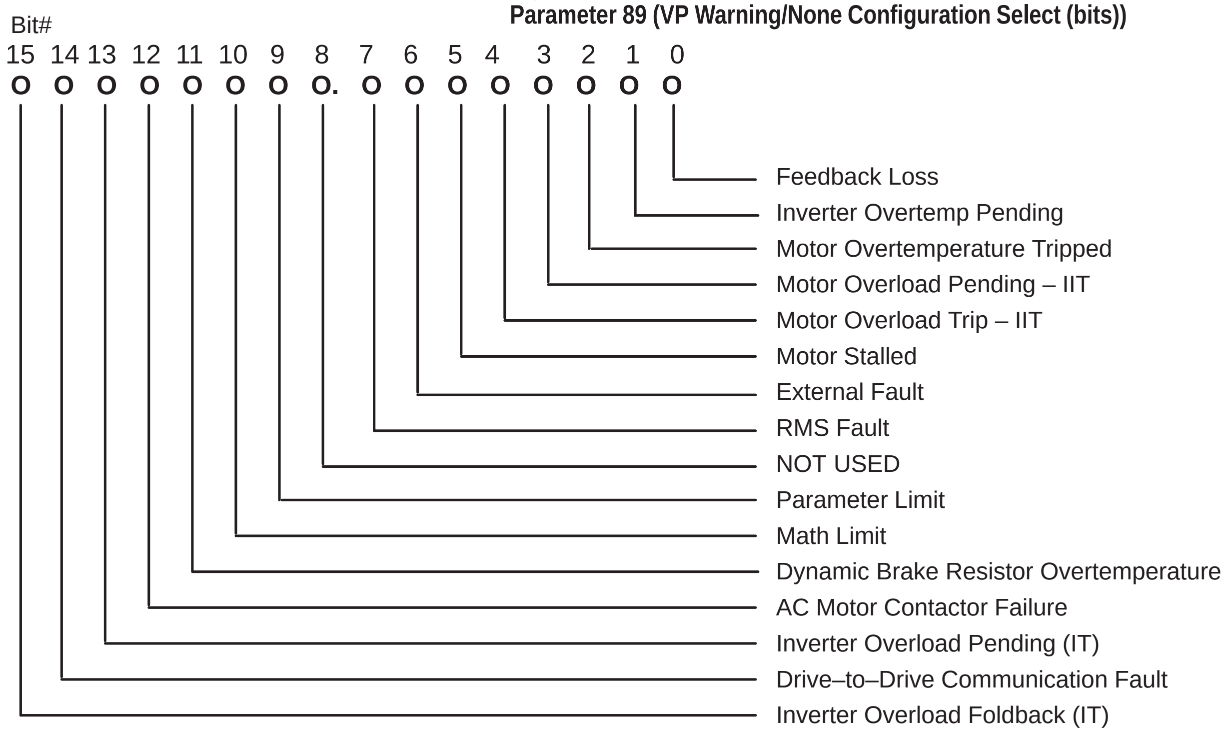
This word parameter indicates conditions detected by the Velocity Processor (VP) that have been configured to report as a Drive warning condition. Each configuration bit matches the bit definitions of Parameters 83, 85 and 89. When a bit is set to “1”, the corresponding condition in the Drive will be reported as a FAULT, otherwise the condition is reported as a WARNING.

Figure 6.6
Parameter 83 (VP Configurable Fault Status)



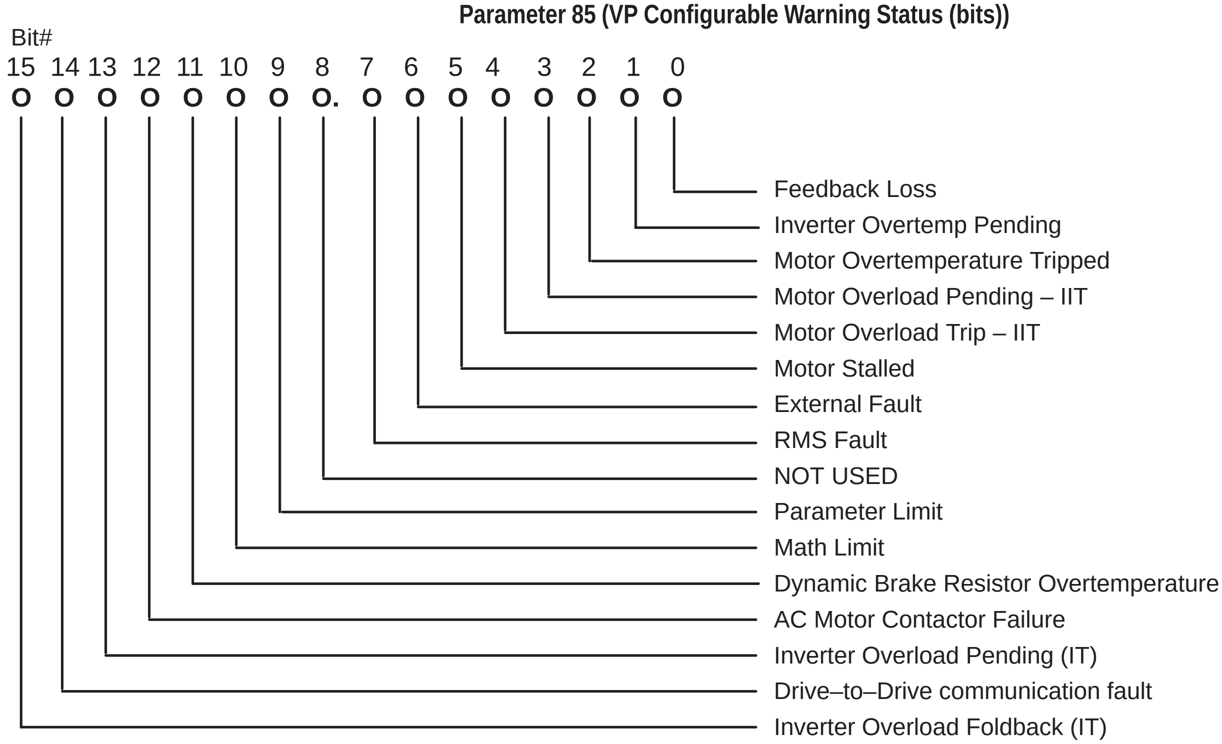
This word parameter indicates conditions detected by the Velocity Processor (VP) that have been configured to report as a Drive fault condition. Each configuration bit matches the bit definitions of Parameters 85, 88 and 89. When a bit is set to "1", the corresponding condition in the Drive is true, otherwise the condition is false.

Figure 6.7
Parameter 89 (VP Warning/None Configuration Select (bits))



This word parameter indicates conditions detected by the Velocity Processor (VP) that will be reported as either a drive fault or warning or not reported at all (ignored). Each configuration bit matches the bit definitions of Parameters 83, 85 and 88. When a bit is set to "1", the corresponding condition in the Drive will be reported as configured by parameter 88. When the bit is set to "0", the condition is not reported.

Figure 6.8
Parameter 85 (VP Configurable Warning Status (bits))



This word parameter indicates conditions detected by the Velocity Processor (VP) that have been configured to report as a Drive warning condition. Each configuration bit matches the bit definitions of Parameters 83, 88 and 89. When a bit is set to “1”, the corresponding condition in the Drive is true, otherwise the condition is false.

Auto–Tuning Test Procedure

Auto–Tuning is a procedure which involves the running of a group of tests on the motor/drive combination. Some of these tests check the Drive hardware and others configure Drive parameters for torque control with the attached motor.
NOTE: The Quickstart procedure in Chapter 4 will take you step–by–step throught the Autotuning Procedure. The information presented here explains how to manually tune specific areas.

ATTENTION: Power must be applied to the Drive and the motor must be connected for some of the following tests. Some of the voltages present are at incoming line potential. To avoid electrical shock hazard or damage to equipment, only qualified service personnel should perform the following procedures.

Test Overview: Auto–Tuning includes 6 tests, all of which can be performed on a motor which is either coupled or decoupled from load. These tests include:

Power Structure and Transistor Diagnostics Tests

The power structure and transistor diagnostics routines let you determine if any problems exist in the power structure of the drive and determine the probable cause of these problems.

The diagnostic software determines hardware problems through a series of system tests. These tests are parameter dependent. The test results depend on drive size, motor size, system wiring, and other factors that affect system voltage and load impedance.

In most cases, the software can properly determine if faults exist; however, there may be some installations where some faults cannot be properly checked. In general, test results are listed as failed if a questionable case is found. You must review test results with respect to the whole drive system to properly interpret whether a real problem exists.

You can run the transistor diagnostics before a start by setting bits 6–8 of *Logic Options* (parameter 59). Transistor diagnostics require motor current, so a user–start transition is required to run the tests.

To run the transistor diagnostics independently:

1. In *Autotune/Dgn Sel* (parameter 256), set bit 0 to 1.

2. Enable the drive.

The green enable light (D1) turns on very briefly (approximately 300 ms) and then turns off. This runs only the transistor diagnostics and leaves the drive disabled after the diagnostics are complete. *Autotune/Diagnostics Selection* is automatically cleared to zero after the diagnostics have run.

Because the test results depend on your particular system, you can disable tests that may give questionable or nuisance faults. Use *Transistor Diagnostics Configuration* (parameter 257) to disable individual tests:

If you want to disable:	**Then, set this bit:**
Current feedback phase U offset tests	0
Current feedback phase W offset tests	1
Shorted power transistor tests	2
Ground fault tests	3
Open transistor, open motor, open current feedback, open gate drive, and open bus fuse tests	4
Power transistor U upper for all tests	6
Power transistor U lower for all tests	7
Power transistor V upper for all tests	8
Power transistor V lower for all tests	9
Power transistor W upper for all tests	10
Power transistor W lower for all tests	11

Bits 5 and 13 through 15 are reserved. You must leave these bits 0.

► Even though you set bits 6 through 11 to disable the individual tests, you will still get a fault with the other tests if there is an open in an individual section.

To test specific modules within the power structure, you can disable any transistor or any combination of transistors. You must leave all transistors enabled under most conditions. Use sound judgement to verify that power transistor fault conditions do not exist before disabling tests.

Inverter Diagnostics Result #1 (parameter 258) and *Inverter Diagnostics Result #2* (parameter 259) contain the results of the transistor diagnostic tests.

Important: Serious component failures may occur if unverified power transistor fault conditions are ignored or tests are disabled before you proceed to run the drive under load.

Inverter Diagnostics Result #1 (parameter 258) is defined as follows:

When this bit is set (1):	Then:
0	A software fault occurred.
1	No motor is connected, or a bus fuse is open.
2	Phase U and W shorted.
3	Phase U and V shorted.
4	Phase V and W shorted.
5	There are shorted modules.
6	A ground fault occurred.
7	A fault occurred before the short module ran.
8	A hardware overvoltage fault occurred.
9	A hardware desat fault occurred.
10	A hardware ground fault occurred.
11	A hardware phase overcurrent fault occurred.
12	There are open power transistor(s).
13	There are current feedback faults.

Bits 14 and 15 are reserved.

Inverter Diagnostics Result #2 (parameter 259) is defined as follows:

When this bit is set (1):	Then:
0	Transistor U upper shorted.
1	Transistor U lower shorted.
2	Transistor V upper shorted.
3	Transistor V lower shorted.
4	Transistor W upper shorted.
5	Transistor W lower shorted.
6	The current feedback phase U offset is too large.
7	The current feedback phase W offset is too large.
8	Transistor U upper open.
9	Transistor U lower open.
10	Transistor V upper open.
11	Transistor V lower open.
12	Transistor W upper open.
13	Transistor W lower open.
14	Current feedback phase U open.
15	Current feedback phase W open.

If any hardware fault occurs during the open transistor testing, then the following occur:

- The hardware fault is saved.
- A phase–to–phase fault is set.
- All subsequent testing is stopped.
- Some untested devices may be set as open.

Typically, you should fix the hardware faults and run open tests again to determine if any opens exist.

What Do Open Transistor Faults Indicate?

Open transistor faults could indicate an open anywhere in the control or power section that turns on a given transistor. You should check the power transistor gate drive signal from the control board through the cabling to the opto–isolators continuing through the gate drives and finally through the cabling to the power transistor. This includes the power wiring to the motor terminals and the motor. If the bus voltage is too low, opens could occur; bus voltage should be greater than 85% of nominal line.

Phase Rotation Tests

For proper drive operation it is necessary to have:

A. A specific phase sequence of the motor leads (M1 M2 M3, M1 M3 M2 etc.)
B. A specific sequence of encoder leads (pulse A leads B etc.) These sequences determine the direction of rotation of the motor shaft on application of torque. An improper sequence can result in either the motor rotating the wrong direction or no production of torque. This test is used to ensure the above conditions by applying a positive torque and manually checking motor rotation and velocity feedback.

Sequential Torque Block Tuning

Set parameter 256 (*Autotune Diagnostics Selection*) Bit 3 to a value of 1:

Running the Inductance Test

A measurement of the motor inductance is required to determine the references for the regulators that control torque. This test measures the motor inductance and displays it in *Lsigma Tune [Leakage Inductance]* (parameter 237).

When running this test, you should be aware of the following:

- The motor should not rotate during this test although rated voltages and currents are present and the possibility of rotation exists. For encoderless systems, you must visually verify that the motor does not rotate.
- This test is run at rated motor current and by–passes the normal current limit functions.

Before running the inductance test, make sure that you have entered the correct motor nameplate information.

To run the inductance test:

1. Set bit 2 in *Autotune/Diagnostics Selection* (parameter 256).

2. Enable the drive.

The drive enable light turns off when the test is complete. The inductance test runs for approximately 1 minute. When a reading is obtained in *Lsigma Tune*, perform the resistance test.

Typical values for per unit inductance are in the range of 15% to 25% motor impedance. The value shown in *Lsigma Tune* is a percent value. If you are using long wiring runs, the typical value for per unit inductance should increase by the ratio of wiring inductance to motor inductance.

The motor inductance measuring routine contains several special faults. If the drive trips during the inductance test, check bits 0 through 5 of *Motor Inductance Test Errors* (parameter 295):

If this bit is set (1):	Then:
0	**Motor Not at Zero Speed** The motor is not at zero speed. Generally, this bit is set in two cases: • If the motor rotates during this test, an improper result is likely. Make sure the motor (decoupled from load or process) is not rotating just before or during the test. • If the motor is not rotating during this test, then investigate electrical noise creating encoder transitions. Improper encoder grounding or a noisy encoder power supply could cause noise. This fault cannot be determined for encoderless applications. You must visually check for this condition on encoderless systems. If your motor does rotate during this test, consult the factory.
1	**Sign Err**or A sign error fault occurs when the average voltage is negative. If you receive a sign error, you need to: 1. Run the test again. 2. Consider replacing the circuit boards.
2	**Zero Current** If this bit is set, you need to: 1. Set the rated motor current in *Nameplate Amps* (parameter 4) to the correct value. 2. Run the test again. 3. Consider replacing the control board.
3	**A/D Overflow at Min gain** The motor terminal voltage measuring circuit is not working properly. You need to: 1. Determine if the motor is connected. 2. Check cable connections between the gate drive and control boards. 3. Consider replacing the circuit boards. 4. Investigate any noise problems.
4	**Enable Dropout** The drive enable was lost during the inductance test. Consider running the test again and monitor the drive enable (bit 9 of *Inverter Status* (parameter 54) and/or the Inv En LED on the main control board.
5	**Sign error / Overflow** The calculated inductance is negative 1. Run the test again 2. Consider replacing the circuit boards

Running the Resistance Test

The drive requires a motor resistance measurement to determine the references for the regulators that control torque. The motor resistance test measures the motor resistance and displays it in *Rs Tune* (parameter 236). The test runs for approximately 10 – 30 seconds.

When running this test, you should be aware of the following:

- The motor should not rotate during this test although rated voltages and currents are present and the possibility of rotation exists. For encoderless systems, you must visually verify that the motor does not rotate.
- This test is run at rated motor current and by–passes the normal current limit functions.

Before running the resistance test make sure that you have entered the correct motor nameplate information.

To run the motor resistance test:

1. Set bit 3 in *Autotune/Diagnostic Selection* (parameter 256).

2. Enable the drive.

The drive enable light turns off when the test is complete. When a reading is obtained in *RS Tune*, perform the flux test.

Typical values for per unit motor resistance are in the range of 1% to 3% as displayed in *RS Tune*. The value in *RS Tune* increases as the length of wiring runs increase.

Several faults have been included to identify some problems that can occur in the resistance measuring routine. If the drive trips during the resistance test, check bits 0 through 7 of *Motor Stator Resistance Test Errors* (parameter 296):

If this bit is set:	Then:
0	**Motor Not at Zero Speed** The motor is not at zero speed. Generally, this bit is set in two cases: • If the motor rotates during this test, an improper result is likely. Make sure the motor (decoupled from load or process) is not rotating just before or during the test. • If the motor is not rotating during this test, then investigate electrical noise creating encoder transitions. Improper encoder grounding or a noisy encoder power supply could cause noise. This fault cannot be determined for encoderless applications. You must visually check for this condition on encoderless systems. If your motor does rotate during this test, consult the factory.
1	**Sign Error** A sign error fault occurs when the average voltage is negative. If you receive a sign error, run the test again because the value returned is not reliable.
2	**Not Used**
4	**Not Used**
6	**Not Used**
8	**Zero Current** If this bit is set, you need to: 1. Set the rated motor current in *Nameplate Amps* (parameter 4) to the correct value. 2. Run the test again. 3. Consider replacing the control board.
9	**Software Error** A software fault is generated when an improper sequence of events has occurred. Consider running the test again.
10	**Enable Dropout** The drive enable was lost during the resistance test. Consider running the test again and monitor the drive enable (bit 9 of *Inverter Status* (parameter 54) and/or the Inv En LED on the main control board).

What Happens If Multiple Opens Occur?

If multiple opens occur, several additional faults may be indicated. For example, if transistor U upper and U lower are open, the test also indicates that current feedback U phase is open. Because current cannot run through phase U, the current feedback device cannot be checked and therefore is listed as a malfunction The type of installation often determines which parts of the transistor diagnostics may or may not work. As a result, treat the software only as an aid for testing the power structure.

What Do I Do If I Get a Software Fault?

If bit 0 of *Inverter Diagnostics Result # 1 (P 258)* is set to 1, an improper sequence of events has occurred. Either the software cannot distinguish what is occurring, or there is noise in the system. If a fault occurs repeatedly, the problem may be a fault that the software cannot directly identify (for example, a voltage breakdown in a snubber). If this is the case, you need to determine through external measurements if the problem is real or if there is a noise problem. In cases where a specific test continually results in nuisance faults, use *Transistor Diagnostics Configuration* (parameter 257) to disable that test.

Running the Flux Test

Rated motor flux is required in order to produce rated torque at rated current.

Set **Parameter 256** Bit 4 to a value of 1. This selects the Motor Flux Test. This test measures the amount of current required to produce rated motor flux and displays it in **Parameter 238**. The motor will accelerate to approximately two–thirds base speed and then coast for several seconds. This cycle may repeat several times. The motor will then decelerate to a low speed before disabling. If the motor will not accelerate; increase parameter 40 (Torque Limit) until the motor accelerates. Parameter 41 (Speed Limit) will change the speed the motor accelerates to.

The Transistor Diagnostics, Phase Rotation, Inductance and Resistance Tests MUST be run before this test can be performed!

Toggle the start bit in the logic command to start the test. The Drive enable light will go out when the test is complete. When a reading is obtained in **Parameter 238**, record it and then update the torque block gains. If the test still faults, refer to the flux test faults.

***Flux Test Faults*:** Typical values for rated motor flux range from 20% to 50%. Several faults have been added to identify some problems that can occur in the flux test. Should the drive trip while the flux test is being performed, the cause can be found using parameter 297. The possible faults are detailed in Table 6.D.

Table 6.D
Flux Test Fault Descriptions

Bit #		Fault
0	Set	Parameter 41 set to less than 33% speed
1	Set	Parm 238 < 0 Current
2	Set	Parm 238 > 100% Drive current
3	Set	Master_Slave enable dropout fault
4	Set	Not Used
5	Set	Not Used
6	Set	Not Used
7	Set	Not Used

Responses for faults:

<u>Parm 41 set to less than 33% speed</u>: The Autotune speed must be set higher in order to get a meaningful result out of the flux test.

<u>Parm 238 < 0 Current</u>: This indicates that either 1 or some of the parameters are incorrectly set, electrical noise is/was present, motor phasing could be incorrect or other problems exist.

<u>Parm 238 > 100% Drive Current</u>: This identifies flux current greater than the drive rated current. This may be due to incorrect parameter settings, an undersized drive for the motor, or a problem motor.

<u>Master–Slave Enable Dropout</u>: This cable interlock between the Master and Slave drive was opened during the test.

If you experience problems while running the Flux Test it may be necessary to verify that parameters are set properly. The parameters listed in Table 6.E are the parameters that directly effect the Flux Test.

Table 6.E
Flux Test Parameters

Parameter Number	Description	Value/Comments
40	Autotune Torque Limit	100% allows 1 p.u. torque during accel
41	Autotune Speed	+/– 68% is the max. for the flux test, limited internally by the software.
127	Reverse Speed Limit	Set this to the limit of the application, if set to 0, the motor may not accelerate.
128	Forward Speed Limit	Set this to the limit of the application, if set to 0, the motor may not accelerate.
175	Positive Torque Ref Limit	Set this to the limit of the application, if set too low, the motor may not accelerate.
176	Negative Torque Ref Limit	Set this to the limit of the application, if set too low, the motor may not accelerate.
177	Motoring Power Limit	Set this to the limit of the application, if set too low, the motor may not accelerate.
178	Regen Power Limit	If set too high, you may trip out on a Bus Overvolts (see note).
179	Positive Motor Current Ref Limit	Set this to the limit of the application, if set too low, the motor may not accelerate.
180	Negative Motor Current Ref Limit	Set this to the limit of the application, if set too low, the motor may not accelerate.
227	Cp Operating Options	Set to 0 to allow the motor to coast to stop once the flux test is completed. Set to 128 to regen to stop even without a brake once the flux test is completed*.

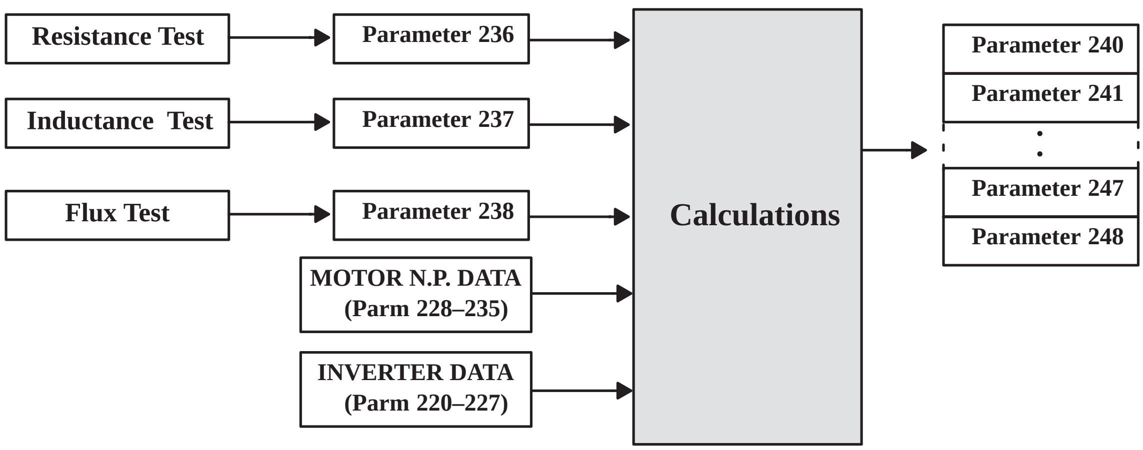
*Note: *The option to regenerate to stop following identification of flux producing current should function properly with or without a brake or regeneration unit. However, if a bus overvoltage fault occurs during the regen to stop, the identified value of flux producing current can be retrieved and placed in P238 without re–running the flux identification test with the regen to stop disabled. The identified value of flux can be found by using Software Testpoint Parameter 273 and placing 67 into it. The value of flux can be read by the user in the corresponding testpoint data parameter #274. The value of 274 is the identified flux current and must then be entered into parameter 238.*

Torque Block Update

To update the Torque Block gains, bit 5 in **Parameter 256** must be set to 1, and then a Start command must be given to the drive. Bit 5 of parameter 256 will automatically be set back to zero. The values in parameters 240 thru 248 will now to be updated.

***Calculations*:** This procedure takes the motor parameter information from Parameters 236, 237 and 238 along with the inverter and motor nameplate data and calculates the proper regulator references for torque control (Fig 6.9).

Figure 6.9
Calculations Test



Velocity Loop Autotune

The Velocity Loop Autotune procedure for the 1336 FORCE is designed to let you determine the maximum bandwidth for a particular system. You can select operation at any bandwidth at or below the maximum bandwidth that has been calculated.

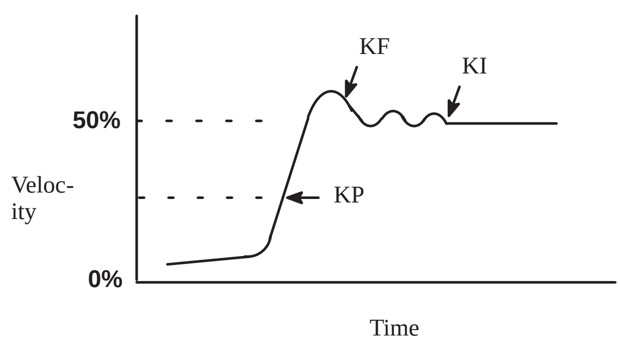
The velocity regulator is a PI regulator with a Velocity Feed Forward term (K_F Parm 141). The K_F term is user chosen and describes the system response to a change in velocity reference only. By decreasing the value of K_F the overshoot of the system will be reduced. When K_F is 1.0 the velocity loop behaves like a normal PI loop with the overshoot equaling approximately 10%. If K_F is reduced to 0.7 (the recommended operating point) then the overshoot is typically less than 1%, if K_F is reduced even further to 0.5 (the lowest recommended value) the response becomes underdamped with no overshoot.

The velocity loop KI term (parm 139) is the integral term of the PI regulator. The KI term is adjusted to remove any steady state instabilities.

The velocity loop KP term (Parm 140) is the proportional term of the PI regulator. The KP term is adjusted to determine how the drive responds to a step change in load.

IMPORTANT: If the velocity regulator is tuned too responsive, the motor and load could potentially chatter. If tuned non–responsive, the regulator will seem sluggish. The value for Kp will increase as the system inertia increases. For High inertia systems, Kp may be greater than for KI. For low inertia systems (systems with inertias under 1 Sec.) KI will typically be larger than KP.

Figure 6.10
Velocity Regulator Functional Diagram



The list of parameters that must be set to achieve proper velocity loop tuning is detailed in Table 6.F.

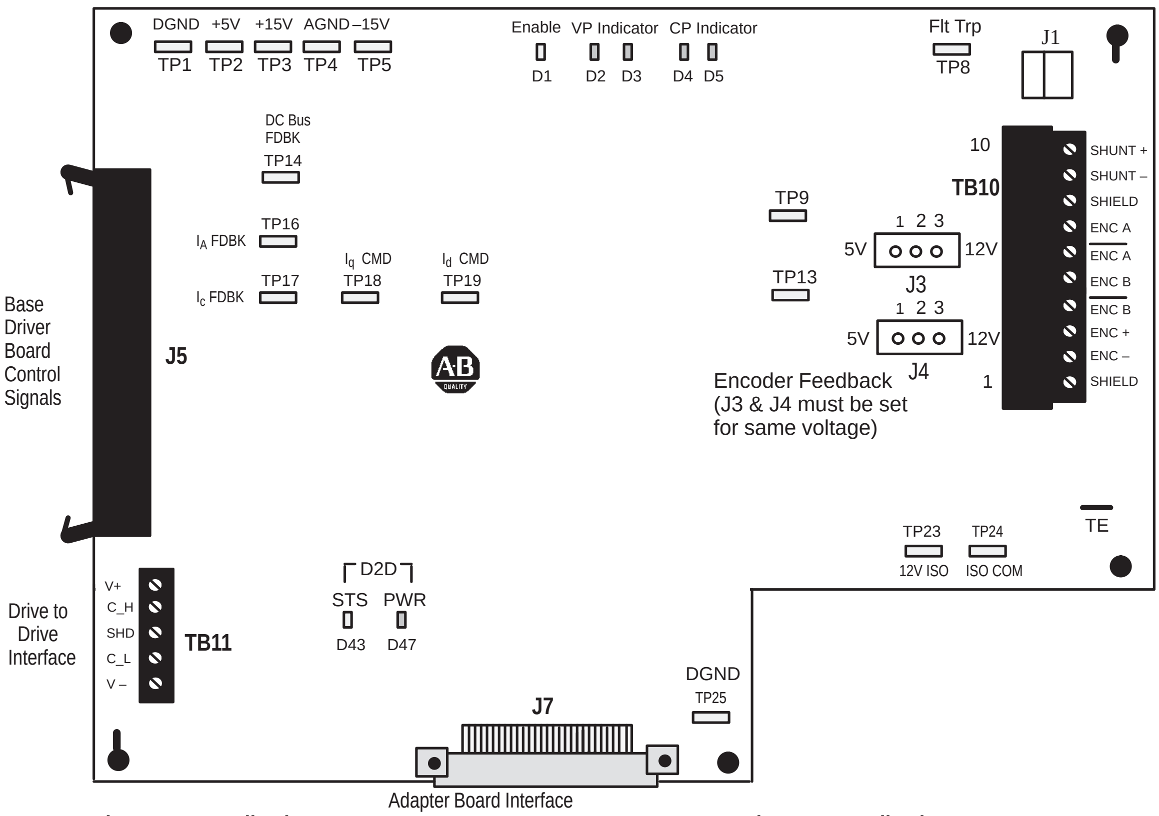
Table 6.F
Velocity Loop Parameters

Parameter Number	Description	Value/Comments
40	Autotune Torque Limit	75% allows 75% rated torque during accel
41	Autotune Speed	75% allows Autotune velocity to go to 75% Percent base motor velocity
53	Torq Mode Select	Set to Value of 1 for encoder fdbk
127	Reverse Speed Limit	Set this to the limit of the application, if set to 0, the motor may not accelerate.
128	Forward Speed Limit	Set this to the limit of the application, if set to 0, the motor may not accelerate.
150	Feedback Device Type	Set to Value of 1 for encoder fdbk
175	Positive Torque Ref Limit	Set this to the limit of the application, if set too low, the motor may not accelerate.
176	Negative Torque Ref Limit	Set this to the limit of the application, if set too low, the motor may not accelerate.
177	Motoring Power Limit	Set this to the limit of the application, if set too low, the motor may not accelerate.
178	Regen Power Limit	If set too high may trip on a Bus Overvoltage fault.
179	Positive Motor Current Ref Limit	Set this to the limit of the application, if set too low, the motor may not accelerate.
180	Negative Motor Current Ref Limit	Set this to the limit of the application, if set too low, the motor may not accelerate.
235	Encoder PPR	Pulses Per Revolution

Hardware Testpoints

The Hardware Testpoints on the Series B 1336 FORCE Control Board are illustrated in Figure 6.11. The accompanying table details the expected output from each testpoint.

