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ALLEN-BRADLEY

Bulletin 1336
Adjustable Frequency AC Drive

User Manual



Important User Information

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.

DANGER labels may be located on or inside the drive to alert people that dangerous voltage may be present.

Summary of Changes

Summary of Manual Changes

This release of the 1336-5.0 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
Unit Schematics – Figures 3.1, 3.2, 3.3, 3,4	3-2 – 3-9	Updated
General Installation Requirements Attention	5-1	New
General Wiring Procedures Attention	6-1	New

Table of Contents

Pre-Installation Care 1-1

Receiving – Once you have received your drive, careful inspection for shipping damage must be made. Damage to the shipping carton is usually a good indication that it has received improper handling. Any and all damage should be immediately reported to the freight carrier and your nearest Allen-Bradley Area Sales/Support Center. 1-1

Storage – If the drive will not immediately be installed, it should be stored in a clean, dry area where the ambient temperature is not less than -405C nor more than +855C. The drive must not be stored in a corrosive environment nor subject to conditions in excess of the storage environment parameters stated in Chapter 4 — Specifications. 1-1

Handling – Depending upon the rating and options ordered, the weight of your drive can vary. To guard against injury to personnel, proper safety precautions and practices must be observed whenever the drive is being moved from one location to another. 1-1

Shipping – The carton and materials that came with your drive have been designed and tested to provide reasonable protection against damage during transit. Should the drive be shipped to another location, it is recommended that the original shipping carton and packing material be used to protect the drive from damage in transit. . . . 1-1

Electrostatic Discharge – Electrostatic discharge generated by static electricity can damage the 1-2

Precautions – Complimentary metallic oxide semiconductor devices on various drive boards. It is recommended that you perform these procedures to guard against this type of damage when circuit boards are removed or installed: 1-2

Overview 3-1

Wiring 6-1

Important User Information 2

Manual Objective

This manual defines the installation, operation, startup and fault codes for the Allen-Bradley 1336 Adjustable Frequency AC Drive. It is intended for use by personnel familiar with the functions of solid-state drive equipment. Also provided are interconnection drawings for 1336 logic interface options in Appendix A.

The 1336 User Manual is designed to be read and used like an ordinary textbook. Read the manual once from the beginning in the order presented to gain basic knowledge about your drive. Each chapter builds upon information presented in the previous chapter.

To assure successful installation and operation, the material presented in each chapter must be thoroughly read and understood before proceeding to the next chapter. Particular attention should be directed to the Attention and Important statements contained within. Become familiar with tasks that must be performed in a sequence for safety and successful completion.

Important: The Handheld Programming Terminal (Cat. No. 1336-MOD-E1) firmware must be upgraded with Kit SP-148340 (Version 2.01) to be compatible with drive firmware Version 2.01 and 3.01.

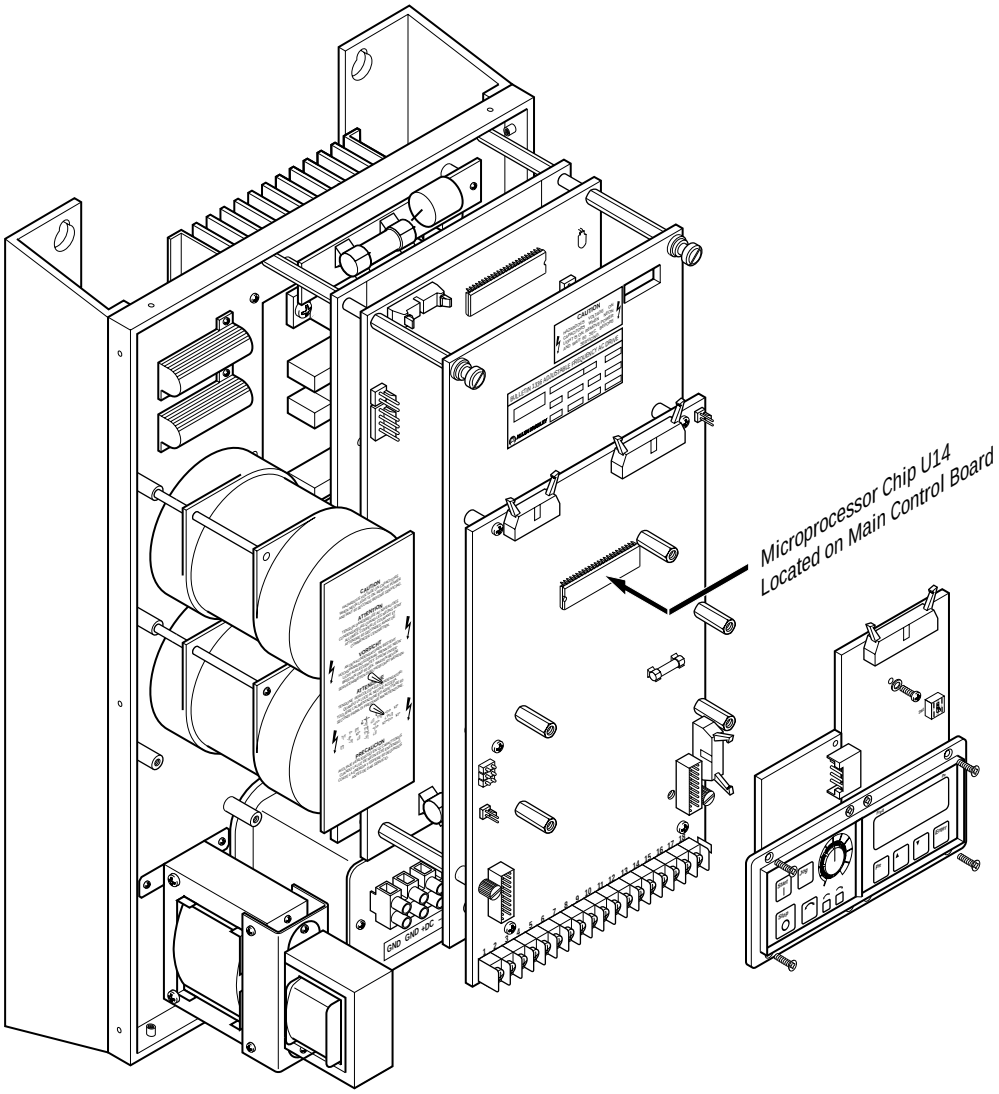
The Monitor Display (Cat. No. 1336-MOD-E2) firmware must be upgraded with Kit SP-148341 (Version 2.01) to be compatible with drive firmware Version 2.01 and 3.01.

Manual Objective (cont.)

Firmware versions are marked at two locations in the drive – on the Main Control Board and on the Base Driver/Power Supply Board.

For all drive ratings, the microprocessor chip U14 located on the Main Control Board has the following firmware identification:

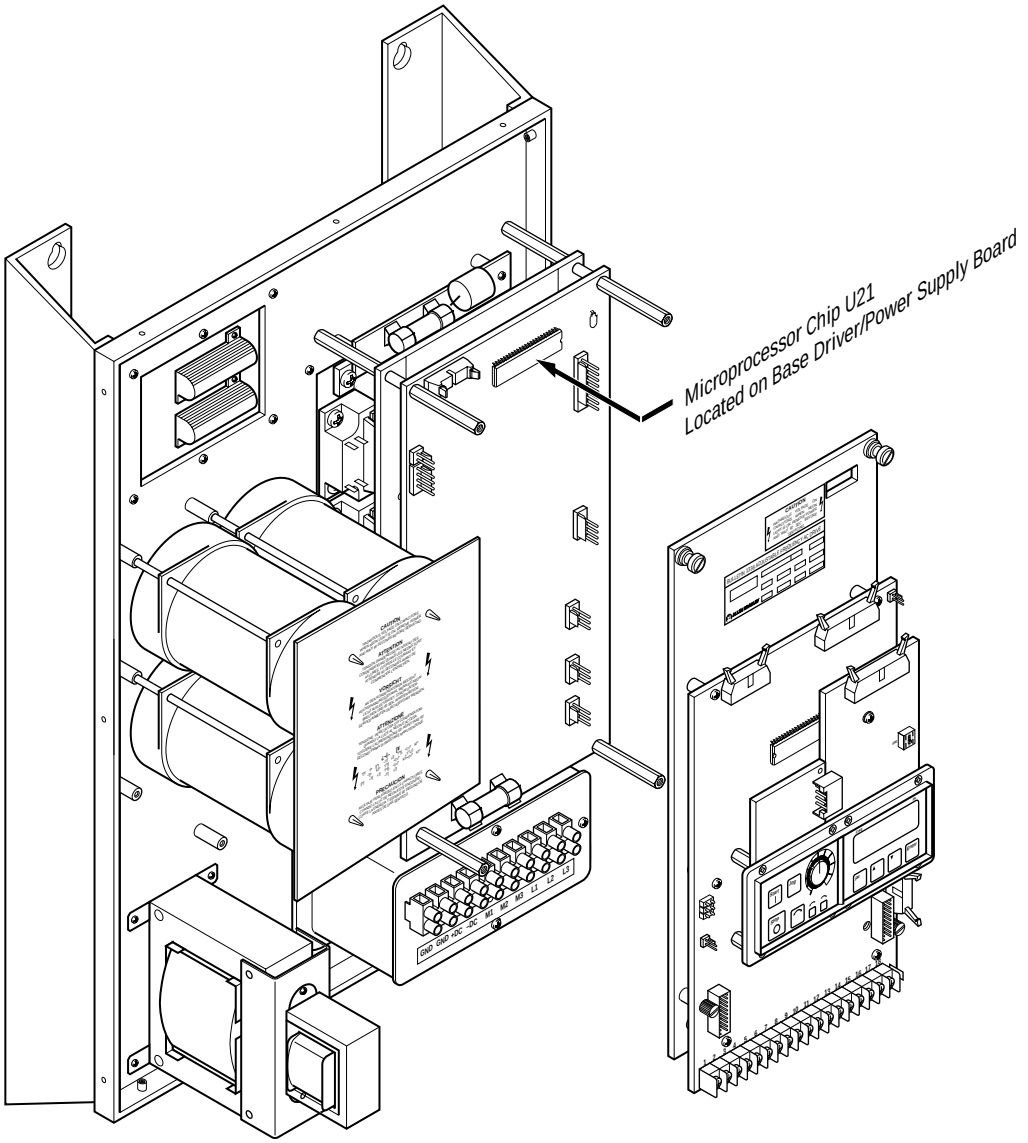
- P/N XXXXXXV1.01 — Firmware Version 1.01.
- P/N XXXXXXV1.10 — Firmware Version 1.10.
- P/N XXXXXXV1.11 — Firmware Version 1.11.
- P/N XXXXXXV2.01 — Firmware Version 2.01.