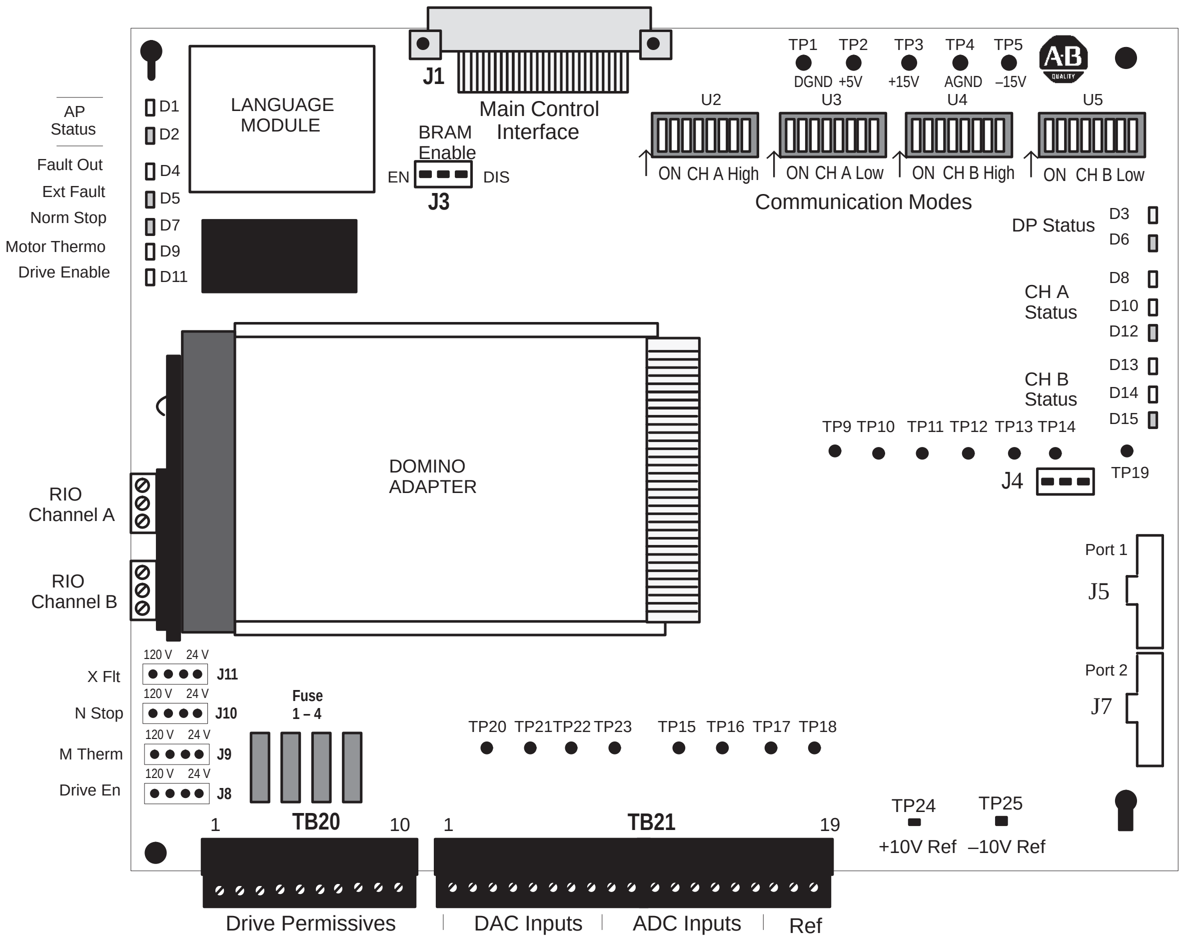
Figure 6.11
Main Control Board Test Points



Testpoint	Application	Testpoint	Application
TP1	DGND	TP16	Ia FDBK (0 to =/– 5V sine wave) same as Iq feedback
TP2	+5V	TP17	Ic FDBK (0 to =/– 5V sine wave) same as Iq feedback
TP3	+15V	TP18	Iqs Command (0 to +/– 10V sine wave)
TP4	AGND	TP19	Ids Command (0 to +/– 10V sine wave)
TP5	–15V	TP20	Master Reset (5V = Reset)
TP6	–2.5 to 2.5 V	TP21	Id FDBK (0 to +/– 5V sine wave)
TP7	0 to 2.5V	TP22	Feed Forward Voltage (0 to +/–/7.5V sine wave)
TP8	+5V when faulted	TP23	ISO 12V for Tachometer/Encoder
TP9	CHA Encoder Fdbk 0 to 5 Square Wave with respect to TP1 or TP25 DGND	TP24	ISO RTN for Tachometer/Encoder
		TP25	DGND
TP10	Test DAC2 (Development Use Only)		
TP11	Square Wave (Follows Carrier Frequency)		
TP12	Test DAC1 (Development Use Only)		
TP13	CHB Encoder Fdbk 0 to 5V Square Wave with respect to TP1 or TP25 DGND		
TP14	Bus Voltage FDBK (4V = 650 vdc)		
TP15	Feed Forward Voltage (0 to +/– 7.5V sine wave)		

The Hardware Testpoints on the PLC Comm Adapter Board are illustrated in Figure 6.12. The accompanying table details the expected output from each testpoint.

Figure 6.12
PLC Comm Board Test Points



Testpoint	Application	Testpoint	Application
TP1	DGND	TP15	AIN – 1
TP2	+5V	TP16	AIN – 2
TP3	+15V	TP17	AIN – 3
TP4	AGND	TP18	AIN – 4
TP5	–15V	TP19	+12V
TP9	Not Used	TP20	AOUT – 1
TP10	Not Used	TP21	AOUT – 2
TP11	ISO +12 VDC	TP22	AOUT – 3
TP12	ISO –5V	TP23	AOUT – 4
TP13	ISO GND	TP24	+10V Ref
TP14	IGND	TP25	–10V Ref

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Appendix

Motor Cables

A variety of cable types are acceptable for 1336 FORCE drive installations. For many installations, unshielded cable is adequate, provided it can be separated from sensitive circuits. As an approximate guide, allow a spacing of 1 meter (3.3 feet) for every 10 meters (33 feet) of length. In all cases, long parallel runs must be avoided.

The cable should be 4–conductor with the ground lead being connected directly to the drive ground terminal (PE) and the motor frame ground terminal.

Shielded Cable – Shielded cable is recommended if sensitive circuits or devices are connected or mounted to the machinery driven by the motor. The shield must be connected to the drive ground terminal (PE) and the motor frame ground terminal. It is important that the connection be made at both ends to minimize the external magnetic field.

If cable trays or large conduits are used to distribute the motor leads for multiple drives, shielded cable is recommended to reduce or capture the noise from the motor leads and minimize “cross coupling” of noise between the leads of different drives. The shield should be connected to the ground (PE) connections at both the motor and drive end.

Armored cable also provides effective shielding. Ideally it should be grounded only at the the drive (PE) and motor frame. Some armored cable has a PVC coating over the armor to prevent incidental contact with grounded structure. If, due to the type of connector, the armor must be grounded at the cabinet entrance, shielded cable should be used within the cabinet to continue as far as possible to the coaxial arrangement of power cable and ground.

In some hazardous environments it is not permissible to ground both ends of the cable armor. This is because of the possibility of high current circulating at the input frequency if the ground loop is cut by a strong magnetic field. This only applies in the proximity of powerful electrical machines. In this case, the ground connection at one end may be made through a capacitance which will block the frequency current but present a low impedance to RF. Because of the highly pulsed nature of the circulating current, the capacitor type used must be rated for AC–to–ground voltage. Consult factory for specific guidelines.

Conduit – If metal conduit is preferred for cable distribution the following guidelines must be followed:

1. Drives are normally mounted in cabinets and ground connections are made at a common ground point in the cabinet. If the conduit is connected to the motor junction box and the drive end, no further conduit connections are necessary.

2. No more than three sets of motor leads can be routed through a single conduit. This will minimize “cross talk” that could reduce the effectiveness of the noise reduction methods described. If more than three drive/motor connections per conduit are required, shielded cable as described above must be used. If practical, each conduit should contain only one set of motor leads.

ATTENTION: To avoid a possible shock hazard caused by induced voltages, unused wires in the conduit must be grounded at both ends. For the same reason, if a drive sharing a conduit is being serviced or installed, all drives using this conduit should be disabled. This will eliminate the possible shock hazard from “cross coupled” drive motor leads.

Motor Lead Length – Installations with long cables to the motor may require the addition of output reactors or cable terminators to limit voltage reflections at the motor. Refer to the following tables for the maximum length cable allowed for various installation techniques.

Table A.1
Maximum Motor Cable Length Restrictions in meters (feet) – 380V-480V Drives [1]

Drive Frame	Drive kW (HP)	Motor kW (HP)	No External Devices				w/ 1204-TFB2 Term.			w/ 1204-TFA1 Terminator					Reactor at Drive[2]	
			Motor				Motor			Motor					Motor	
			A	B	1329	1329R, HR, L	A or B		1329	A		B		1329	A	B or 1329
			Any Cable	*Any Cable*	*Any Cable*	*Any Cable*	Cable Type		*Any Cable*	Cable Type		Cable Type		*Any Cable*	*Any Cable*	*Any Cable*
							Shld.[3]	*Unshld.*		*Shld.*[3]	*Unshld.*	*Shld.*[3]	*Unshld.*			
A1	0.37 (0.5)	0.37 (0.5)	12.2 (40)	33.5 (110)	114.3 (375)	**Unlimited** Applies to new installations using new motors and new drives. For retrofit situations, check with the motor manufacturer for insulation rating.	**Use 1204-TFA1**			30.5 (100)	61.0 (200)	30.5 (100)	61.0 (200)	182.9 (600)	22.9 (75)	182.9 (600)
	0.75 (1)	0.75 (1)	12.2 (40)	33.5 (110)	114.3 (375)					30.5 (100)	30.5 (100)	30.5 (100)	30.5 (100)	182.9 (600)	22.9 (75)	182.9 (600)
		0.37 (0.5)	12.2 (40)	33.5 (110)	114.3 (375)					30.5 (100)	61.0 (200)	30.5 (100)	61.0 (200)	182.9 (600)	22.9 (75)	182.9 (600)
A2	1.2 (1.5)	1.2 (1.5)	12.2 (40)	33.5 (110)	114.3 (375)					30.5 (100)	30.5 (100)	61.0 (200)	61.0 (200)	182.9 (600)	22.9 (75)	182.9 (600)
		0.75 (1)	12.2 (40)	33.5 (110)	114.3 (375)					30.5 (100)	30.5 (100)	61.0 (200)	61.0 (200)	182.9 (600)	22.9 (75)	182.9 (600)
		0.37 (0.5)	12.2 (40)	33.5 (110)	114.3 (375)					30.5 (100)	30.5 (100)	61.0 (200)	61.0 (200)	182.9 (600)	22.9 (75)	182.9 (600)
	1.5 (2)	1.5 (2)	7.6 (25)	12.2 (40)	114.3 (375)		91.4 (300)	182.9 (600)	182.9 (600)	30.5 (100)	30.5 (100)	91.4 (300)	61.0 (200)	182.9 (600)	22.9 (75)	182.9 (600)
		1.2 (1.5)	7.6 (25)	12.2 (40)	114.3 (375)		91.4 (300)	182.9 (600)	182.9 (600)	30.5 (100)	30.5 (100)	91.4 (300)	61.0 (200)	182.9 (600)	22.9 (75)	182.9 (600)
		0.75 (1)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)	30.5 (100)	30.5 (100)	91.4 (300)	61.0 (200)	182.9 (600)	22.9 (75)	182.9 (600)
		0.37 (0.5)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)	30.5 (100)	30.5 (100)	91.4 (300)	61.0 (200)	182.9 (600)	22.9 (75)	182.9 (600)
	2.2 (3)	2.2 (3)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)	**Use 1204-TFB2**					22.9 (75)	182.9 (600)
		1.5 (2)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						22.9 (75)	182.9 (600)
		0.75 (1)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						22.9 (75)	182.9 (600)
		0.37 (0.5)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						22.9 (75)	182.9 (600)
A3	3.7 (5)	3.7 (5)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						22.9 (75)	182.9 (600)
		2.2 (3)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						22.9 (75)	182.9 (600)
		1.5 (2)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						22.9 (75)	182.9 (600)
		0.75 (1)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						22.9 (75)	182.9 (600)
		0.37 (0.5)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						22.9 (75)	182.9 (600)
A4	5.5-7.5 (7.5-10)	5.5-7.5 (7.5-10)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						24.4 (80)	182.9 (600)
B	5.5-22 (7.5-30)	5.5-22 (7.5-30)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						24.4 (80)	182.9 (600)
C	30-45 (X40-X60)	30-45 (40-60)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						76.2 (250)	182.9 (600)
D	45-112 (60-X150)	45-112 (60-150)	12.2 (40)	30.5 (100)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						61.0 (200)	91.4 (300)
E	112-187 (150-250)	112-224 (150-300)	12.2 (40)	53.3 (175)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						182.9 (600)	182.9 (600)
F	187-336 (250-450)	187-336 (250-450)	18.3 (60)	53.3 (175)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						182.9 (600)	182.9 (600)
G	187-448 (X250-600)	187-448 (250-600)	18.3 (60)	53.3 (175)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						182.9 (600)	182.9 (600)

Type A Motor Characteristics: No phase paper or misplaced phase paper, lower quality insulation systems, corona inception voltages between 850 and 1000 volts.

Type B Motor Characteristics: Properly placed phase paper, medium quality insulation systems, corona inception voltages between 1000 and 1200 volts.

1329R Motors: These AC Variable Speed motors are “Power Matched” for use with Allen-Bradley Drives. Each motor is energy efficient and designed to meet or exceed the requirements of the Federal Energy Act of 1992. All 1329R motors are optimized for variable speed operation and include premium inverter grade insulation systems which meet or exceed NEMA MG1. Part 31.40.4.2.

Table A.2
Maximum Motor Cable Length Restrictions in meters (feet) – 500V-600V Drives[4]

			No External Devices			**w/ 1204-TFB2 Terminator**			**w/ 1204-TFA1 Terminator**			**Reactor at Drive**[2]		
			Motor w/ Insulation V_{P-P}			Motor w/ Insulation V_{P-P}			Motor w/ Insulation V_{P-P}			Motor w/ Insulation V_{P-P}		
			1000V	1200V	1600V[6]	1000V	1200V	1600V[6]	1000V	1200V	1600V[6]	1000V	1200V	1600V[6]
Drive Frame	**Drive kW (HP)**	**Motor kW (HP)**	*Any Cable*	*Any Cable*	*Any Cable*	*Any Cable*	*Any Cable*	*Any Cable*	*Any Cable*	*Any Cable*	*Any Cable*	*Any Cable*	*Any Cable*	*Any Cable*
A4	0.75 (1)	0.75 (1)	NR	NR	15.2 (50)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)	Not Recommended		
		0.37 (0.5)	NR	NR	15.2 (50)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
	1.5 (2)	1.5 (2)	NR	NR	15.2 (50)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		1.2 (1.5)	NR	NR	15.2 (50)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		0.75 (1)	NR	NR	15.2 (50)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		0.37 (0.5)	NR	NR	15.2 (50)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
	2.2 (3)	2.2 (3)	NR	NR	15.2 (50)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		1.5 (2)	NR	NR	15.2 (50)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		0.75 (1)	NR	NR	15.2 (50)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		0.37 (0.5)	NR	NR	15.2 (50)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
	3.7 (5)	3.7 (5)	NR	NR	15.2 (50)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		2.2 (3)	NR	NR	15.2 (50)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		1.5 (2)	NR	NR	15.2 (50)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		0.75 (1)	NR	NR	15.2 (50)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		0.37 (0.5)	NR	NR	15.2 (50)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
B	5.5-15 (7.5-20)	5.5-15 (7.5-20)	NR	9.1 (30)	15.2 (50)	91.4 (300)	182.9 (600)	182.9 (600)	NR	61.0 (200)	182.9 (600)	30.5 (100)	91.4 (300)	182.9 (600)
C	18.5-45 (25-60)	18.5-45 (25-60)	NR	9.1 (30)	12.2 (40)	91.4 (300)	182.9 (600)	182.9 (600)	NR	61.0 (200)	182.9 (600)	30.5 (100)	91.4 (300)	182.9 (600)
D	56-93 (75-125)	56-93 (75-125)	NR	9.1 (30)	33.5 (110)	91.4 (300)	182.9 (600)	182.9 (600)	NR	61.0 (200)	182.9 (600)	61.0 (200)	91.4 (300)	182.9 (600)
E	112-224 (150-X300)	112-224 (150-X300)	NR	9.1 (30)	21.3 (70)	91.4 (300)	182.9 (600)	182.9 (600)	NR	61.0 (200)	182.9 (600)	182.9 (600)	182.9 (600)	182.9 (600)
F	187-336 (250-450)	187-336 (250-450)	NR	9.1 (30)	41.1 (135)	91.4 (300)	182.9 (600)	182.9 (600)	NR	61.0 (200)	182.9 (600)	182.9 (600)	182.9 (600)	182.9 (600)
G	224-448 (300-600)	224-448 (300-600)	NR	9.1 (30)	41.1 (135)	91.4 (300)	182.9 (600)	182.9 (600)	NR	61.0 (200)	182.9 (600)	182.9 (600)	182.9 (600)	182.9 (600)
H	522-597 (700-800)	522-597 (700-800)	NR	9.1 (30)	41.1 (135)	91.4 (300)	182.9 (600)	182.9 (600)	NR	61.0 (200)	182.9 (600)	182.9 (600)	182.9 (600)	182.9 (600)

NR = Not Recommended

1 Values shown are for 480V nominal input voltage and drive carrier frequency of 2 kHz. Consult factory regarding operation at carrier frequencies above 2 kHz. Multiply values by 0.85 for high line conditions. For input voltages of 380, 400 or 415V AC, multiply the table values by 1.25, 1.20 or 1.15, respectively.

2 A 3% reactor reduces motor and cable stress but may cause a degradation of motor waveform quality. Reactors must have a turn–turn insulation rating of 2100 volts or higher.

3 Includes wire in conduit.

4 Values shown are for nominal input voltage and drive carrier frequency of 2 kHz. Consult factory regarding operation at carrier frequencies above 2 kHz. Multiply values by 0.85 for high line conditions.

5 Information not available at time of printing.

6 1329R only.

Cable Termination

Optional Cable Terminator

Voltage doubling at motor terminals, known as reflected wave phenomenon, standing wave or transmission line effect, can occur when using drives with long motor cables.

Inverter duty motors with phase–to–phase insulation ratings of 1600 volts or higher should be used to minimize effects of reflected wave on motor insulation life.

Applications with non–inverter duty motors or any motor with exceptionally long leads may require an output inductor or cable terminator. An inductor or terminator will help limit reflection to the motor, to levels which are less than the motor insulation value.

Tables 2.A & 2.B list the maximum recommended cable length for unterminated cables, since the voltage doubling phenomenon occurs at different lengths for different drive ratings. If your installation requires longer motor cable lengths, a reactor or cable terminator is recommended.

Optional Output Reactor

The reactors listed in the 1336 FORCE price list can be used for drive input and output. These reactors are specifically constructed to accomodate IGBT inverter applications with switching frequencies up to 20 KHz. They have a UL approved dielectric strength of 4000 volts, opposed to a normal rating of 2500 volts. The first two and last two turns of each coil are triple insulated to guard against insulation breakdown resulting from high dv/dt. When using motor line reactors, it is recommended that the drive PWM frequency be set to its lowest value to minimize losses in the reactors.

Important: By using an output reactor the effective motor voltage will be lower because of the voltage drop across the reactors – this may also mean a reduction of the motor torque.

Common Mode Cores – Common Mode cores will help reduce the common mode noise at the drive output, and guard against tripping of the drive caused by capacitive leakage effects. The capacitive currents are larger at higher PWM frequencies.

Enclosures

Customer Supplied Enclosure Requirements – 1336 FORCE drives installed in customer supplied enclosures may be mounted within an enclosure or may be mounted to allow the heatsink to extend outside the enclosure. Use the information in Table A.3 in combination with the enclosure manufacturer’s guidelines for sizing.

Table A.3 – Enclosure Requirements

	Catalog No.	Base Derate Amps[1]	Derate Curve[2,3]	Heat Dissipation Drive Watts [2,3,4]	Heatsink Watts [2]	Total Watts [2]
200 – 240 V Drives	A001	4.5	None	17	32	49
	A003	12	None	33	72	105
	A007	27	None	156	486	642
	A010	34	Fig. 1	200	721	921
	A015	48	Fig. 2	205	819	1024
	A020	65	Fig. 3	210	933	1143
	A025	78	Fig. 4	215	1110	1325
	A030	80	[4]	220	1110	1330
	A040	120	Fig. 5	361	1708	2069
	A050	149	Fig. 6	426	1944	2370
	A060	180	Fig. 7	522	2664	3186
	A075	240	Fig. 8	606	2769	3375
	A100	291	Fig. 9	755	3700	4455
	A125	327	Fig. 16	902	4100	5002
380 – 460 V Drives	B001	2.5	None	15	20	35
	B003	6	None	23	54	77
	B007	14	None	91	270	361
	B010	21	None	103	394	497
	B015	27	Fig. 10	117	486	603
	B020	34	Fig. 1	140	628	768
	B025	42	Fig. 11	141	720	861
	B030	48	Fig. 2	141	820	961
	BX040	59	Fig. 12	175	933	1108
	B040	65	Fig. 3	175	933	1108
	B050	78	Fig. 4	193	1110	1303
	BX060	78	Fig. 4	193	1110	1303
	B060	97	[4]	361	1708	2069
	B075	120	Fig. 13	361	1708	2069
	B100	150	Fig. 14	426	1944	2370
	B125	180	Fig. 15	522	2664	3186
	BX150	180	Fig. 15	606	2769	3375
	B150	240	Fig. 8	606	2769	3375
	B200	291	Fig. 9	755	3700	4455
	B250	327	Fig. 16	902	4100	5002
	B300	406	None	1005	4805	5810
	BP300	406	Fig. 33	619	5342	5961
	B350	459	None	1055	5455	6510
	BP350	459	Fig. 34	733	6039	6772
	B400	505	None	1295	6175	7470
	BP400	481	Fig. 35	793	6329	7122
	B450	570	None	1335	6875	8210
	BP450	532	Fig. 36	931	7000	7931
	B500	599	Fig. 17	1395	7800	9200
	B600	673	Fig.18	1485	8767	10252
500 – 600 V Drives	C001	2.5	[4]	[4]	[4]	[4]
	C003	6	[4]	[4]	[4]	[4]
	C007	10	[4]	91	217	308
	C010	12	[4]	103	251	354
	C015	19	[4]	117	360	477
	C020	24	[4]	140	467	607
	C025	30	[4]	141	492	633
	C030	35	[4]	141	526	667
	C040	45	[4]	175	678	853
	C050	57	[4]	193	899	1092
	C060	62	[4]	193	981	1174
	C075	86	Fig. 19	361	1553	1894
	C100	109	Fig. 20	426	1978	2504
	C125	138	Fig. 21	522	2162	2683
	C150	160	Fig. 22	[4]	[4]	[4]
	C200	252	Fig. 23	755	3065	3820
	C250	284	Fig. 24	890	3625	4515
	C300[5]	298	None	926	5015	5941
	C350[5]	354	None	1000	5935	6935
	C400[5]	406	Fig. 25	1430	7120	8550
	C450[5]	460	Fig. 26	1465	8020	9485
	C500[5]	505	Fig. 27	1500	8925	10425
	C600[5]	600	Fig. 28	1610	10767	12377
	C650[5]	673	Fig. 29	1700	12000	1400

1
Base Derate Amps are based on nominal voltage (240, 480 or 600V). If input voltage exceeds Drive Rating, Drive Output must be derated. **Refer to Figure 31.**

2
Drive Ambient Temperature Rating is 40°C. If ambient exceeds 40°C, the drive must be derated. **Refer to Figures 1–29.**

3
DriveRating is based on altitudes of 1,000m (3000 ft.) or less. If installed at a higher altitude, Drive must be derated.
Refer to Figure 30.

4
Not available at time of publication.

5
Important: Two (2) 725 CFM fans are required if an open type drive is mounted in a user supplied enclosure.

Derating Guidelines

Drive ratings can be affected by a number of factors. If more than one factor exists, consult Allen–Bradley Co.

Standard Rating for Enclosed Drive in 40°C Ambient & Open Drive in 50°C Ambient

Derating Factor for Enclosed Drive in Ambient between 41°C & 50°C.

Figure 1
1336T–A010 and B020

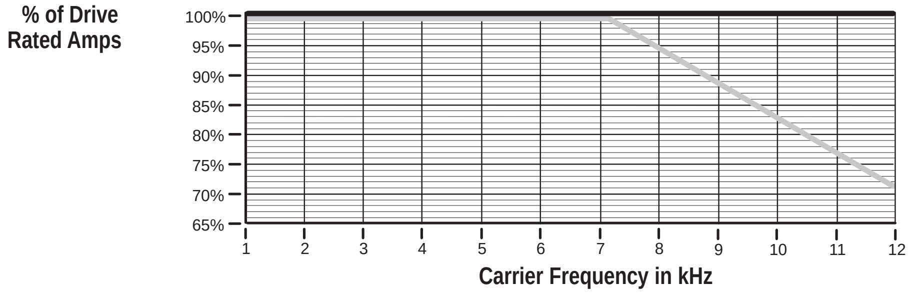


Figure 2
1336T–A015 and B030

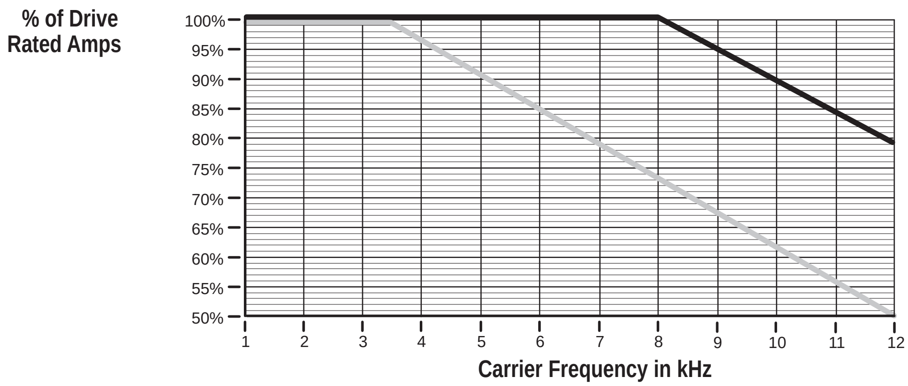


Figure 3
1336T–A020 and B040

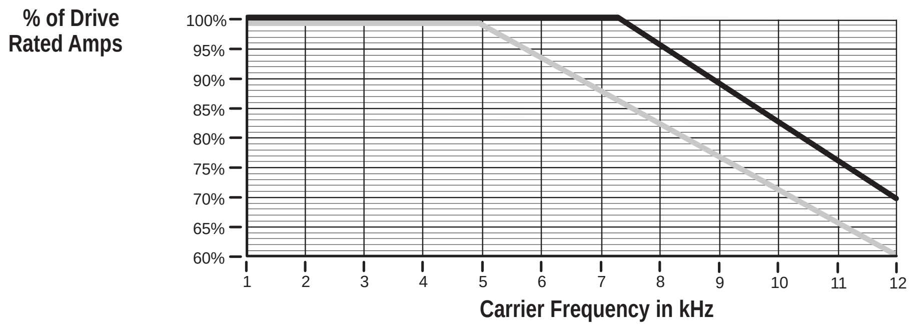
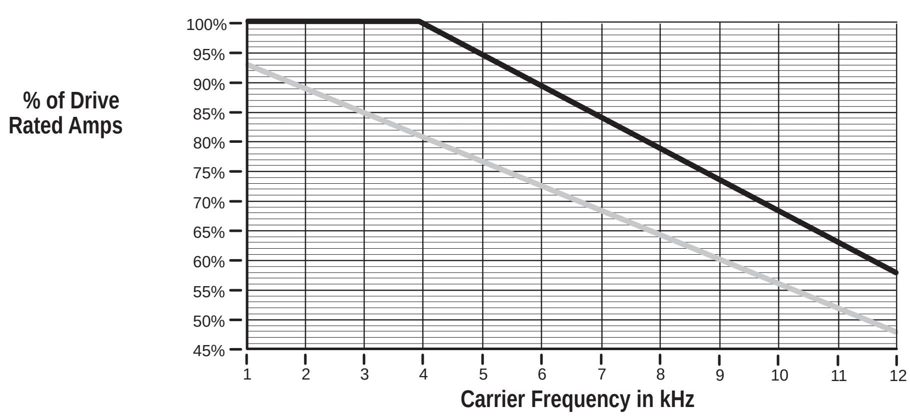


Figure 4
1336T–A025, B050 and BX060



Standard Rating for Enclosed Drive in 40°C Ambient & Open Drive in 50°C Ambient

Derating Factor for Enclosed Drive in Ambient between 41°C & 50°C.

Figure 5
1336T–A040

% of Drive Rated Amps

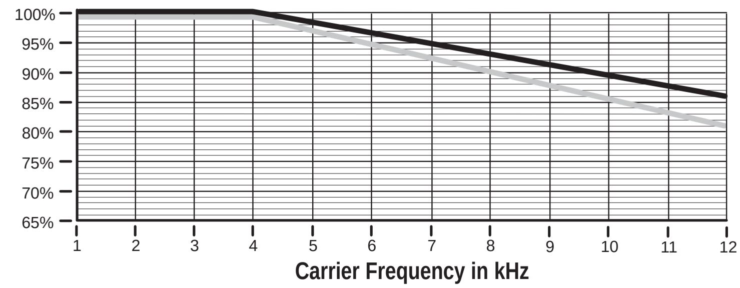


Figure 6
1336T–A050

% of Drive Rated Amps

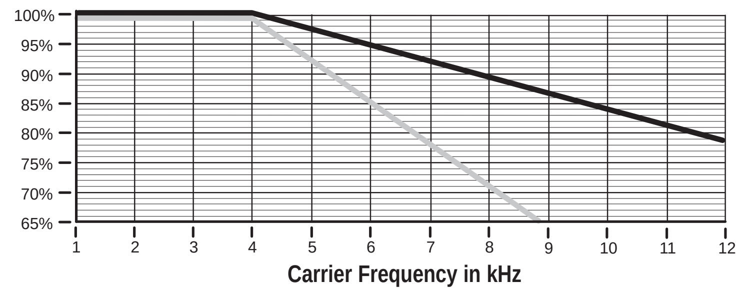


Figure 7
1336T–A060

% of Drive Rated Amps

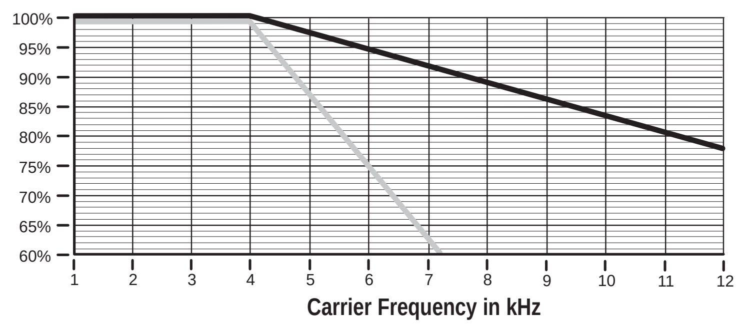
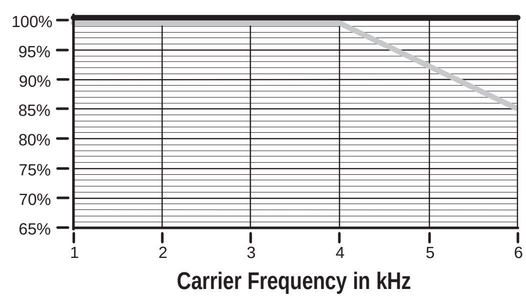


Figure 8
1336T–A075 and B150

% of Drive Rated Amps



Standard Rating for Enclosed Drive in 40°C Ambient & Open Drive in 50°C Ambient

Derating Factor for Enclosed Drive in Ambient between 41°C & 50°C.

Figure 9
1336T–A100 and B200

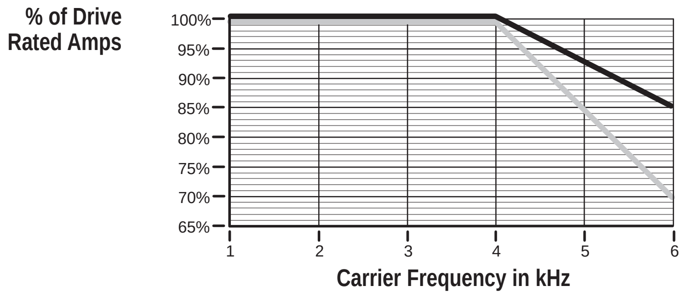


Figure 10
1336T–B015

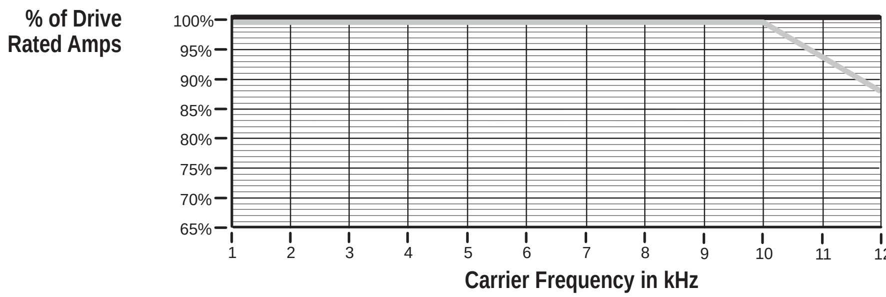


Figure 11
1336T–B025

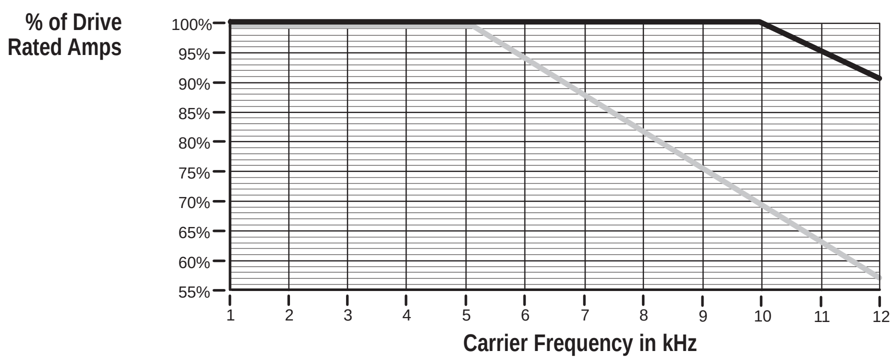


Figure 12
1336T–BX040

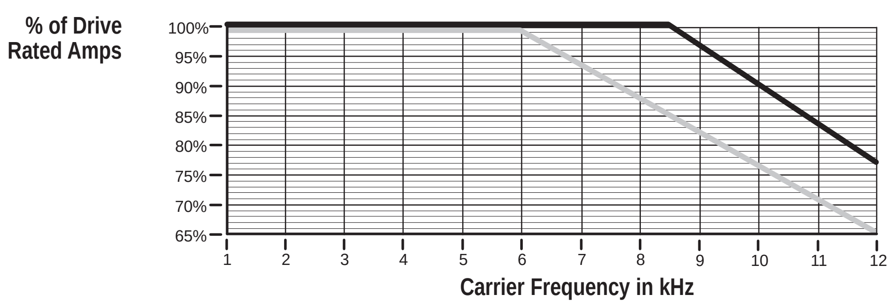
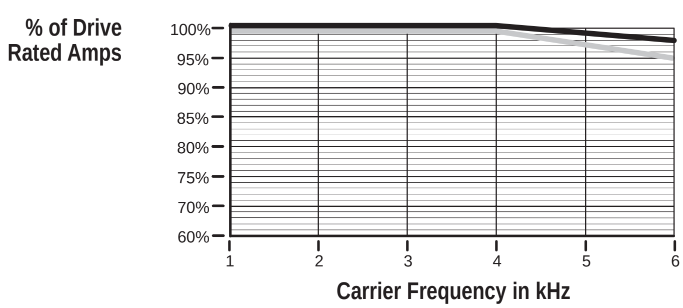


Figure 13
1336T–B075



Standard Rating for Enclosed Drive in 40°C Ambient & Open Drive in 50°C Ambient

Derating Factor for Enclosed Drive in Ambient between 41°C & 50°C.

Figure 14
1336T–B100

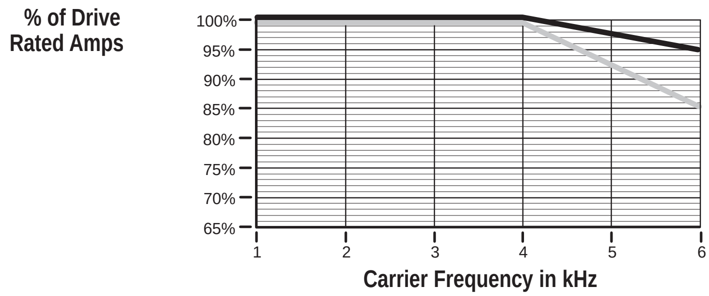


Figure 15
1336T–B125 and BX150

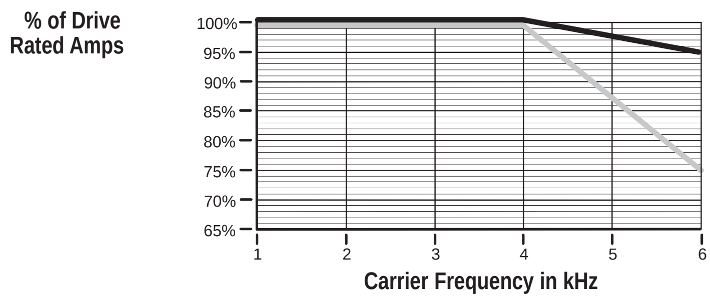


Figure 16
1336T–B250

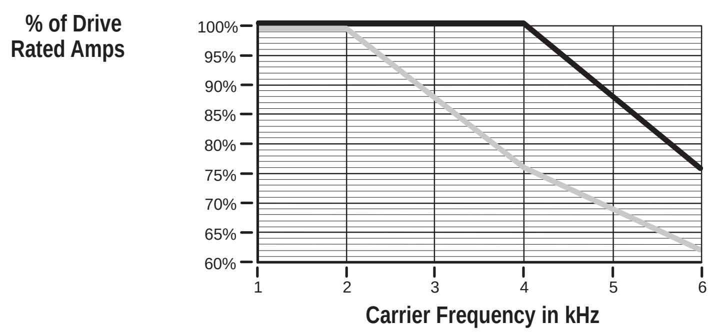


Figure 17
1336T–B500

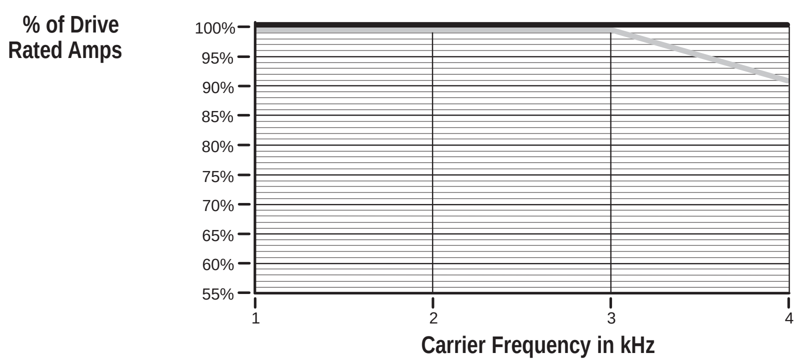
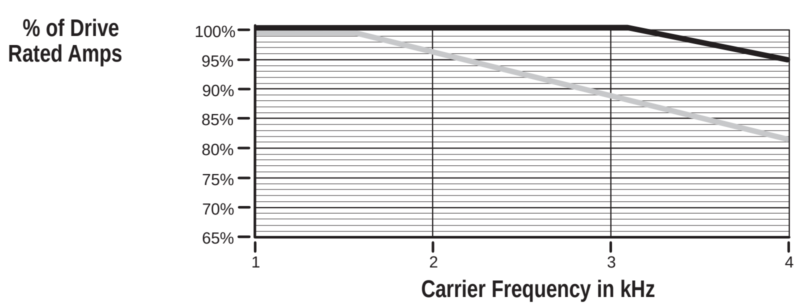


Figure 18
1336T–B600



Standard Rating for Enclosed Drive in 40°C Ambient & Open Drive in 50°C Ambient
Derating Factor for Enclosed Drive in Ambient between 41°C & 50°C.

Figure 19
1336T–C075

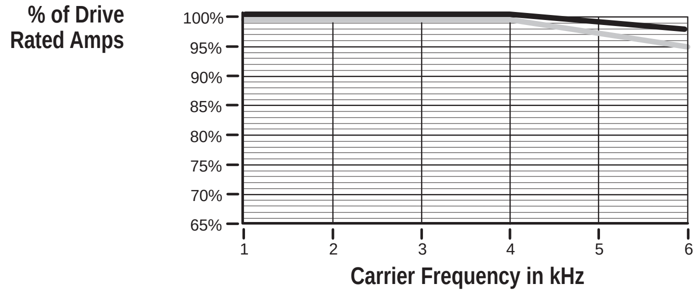


Figure 20
1336T–C100

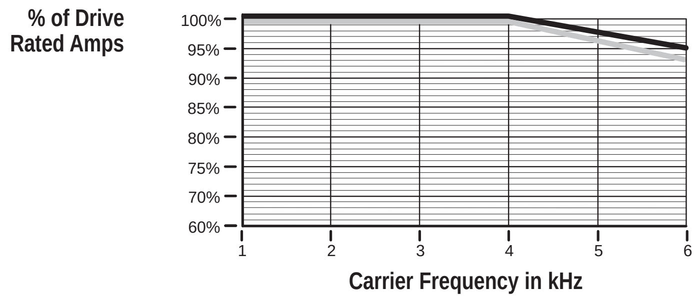


Figure 21
1336T–C125

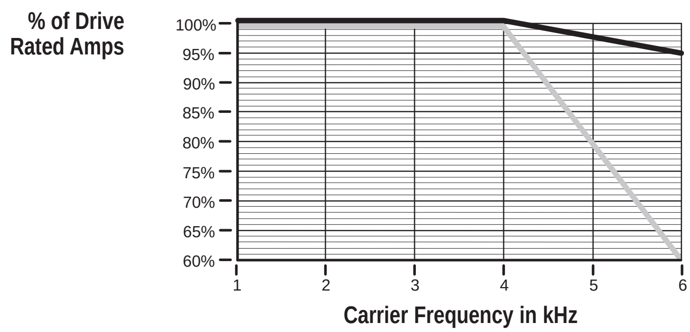


Figure 22
1336T–C150

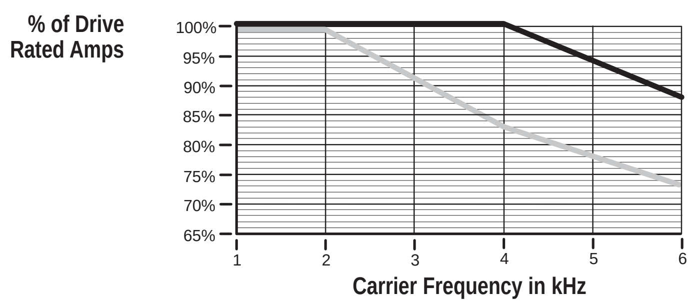
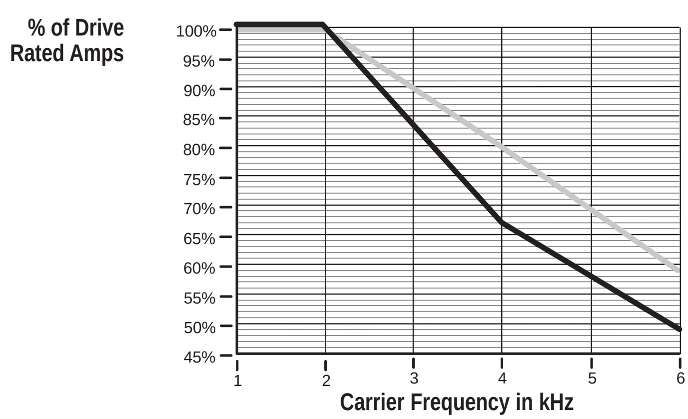


Figure 23
1336T–C200



Standard Rating for Enclosed Drive in 40°C Ambient & Open Drive in 50°C Ambient
Derating Factor for Enclosed Drive in Ambient between 41°C & 50°C.

Figure 24
1336T–C250

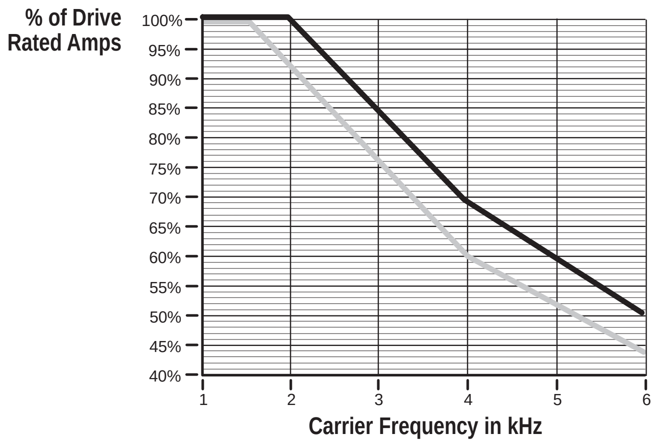


Figure 25
1336T–C400

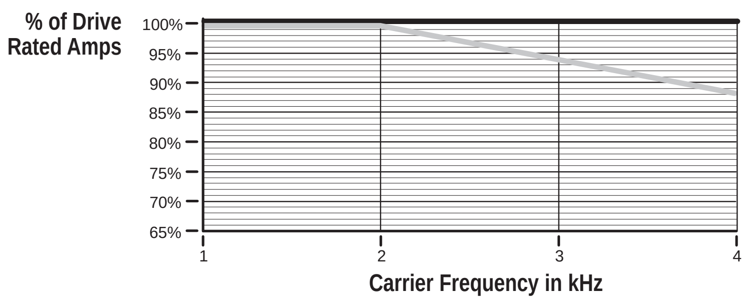


Figure 26
1336T–C450

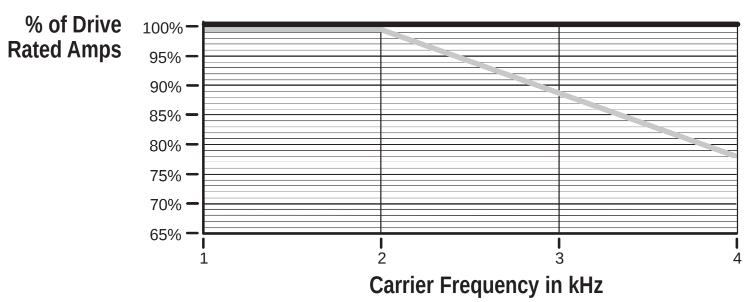
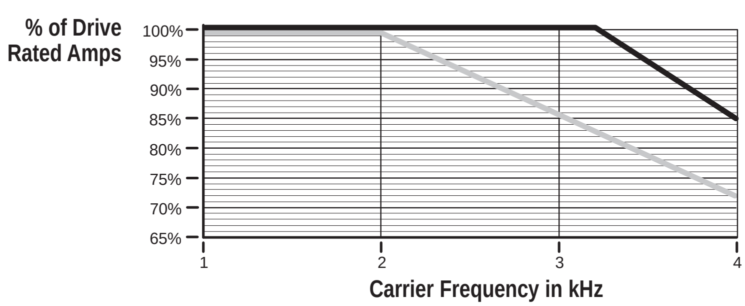


Figure 27
1336T–C500



Standard Rating for Enclosed Drive in 40°C Ambient & Open Drive in 50°C Ambient
Derating Factor for Enclosed Drive in Ambient between 41°C & 50°C.

Figure 28
1336T–C600

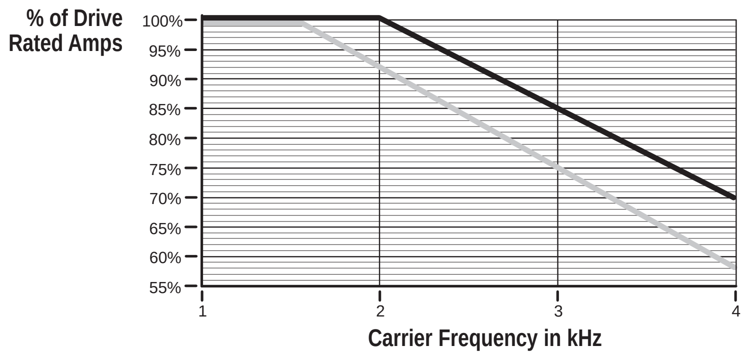


Figure 29
1336T–C650

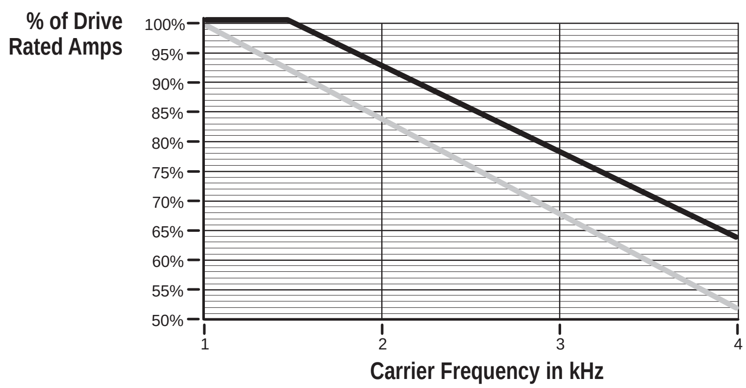


Figure 30
All Drive Ratings

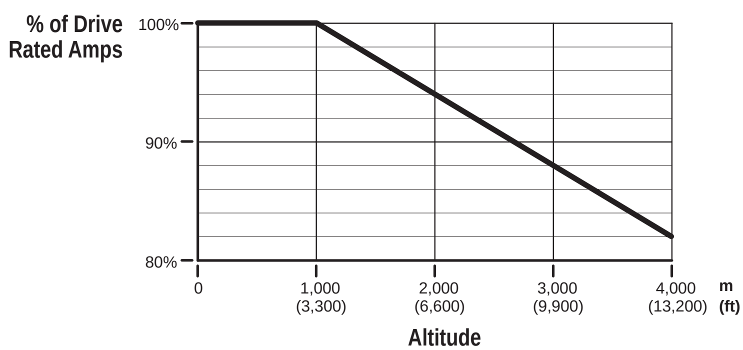


Figure 31
Required Only for the following drives:

1336T–A/B/C–025 18.5 kW (25 HP) at 8 kHz
1336T–A/B/C 22 kW (30 HP) at 6–8 kHz
1336T–A/B/C 45 kW (60 HP) at 6 kHz

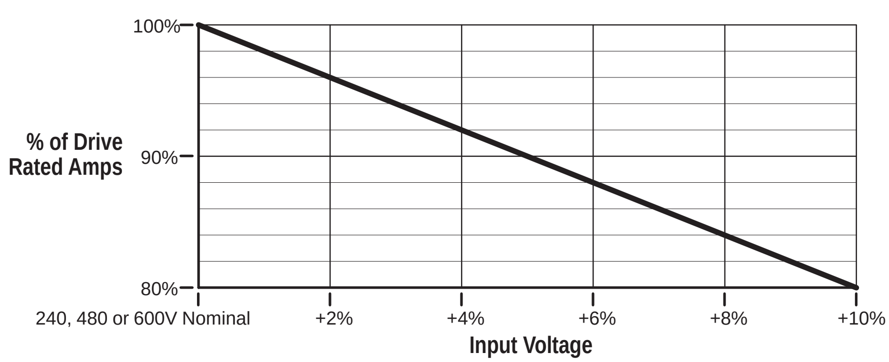


Figure 32
BP 250

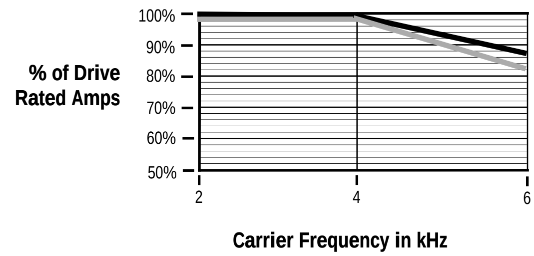


Figure 33
BP 300

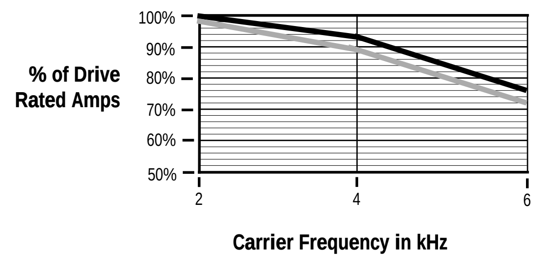


Figure 34
BP 350

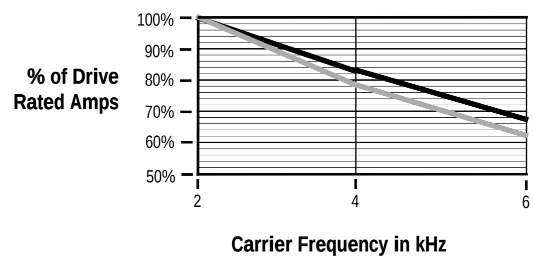


Figure 35
BP 400

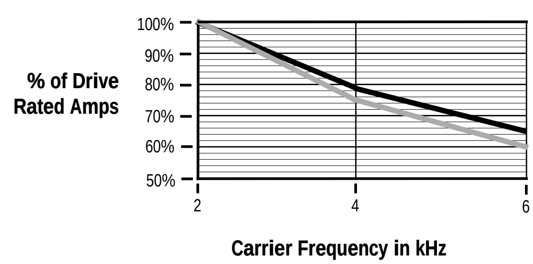


Figure 36
BP 450

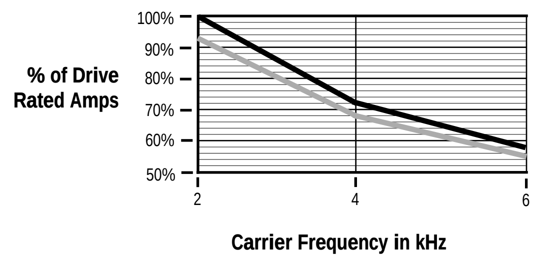


Figure 37
B700C &
B800C

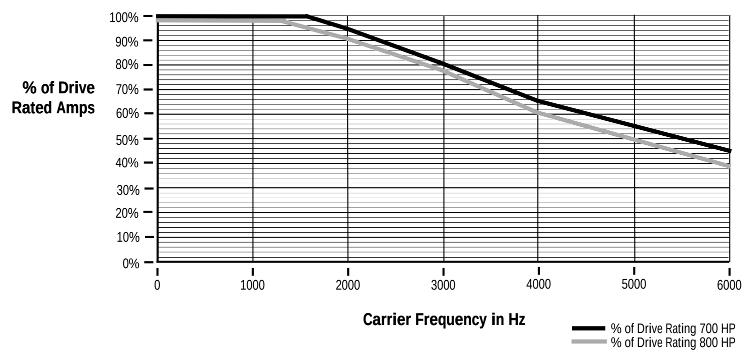
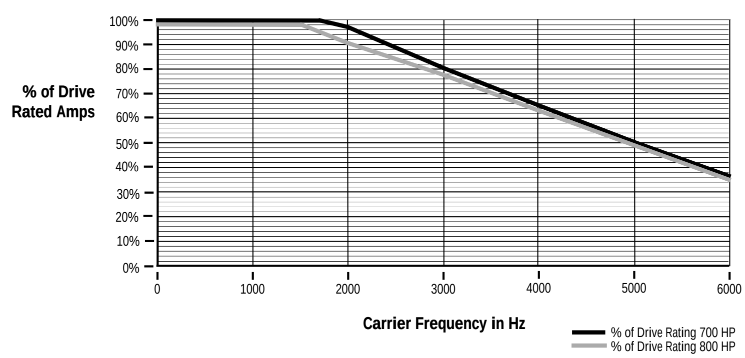
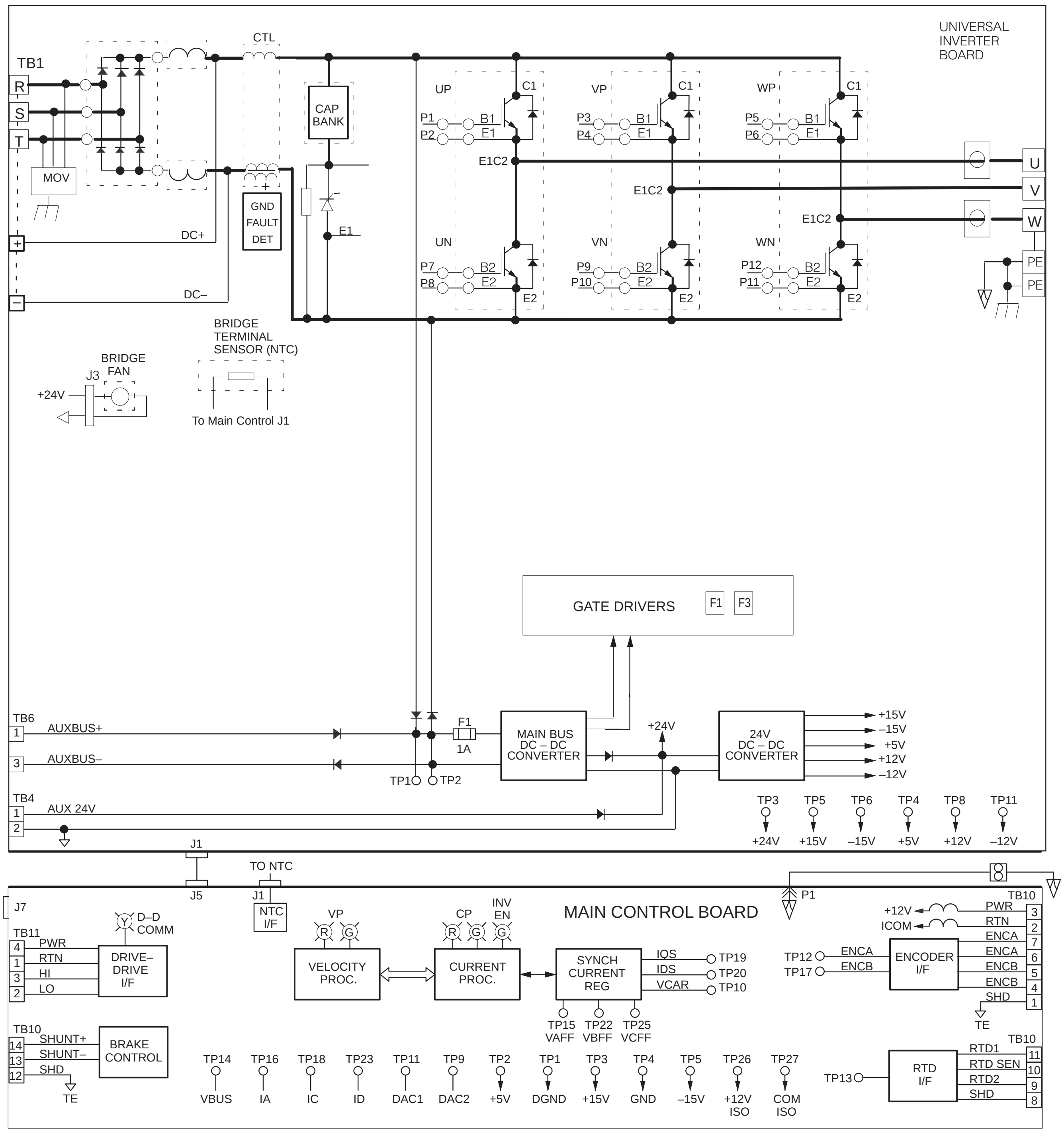


Figure 38
C700C &
C800C

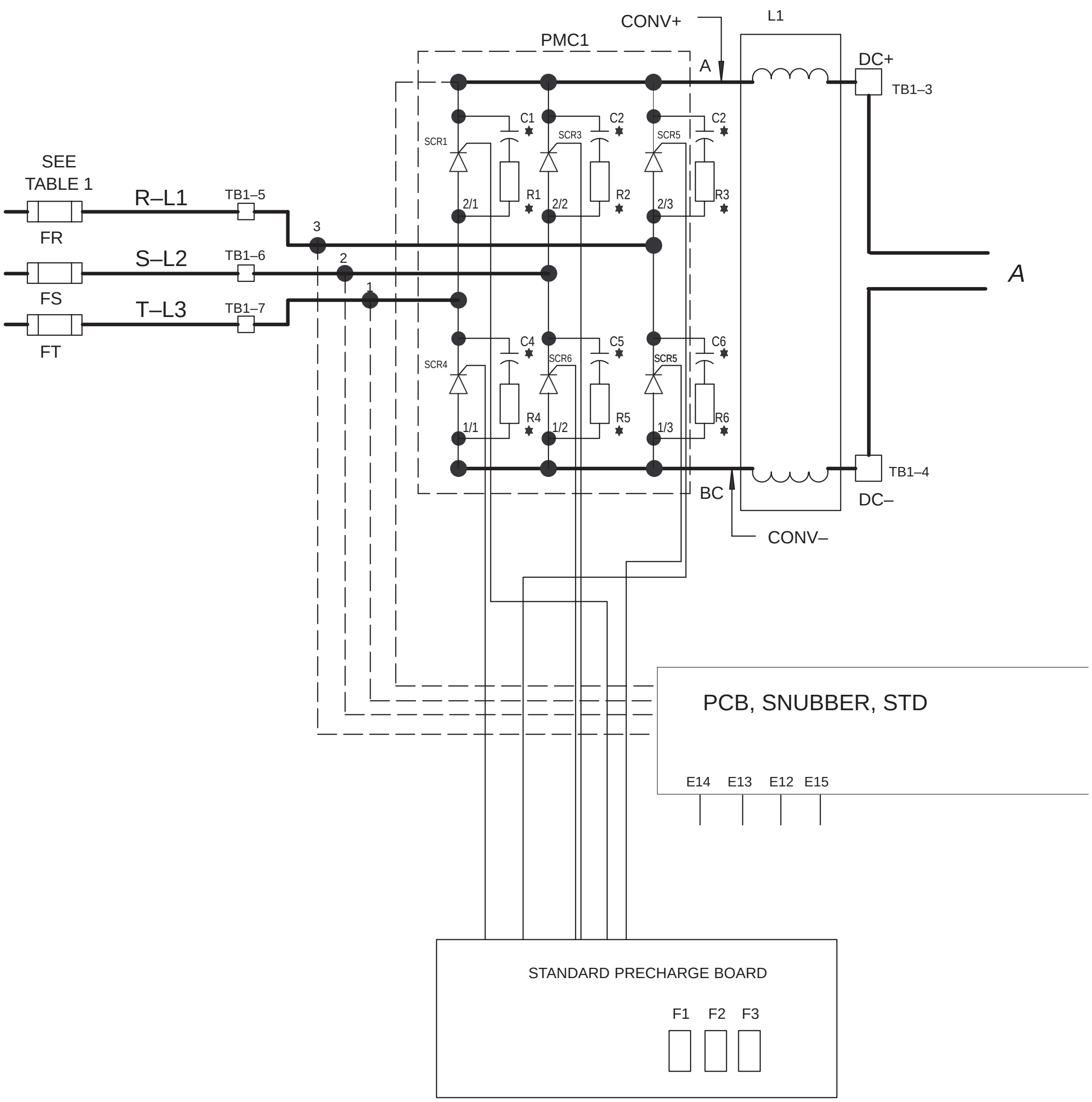


Drive Hardware Overview – The following illustrations are functional block diagrams of the 1336 FORCE Drive detailing the difference in hardware between the various ratings. These are basic overviews of the 1336 FORCE hardware, and should be used as reference material only.