Manual Objective (cont.)

For B003-B030 & C003-C030 ratings, microprocessor chip U21 located on the Base Driver/Power Supply Board has the following firmware identification:

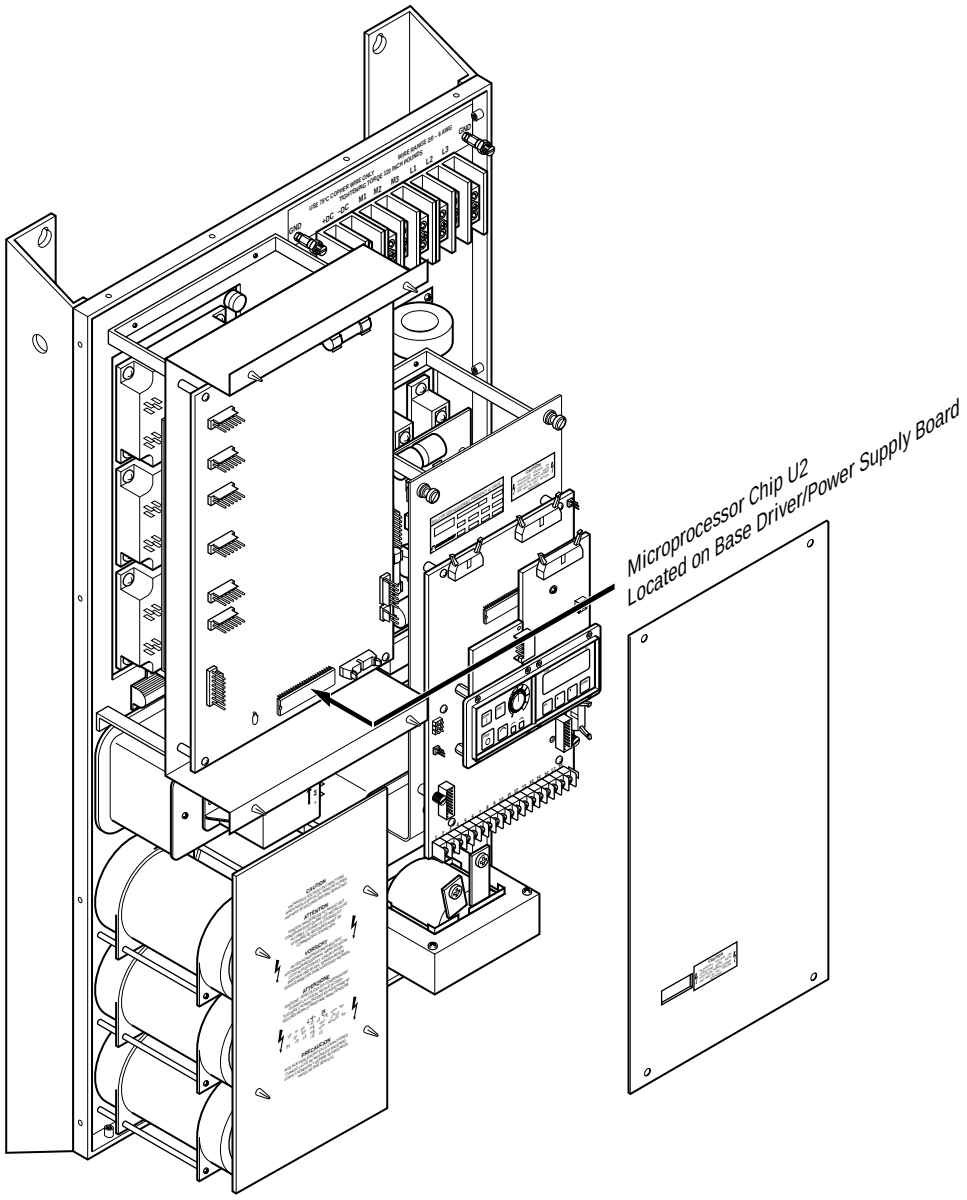
- P/N XXXXXXV1.01 — Firmware Version 1.01.
- P/N XXXXXXV1.11 — Firmware Version 1.11.
- P/N XXXXXXV1.13 — Firmware Version 1.13.
- P/N XXXXXXV1.14 — Firmware Version 1.14.
- P/N XXXXXXV3.01 — Firmware Version 3.01.



Manual Objective (cont.)

For B040-B050 & C040-C050 ratings, microprocessor chip U2 located on the Base Driver/Power Supply Board has the following firmware identification:

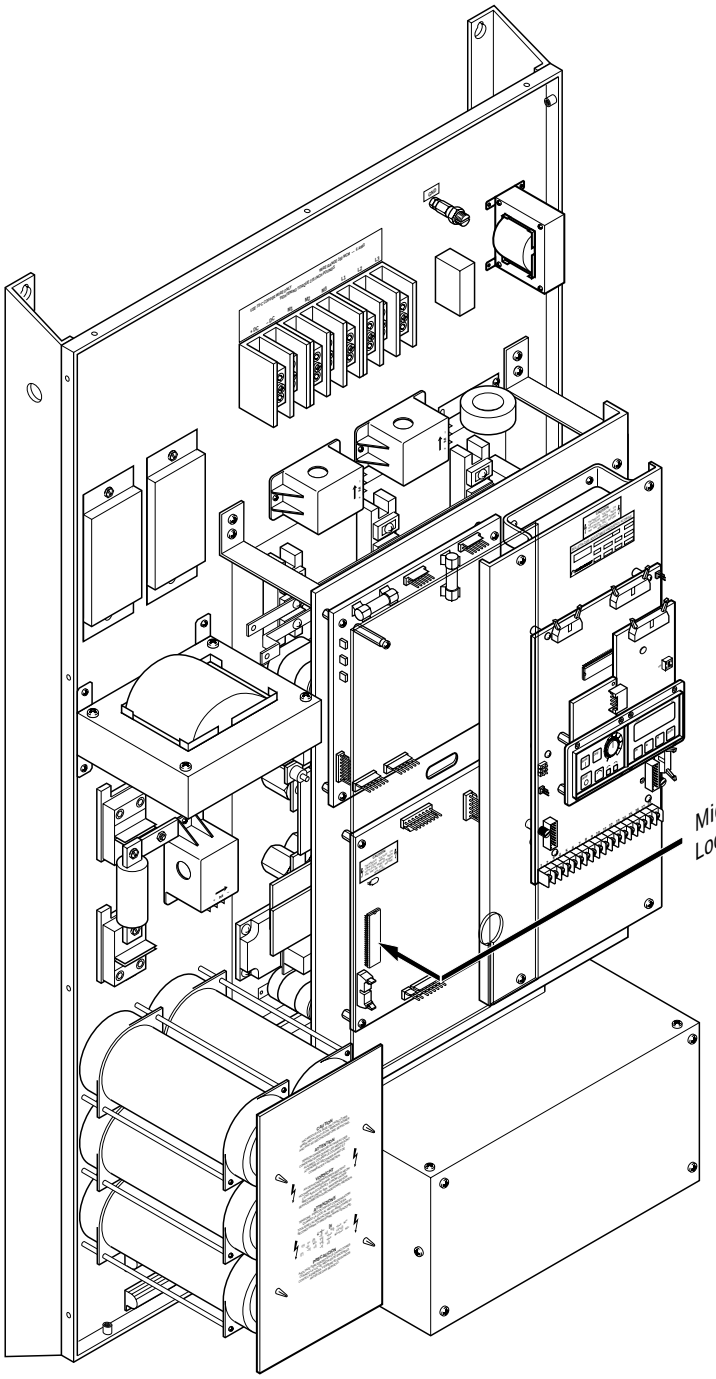
- P/N XXXXXXV1.11 — Firmware Version 1.11.
- P/N XXXXXXV1.13 — Firmware Version 1.13.
- P/N XXXXXXV1.14 — Firmware Version 1.14.
- P/N XXXXXXV3.01 — Firmware Version 3.01.