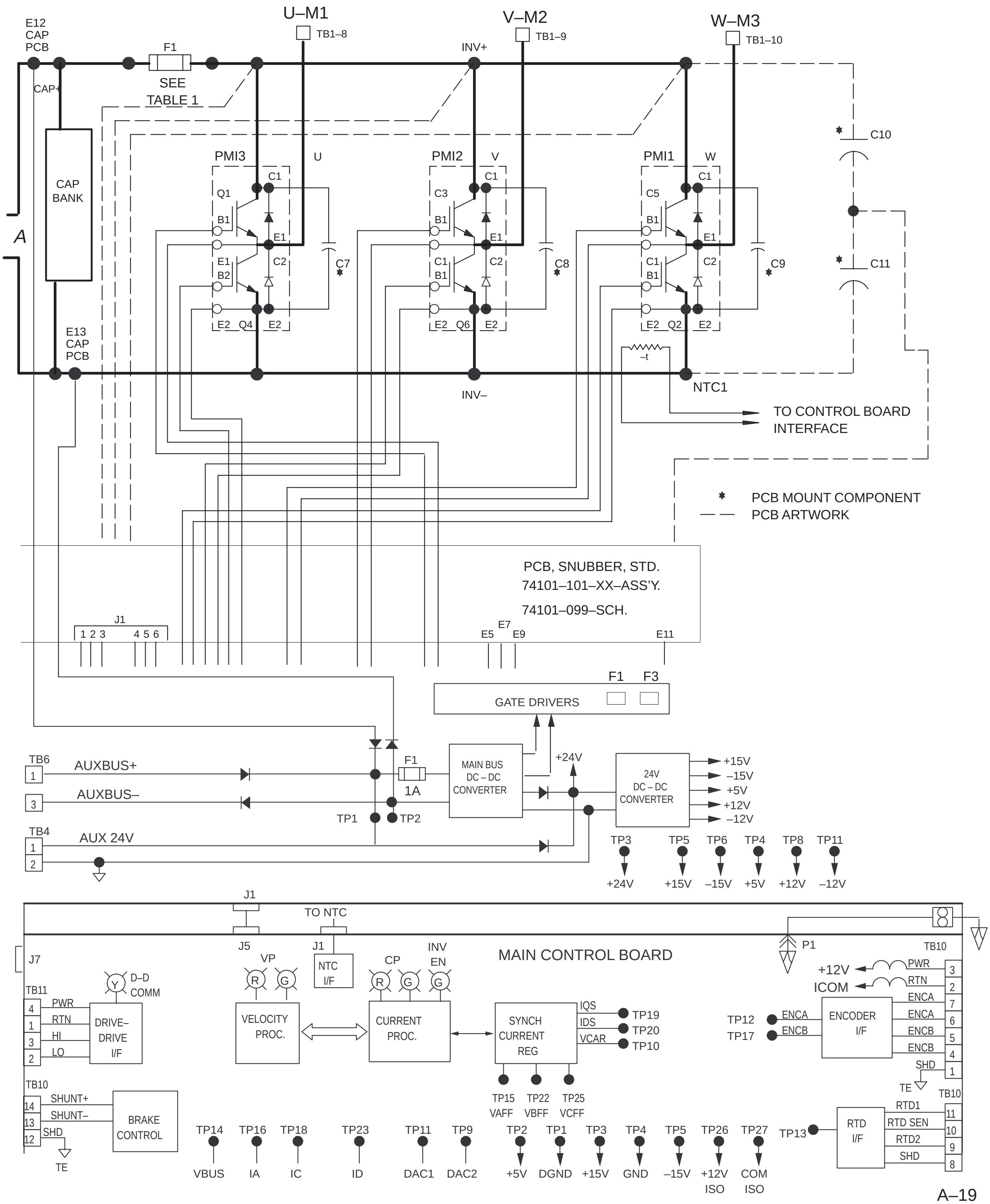
Schematic Diagram – 3 – 15 HP 230V, 3 – 15 HP 460V
3 – 20 HP 575V



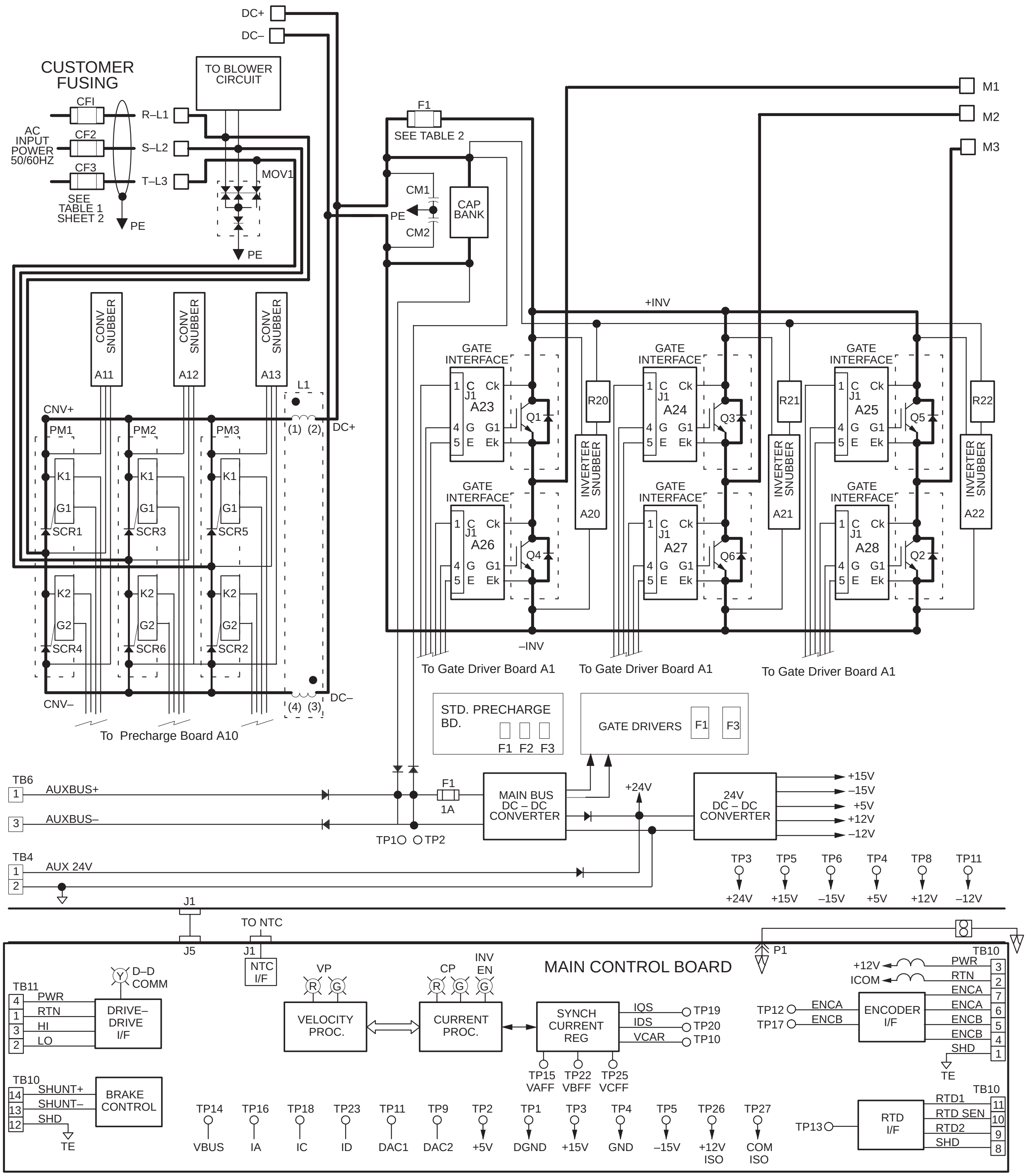
Schematic Diagram – 20–30 HP, 230 VAC
40–60 HP, 460 VAC
25–60 HP, 575 VAC



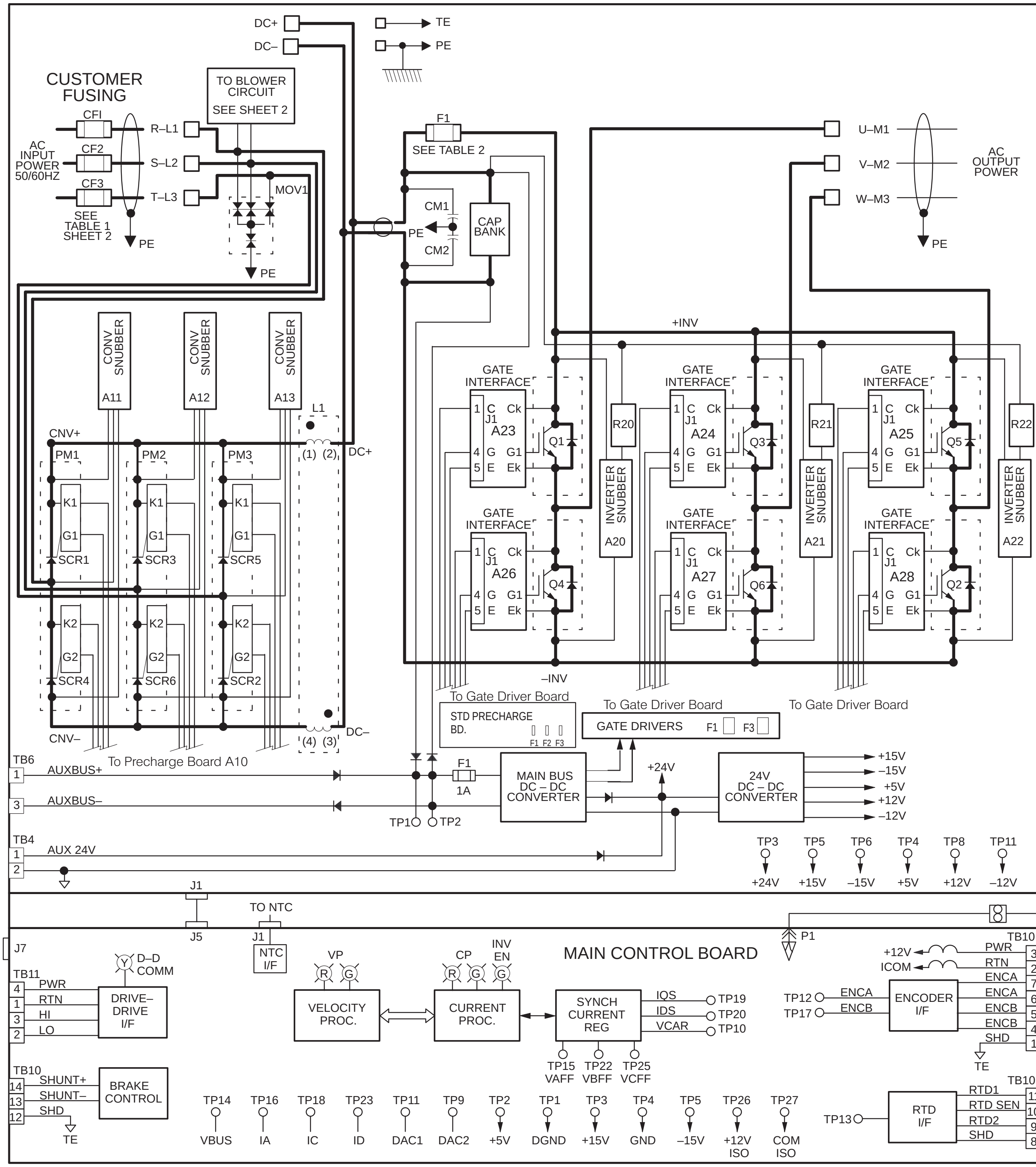
Schematic Diagram – 20–30 HP, 230 VAC, 40–60 HP, 460VAC
25–60 HP, 575 VAC



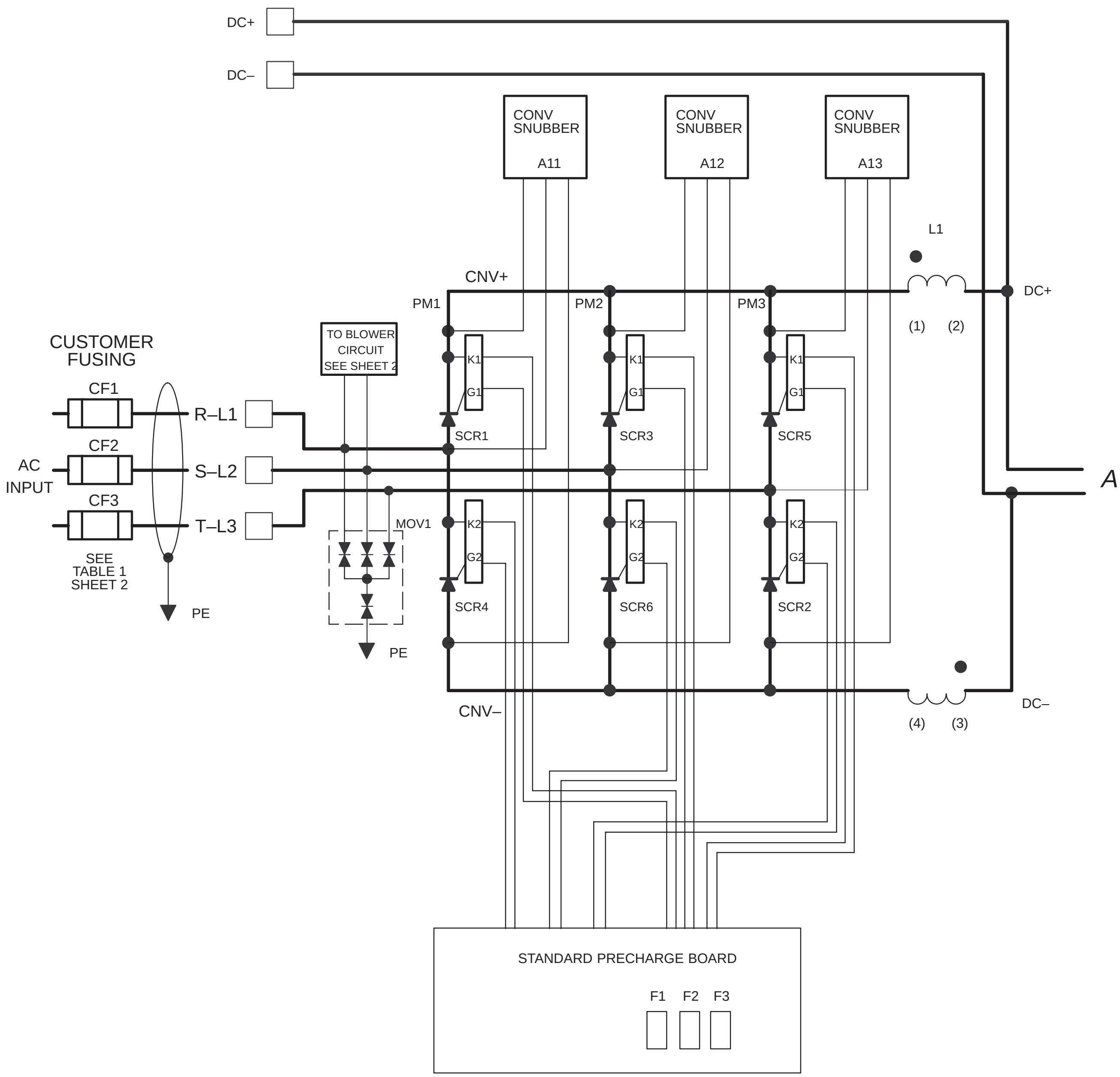
Schematic Diagram – 75 & 100 HP, 230 VAC



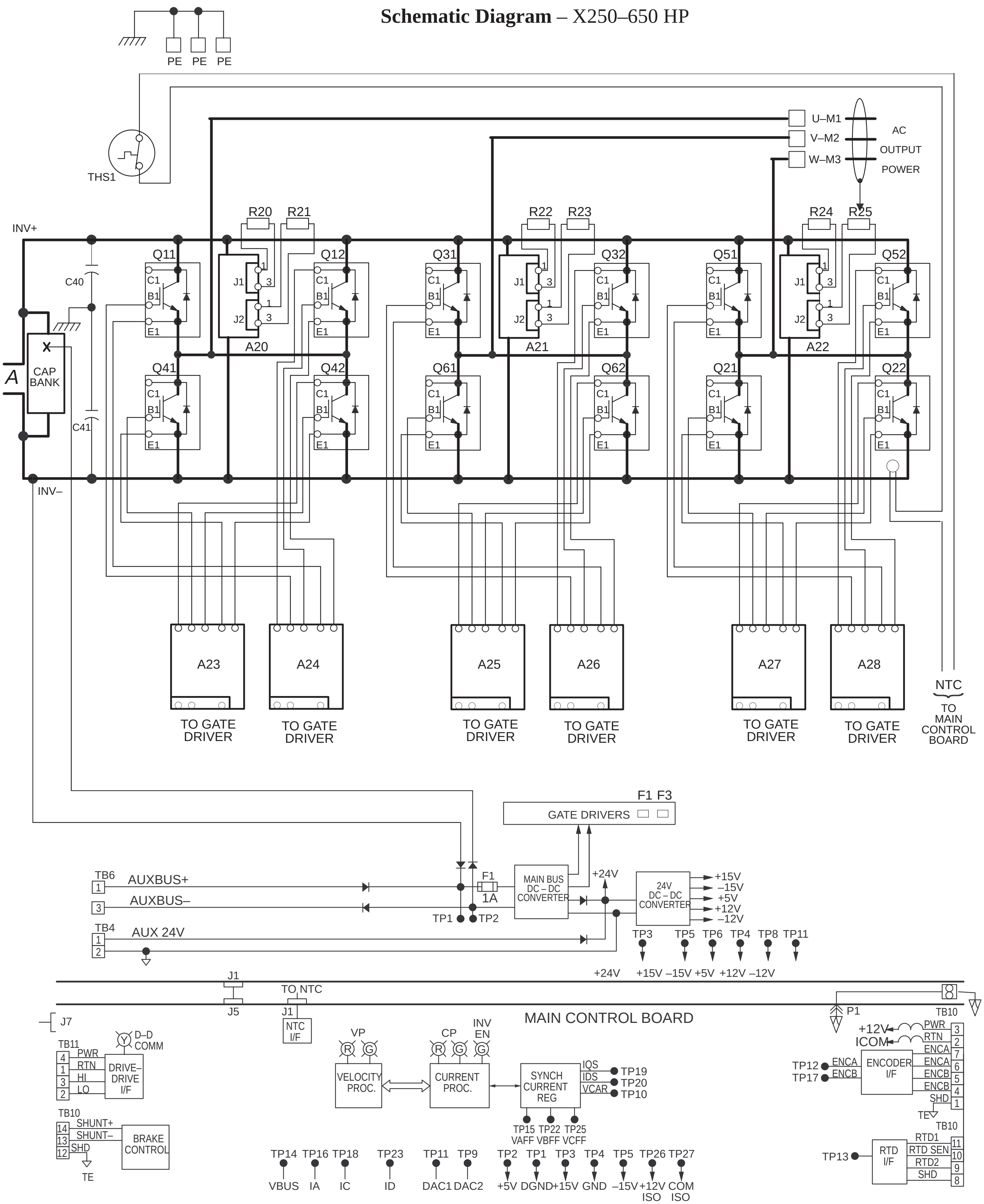
Schematic Diagram – 150–250 HP 380/460V, 150 – 300 HP 575V



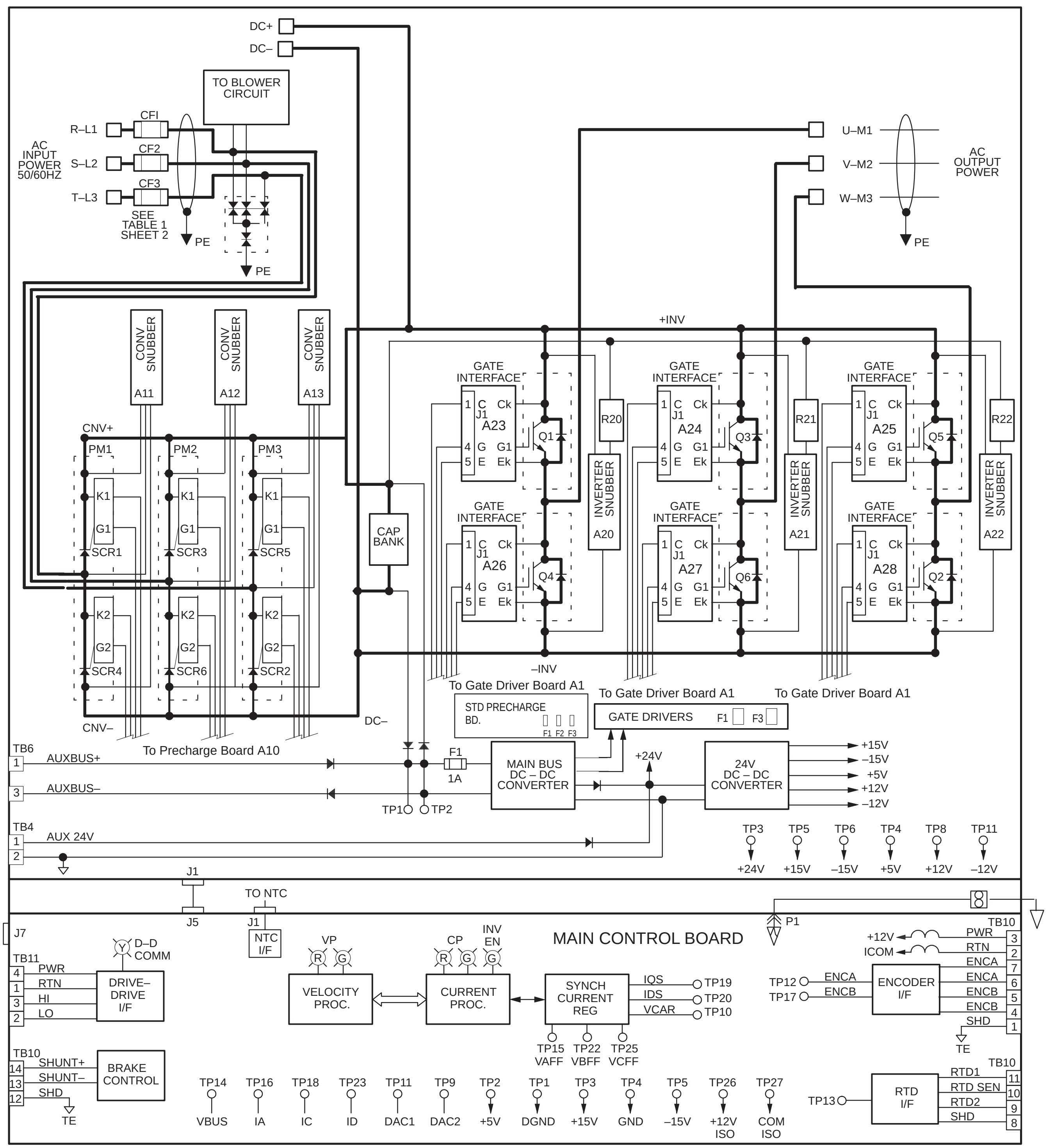
Schematic Diagram – X250 – 650 HP



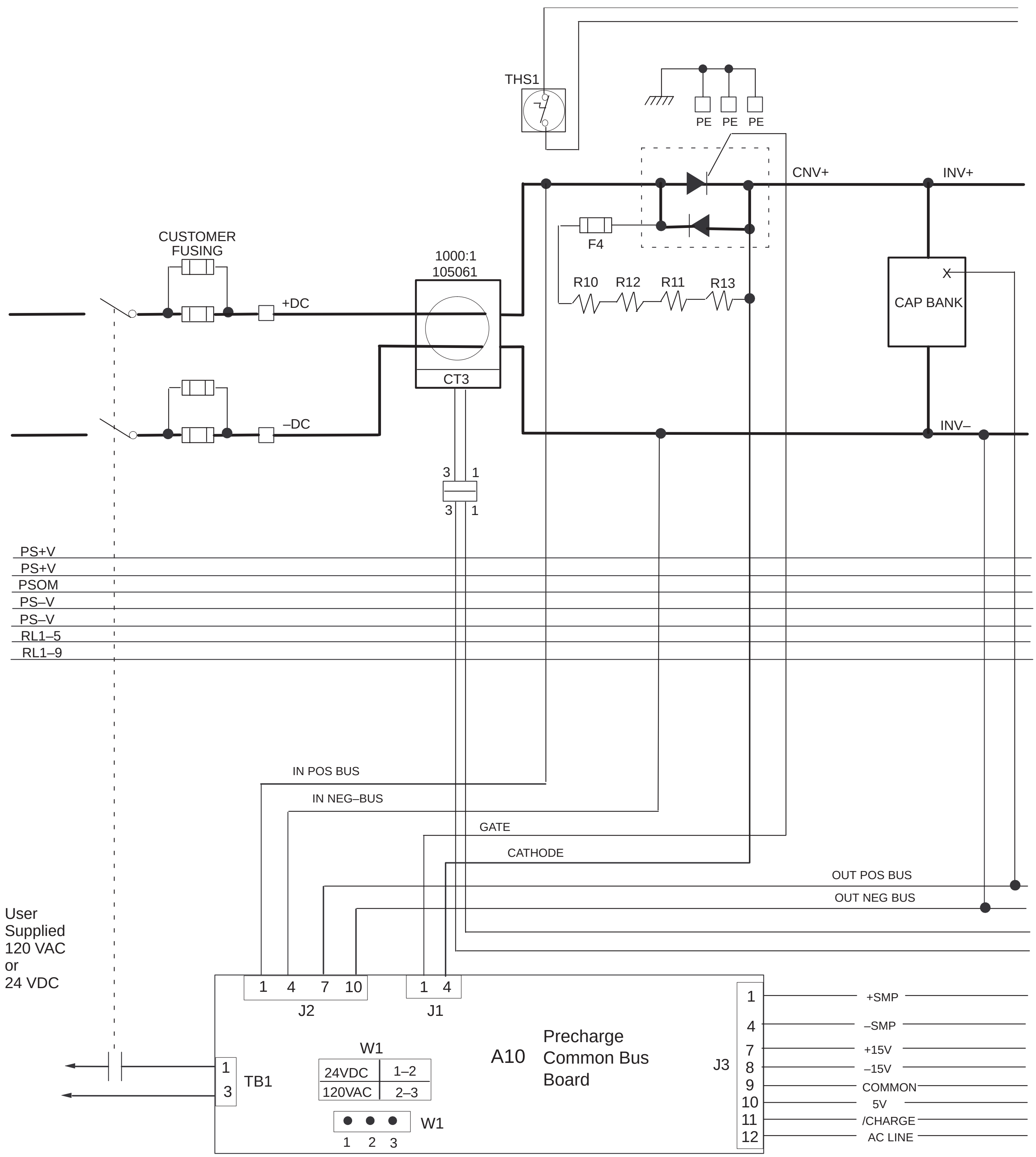
Schematic Diagram – X250–650 HP



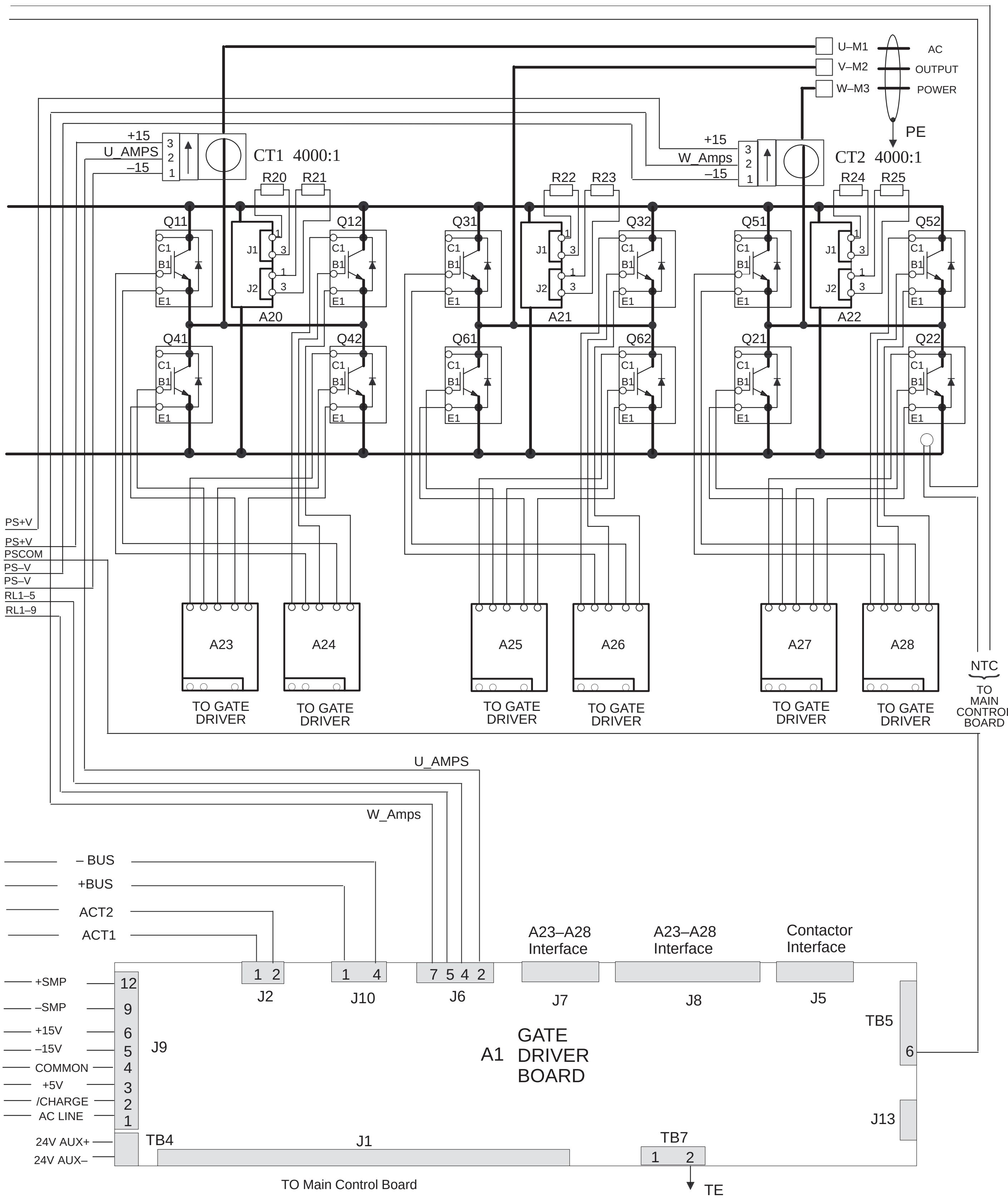
Schematic Diagram – 300–400 HP



Schematic Diagram – 700–800 HP



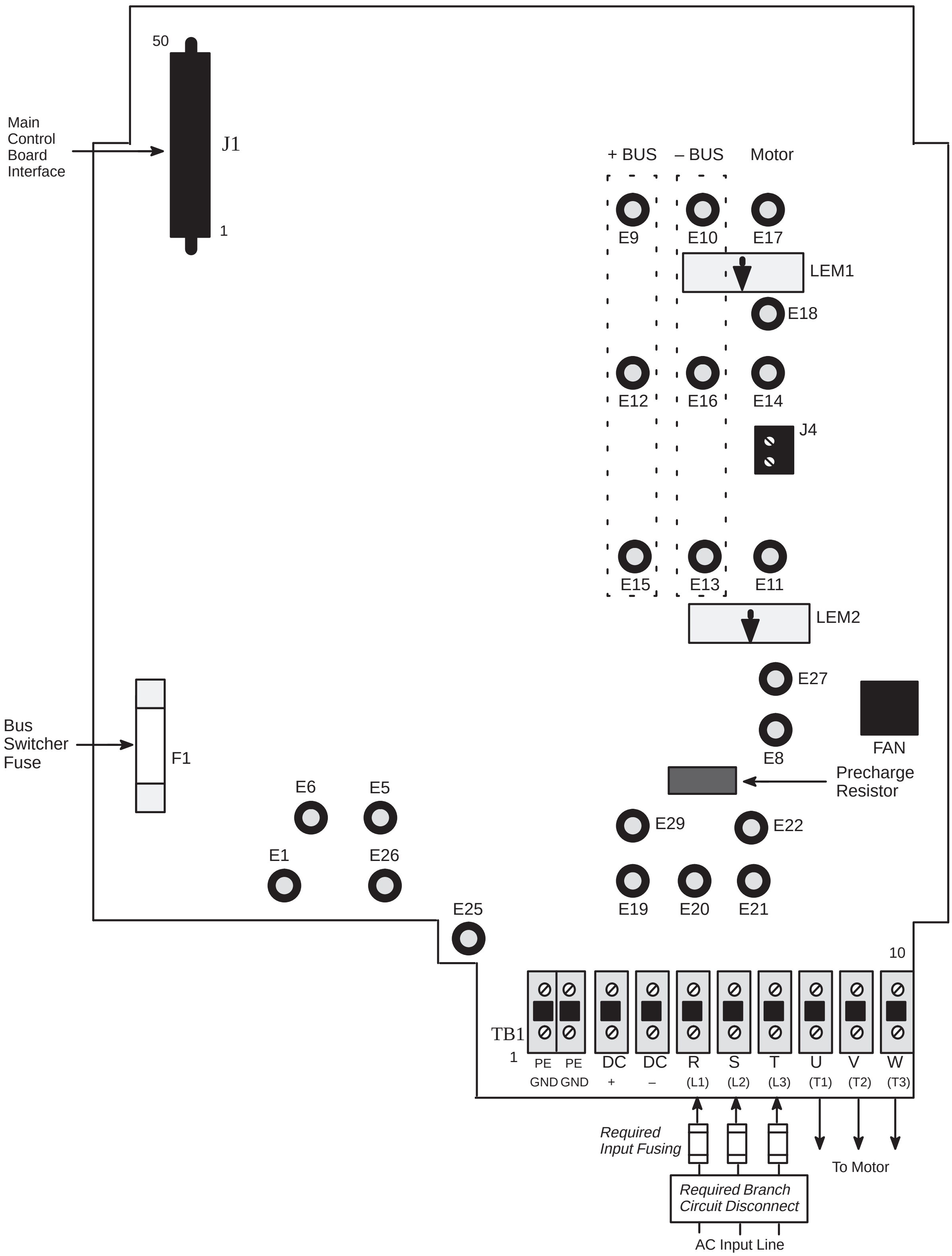
Schematic Diagram – 700 – 800 HP cont.



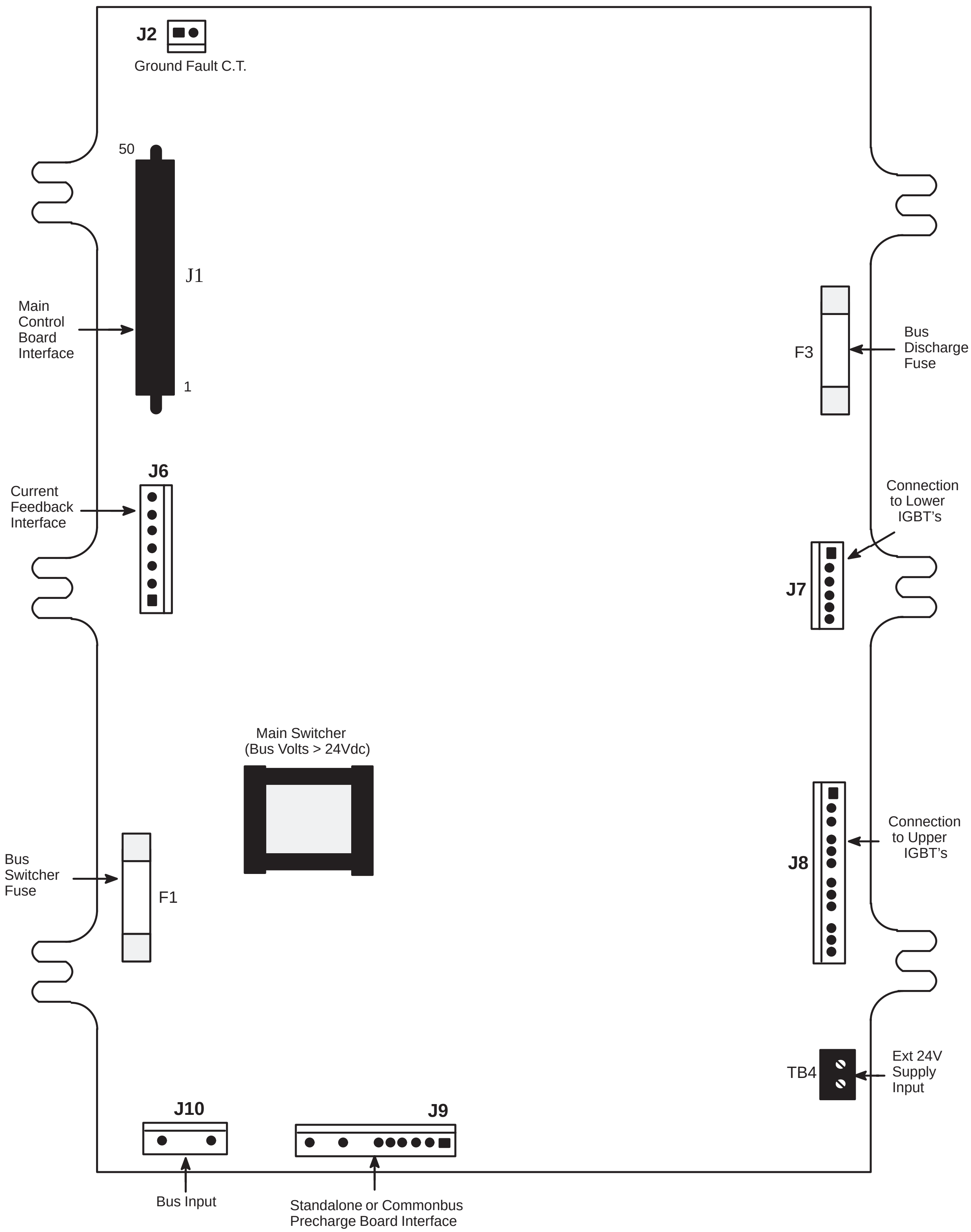
Gate Driver Board Connections

The connections on 1336 FORCE Gate Driver Boards vary by frame size as indicated in the following illustrations:

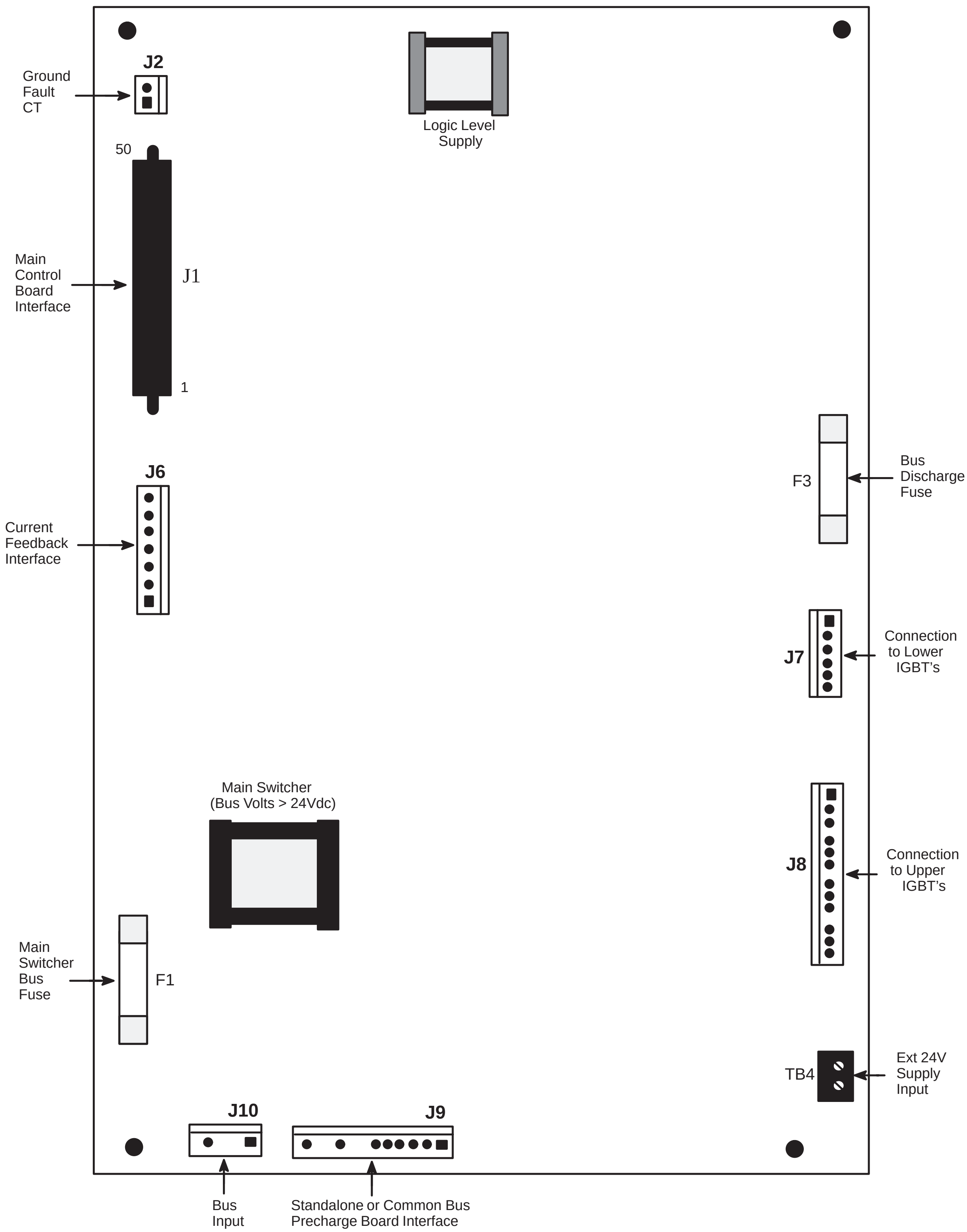
Frame Size B Gate Driver Board Connections



Frame Size C Gate Driver Board Connections



Frame Size D Gate Driver Board Connections



Sensorless Application Notes

Sensorless vs. Encoder Application Guidelines–

– Sensorless is applicable when Speed Regulation requirements are greater than +/– 1.0% of base speed. Sensorless may be applicable for regulation requirements between 0.2% and 1.0% with manual adjustments. Encoder operation is recommended below 0.2%.

– Sensorless is applicable when the minimum speed is greater than 1/40 of base speed (i.e. 45 RPM on a 60 Hz, 4 pole motor). Sensorless may be applicable down to speeds of 1/60 of base speed (30 RPM) if high bandwidth responses are not required. Encoder operation is recommended for speeds < 1/60 of base speed (30 RPM).

– Maximum Speed is the same for sensorless and encoder operation.

– The maximum velocity bandwidth achievable with sensorless is approximately twice the default bandwidth value.
Bandwidths higher than this may require an encoder because the velocity ripple may be intolerable or there may be stability problems. The maximum bandwidth achievable with sensorless is half the bandwidth achievable with an encoder. Note that the maximum achievable bandwidths decrease with increasing inertia for both sensorless and encoder.

– The starting torque available is the same with sensorless or encoder. Available starting torque is at least 150% motor torque and could be as high as 200% if the inverter can supply the current.

– Minimum (current limit) acceleration and deceleration times are comparable with sensorless and encoder.

– Torque regulation (+/–5%) is comparable with sensorless and encoder at velocities greater than approximately 25% of base speed. At lower speeds sensorless torque regulation may degrade with changing motor temperature.

– Torque response is comparable with sensorless and encoder (400Hz).

Sensorless Mode Selection –

– **Param 150 = 5**
Minimum preset speed is 1/60 of base speed. When preset speed and actual speed are both <1/60 of base speed, torque is set to zero. When preset speed is > 1/60 of base speed, torque will be developed to accelerate the motor through the min. speed to the preset speed.

When a motor is accelerated from a **preset spee**d of 0 to a preset speed > 1/60 of base speed, the motor will accelerate at the accel rate set by the drive. But, if the accel rate in the drive is set to 0 or some low value and the acceleration is controlled by ramping the preset speed parameter with a PLC, the motor will not accelerate until the preset speed is > 1/60 base speed. This will result in an accel delay until that speed is reached, followed by an acceleration at the speed set by the PLC. If this is a problem, Mode 7 should be used.

– **Param 150 = 6**
Minimum preset speed is 1/1000 of base speed. Preset speeds down to zero are permitted, although it is very likely that the motor will not operate smoothly at these low speeds. This mode will eliminate the problems associated with controlling the acceleration rate by ramping preset speeds from a PLC described in Mode 5 (Param 150 = 5).

– **Param 150 = 7 (Available in 3.01 version)**
Minimum present speed is 1/1000 of base speed. This mode is similar to mode 6 except that the motor can be expected to operate more smoothly and develop higher continuous torque at speeds < 1/60 of base speed. This mode will also allow operation with lower

velocity bandwidths than Mode 5 and allow smoother acceleration.

The disadvantage of this mode is that the response to load changes at low speeds is not as fast as mode 5. Also, fast speed reversals may not work when the preset speed is ramped from a PLC and the drives accel/decel rate is set to 0.

Sensorless Troubleshooting Procedures –

– *Problem: Motor won't accelerate or doesn't start smoothly*

– *Possible Solutions:*
Increase the bandwidth. If the bandwidth is too low, there is a chance the motor won't accelerate, although the current will increase to current limit.

If the regen power limit is 0, increase it to at least –5%.

Decrease the acceleration time. (faster acceleration)

Change Param 150 to mode 7.

– *Problem: Motor oscillates after it is up to speed*

– *Possible Solutions:*
Decrease the bandwidth if the process will allow. If this doesn't help, set Param 142 to 1500.

If unstable in field weakening, change Param 174 to 100%.

– *Problem: Inverter trips on absolute overspeed during starting*

Increase the bandwidth.

If the overspeed occurs during a reversal, increase the deceleration time (slower deceleration).

Sensorless Fine–Tuning Procedures –

– *Improving Speed Regulation*

Typically the speed regulation (as a function of load) in sensorless mode can be improved by adjusting Param 246 (Base Slip Frequency) after the drive has been completely auto–tuned. This parameter is originally calculated during the torque calculation section of auto–tune and is dependent on the nameplate speed of the motor.

Ideally this adjustment is made while the motor is fully loaded and at its normal operating temperature. Adjust Param 246 until the actual speed, as measured by an independent source (i.e. hand tach), is equal to the desired speed. This should result in a minimum steady state speed deviation as load changes. The proper slip for good speed regulation is also motor temperature dependent, thus if the motor operating temperature normally varies between cold and hot, a compromise slip must be selected.

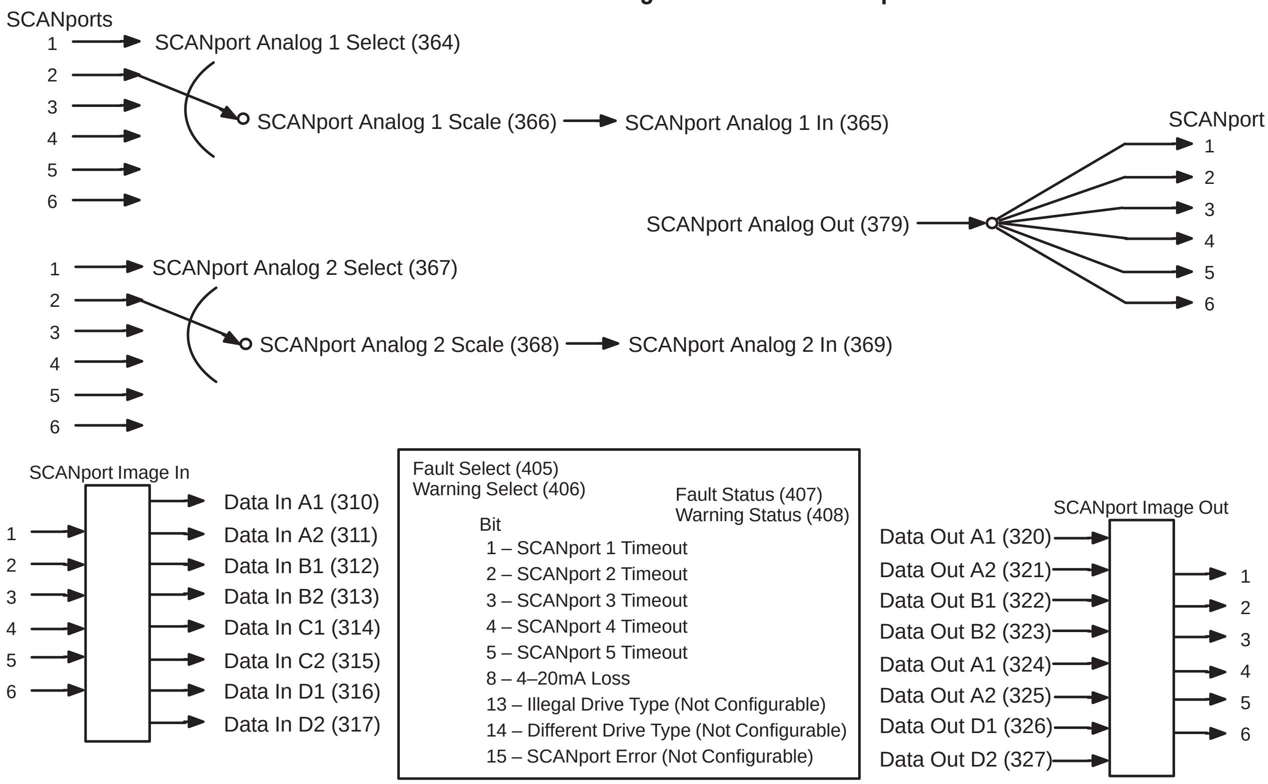
– *Minimizing Acceleration Time from 0 Speed*

After a start command is issued, there is a 0.5 sec flux up delay before the motor will start accelerating with sensorless control. This delay can be eliminated in subsequent accelerations from 0 speed by configuring the drive to decel down to a preset speed of 0 rather than decelerating to stop.

– *Increasing Speed Range*

Speeds down to zero speed may be commanded when Param 150 is set to 7. As operation nears 0, speed cogging may result.

Software Block Diagram – Standard Adapter



Discrete I/O

Input Mode (385)*
Input Status (386)

*Power Cycle or Reset required to take effect

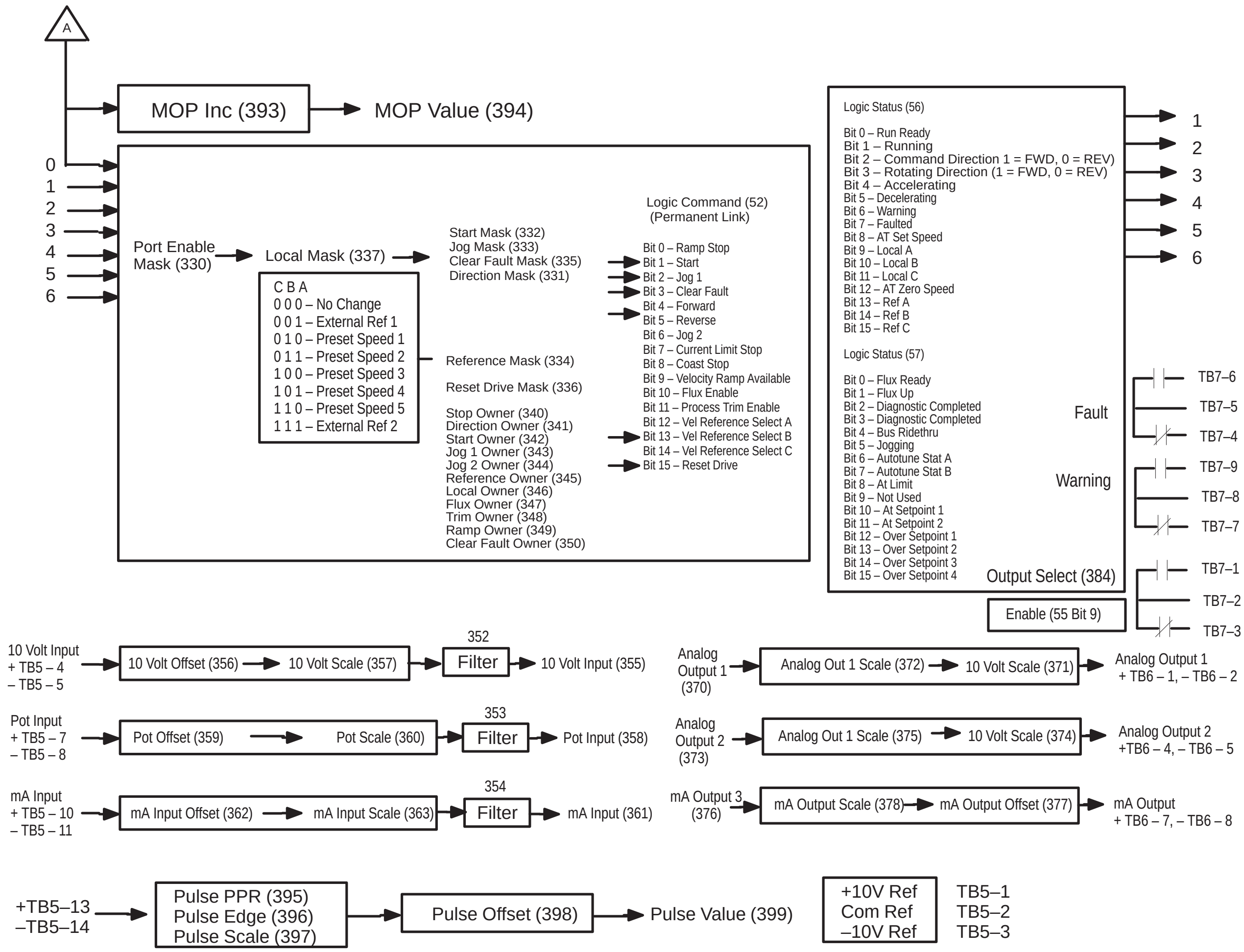
Mode	TB3–19 Input 1	TB3–20 Input 2	TB3–22 Input 3	TB3–23 Input 4	TB3–24 Input 5	TB3–26 Input 6	TB3–27 Input 7	TB3–28 Input 8	TB3–30 Input 9
1	Status	Not–Stop (P59), Clr Flt	Status	Status	Status	Status	Status	Status	Enable
2	Start	Not–Stop (P59), Clr Flt	Rev/Fwd	Jog	Ext Fault	Spd Sel 3	Spd Sel 2	Spd Sel 1	Enable
3	Start	Not–Stop Clr Flt	Rev/Fwd	Stop Type	Ext Fault	Spd Sel 3	Spd Sel 2	Spd Sel 1	Enable
4	Start	Not–Stop (P59), Clr Flt	Rev/Fwd	1st/2nd Acc	Ext Fault	1st/2nd Dec	Spd Sel 2	Spd Sel 1	Enable
5,27	Start	Not–Stop (P59), Clr Flt	Rev/Fwd	MOP Inc.	Ext Fault	MOP Dec	Spd Sel 2	Spd Sel 1	Enable
6	Start	Not–Stop (P59), Clr Flt	Rev/Fwd	Jog	Ext Fault	Loc/Rem	Spd Sel 2	Spd Sel 1	Enable
7	Start	Not–Stop (P59), Clr Flt	Rev	Fwd	Ext Fault	Jog	Spd Sel 2	Spd Sel 1	Enable
8	Start	Not–Stop (P59), Clr Flt	Rev	Rwd	Ext Fault	Spd Sel 3	Spd Sel 2	Spd Sel 1	Enable
9,28	Start	Not–Stop (P59), Clr Flt	MOP Inc	MOP Dec	Ext Fault	Spd Sel 3	Spd Sel 2	Spd Sel 1	Enable
10,29	Start	Not–Stop (P59), Clr Flt	Rev	Fwd	Ext Fault	MOP Inc	MOP Dec	Spd Sel 1	Enable
11	Start	Not–Stop (P59), Clr Flt	1st Acc	2nd Acc	Ext Fault	1st Dec	2nd Dec	Spd Sel 1	Enable
12	Run Fwd	Not–Stop (P59), Clr Flt	Run Rev	Loc/Rem	Ext Fault	Spd Sel 3	Spd Sel 2	Spd Sel 1	Enable
13	Run Fwd	Not–Stop (P59), Clr Flt	Run Rev	Stop Type	Ext Fault	Spd Sel 3	Spd Sel 2	Spd Sel 1	Enable
14	Run Fwd	Not–Stop Clr Flt	Run Rev	1st/2nd Acc	Ext Fault	1st/2nd Dec	Spd Sel 2	Spd Sel 1	Enable
15,30	Run Fwd	Not–Stop (P59), Clr Flt	Run Rev	MOP Inc	Ext Fault	MOP Dec	Spd Sel 2	Spd Sel 1	Enable
16	Run Fwd	Not–Stop (P59), Clr Flt	Run Rev	Loc/Rem	Ext Fault	Stop Type	Spd Sel 2	Spd Sel 1	Enable
17	Start	Not–Stop (P59), Clr Flt	Rev/Fwd	PTrim En	Ext Fault	Ramp Dis	Spd Sel 2	Spd Sel 1	Enable
18	Start	Not–Stop (P59), Clr Flt	Rev/Fwd	Flux Enable	Ext Fault	Reset	Spd Sel 2	Spd Sel 1	Enable
19	Start	Not–Stop (P59), Clr Flt	Spd/Trq3	Spd/Trq2	Ext Fault	Spd/Trq 1	Ptrim En	Spd Sel 1	Enable
20	Start	Not–Stop (P59), Clr Flt	Spd/Trq3	Spd/Trq2	Ext Fault	Spd/Trq 1	Flux Enable	Spd Sel 1	Enable
21	Start	Not–Stop (P59), Clr Flt	Reverse	Forward	Ext Fault	Ramp Dis	Reset	Spd Sel 1	Enable
22	Start	Not–Stop (P59), Clr Flt	Spd/Trq3	Spd/Trq2	Ext Fault	Spd/Trq 1	Spd Set 2	Spd Sel 1	Enable
23	Run Fwd	Not–Stop (P59), Clr Flt	Run Rev	PTrim En	Ext Fault	Reset	Spd Set 2	Spd Sel 1	Enable
24	Run Fwd	Not–Stop (P59), Clr Flt	Run Rev	Flux Enable	Ext Fault	Reset	Spd Set 2	Spd Sel 1	Enable
25	Run Fwd	Not–Stop (P59), Clr Flt	Run Rev	PTrim En	Ext Fault	Ramp Dis	Spd Set 2	Spd Sel 1	Enable
26	Run Fwd	Not–Stop (P59), Clr Flt	Run Rev	Jog	Ext Fault	Spd Sel 3	Spd Set 2	Spd Sel 1	Enable

TB3–21
TB3–25
TB3–29
COMMON

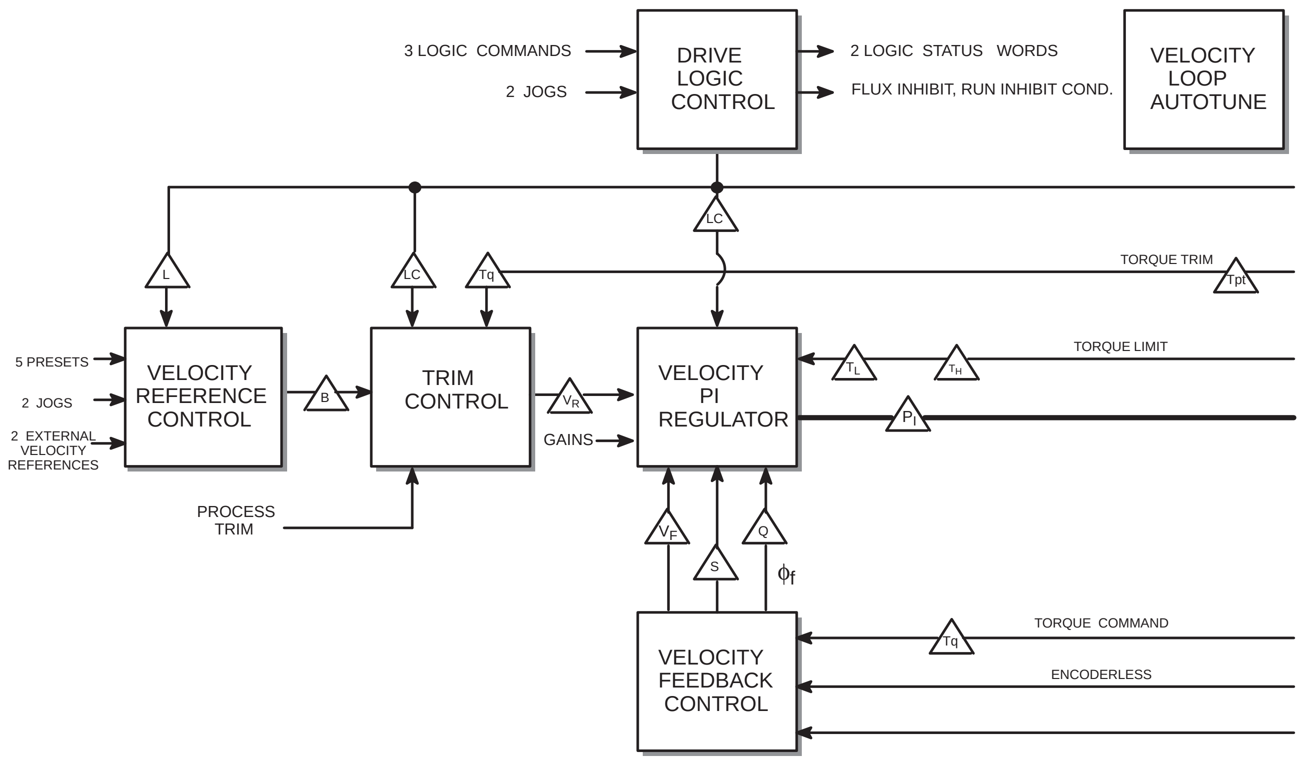
Stop Select 1 (387)
Stop Select 2 (388)
Accel Rate 1 (389)
Accel Rate 2 (390)
Decel Rate 1 (391)
Decel Rate 2 (392)

A

Software Block Diagram – Standard Adapter



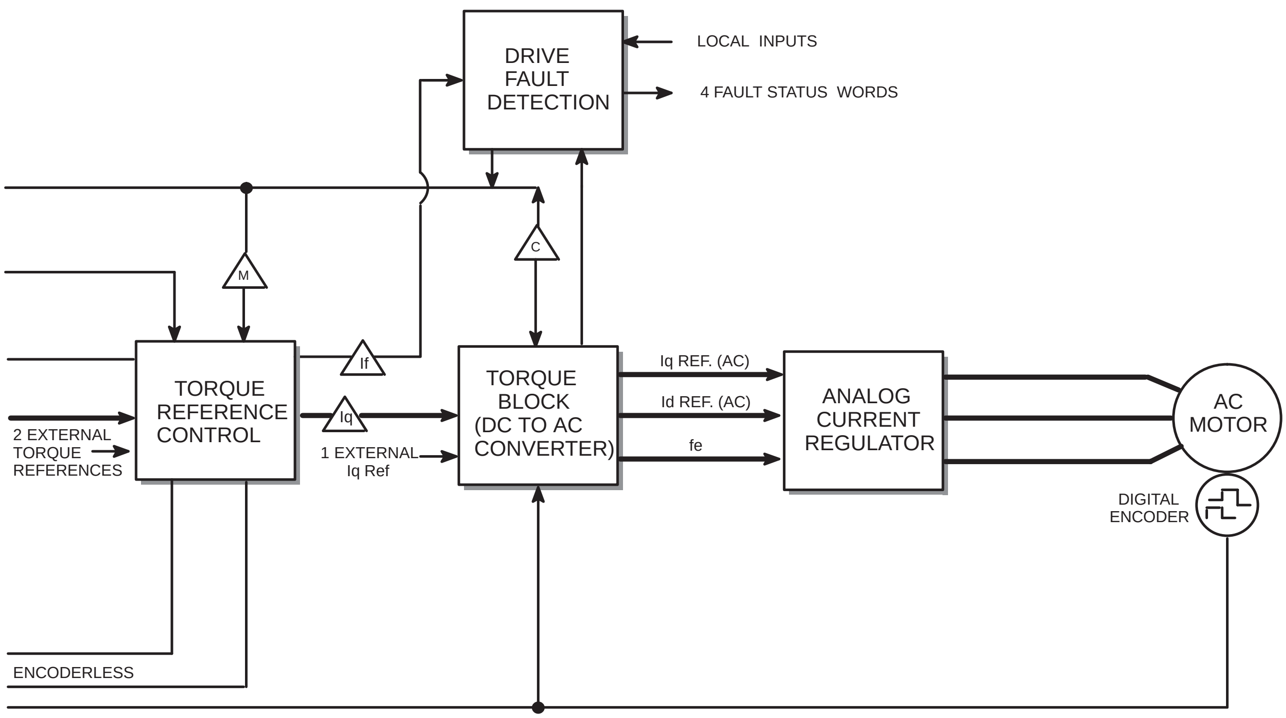
36T Firmware Function (Motor Control Board Overview)



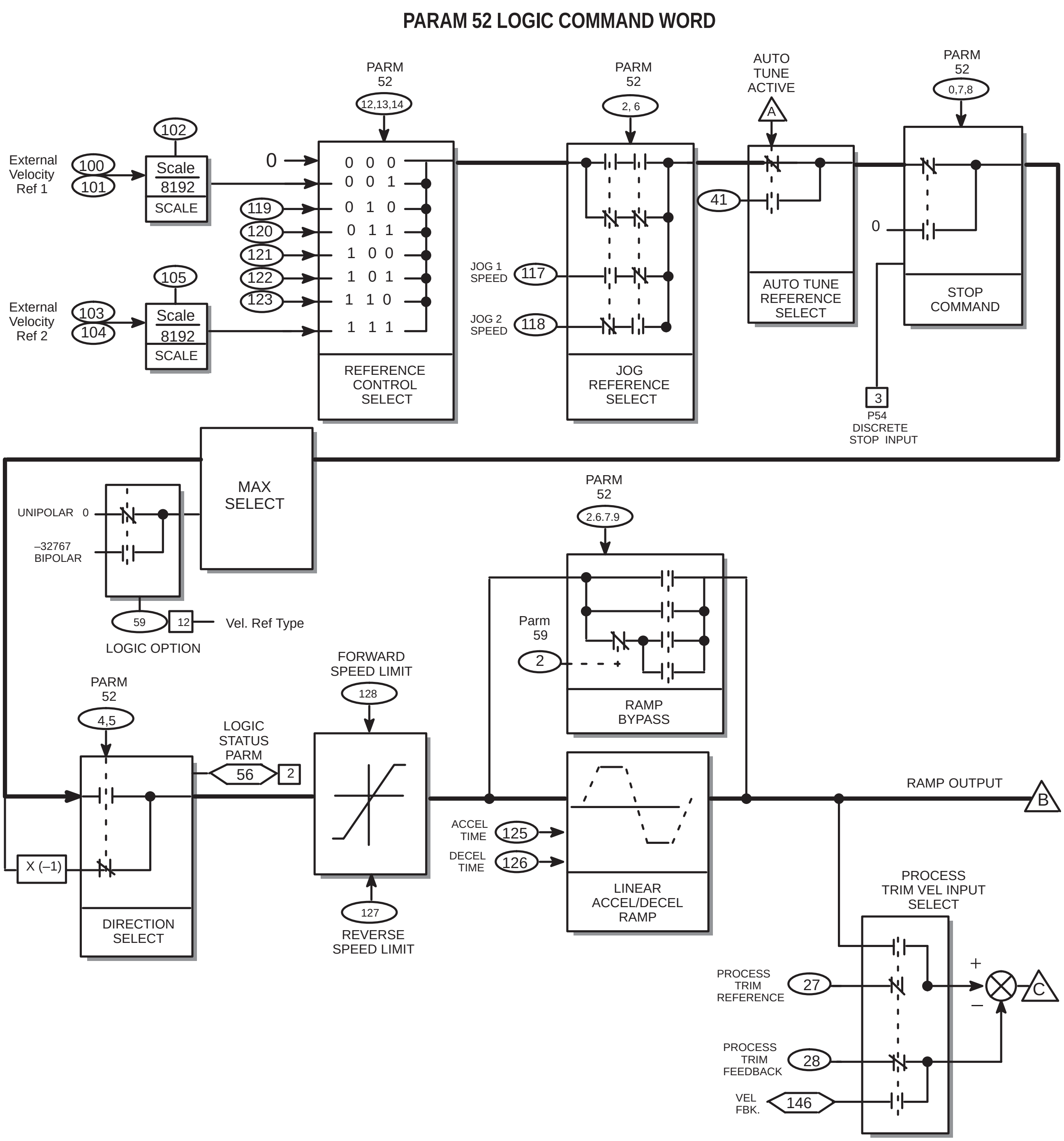
Sheet Connection Symbols

- B — VELOCITY RAMP OUTPUT
- C — CURRENT PROCESSOR COMMAND
- I f — FILTERED Iq REFERENCE
- Iq — Iq REFERENCE
- V_T — VELOCITY TRIM
- LC — LOGIC CONTROL WORD
- M — ACTIVE TORQUE MODE
- P_I — VELOCITY PI REGULATOR OUTPUT
- Q — ϕ_f
- S — FILTERED Iq REFERENCE
- T_H — TORQUE LIMIT HIGH
- T_L — TORQUE LIMIT LOW
- Tq — TORQUE COMMAND
- V_F — VELOCITY FEEDBACK
- V_R — VELOCITY REFERENCE
- Tpt — TORQUE TRIM