Manual Objective (cont.)

For B075-B125 & C075-C125 ratings, microprocessor chip U2 located on the Base Driver/Power Supply Board has the following firmware identification:

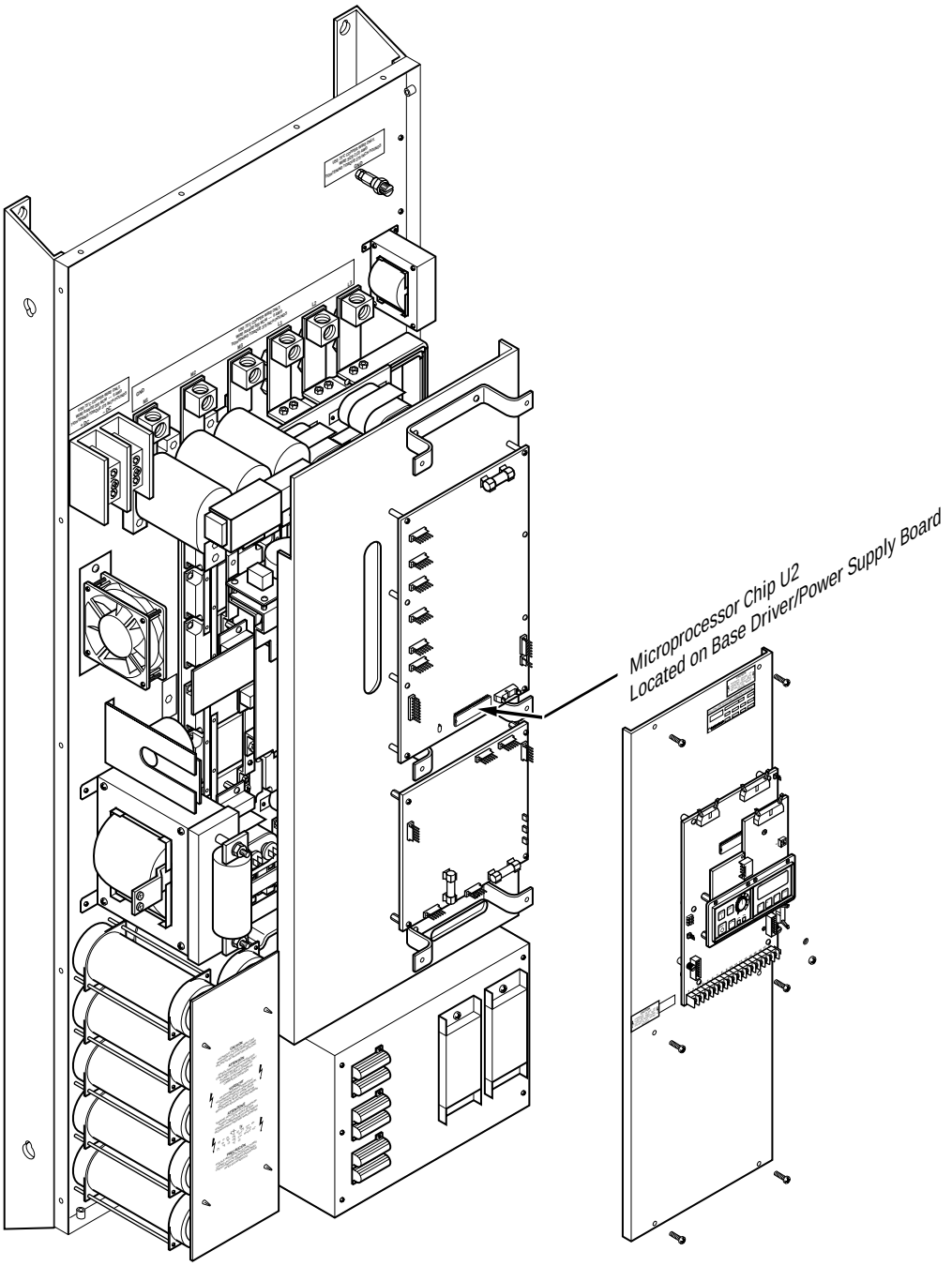
- P/N XXXXXXV1.11 — Firmware Version 1.11.
- P/N XXXXXXV1.13 — Firmware Version 1.13.
- P/N XXXXXXV1.14 — Firmware Version 1.14.
- P/N XXXXXXV3.01 — Firmware Version 3.01.



Manual Objective (cont.)

For B150-B200 & C150-C200 ratings, microprocessor chip U2 located on the Base Driver/Power Supply Board has the following firmware identification:

- P/N XXXXXXV1.11 — Firmware Version 1.11.
- P/N XXXXXXV1.13 — Firmware Version 1.13.
- P/N XXXXXXV1.14 — Firmware Version 1.14.
- P/N XXXXXXV3.01 — Firmware Version 3.01.



Manual Objective (cont.)

This manual is meant to guide the user with interface, installation, setup and troubleshooting of a 1336. The contents are arranged in order from a general description to troubleshooting and maintenance. To assure successful installation and operation, the material presented must be thoroughly read and understood before proceeding. Particular attention must be directed to the Caution, Warning and Important statements contained within.

Important Information about this Manual

This manual has been prepared primarily to support this product in a single application. It is a standard document that is intended to help the user understand the individual operating characteristics and limitations of this equipment including hazards associated with installation and setup procedures. Note the following points:

- This equipment has been designed to meet the requirements of a component in an integrated system.
- It must be noted that special considerations are to be given to characteristics of other peripheral solid-state control equipment and the cumulative impact on safety.
- Manufacturers and engineering groups responsible for specification or design of electrical control equipment must refer to applicable industry standards and codes for specific safety guidelines and interface requirements.
- In the actual factory environment, the user is responsible to assure compliance with applicable machine and operator safety codes or regulations which are beyond the scope and purpose of this document.

General Precautions

In addition to the precautions listed throughout this manual, the following statements which are general to the system must be read and understood.



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



ATTENTION: This assembly may contain parts and sub-assemblies that are sensitive to electrostatic discharge. Static control precautions are required when testing, servicing or repairing this assembly. Component damage may result if you ignore electrostatic discharge control procedures. 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.



ATTENTION: An incorrectly applied or installed system can result in component damage or 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 malfunction of the system.

Chapter 1

Pre-Installation Care

Before installing and operating your 1336, carefully read this manual and observe all precautions. The catalog number of your drive as explained in Chapter 2 — Drive and Option Identification lists the drive rating, type of enclosure, nominal line voltage, phase and frequency, as well as any additional options that you may have specified. Specifications for all drives including standard controls, adjustment range, diagnostics and environmental qualifications are listed in Chapter 4 — Specifications.

Receiving

Once you have received your drive, careful inspection for shipping damage must be made. Damage to the shipping carton is usually a good indication that it has received improper handling. Any and all damage should be immediately reported to the freight carrier and your nearest Allen-Bradley Area Sales/Support Center.

Carefully unpack the drive, taking care to save the shipping carton and any packing material should return be necessary. Verify that the items on the packing list or bill of lading agree with your order.

Storage

If the drive will not immediately be installed, it should be stored in a clean, dry area where the ambient temperature is not less than -40°C nor more than +85°C. The drive must not be stored in a corrosive environment nor subject to conditions in excess of the storage environment parameters stated in Chapter 4 — Specifications.

Handling

Depending upon the rating and options ordered, the weight of your drive can vary. To guard against injury to personnel, proper safety precautions and practices must be observed whenever the drive is being moved from one location to another.

Shipping

The carton and materials that came with your drive have been designed and tested to provide reasonable protection against damage during transit. Should the drive be shipped to another location, it is recommended that the original shipping carton and packing material be used to protect the drive from damage in transit.

ATTENTION: This assembly contains parts and sub-assemblies that are sensitive to electrostatic discharge. Static control precautions are required when servicing this assembly. Component damage may result if you ignore electrostatic discharge control procedures. 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.