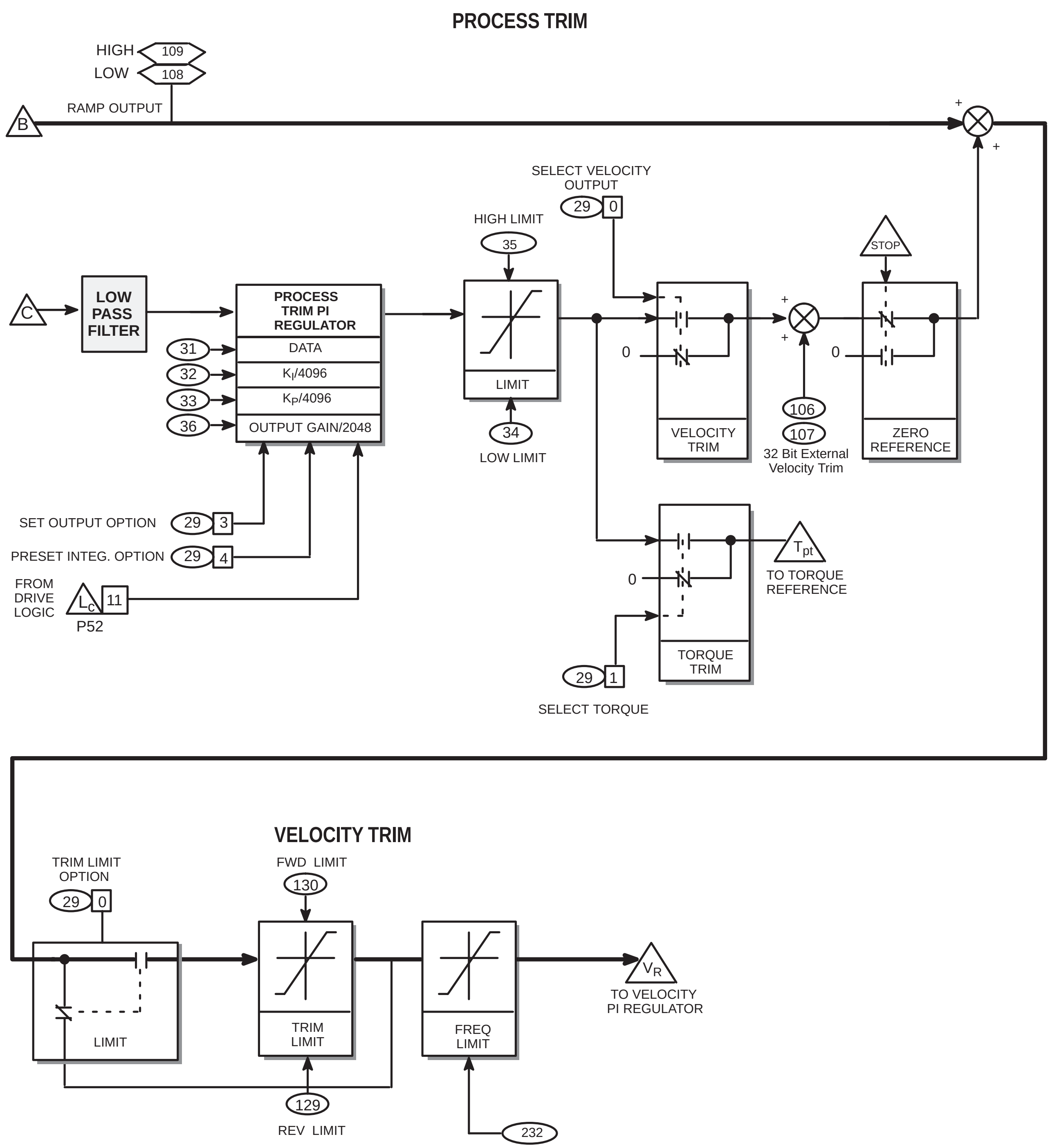
36T Firmware Function (Motor Control Board Overview)



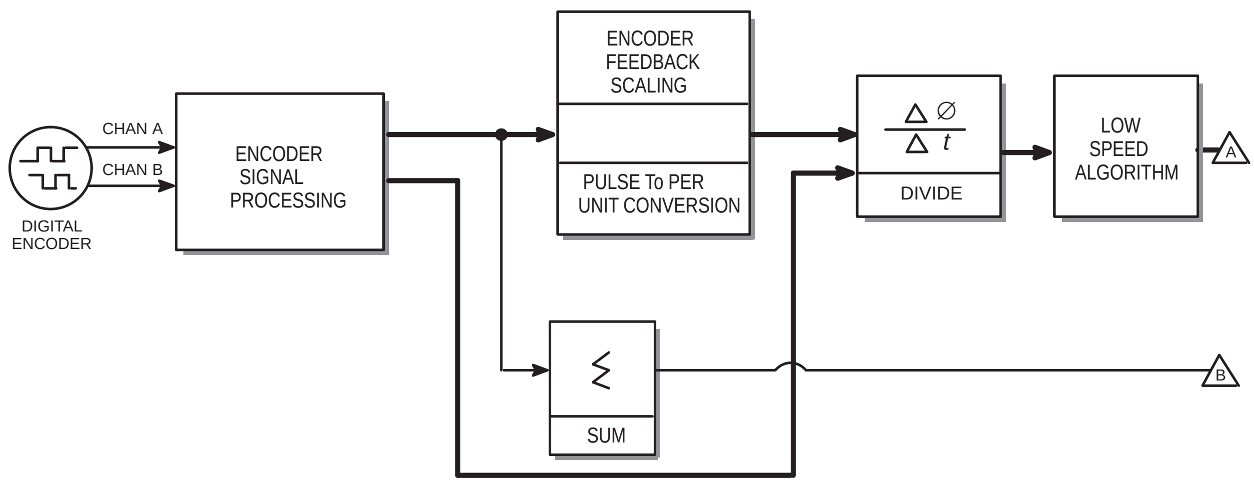
36T Firmware Function (Velocity Reference Overview)



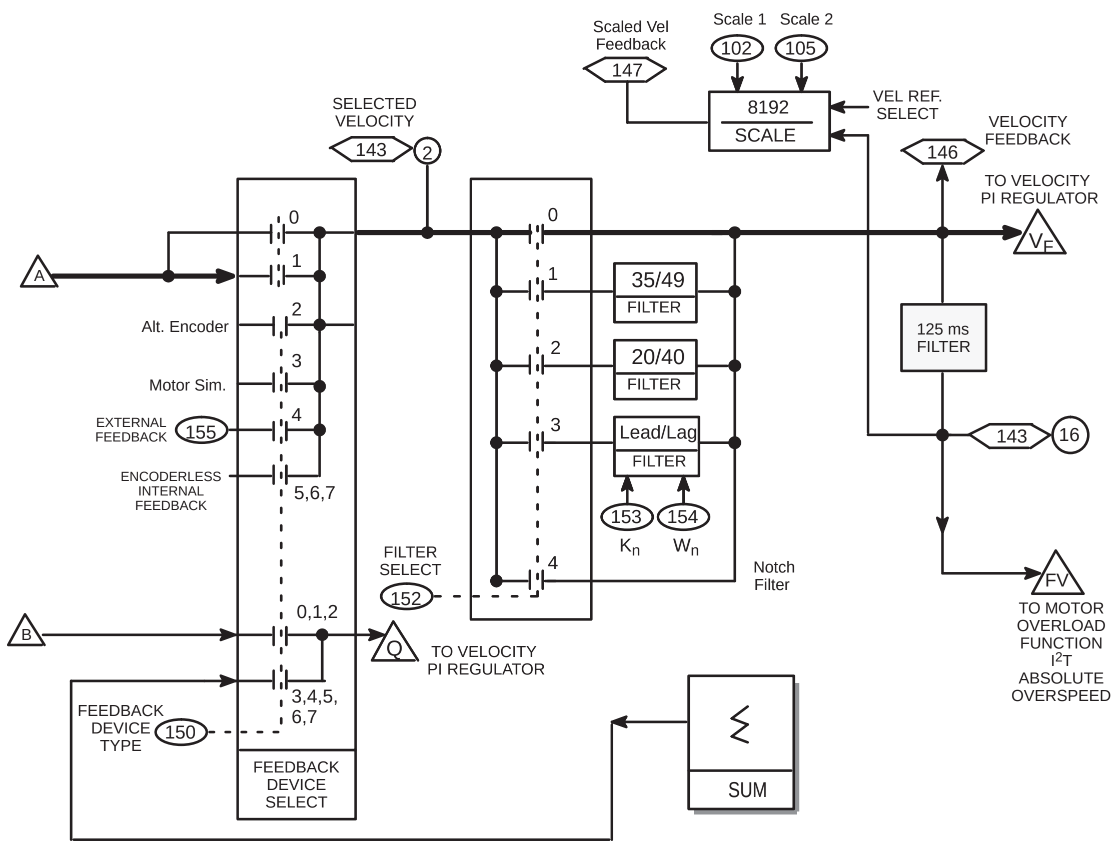
36T Firmware Function (Trim Control Overview)



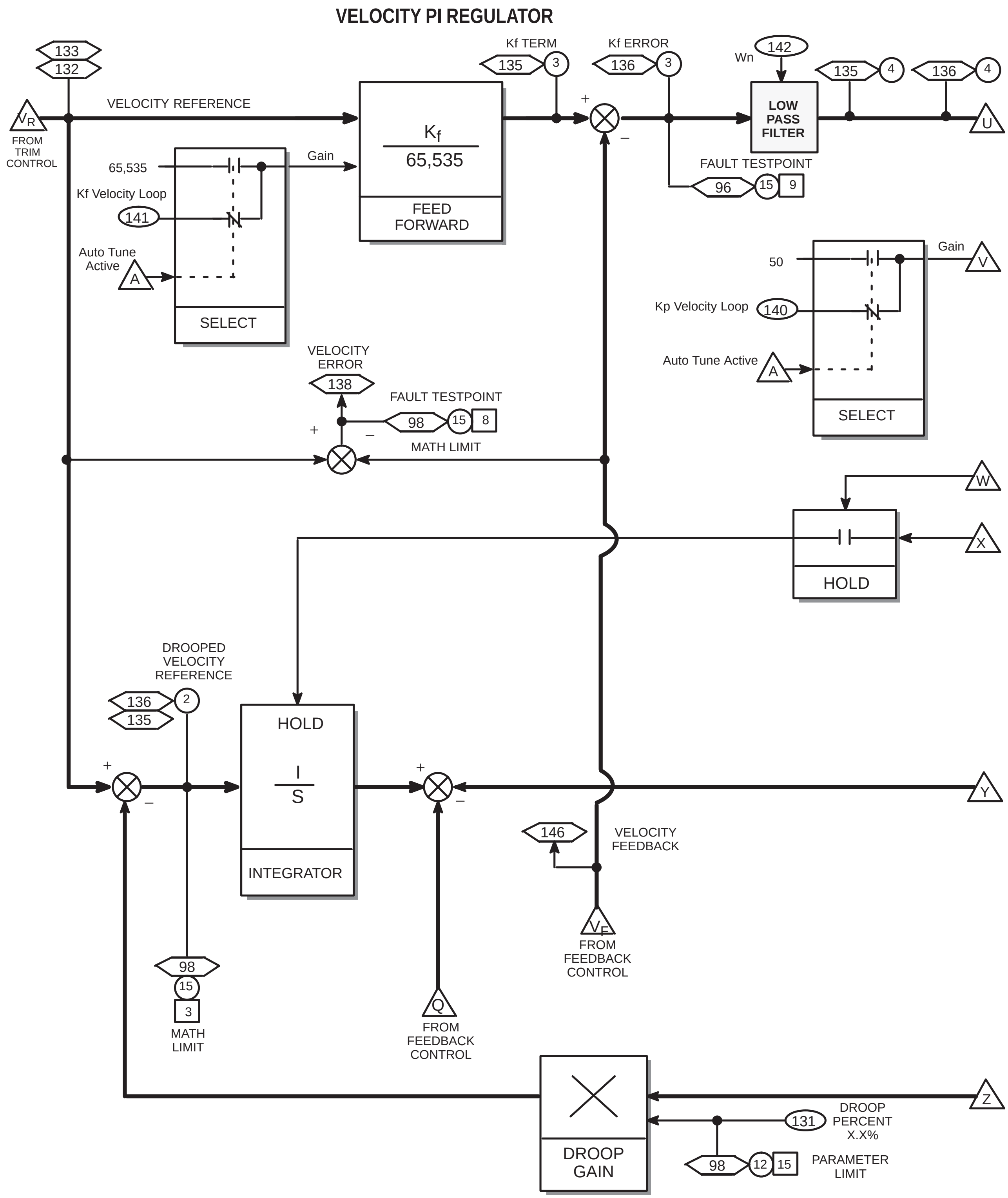
36T Firmware Function (Velocity Feedback Overview)



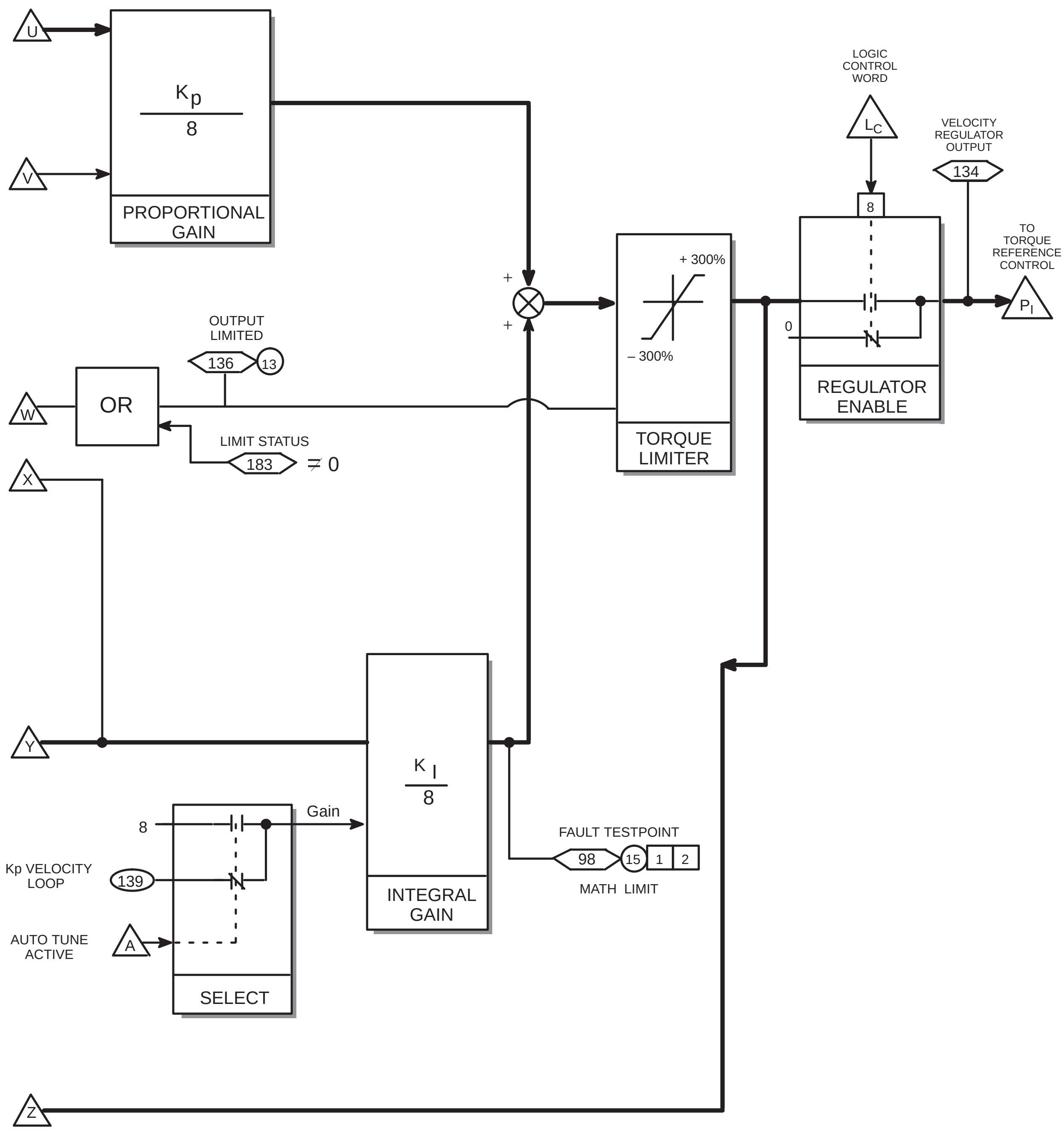
36T Firmware Function (Velocity Feedback Overview)



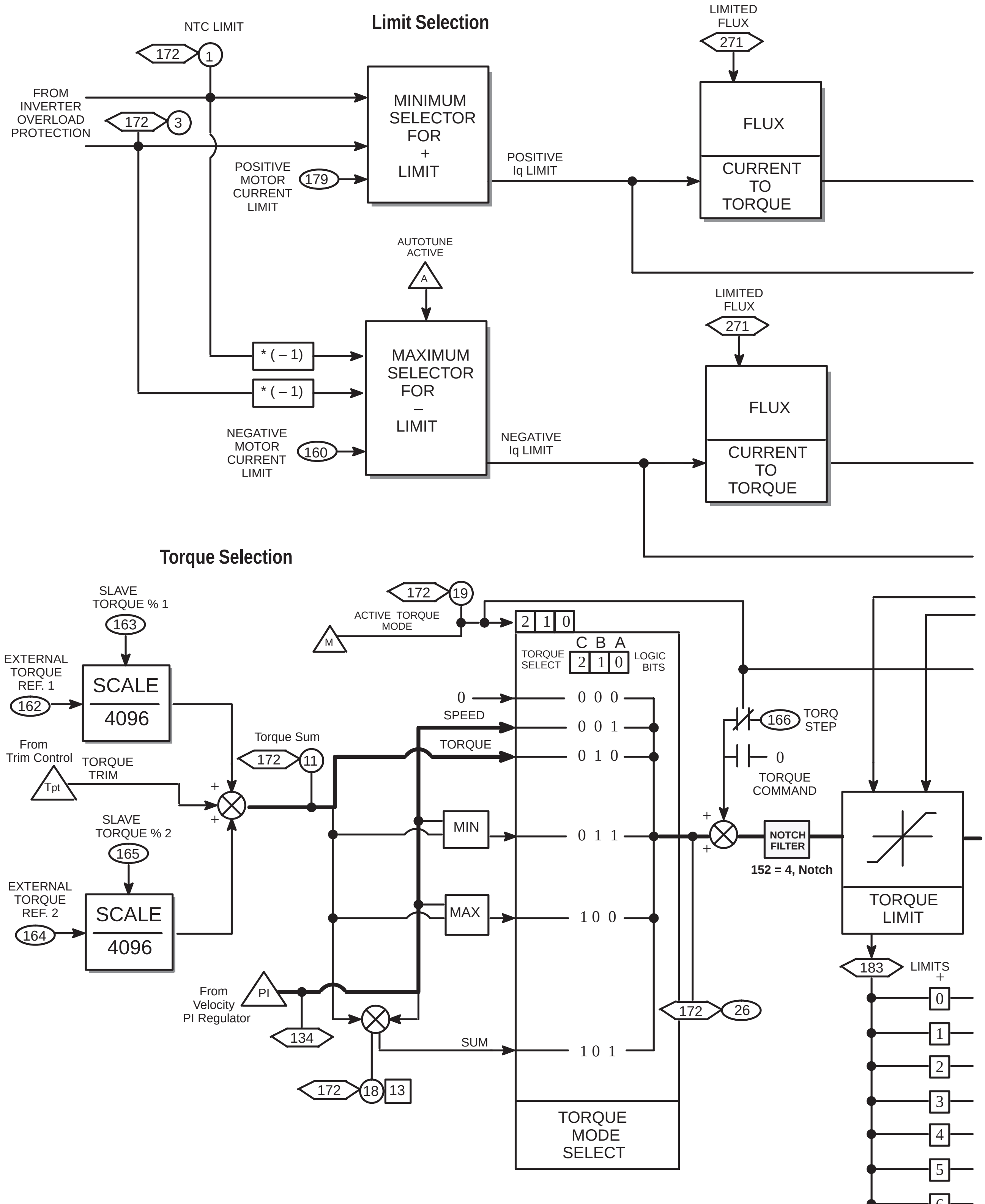
36T Firmware Function (Velocity PI Regulator Overview)



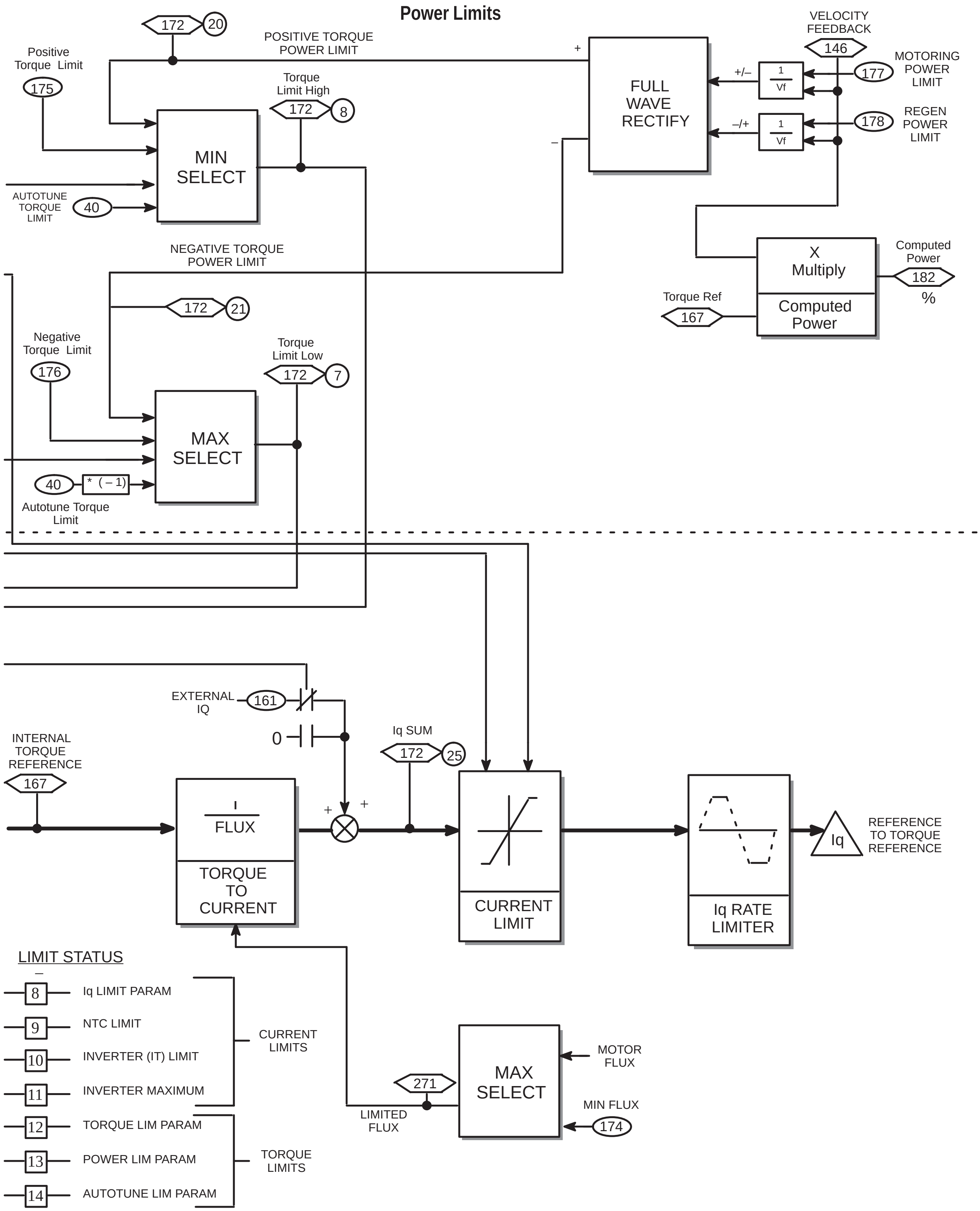
36T Firmware Function (Velocity PI Regulator Overview)



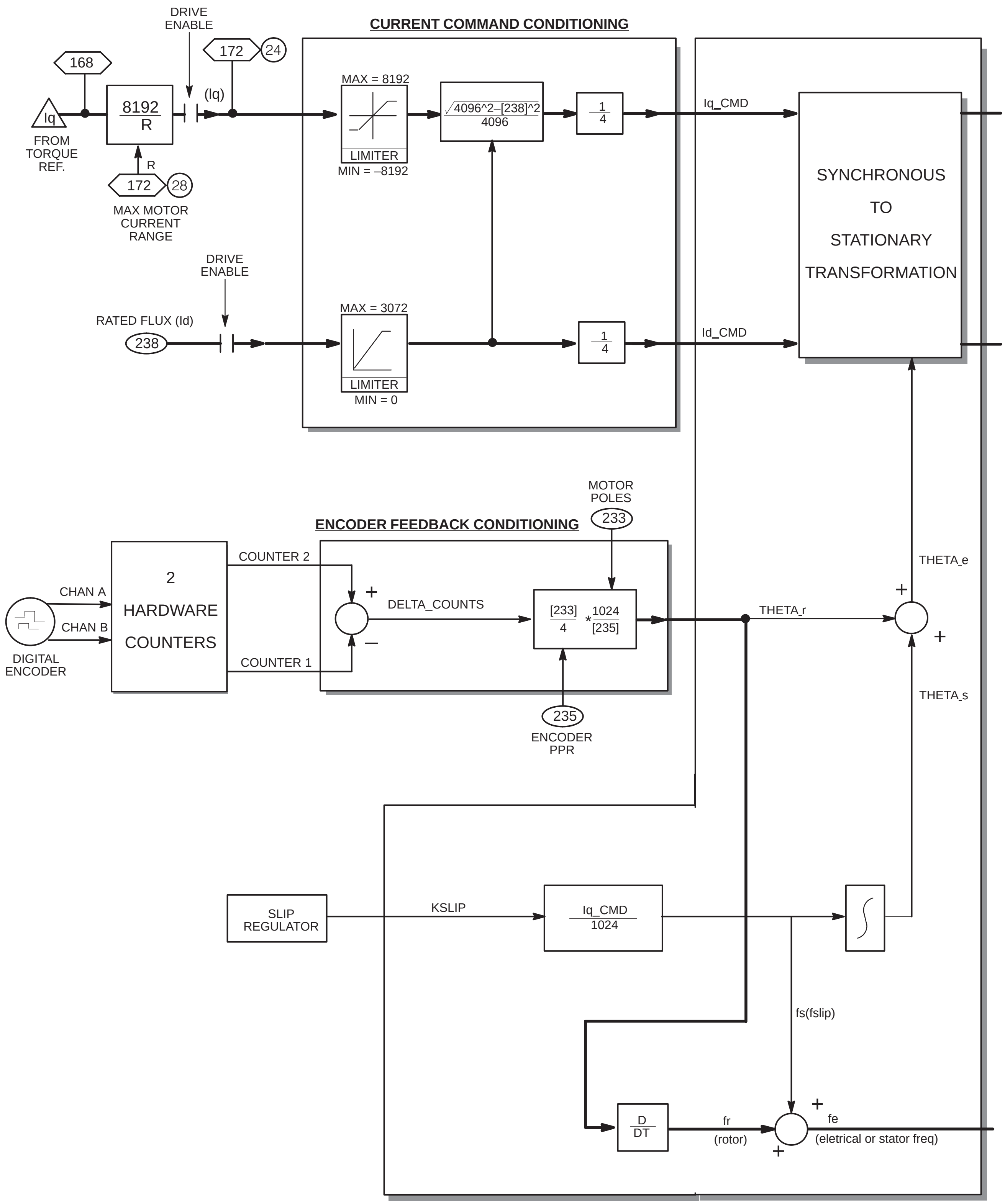
36T Firmware Function (Torque Reference Overview)



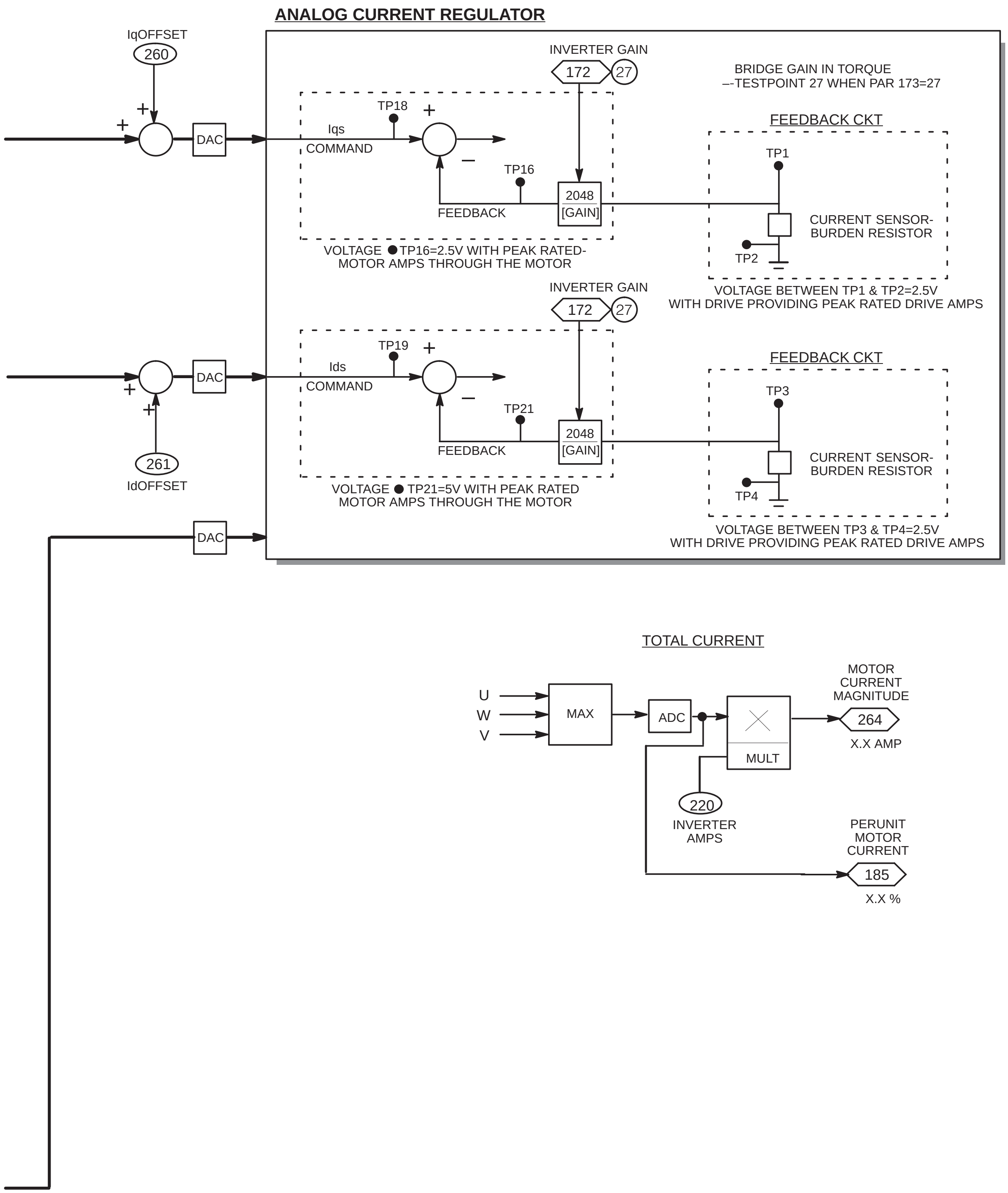
36T Firmware Function (Torque Reference Overview)