Electrostatic Discharge Precautions

Electrostatic discharge generated by static electricity can damage the complimentary metallic oxide semiconductor devices on various drive boards. It is recommended that you perform these procedures to guard against this type of damage when circuit boards are removed or installed:

- Wear a wrist type grounding strap that is grounded to the drive chassis.
- Attach the wrist strap before removing the new circuit board from the conductive packet.
- Remove boards from the drive and immediately insert them into their conductive packets.

Chapter 2

Drive and Option Identification

The following is an explanation of the catalog numbering system for 1336 Adjustable Frequency AC Drives and options. The catalog number is coded to identify the drive power rating and can be found on the drive shipping carton.

1336 Drive Catalog Numbers

1336	–	B 015	–	EAE	–	FA2	–	L2	–	S1
Bulletin Number		Drive Rating		Enclosure Type		Options		Options		Options

Bulletin Number

The Allen-Bradley reference number identifying the type or family of products.

Drive Ratings

A group of four characters coded to indicate input voltage and output power rating.

The first character indicates the input voltage range of the drive.

Drives with a code “B” are suitable for operating from any one of the following voltage inputs: 380/415/460V AC, 50/60 Hz, 3-phase.

Drives with a code “C” are suitable for operating only from 500 or 575V AC, 50/60 Hz, 3-phase voltage input.

Fan Transformer Reconnection for Alternate Drive Input Voltages

Important:

For drives rated C003-C200, reconnection of Fan Transformer T1 is not necessary.

For drives rated B003-B030, reconnection of Fan Transformer T1 is not necessary.

For drives rated B040-B200, Fan Transformer T1 must be reconnected for 380 or 415V operation. If Fan Transformer T1 is not connected to match the incoming voltage, overtemperature fault F08 may occur. Refer to Chapter 6 for wiring details.

The second, third and fourth characters indicate the power rating of the drive, as shown in Tables 2.1 and 2.2.

Table 2.1 – B003-B200 Output Current and kVA

Rating Code	Amp Out	kVA Out 380V AC	kVA Out 415V AC	kVA Out 460V AC
B003	6.0	3.9	4.3	4.8
B005	9.6	6.3	6.9	7.6
B007	13.0	8.6	9.3	10.4
B010	17.0	11.2	12.2	13.5
B015	25.0	16.5	18.0	20.0
B020	33.0	22.0	24.0	26.0
B025	41.0	27.0	29.0	33.0
B030	48.0	32.0	35.0	38.0
B040	60.0	39.0	43.0	48.0
B050	75.0	49.0	54.0	60.0
B075	120.0	79.0	86.0	96.0
B100	150.0	99.0	108.0	120.0
B125	180.0	118.0	129.0	143.0
B150	218.0	143.0	157.0	174.0
B200	290.0	191.0	208.0	231.0

Table 2.2 – C003-C200 Output Current and kVA

Rating Code	Amp Out	kVA Out 500V AC	kVA Out 575V AC	kVA Out 600V AC
C003	4.3	3.7	4.3	4.3
C005	6.7	5.8	6.7	6.7
C007	9.9	8.6	9.9	9.9
C010	12.1	10.5	12.1	12.1
C015	19.1	16.5	18.9	18.9
C020	24.0	20.8	23.9	23.9
C025	30.0	26.0	29.9	23.9
C030	35.0	30.3	34.9	34.9
C040	45.0	39.0	44.9	44.9
C050	57.0	49.4	56.8	56.8
C075	85.0	73.6	84.7	84.7
C100	109.0	94.4	108.6	108.6
C125	138.0	119.5	137.4	137.4
C150	158.0	136.8	157.4	157.4
C200	210.0	181.9	209.1	209.1

Drive Enclosure Type

The first character “E” indicates enclosure code.

The second character indicates the type of enclosure as initially shipped from the factory.

O — Open style (IP00)
A — NEMA Type 1 (IP20)
C — NEMA Type 4 (IP56)
J — NEMA Type 12 (IP54)

The third character indicates enclosure size by amp rating.

D — 003, 005, 007 or 010 drive ratings
E — 015 or 020 drive ratings
F — 025 or 030 drive ratings
G — 040 or 050 drive ratings
H — 075, 100 or 125 drive ratings
J — 150 or 200 drive ratings

Factory Installed Options

All additional characters indicate drive options that were initially installed at the factory. Each option code is added to the catalog number and separated by a hyphen.

Chapter 3

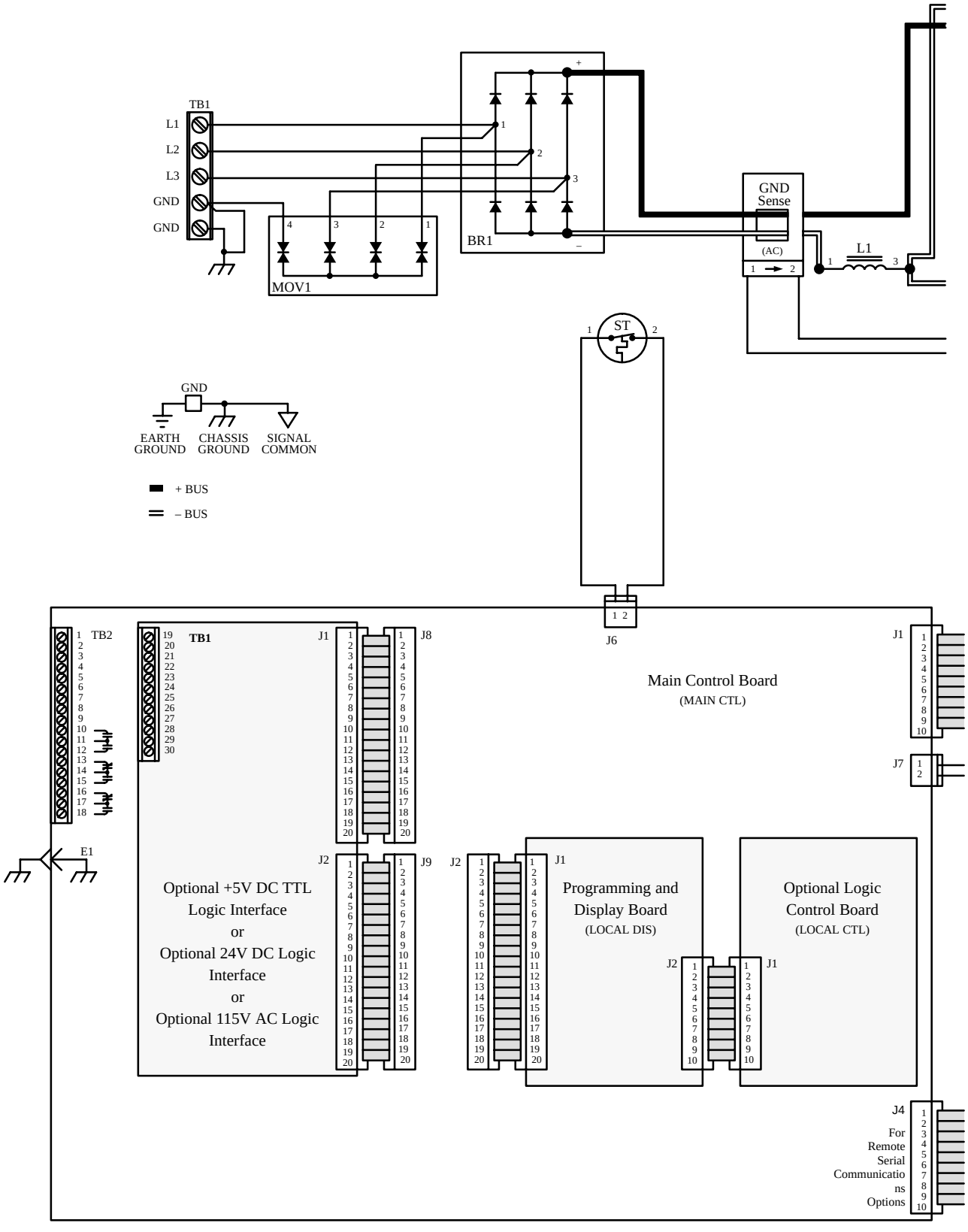
Overview

The 1336 is a microprocessor controlled, high performance, adjustable frequency drive designed to control three phase induction motors on critical industrial applications. The drive produces a three phase, PWM, adjustable frequency output to supply an adjustable motor speed. The drive output voltage is a function of output frequency and is adjustable to match motor parameters to obtain optimum motor performance.

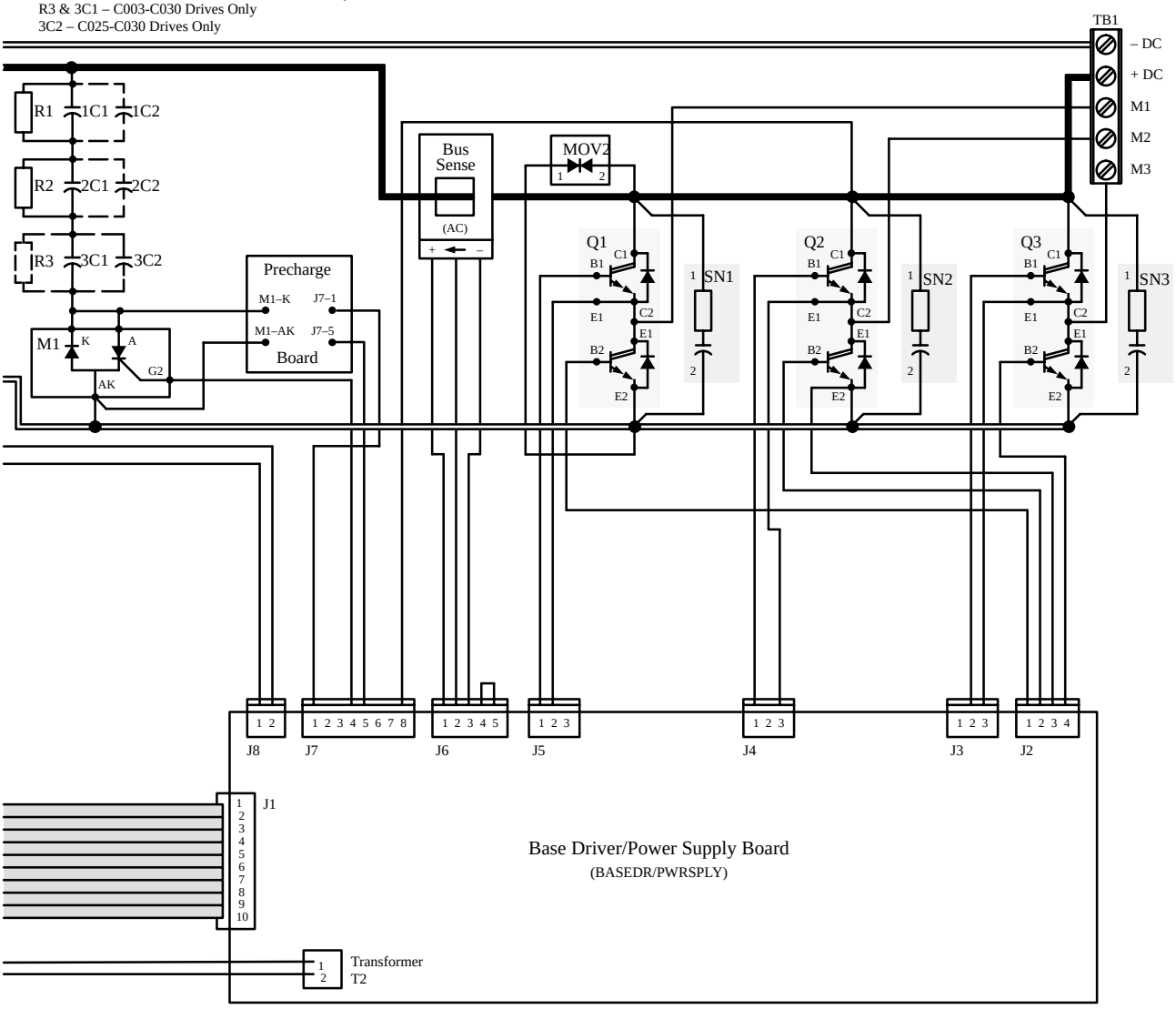
To help achieve precise and repeatedly accurate control, setup and operation, the 1336 is digitally programmable. The drive may be programmed from a Local or Remote Control Panel or through the Serial Communication Port using optional devices.

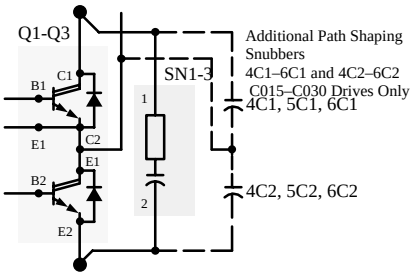
Depending upon your configuration, various status and fault conditions are reported either through the Programming and Display Panel or through the Serial Communications Port. All fault diagnostics start with both load and drive self-check diagnostics each time the drive is powered up. While running, the drive continues to monitor potential fault