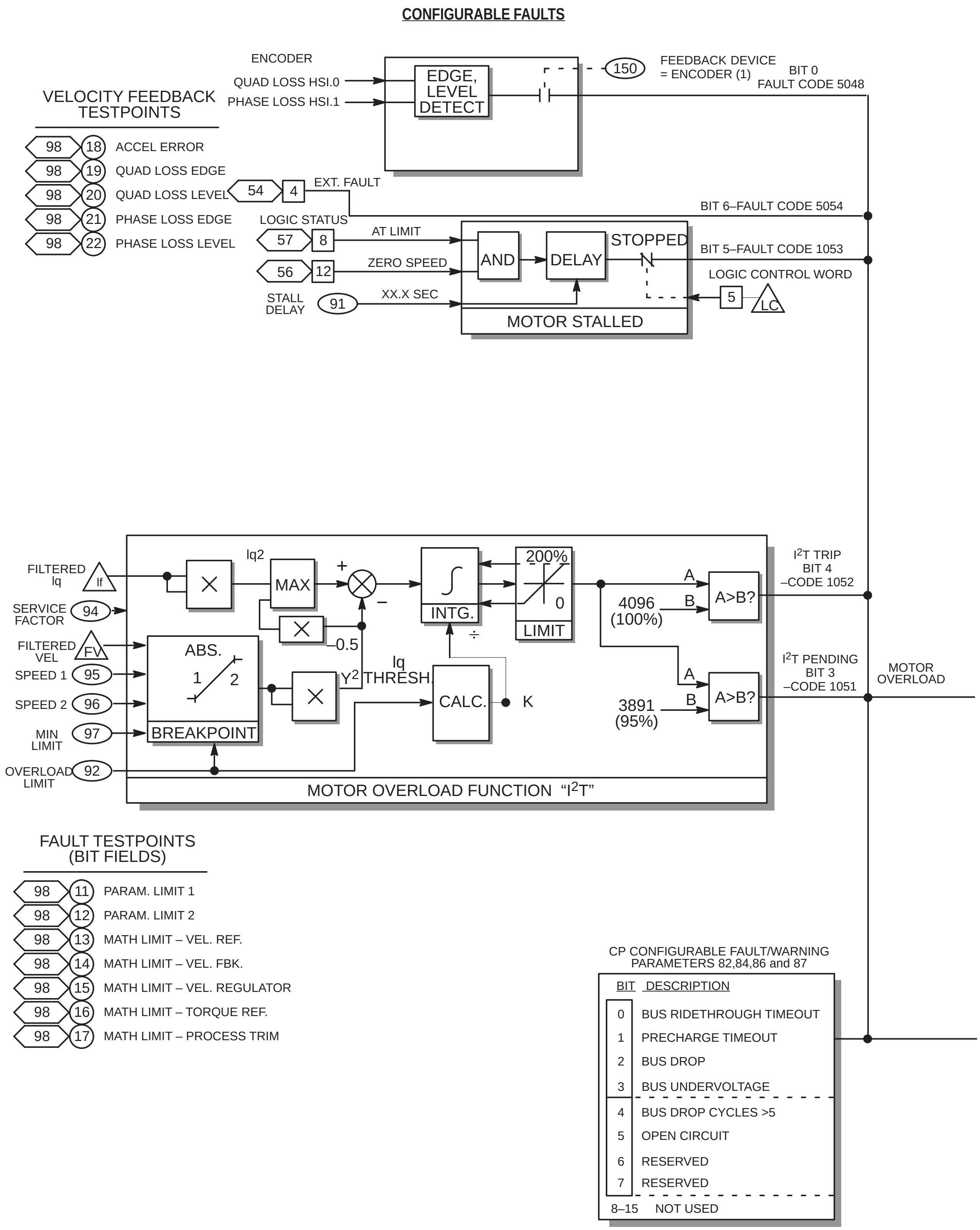
36T Firmware Function (Torque Block Overview)



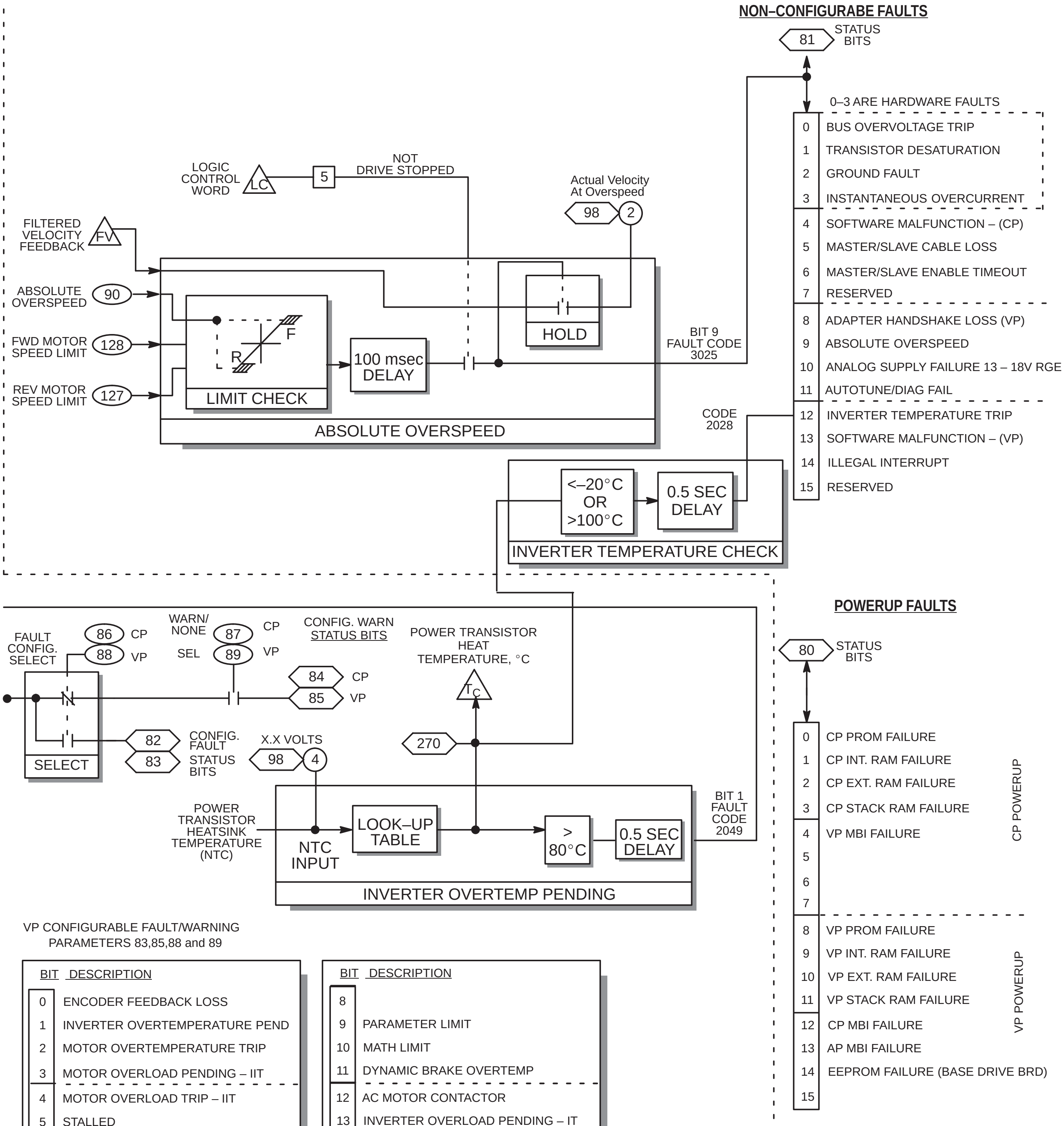
36T Firmware Function (Torque Block Overview)



36T Firmware Function (Drive Fault Detection)



36T Firmware Function (Drive Fault Overview)

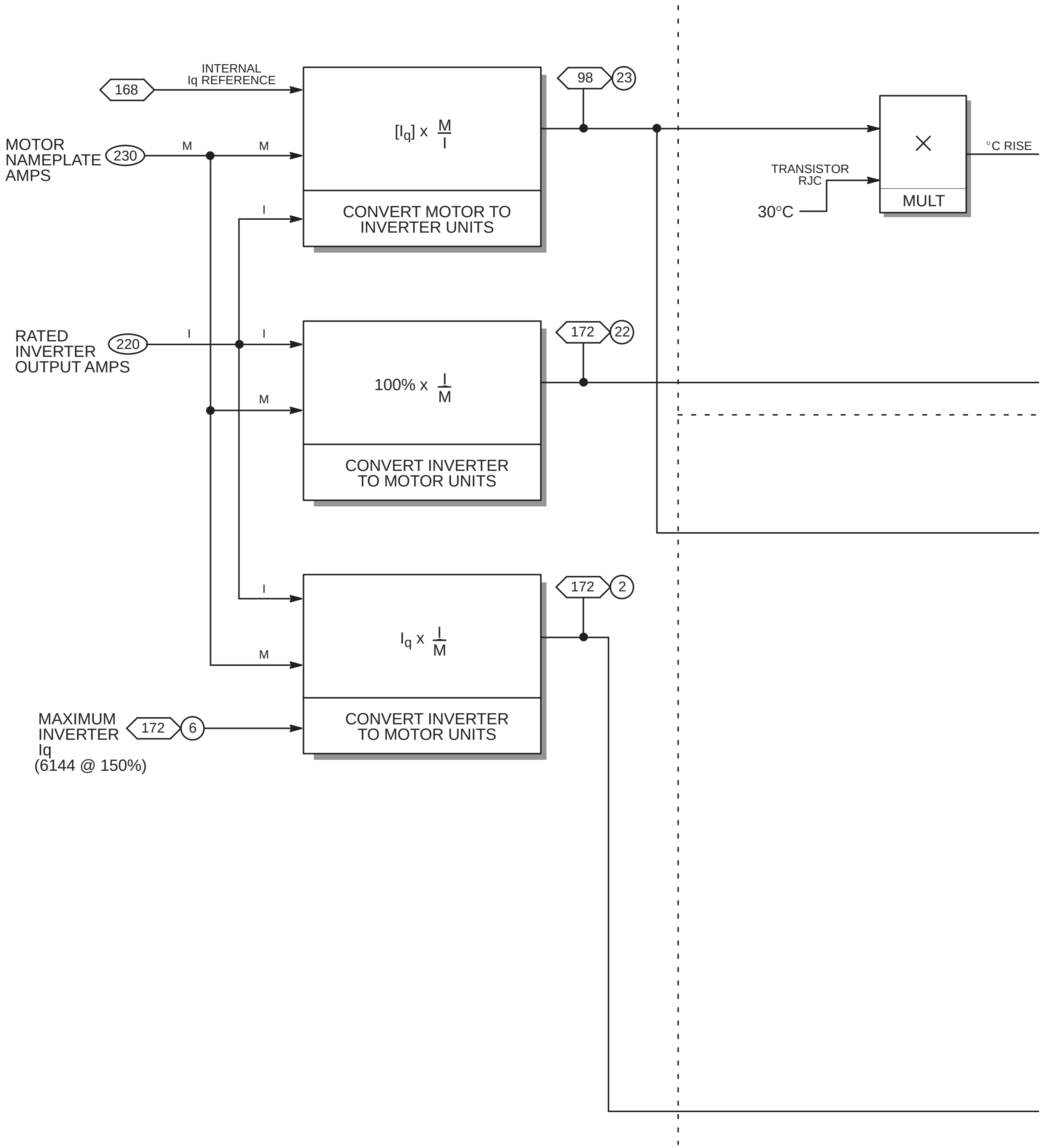


VP CONFIGURABLE FAULT/WARNING PARAMETERS 83,85,88 and 89

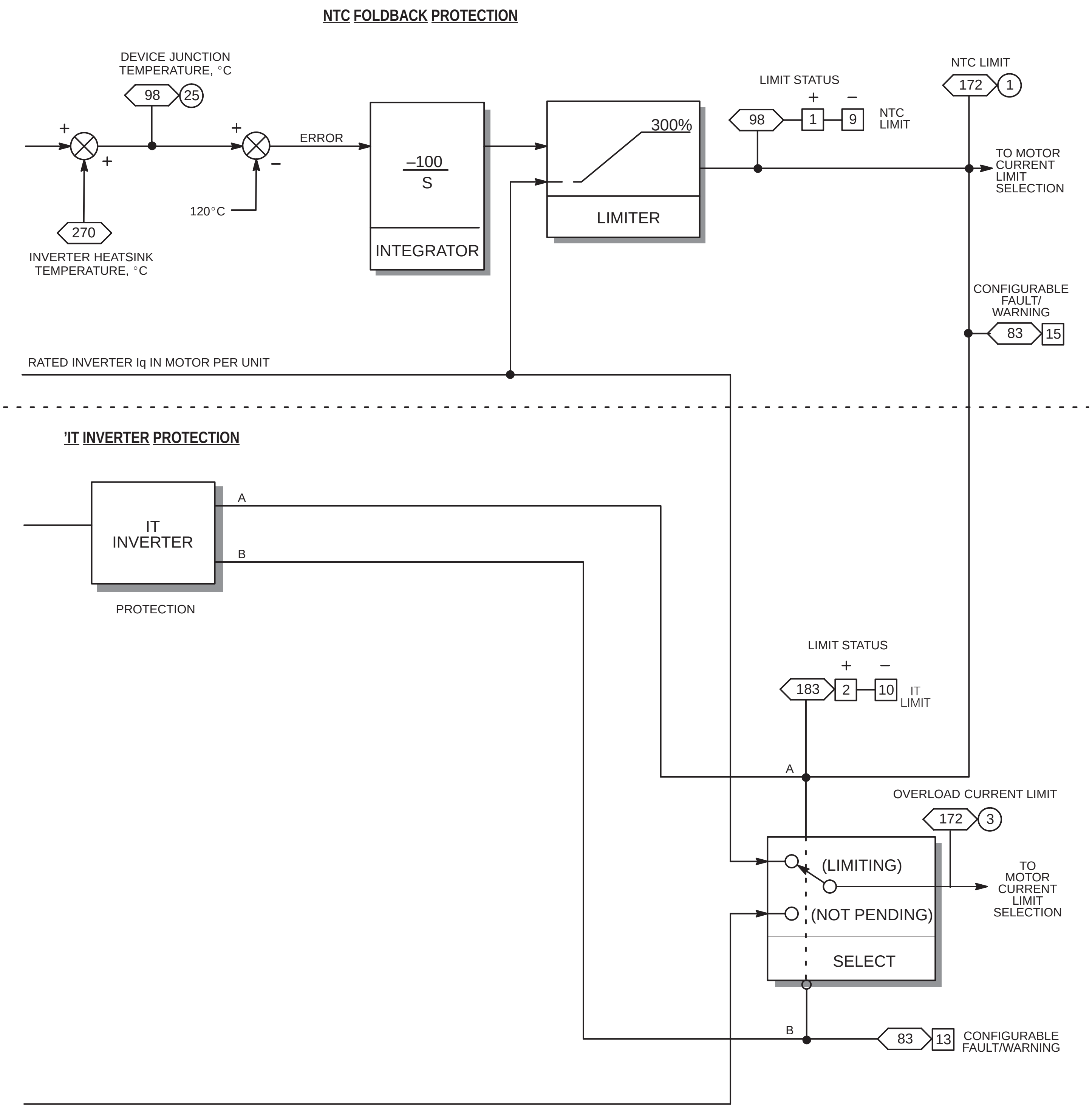
BIT	DESCRIPTION
0	ENCODER FEEDBACK LOSS
1	INVERTER OVERTEMPERATURE PEND
2	MOTOR OVERTEMPERATURE TRIP
3	MOTOR OVERLOAD PENDING – IIT
4	MOTOR OVERLOAD TRIP – IIT
5	STALLED
6	EXTERNAL FAULT
7	RMS FAULT

BIT	DESCRIPTION
8	
9	PARAMETER LIMIT
10	MATH LIMIT
11	DYNAMIC BRAKE OVERTEMP
12	AC MOTOR CONTACTOR
13	INVERTER OVERLOAD PENDING – IT
14	DRIVE–TO–DRIVE FAULT
15	INVERTER OVERLOAD TRIP–IT or NTC

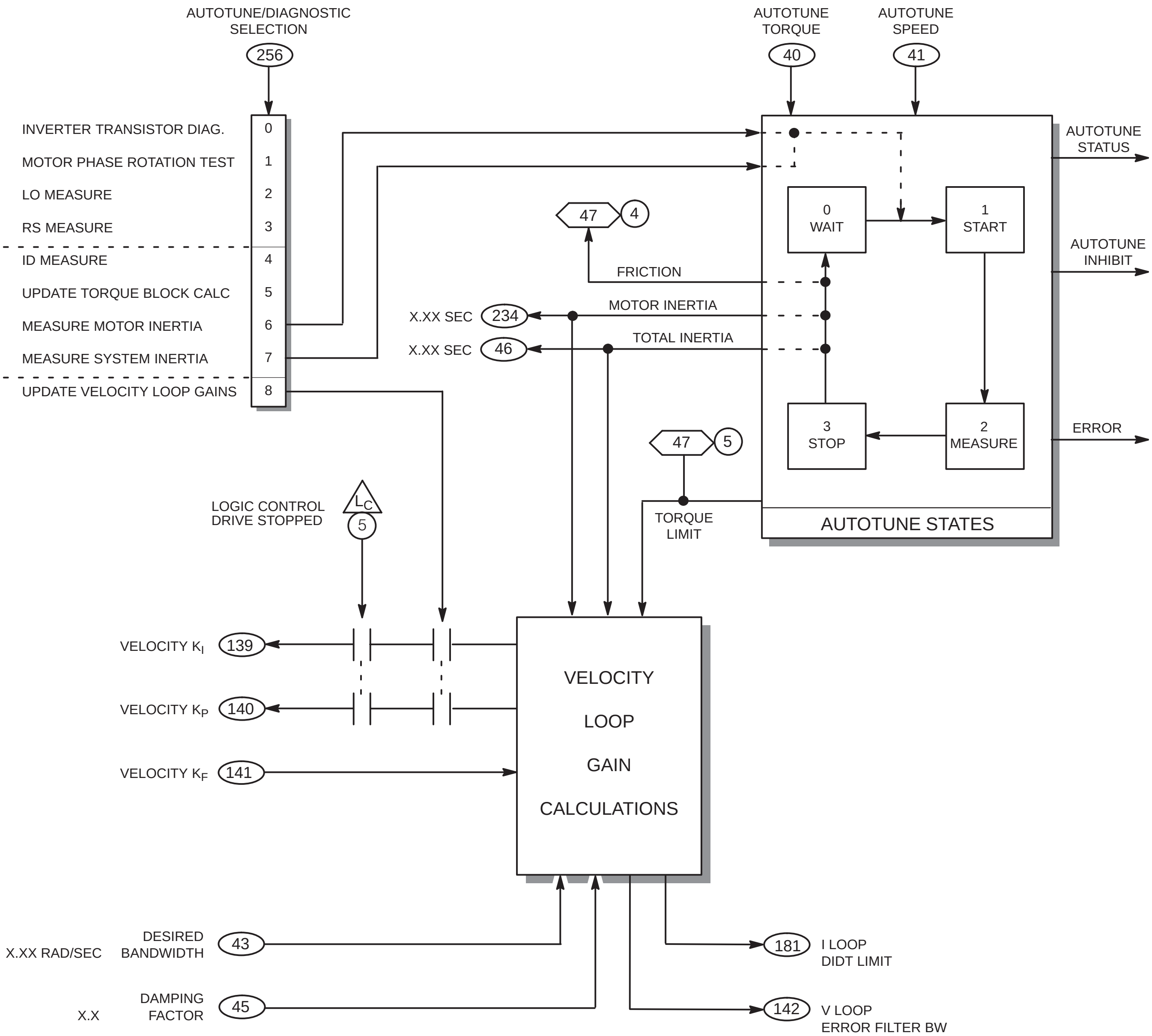
36T Firmware Function (Inverter Overload)



36T Firmware Function (Inverter Overload)



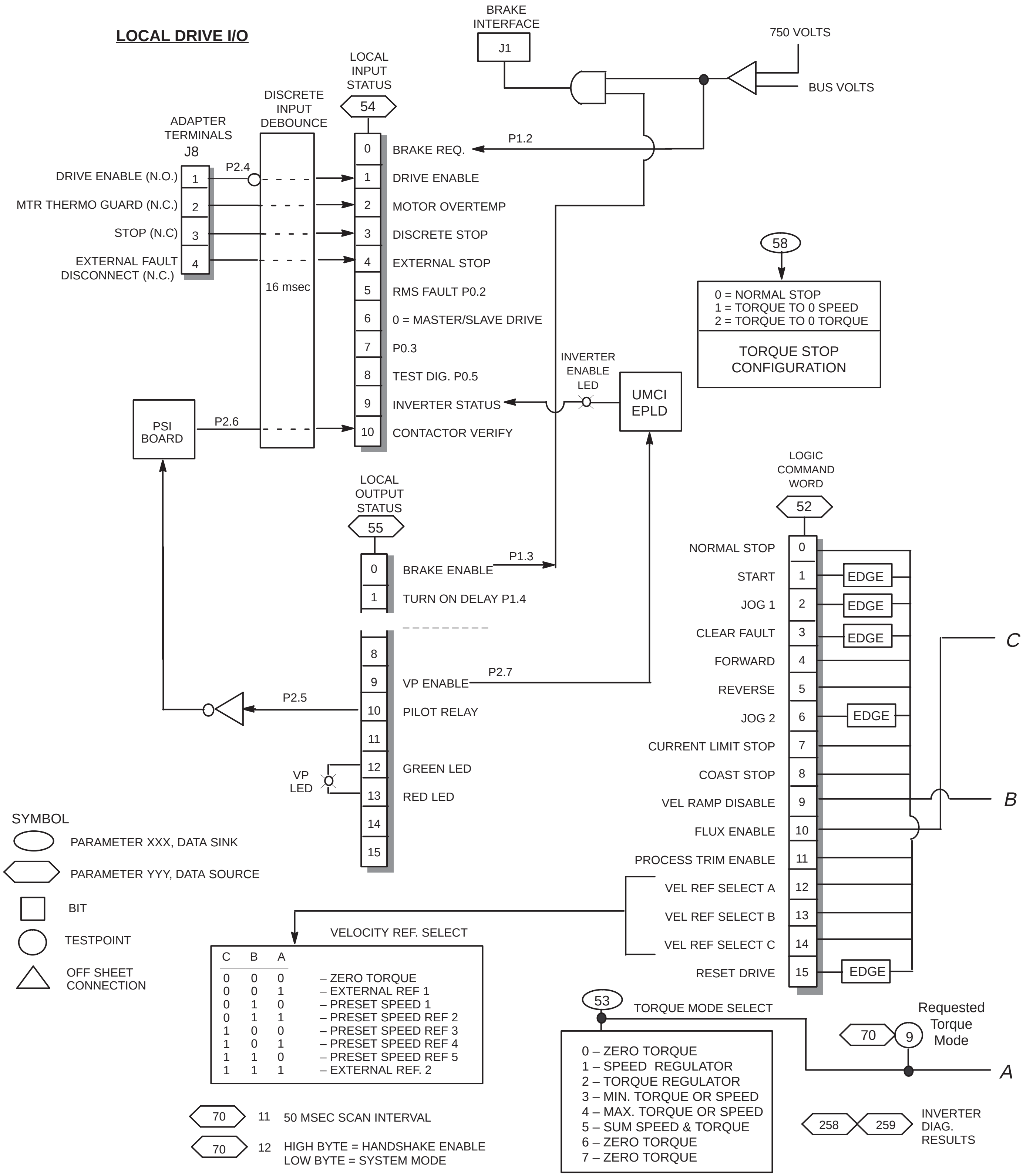
VELOCITY LOOP AUTOTUNE



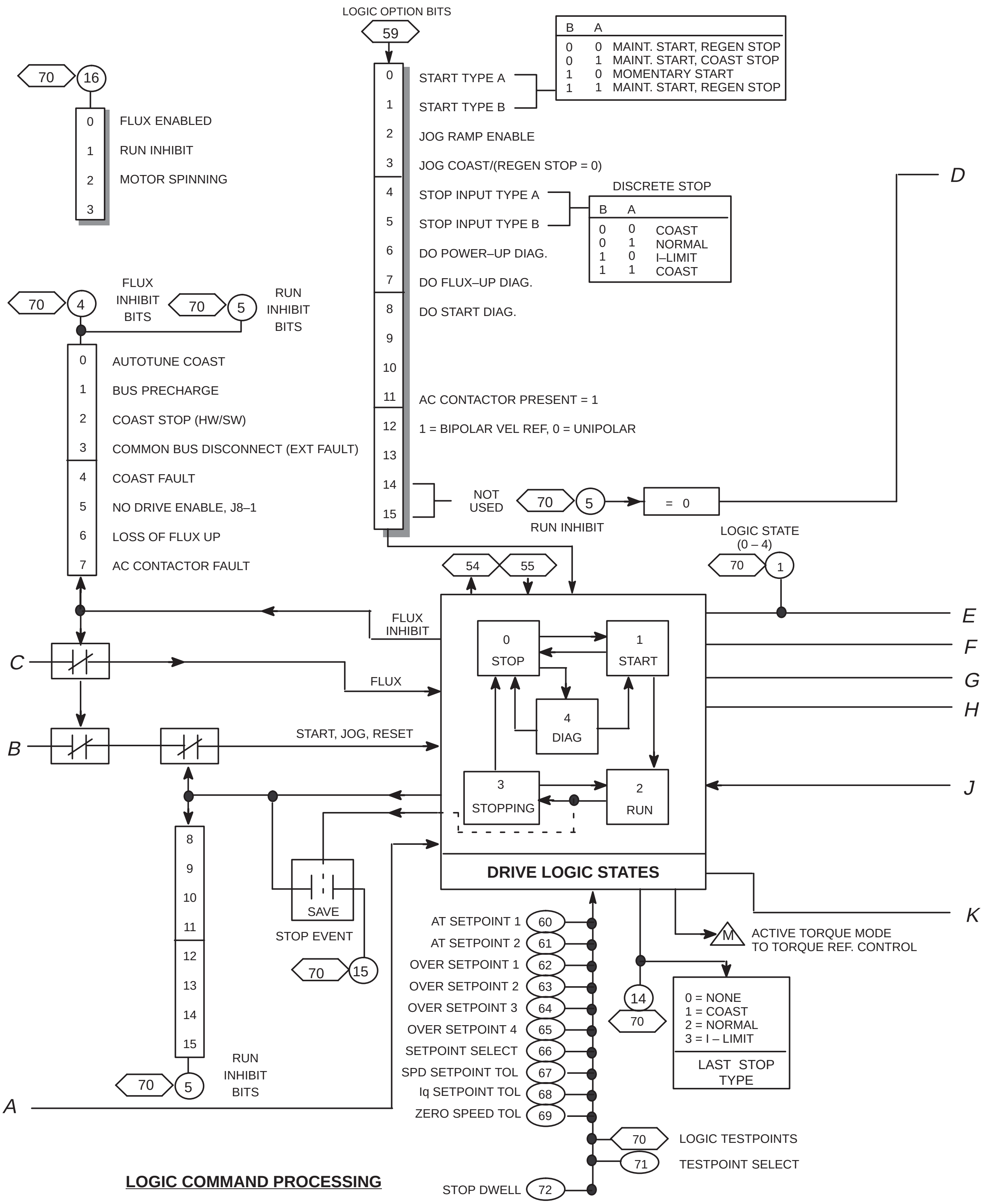
AUTOTUNE PROCEDURE

1. RUN TRANSISTOR DIAGNOSTICS – SET BIT 0 IN PARM. 256 AND TOGGLE START BIT IN LOGIC COMMAND.
2. RUN PHASE ROTATION TEST – SET BIT 1 IN PARM. 256 AND SET START BIT IN LOGIC COMMAND.
   CHECK SIGN OF VELOCITY FEEDBACK (PARM. 146) AGAINST FREQ. REF. (PARM. 263).
   STOP DRIVE AND CLEAR PARAMETER 256.
   SWAP ENCODER PHASES IF NECESSARY TO GET SIGNS TO MATCH.
3. RUN TORQUE AUTOTUNE – SET BITS 2 THROUGH 5 IN PARM. 256 AND TOGGLE START BIT IN LOGIC COMMAND.
4. RUN VELOCITY AUTOTUNE – ENTER DESIRED BANDWIDTH IN PARM. 43. SET BITS 6 THROUGH 8 IN PARM. 256 AND TOGGLE START BIT IN LOGIC COMMAND. CHECK DI/DT LIMIT IN PARM. 181.

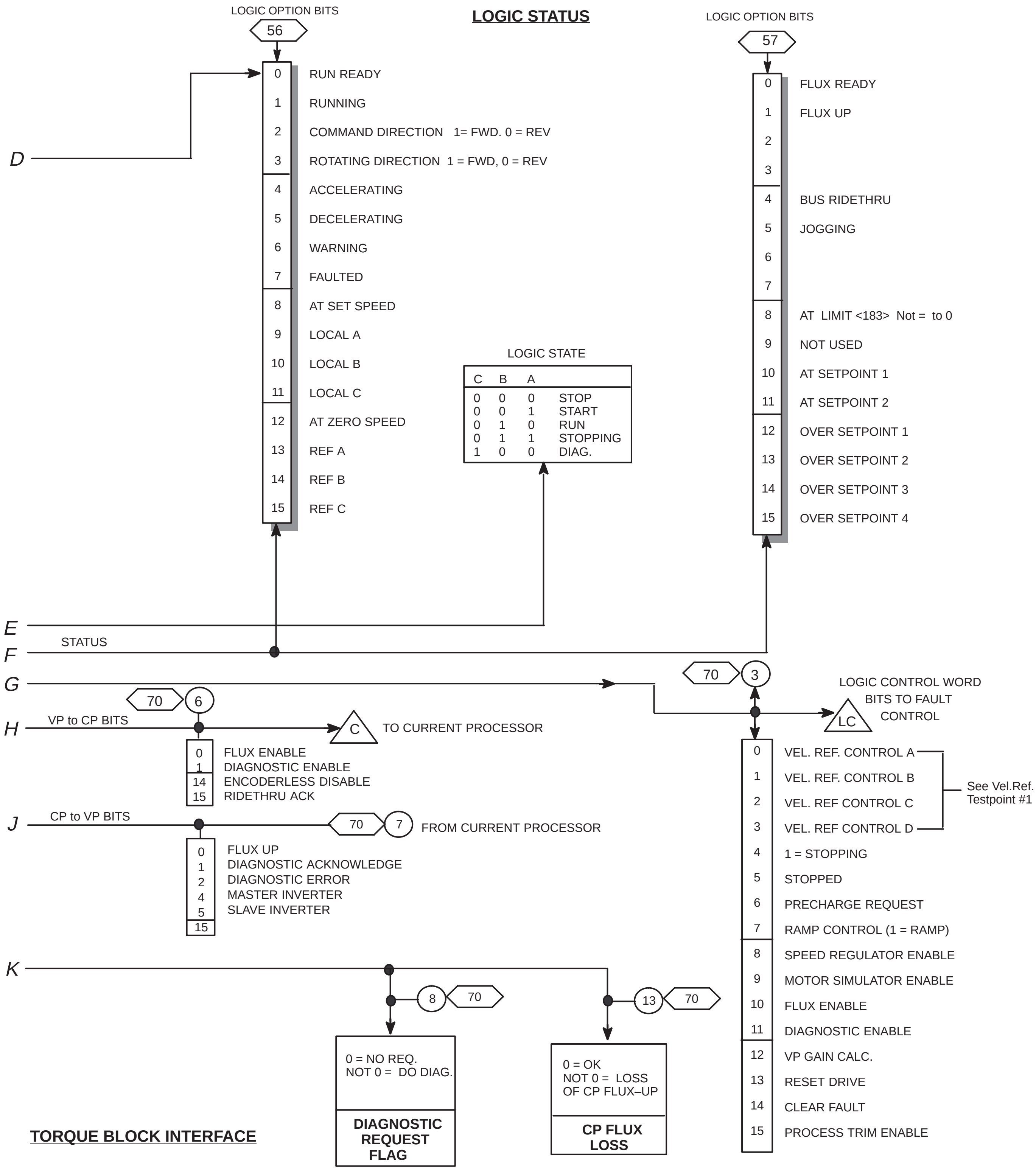
36T Firmware Function (Logic Control)



36T Firmware Function (Logic Control)



36T Firmware Function (Logic Control)



Battery Disposal

When it becomes necessary to replace the battery that supports the real time clock on the 1336 FORCE, precautions must be taken when disposing of the old battery. The following procedure must be followed when disposing of lithium batteries:

ATTENTION: Do not incinerate or dispose of lithium batteries in general trash collection. Explosion or violent rupture is possible. Batteries should be collected for disposal in a manner to prevent against short circuiting, compacting, or destruction of case integrity and hermetic seal.

For disposal, batteries must be packaged and shipped in accordance with Federal, state, local or provincial laws to an appropriate Transfer, Storage and Disposal facility.

The person disposing of the material is responsible for any hazards created in doing so, as the material may be considered toxic, reactive, or corrosive.

Appendix B

CE Conformity

EMC Directive

This apparatus is tested to meet Council Directive 89/336 Electromagnetic Compatibility (EMC) using a technical construction file and the following standards:

- EN 50081–1, –2 – Generic Emission Standard
- EN 50082–1, –2 – Generic Immunity Standard

Marked for all applicable directives [1]		
Emissions	EN 50081-1 EN 50081-2 EN 55011 Class A EN 55011 Class B	CE
Immunity	EN 50082-1 EN 50082-2 IEC 801-1, 2, 3, 4, 6, 8 per EN50082-1, 2	

Important: The conformity of the drive and filter to any standard does not guarantee that the entire installation will conform. Many other factors can influence the total installation and only direct measurements can verify total conformity.

Requirements for Conforming Installation

The following seven items **are** **required** for CE conformance:

1. Standard 1336 FORCE Drive 0.37-45 kW (1-60 HP) CE compatible (Series D or higher).
2. Factory installed EMC enclosure (-AE option) or field installed EMC Enclosure Kit (1336x-AEx – see page B–2)
3. Filter as called out on the following page.
4. Grounding as shown on page B–2.
5. Maximum cable length (drive to motor) of 75 meters (250 feet).
6. Input power (source to filter) and output power (filter to drive & drive to motor) wiring must be braided, shielded cable with a coverage of 75% or better, metal conduit or other with equivalent or better attenuation, mounted with appropriate connectors. For shielded cable it is recommended to use a compact strain relief connector with double saddle clamp for filter and drive input and compact strain relief connector with EMI protection for motor output.
7. Control (I/O) and signal wiring must be in conduit or have shielding with equivalent attenuation.

Filter

Filter Selection:

Filter Catalog Number	Three-Phase Volts	Used with . . .	Frame Reference
1336-RFB-30-A	200-240V	1336T-A001 - A003	A
	380-480V	1336T-B001 - B003	B
1336-RFB-27-B	200-240V	1336T-A007	B
	380-480V	1336T-B007 - B015	B
1336-RFB-48-B	200-240V	1336T-A010 - A015	B
	380-480V	1336T-B020 - B030	B
1336-RFB-80-C	200-240V	1336T-A020 - A030	C
	380-480V	1336T-BX040 - BX060	C
1336-RFB-150-D	200-240V	1336T-A040 - A050	D
	380-480V	1336T-B060 - B100	D
1336-RFB-180-D	200-240V	1336T-A060	D
	380-480V	1336T-B125 - BX150	D
1336-RFB-340-E	200-240V	1336T-A075 - A125	E
	380-480V	1336T-B150 - B250	E
1336-RFB-475-G	380-480V	1336T-BX250 - B350	G
1336-RFB-590-G	380-480V	1336T-B400 - B450	G
1336-RFB-670-G	380-480V	1336T-B500 - B600	G
Not Available	380-480V	1336T-B700 - B800	H

EMC Enclosure Kit Selection

Frame Reference	Enclosure Kit Catalog Number		
	200-240V Rating	380-480V Rating	500-600V Rating
B	1336-AE4	1336-AE4	1336-AE4
C	1336-AE5	1336-AE5	1336-AE5
D	1336-AE6	1336-AE6	1336-AE6
E	1336-AE7	1336-AE7	1336-AE7
F–H	Not Available		

RFI Filter Installation

ATTENTION: To prevent electrical shock, disconnect the power source before installing or servicing.

Important: Refer to the instructions supplied with the filter for details.

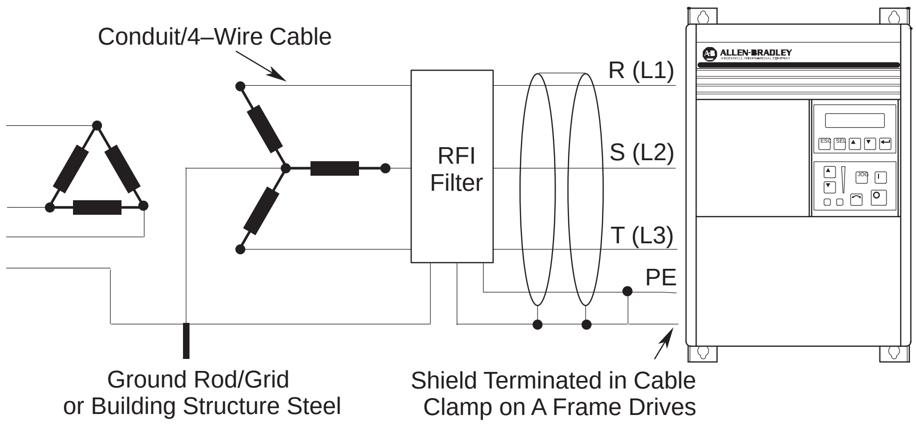
The RFI filter must be connected between the incoming AC supply line and the drive input terminals.

RFI Filter Leakage Current

The RFI filter may cause ground leakage currents. Therefore a solid ground connection must be provided as shown in the electrical configuration scheme shown on the following page.

ATTENTION: To guard against possible equipment damage, RFI filters can only be used with AC supplies that are nominally balanced with respect to ground. In some installations, three-phase supplies are occasionally connected in a 3-wire configuration with one phase grounded (Grounded Delta). The filter must not be used in Grounded Delta supplies or in an ungrounded wye configuration.

Electrical Configuration



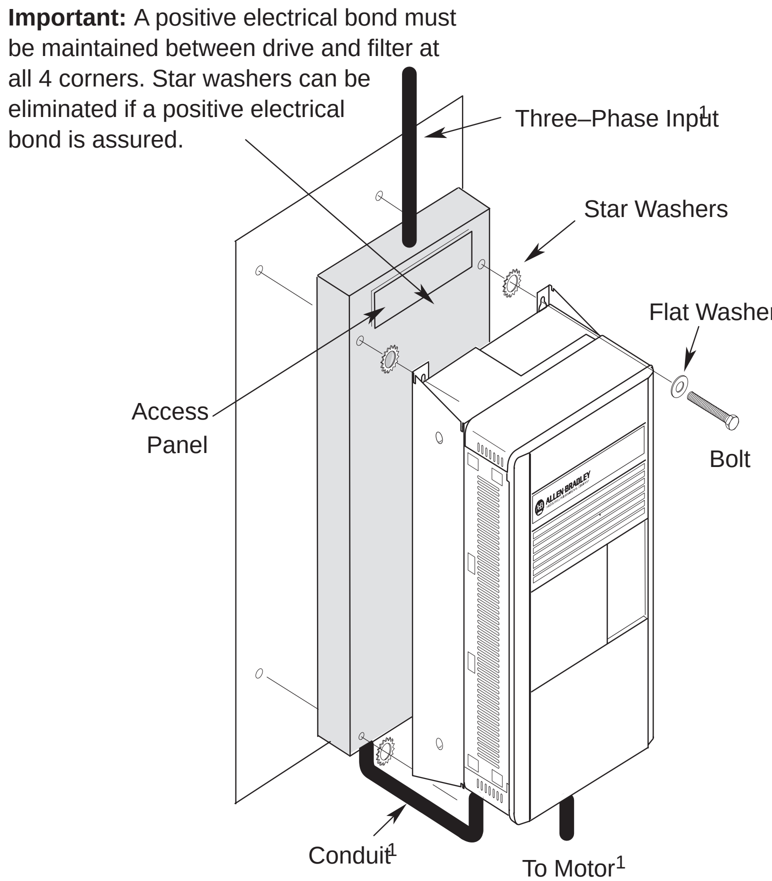
Grounding

RFI Filter Grounding

Important: Using the RFI filter may result in relatively high ground leakage currents. Surge suppression devices are also incorporated into the filter. Therefore, the filter must be permanently installed and solidly grounded (bonded) to the building power distribution ground. Ensure that the incoming supply neutral is solidly connected (bonded) to the same building power distribution ground.

Grounding must not rely on flexible cables and should not include any form of plug or socket that would permit inadvertent disconnection. Some local codes may require redundant ground connections. The integrity of all connections should be periodically checked.

Mechanical Configuration



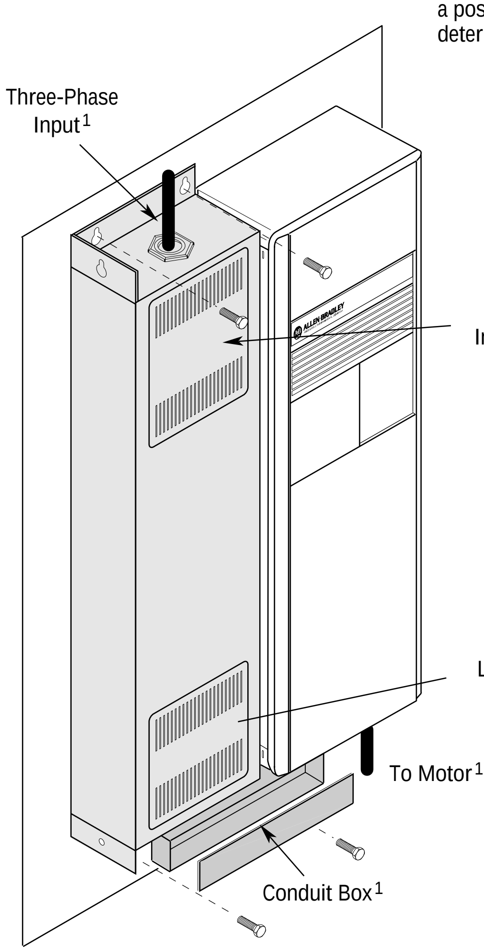
1336 FORCE

.37 – 45 kW (1 – 60 HP)
Frames B & C

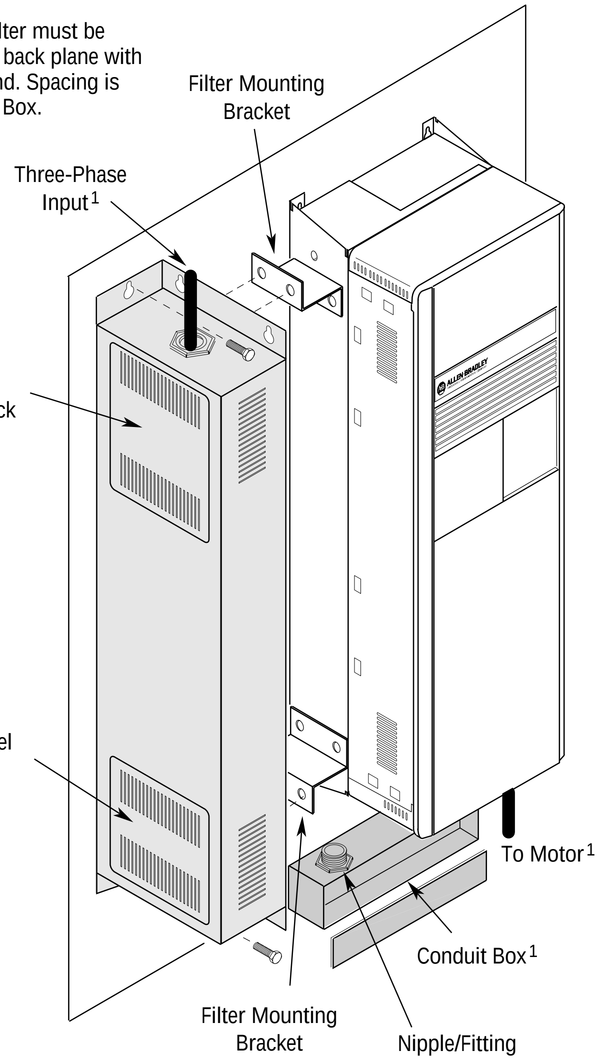
1 Input power (source to filter) and output power (filter to drive & drive to motor) wiring must be in conduit or have shielding/armor with equivalent attenuation. See requirements on page B1

NOTE: 1336 FORCE 40–60 HP, 230V and 60HP, 460V mounted in D Frames are NOT CE approved and cannot be used with the RFB–80–C filter.

Important: Drive and filter must be mounted to a common back plane with a positive electrical bond. Spacing is determined by Conduit Box.



1336 FORCE
Through-the-Wall Mounting)
Frames D & E [2]



1336 FORCE
(Conventional Mounting)
Frames D & E [2]

[1] Input power (source to filter) and output power (filter to drive and drive to motor) wiring must be in conduit or have shielding/armor with equivalent attenuation. Shielding/armor must be bonded to the metal bottom plate. See requirements 6 & 7 on page E–1.

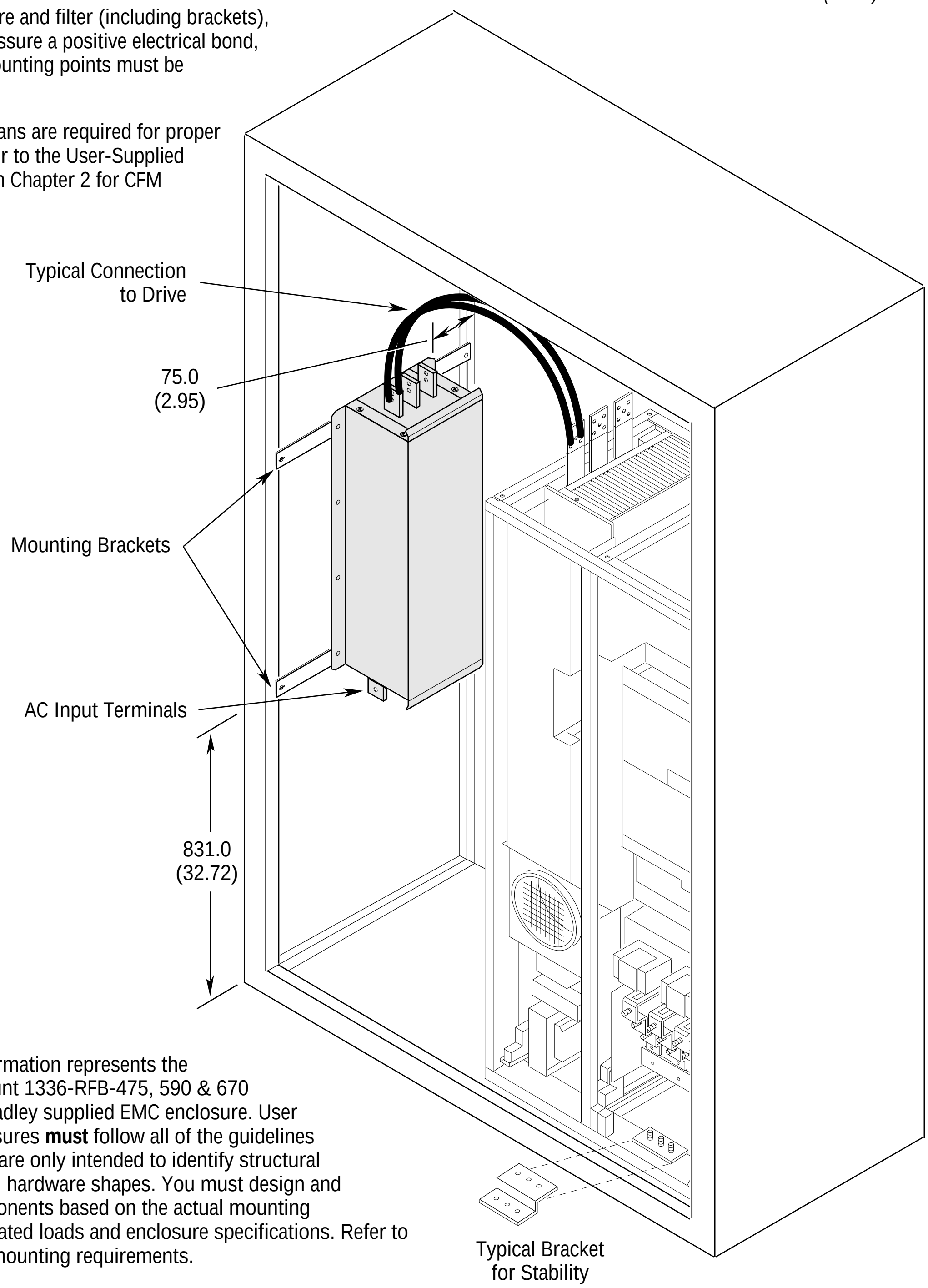
[2] Refer to the Filter Selection table on page B–2 for frame references and corresponding catalog numbers.

Filter Mounting *(continued)*

Important: A positive electrical bond must be maintained between the enclosure and filter (including brackets), fans, and drive. To assure a positive electrical bond, any paint near all mounting points must be removed.

Important: Cooling fans are required for proper drive operation. Refer to the User-Supplied Enclosures section in Chapter 2 for CFM recommendations.

All Dimensions in Millimeters and (Inches)



Important: This information represents the method used to mount 1336-RFB-475, 590 & 670 filters in an Allen-Bradley supplied EMC enclosure. User supplied EMC enclosures **must** follow all of the guidelines shown. Illustrations are only intended to identify structural mounting points and hardware shapes. You must design and fabricate steel components based on the actual mounting configuration, calculated loads and enclosure specifications. Refer to Chapter 2 for drive mounting requirements.

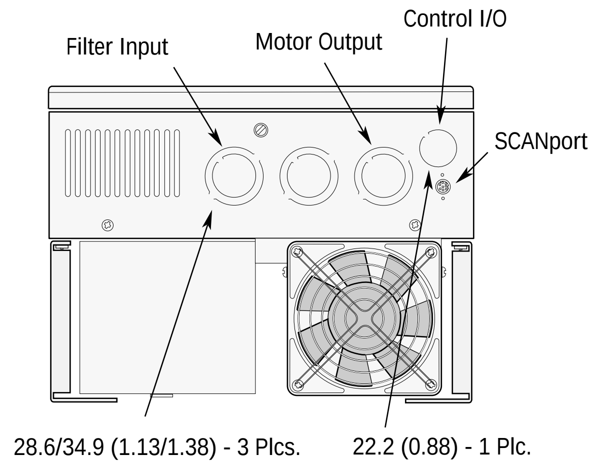
1336 FORCE
(Typical Mounting)
Frame G [2]

[1] Input power (source to filter) and output power (filter to drive and drive to motor) wiring must be in conduit or have shielding/armor with equivalent attenuation. Shielding/armor must be bonded to the metal bottom plate. See requirements 6 & 7 on page E–1.

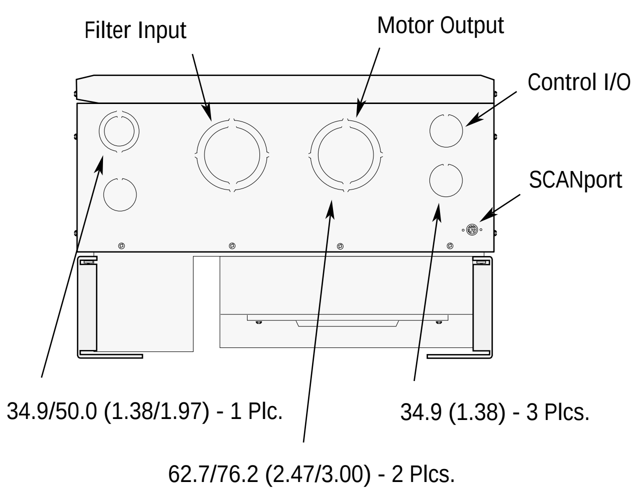
[2] Refer to the Filter Selection table on page B–2 for frame references and corresponding catalog numbers.

Required Knockout Assignments

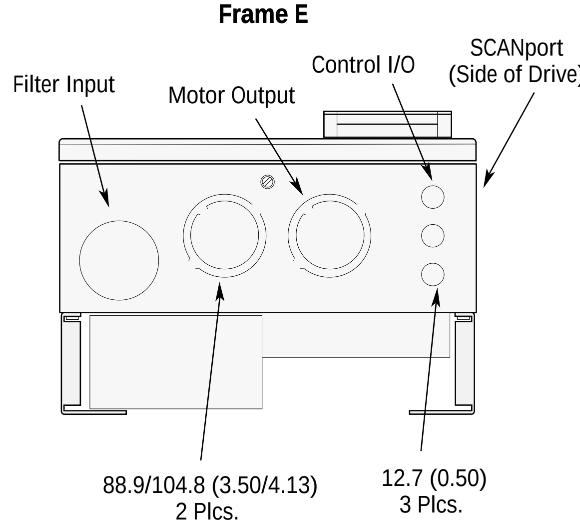
Frames B and C



Frame D



Frame E



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User Parameter Values

Use the tables on the following pages to record your particular parameter value setting for the current application.

No.	Name	Default	Value	No.	Name	Default	Value
1	Drive Software Ver	1.01		47	Autotune TP Data	0000 0000 0000 0000	
5	Power Struct Type	0		48	Autotune TP Select	0	
8	Motor Cntrl Counter	0.0 sec		52	Logic Cmd Word	0000 0000 0000 0000	
9	Drv Comm Tsk Intrvl	1		53	Torque Mode Sel	1	
10	Drv Comm Baud Rate	0		54	Local Input Status	0000 0000 0000 0000	
11	Drv Comm Trans Addr	0		55	Local Output Status	0000 0000 0000 0000	
12	Drv Comm Rcv 1 Addr	0		56	Logic Status Low	0000 0000 0000 0000	
13	Drv Comm Rcv 2 Addr	0		57	Logic Status Hi	0000 0000 0000 0000	
14	Dr Comm Xmit Ind 1	20		58	Torq Stop Config	0	
15	Dr Comm Xmit Ind 2	21		59	Logic Options	0000 0001 1000 0010	
16	Dr Comm Rcv 1 Ind 1	22		60	At Setpoint 1	+0.0%	
17	Dr Comm Rcv 1 Ind 2	23		61	At Setpoint 2	+0.0%	
18	Dr Comm Rcv 2 Ind 1	24		62	Over Setpoint 1	+0.0%	
19	Dr Comm Rcv 2 Ind 2	25		63	Over Setpoint 2	+0.0%	
20	Dr Comm Xmit Data 1	0		64	Over Setpoint 3	+0.0%	
21	Dr Comm Xmit Data 2	0		65	Over Setpoint 4	+0.0%	
22	Dr Comm Rcv1, Data 1	0		66	Setpoint Select	0000 0000 0000 0000	
23	Dr Comm Rcv1, Data 2	0		67	Spd Setpoint Tol	base speed/100	
24	Dr Comm Rcv2, Data 1	0		68	Cur Setpoint Tol	2.0%	
25	Dr Comm Rcv2, Data 2	0		69	Zero Spd Tolerance	base speed/100	
26	Process Trim Output	+0.00%		70	Logic Testpoint Data	0000 0000 0000 0000	
27	Process Trim Ref	+0.00%		71	Logic Testpoint Sel	0	
28	Process Trim Fdbk	+0.00%		72	Stop Dwell	1.0 sec.	
29	Process Trim Select	0000 0000 0000 0000		77	Max Dyn Brake Pwr	0 Watts	
30	Proc Trim Fltr Bdwth	0 radian/seconds		78	Max Dyn Brake Tmp	50 deg	
31	Proc Trim Data	+0.0%		79	Dyn Brk Time Const	10 sec.	
32	Proc Trim KI Gain	1.000		80	Pwr Up Diag Flt Sts	0000 0000 0000 0000	
33	Proc Trim KP Gain	1.000		81	Non Config Flt Sts	0000 0000 0000 0000	
34	Proc Trim Lo Lmt	–100.0%		82	CP Config Flt Sts	0000 0000 0000 0000	
35	Proc Trim Hi Lmt	–100.0%		83	VP Config Flt Sts	0000 0000 0000 0000	
36	Proc Trim Out Gain	+1.00		84	CP Config Warn Sts	0000 0000 0000 0000	
37	Process Trim Tstpnt	+0		85	VP Config Warn Sts	0000 0000 0000 0000	
38	Proc Trim TP Sel	0		86	CP Flt/Warn Sel	0000 0000 0000 0000	
40	Auto Tune Trq Lmt	50.0%		87	CP Warn Config Sel	0000 0000 0000 0000	
41	Auto Tune Speed	0.85 x Base Motor Spd		88	VP Fault Select	1111 1111 1111 1111	
43	VP Desired BW	5.00 radian/seconds		89	VP Warn Config Sel	0000 0000 0000 0000	
44	Autotune Status	50.00 radian seconds		90	Abslte Ovrspd Thrsh	0.1 x base speed	
45	VP Damping Factor	1.0		91	Stall Delay	1.0 sec.	
46	Total Inertia	20.0 sec.		92	Mtr Overload Limit	200.0%	

No.	Name	Default	Value	No.	Name	Default	Value
94	Service Factor	1.00		144	Vel Fdbk TP HI	+0	
95	Mtr Ovrld Speed 1	0.8 x Base Speed		145	Vel Fdbk TP Select	0	
96	Motor Ovrld Speed 2	0.8 x Base Speed		146	Vel Fdbk	+0 0 rpm	
97	Min Ovrld Lim	100.0%		147	Scaled Vel Fdbk	0	
98	Fault Tstpt Data	0		148	Enc Pos Fdbk LOW	0	
99	Fault Tstpt Sel	0		149	Enc Pos Fdbk HI	0	
100	Vel Ref 1 LOW	0		150	Fdbk Device Type	None	
101	Vel Ref 1 HI	0.0 rpm		151	Fdbk Tracker Gain	1.000	
102	Vel Scl Fctr 1	+1.000		152	Fdbk Filter Sel	0	
103	Vel Ref 2 LOW	0		153	Kn Fdbk Filter Gain	+1.00	
104	Vel Ref 2 HI	0.0 rpm		154	Wn Fdbk Filter BW	100 radian/seconds	
105	Vel Scl Fctr 2	+1.000		155	Tach Velocity	+0.00 rpm	
106	Vel Trim LOW	0		156	Notch Filter Freq.	135 Hz	
107	Vel Trim HI	0.0 rpm		157	Notch Filter Q	None	
108	Vel Ref TP LOW	0		161	External Iq Ref	+0.0%	
109	Vel Ref TP HI	0		162	Ext Trq Ref 1	+0.0%	
110	Vel Ref TP Sel	0		163	Slave Torque % 1	+100%	
117	Jog Spd 1	+0.0 rpm		164	Ext Torq Ref 2	+0.0%	
118	Jog Spd 2	+0.0 rpm		165	Ext Torque % 2	+0.0%	
119	Preset Speed 1	+0.0 rpm		166	Ext Torq Step	0.0%	
120	Preset Speed 2	+0.0 rpm		167	Int Torq Ref	+0.0%	
121	Preset Speed 3	+0.00 rpm		168	Internal Iq Ref	+0.0%	
122	Preset Speed 4	+0.0 rpm		172	Torq Ref TP Data	+0.0%	
123	Preset Speed 5	+0.0 rpm		173	Torq Ref TP Sel	0	
125	Accel Time	10.0 seconds		174	Min Flux Level	100%	
126	Decel Time	10.0 seconds		175	Pos Mtr Cur Ref Lmt	200%	
127	Rev Motor Spd Lim	– Base Motor Speed		176	Neg Mtr Cur Ref Lmt	–200%	
128	Fwd Motor Spd Lim	Base Motor Speed		177	Motor Power Lmt	200%	
129	Max Rev Spd Trim	– base speed		178	Regen Power Lmt	–200%	
130	Max Fwd Spd Trim	+ Base Speed		179	Pos Mtr Cur Ref Lim	100%	
131	Droop Percent	0%		180	Neg Mtr Cur Ref Lim	–100%	
132	Vel Ref Out LOW	0		181	Di/Dt Limit	40%	
133	Vel Ref Out HI	+0.0 rpm		182	Computed Power	+0.0%	
134	Vel Reg Out	0		183	Torque Limit Status	0000 0000 0000 0000	
135	Vel Reg TP LOW	0		184	Torque Mode Status	0000 0000 0000 0000	
136	Vel Reg TP HI	0		185	Perunit Motor Curr	0.0%	
137	Vel Reg TP Sel	0		186	Perunit Motor Volt	0.0%	
138	Velocity Error	+0.0 rpm		220	Rtd Inv Out Amps	20.0 amps	
139	KI Velocity Loop	32.0		221	Rtd Inv Input Volts	460 volt	
140	KP Velocity Loop	8.0		222	Inverter Carrier Freq	4.000 Hz	
141	KF Velocity Loop	1.00		223	Prech/Rdthru Sel	0000 0000 0000 0000	
143	Vel Fdbk TP LOW	0		224	Undervolt Setpoint	400 volt	

No.	Name	Default	Value	No.	Name	Default	Value
225	Bus Prech Timeout	30.0 Sec.		271	Lim Motor Flux	100%	
226	Bus Ridethru Timout	1,750 RPM		273	TP Sel 1	0	
227	CP Operat Options	0000 0000 0000 0000		274	TP Data 1	0	
228	Base Motor HP	30.0 HP		275	TP Select #2	0	
229	Base Motor Speed	1,750 RPM		273	TP Sel 1	0	
230	Base Motor Current	0.2 Amps		274	TP Data 1	0	
231	Base Motor Volts	460 Volts		275	TP Select #2	0	
232	Base Motor Freq.	60 Hz		276	TP Data #2	0	
233	Motor Poles	4 poles		277	TP Select #3	0	
234	Mtr Inertia	0.60 sec.		278	TP Data #3	0	
235	Encoder PPR	1,024 PPR		279	TP Select #4	0	
236	RS Tune	1.50%		280	TP Data #4	100%	
237	Lsigma Tune	18.00%		281	TP Select #5	0	
238	Id Tune	30.0%		282	TP Data #5	0	
240	Iq Tune	95.40%		283	TP Select #6	0	
241	Vde Tune	–75.0 volts		284	TP Data #6	0	
242	Vqe Tune	367.0 volts		285	Select for Tst DAC1	0	
243	Vde Maximum	356.0 volts		286	Select for Tst DAC2	0	
244	Vque Maximum	367.0 volts		287	Ki Freq Reg	0	
245	Vde Minimum	3.0 volts		288	Kp Freq Reg	0	
246	Base Slip Freq	0.469 Hz		289	Kff Freq Reg	0	
247	Base Slip Freq Max	2.00 Hz		290	Ksel Freq. Reg.	0	
248	Base Slip Freq Min	0.50 Hz		291	Freq. Track Filt	0	
260	Iq Offset	+0		292	Track Filt Type	3	
261	Id Offset	+0		293	Freq Trim Filt	5000	
262	Ph Rot Cur Ref	50%		294	Mtr Phs Rot Err	0000 0000 0000 0000	
263	Ph Rot Freq Ref	3.0 Hz		295	Mtr InducTest Error	0000 0000 0000 0000	
264	Mtr Cur Mag Fdbk	0.0 Amps		296	Stator RS Test Error	0000 0000 0000 0000	
265	Mtr Volt Fdbk	+0 Volts		297	Id Test Errors	0000 0000 0000 0000	
266	Stator Freq	0.000 Hz		298	Torque Blk Calc	0000 0000 0000 0000	
267	Calc Torque	0.0		300	Adapter ID	2	
268	DC Bus Voltage	0 volts		301	Adapter Version	x.xx	
269	Filter Mtr Vel Fdbk	0.0 rpm		302	Adapter Config		
270	Inv Temp Fdbk	0 deg		304	Language Select	0	

No.	Name	Default	Value	No.	Name	Default	Value
310	Data In A1	0		359	Pot Offset	+0.000	
311	Data In A2	0		360	Pot Scale	+1.000	
312	Data In B1	0		361	Milli Amp Input	+0	
313	Data In B2	0		362	Milli Amp In Offset	+0.000 mA	
314	Data In C1	0		363	Milli Amp In Scale	+2.000	
315	Data In C2	0		364	SP Analog Sel	1	
316	Data In D1	0		365	Sp Analog In	0	
317	Data In D2	0		366	Sp An1 Scale	1 (32767)	
320	Data Out A1	0		367	Sp Analog Select	1	
321	Data Out A2	0		368	Sp Analog2 In	0	
322	Data Out B1	0		369	SP An2 Scale	1 (32767)	
323	Data Out B2	0		370	Analog Output 1	0	
324	Data Out C1	0		371	Analog Out 1 Offset	+0.000 volt	
325	Data Out C2	0		372	An Out 1 Scale	+0.500	
326	Data Out D1	0		373	An Out 2 Scale	0	
327	Data Out D2	0		374	Analog Out 2 Offset	+0.000	
330	SP Port Enable Msk	0111 1111		375	An Out 2 Scale	+0.500	
331	SP Direction Mask	0111 1111		376	mA Output	0	
332	SP Start Mask	0111 1111		377	mA Output Offset	0.000 mA	
333	SP Jog Mask	0111 1111		378	Regen Power Lmt	+0.500	
334	SP Ref Mask	0111 1111		379	Pos Mtr Cur Lim	0	
335	SP Clr Flt Mask	0111 1111		384	Select for Tst DAC2	8	
336	SP Reset Drv Mask	0111 1111		385	Input Mode	1	
337	SP Local Cntrl Mask	0111 1111		386	Input Status	0000 0000	
340	SP Stop Owner	0000 0000		387	Stop Select 1	0	
341	SP Dir. Owner	0000 0000		388	Stop Select 2	0	
342	SP Start Owner	0000 0000		389	Accel Rate 1	10 sec.	
343	SP Jog 1 Owner	0000 0000		390	Accel Rate 2	3	
344	SP Jog 2 Owner	0000 0000		391	Decel Rate 1	5000	
345	SP Ref Owner	0000 0000		392	Decel Rate 2	0000 0000 0000 0000	
346	SP Local Owner	0000 0000		393	Mop Increment	0000 0000 0000 0000	
347	SP Flux Owner	0000 0000		394	Mop Value	0000 0000 0000 0000	
348	SP Trim Owner	0000 0000		395	Pulse PPR	0000 0000 0000 0000	
349	SP Ramp Owner	0000 0000		396	Pulse Edge	0000 0000 0000 0000	
350	SP Clr Fault Owner	0000 0000		397	Pulse Scale	1750	
352	10 Volt In Filtr	0.0 r/s		398	Pulse Offset	0.0	
353	Pot In Fltr	0.0 r/s		399	Pulse Value	0.0	
354	mA In Filtr	0.0 r/s		404	SP Comm Retries	0.0	
355	10 Volt Input	0		405	Fault Select	0000 0000 0111 1111	
356	10 Volt Offset	0.00 Volt		406	Warning Select	0000 0000 0111 1111	
357	10 Volt Scale	+2.000		407	Fault Status	0000 0000 0000 0000	
358	Pot Input	0		408	Warning Status	0000 0000 0000 0000	

Spare Parts Information

Current 1336 FORCE spare parts information including recommended parts, catalog numbers and pricing can be obtained from the following sources:

- Allen–Bradley home page on the World Wide Web at:
  http://www.ab.com

  then select . . .
  "**Drives and Motors**" *followed by* . . .
  "**1336 FORCE**" from the Product Directory *and* . . .
  "**Technical Support**" . . .

  Select "Parts List"

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