conditions. To allow real-time preventive maintenance, parameters such as drive output current and control conditions can be monitored even while the drive is running. Should a fault occur, detailed diagnostic codes isolate the problem to identify the condition, allowing quick, corrective action to be taken to restore process control.

Figure 3.1 – B003-B030 & C003-C030 Unit Schematic



Note: 1C2 & 2C2 – B025-B030 & C025-C030 Drives Only
R3 & 3C1 – C003-C030 Drives Only
3C2 – C025-C030 Drives Only





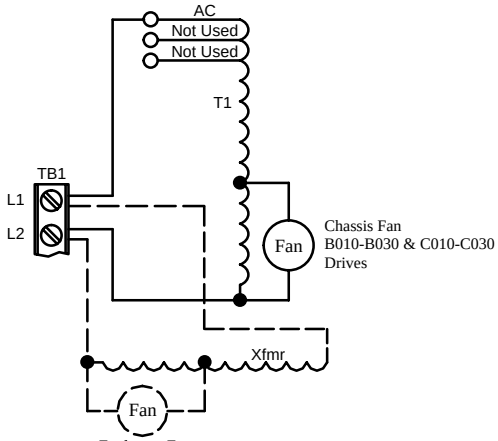
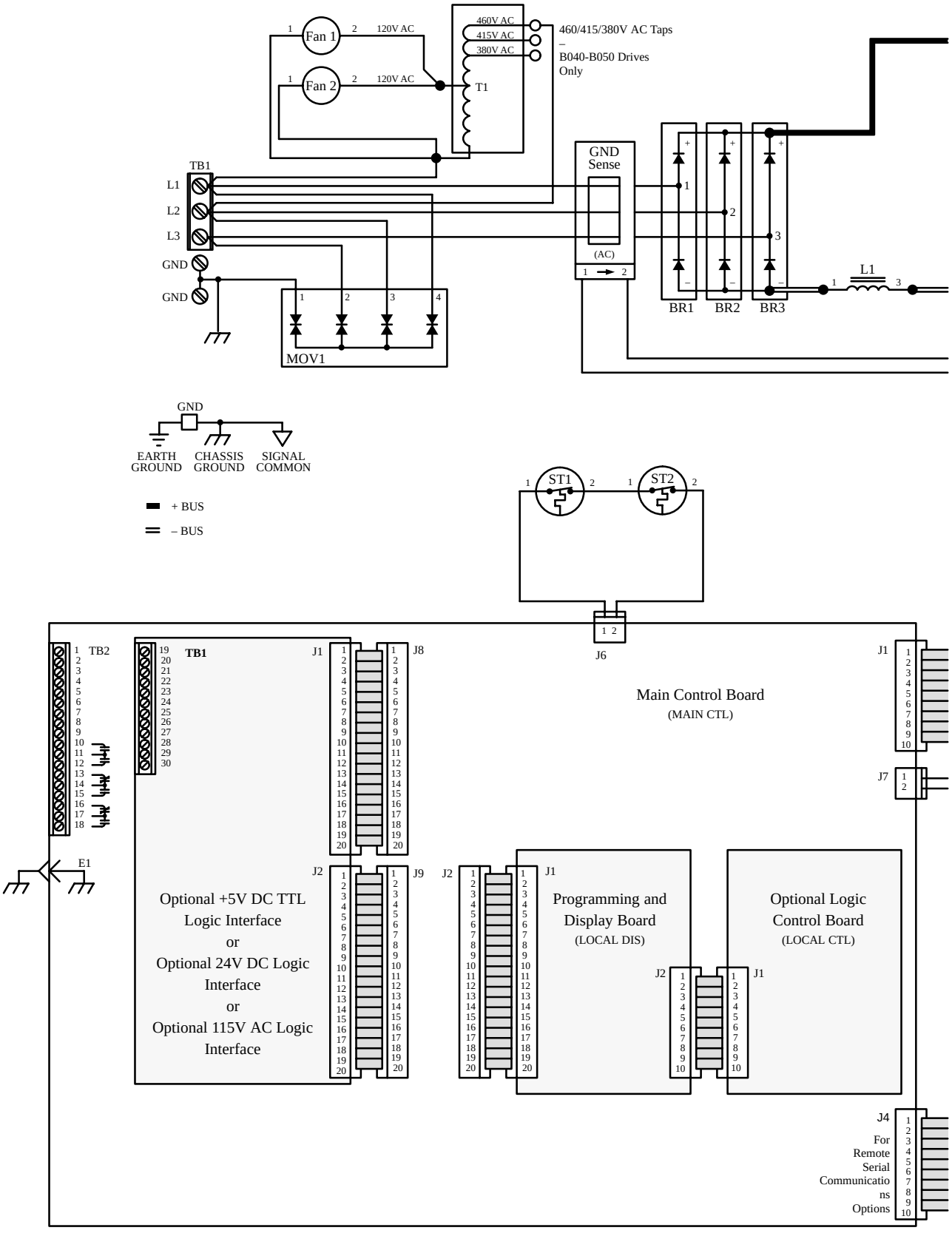
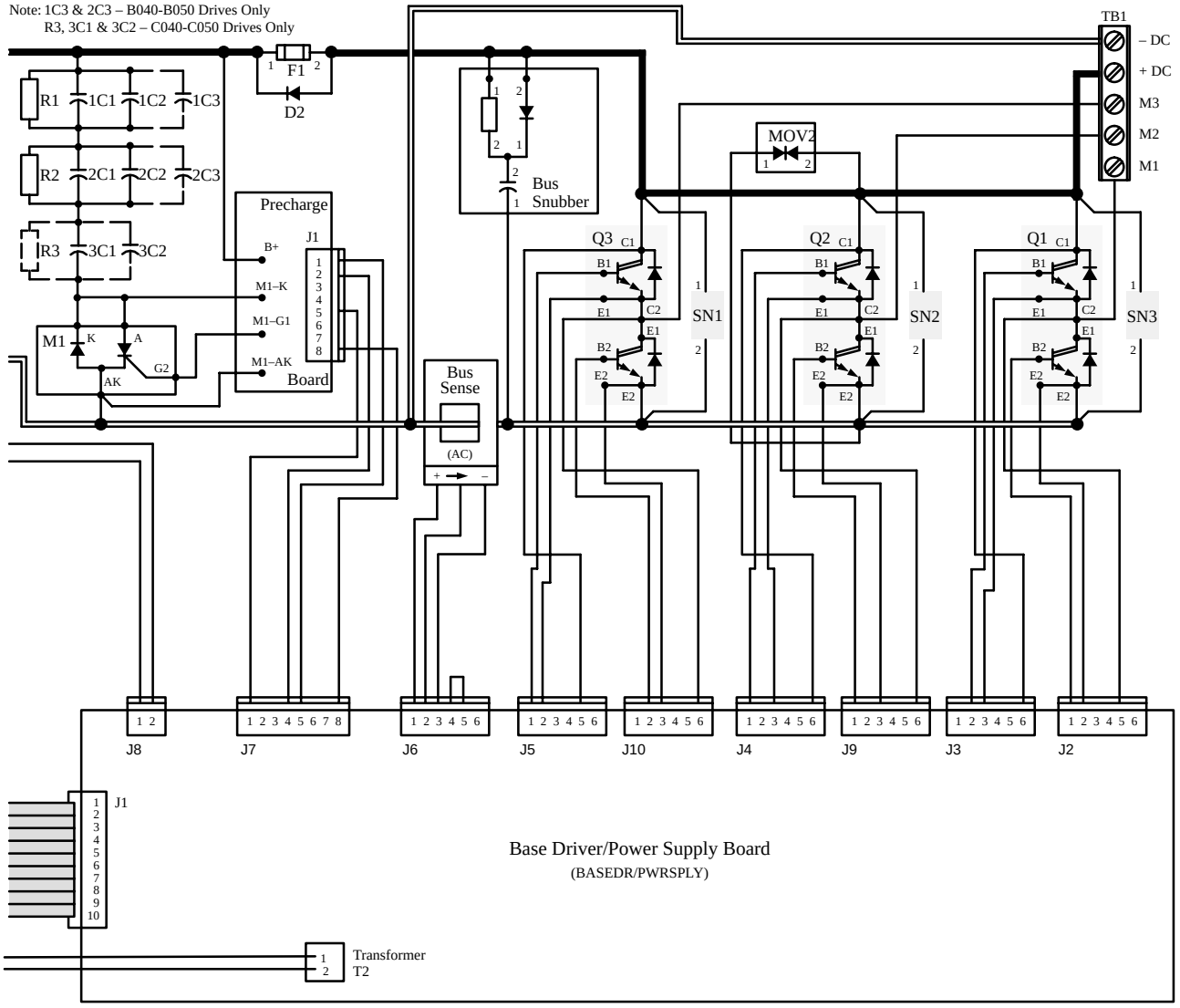
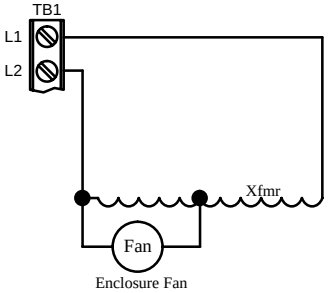


Figure 3.2 – B040-B050 & C040-C050 Unit Schematic

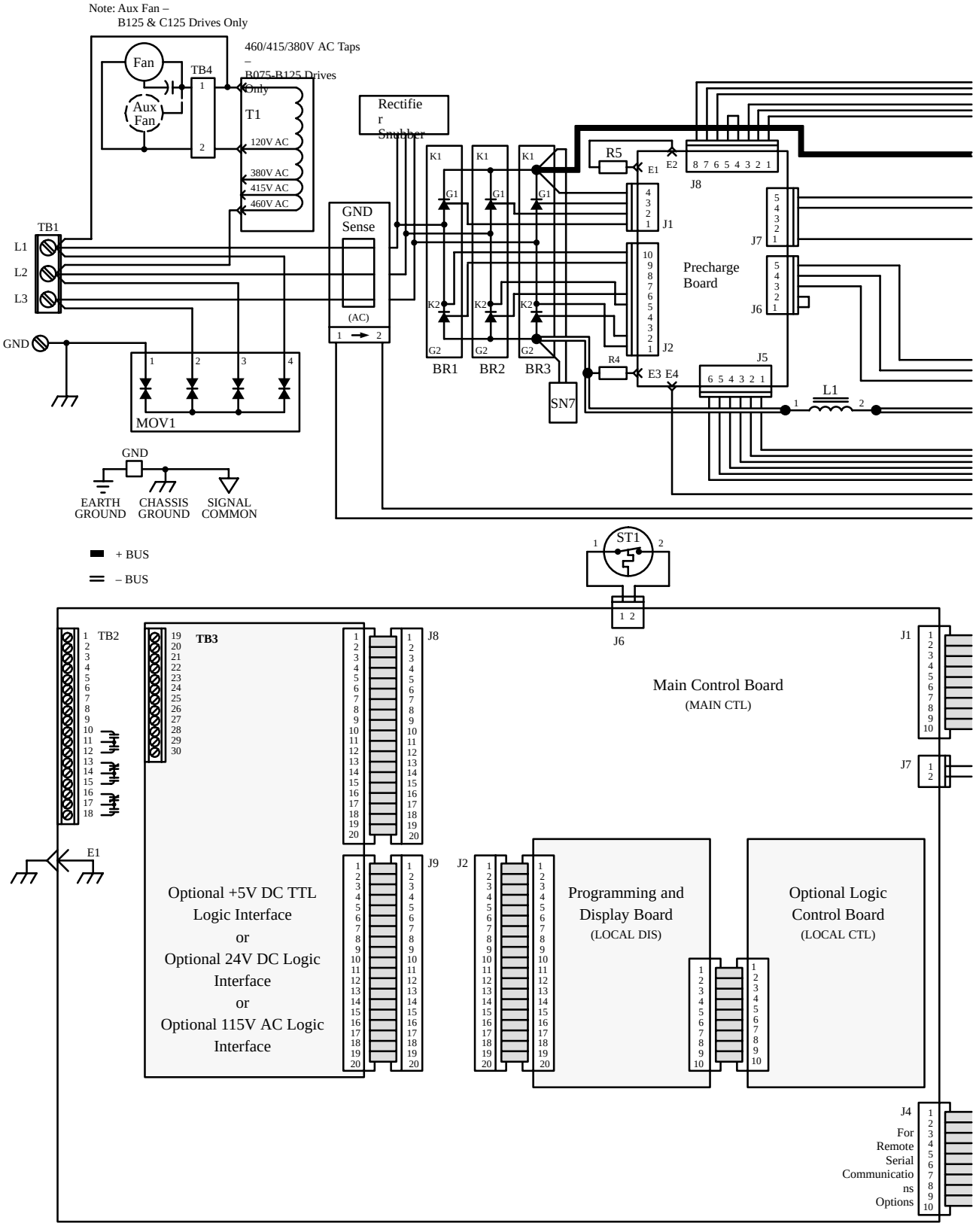


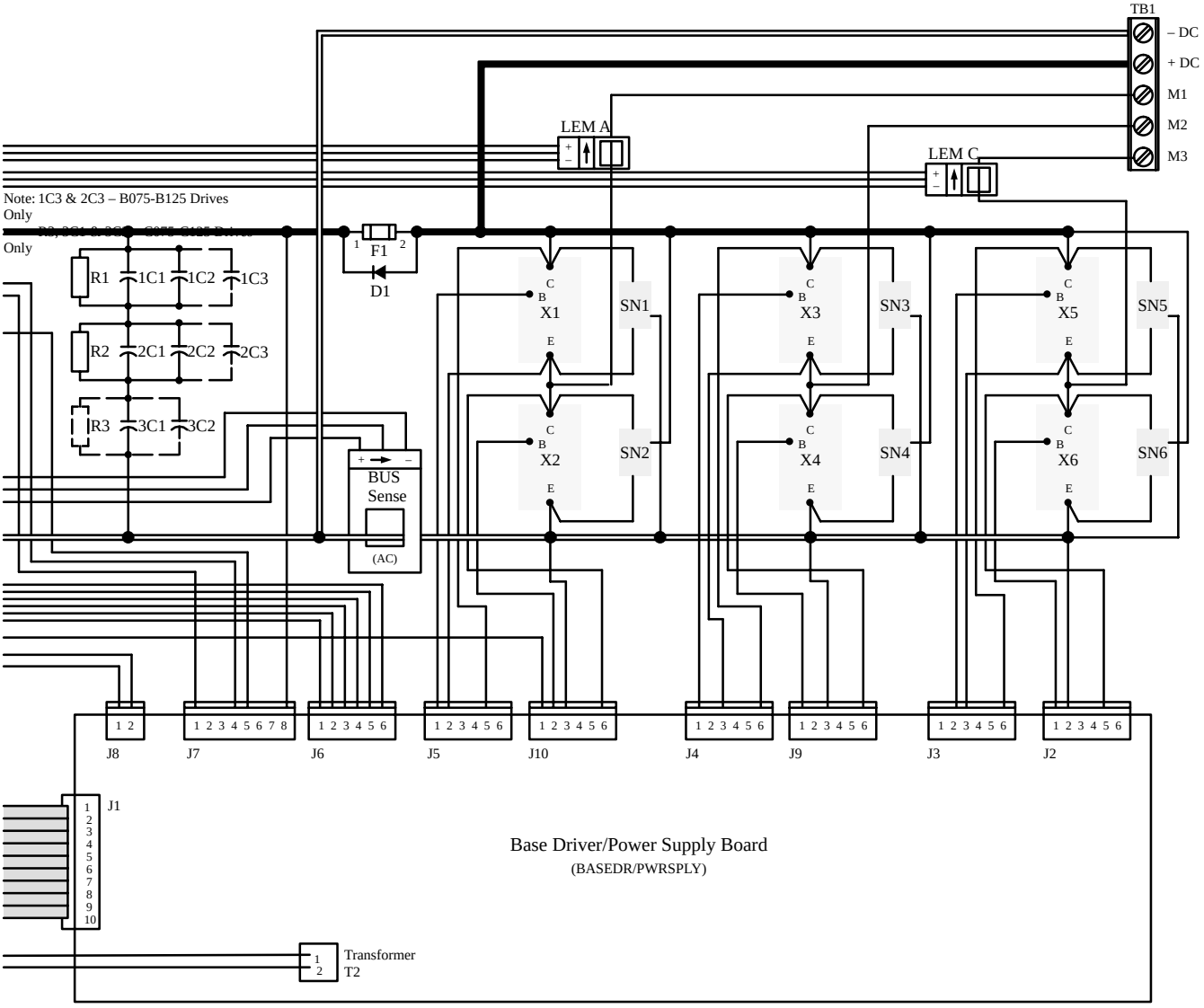


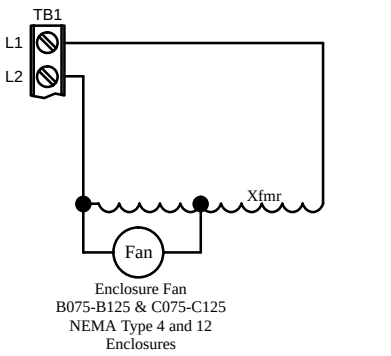


Enclosure Fan
B040-B050 & C040-C050
NEMA Type 4 and 12
Enclosures

Figure 3.3 – B075-B125 & C075-B125 Unit Schematic

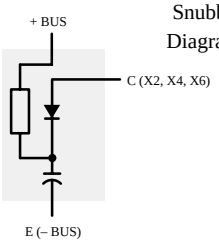




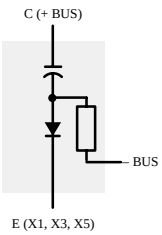


Enclosure Fan
B075-B125 & C075-C125
NEMA Type 4 and 12
Enclosures

Snubber Diagrams

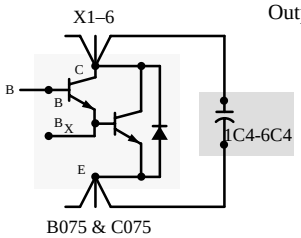


SN2, SN4 & SN6

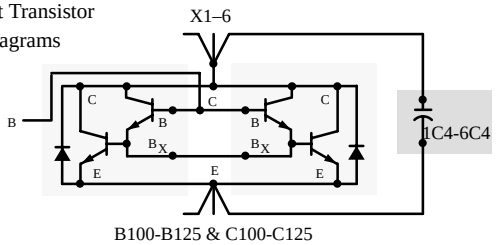


SN1, SN3 & SN5

Output Transistor Diagrams

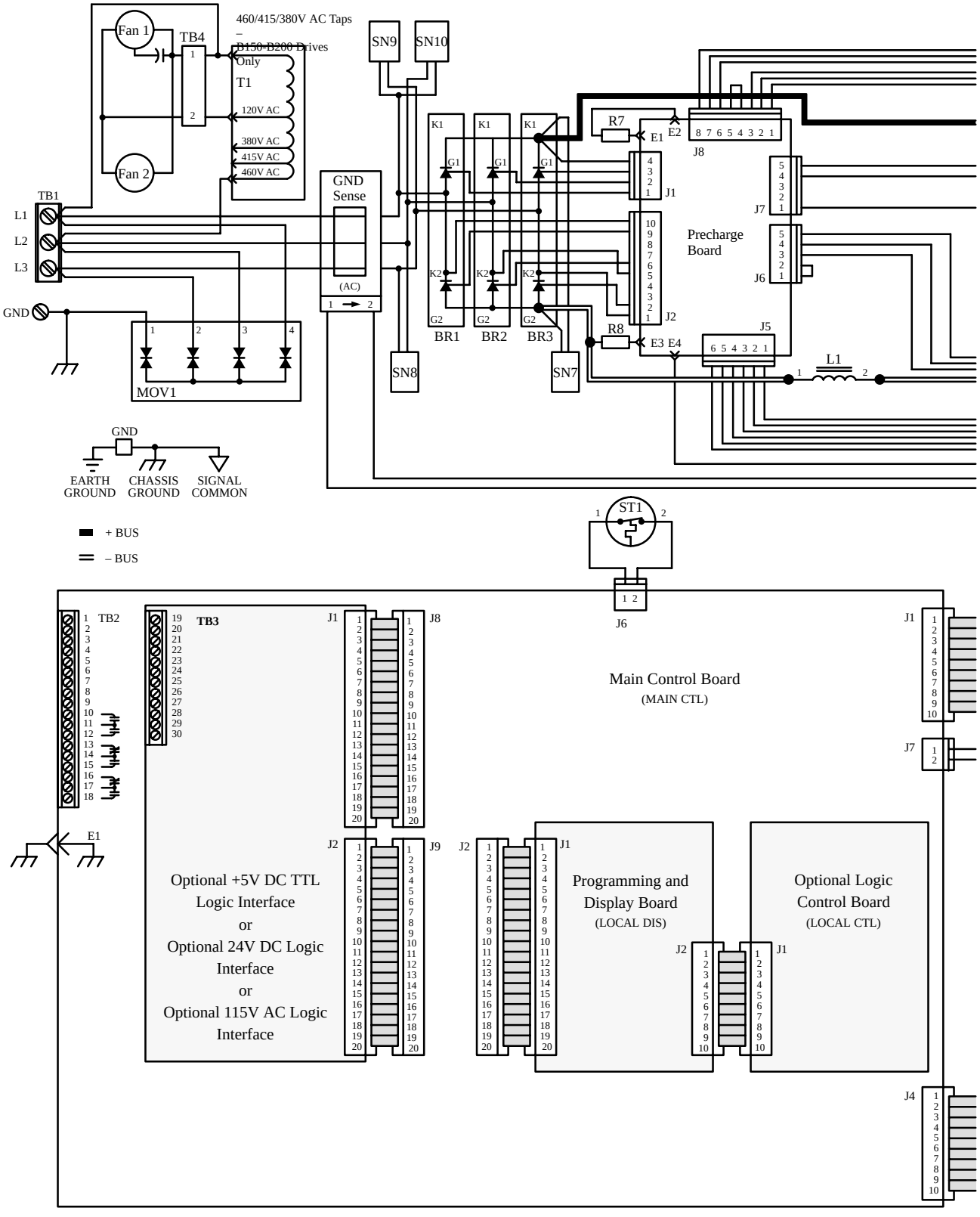


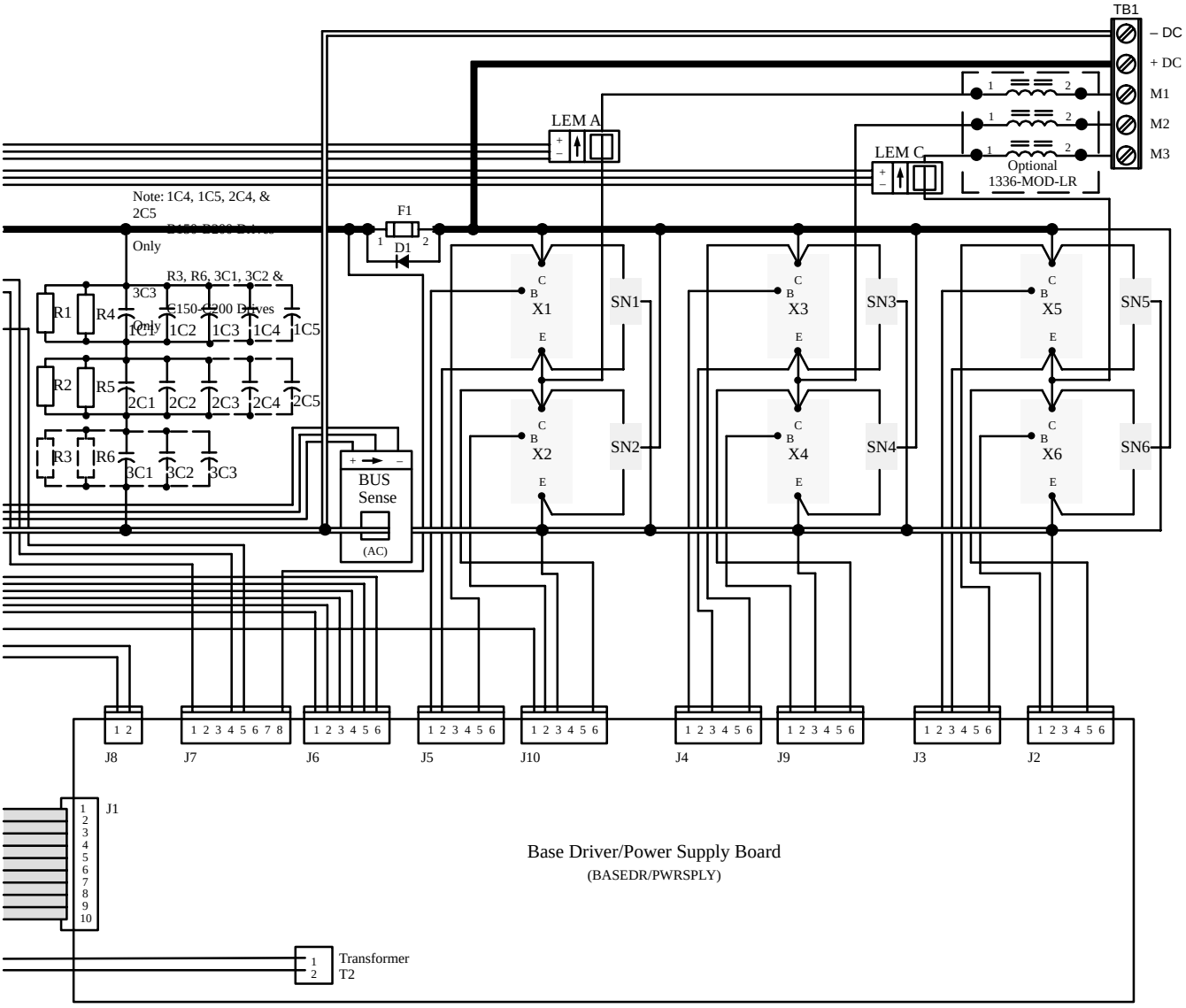
B075 & C075



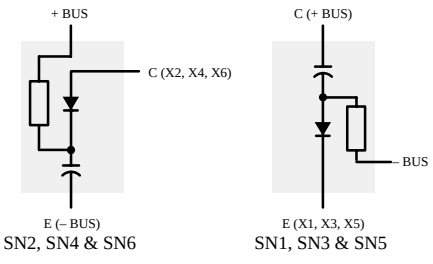
B100-B125 & C100-C125

Figure 3.4 – B150-B200 & C150-C200 Unit Schematic

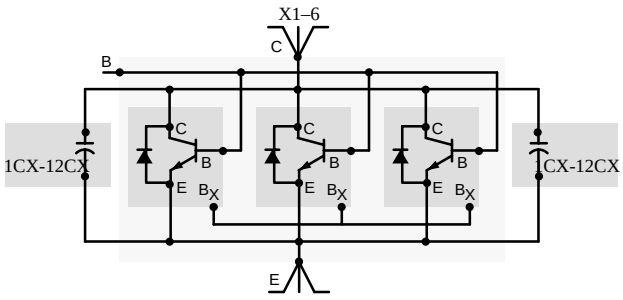




Snubber Diagrams

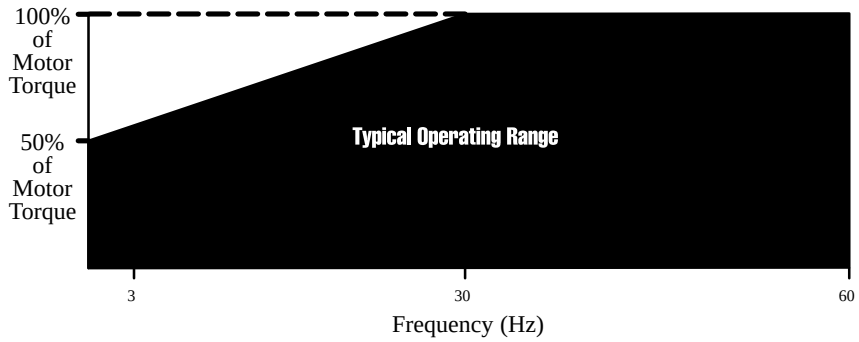


Output Transistor Diagram



The 1336 is an AC adjustable frequency drive designed for use with a standard, three-phase induction motor. The standard control is designed as a constant torque, adjustable speed control with 150% overload capability and is adaptable through programming to handle a wide variety of applications.

The 1336 provides an exceptional output voltage and current waveform. Special considerations however, must be taken when applying an inverter to an existing motor. At slower speeds, cooling is not as effective due to reduced fan rotation. Extended operation at full load torque at slow speeds may damage the motor due to overheating.



Shown above is a typical curve plotting torque versus speed. At slow speeds, if torque requirements continuously exceed levels shown above (10 minutes or longer), a motor rated for the required speed and torque range must be used. To guard against mechanical problems, it is recommended that the entire drive train machinery be checked for various limitations due to the range of the Bulletin 1336.

ATTENTION: Motors may overheat when operated at rated torque for long periods of time below 50% base speed due to the decreased air flow of armature driven fans.

Motors may require special balancing if operated at more than 125% of base speed. Refer to the motor manufacturer for proper sizing of the motor for the intended application.

Chapter 4

Specifications

Operating Environment

Temperature:	Open rating (heat sink), 0 to + 40°C. Open rating (chassis components), 0 to +50°C. Enclosed rating (heat sink), 0 to + 40°C. Enclosed rating (chassis components), 0 to +50°C.
Relative Humidity:	5 to 95% non-condensing — all ratings.
Altitude:	3,300 feet (1,000 meters) maximum without derating.
Vibration:	0.006 inches (0.152 mm) displacement, 1G peak.
Shock:	15G peak for 11ms duration (±1.0mS).

Storage Environment

Temperature:	– 40 to +85°C — all ratings.
Relative Humidity:	5 to 95% non-condensing — all ratings.

Enclosure

Indicated by Catalog Number.

Open (IP00) — all ratings.

NEMA Type 1 (IP20) — all ratings.

NEMA Type 4 (IP56), B003-B030 & C003-C030.

NEMA Type 12 (IP54), B003-B200 & C003-C200.

Input Power Conditioning

General

Typically the 1336 is suitable for direct connection to a correct voltage, 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 should be used.

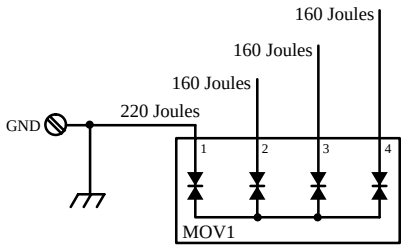
Ungrounded Distribution Systems

All 1336 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-ground connection of the MOV 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 MOV ratings may cause physical damage to the MOV.

Line-to-Line MOV Rating
Energy Rating = 320 Joules Turn On Voltage = 850-1000 volts

Line-to-Ground MOV Rating
Energy Rating = 380 Joules Turn On Voltage = 1500 volts



B003-B200 Input Power

Voltage:	380-460V AC ±10%.
Frequency:	48 to 62 Hz.
Phase:	3-phase.
AC Input Overvoltage Trip:	570V AC.
AC Input Undervoltage Trip:	275V AC.
Bus Overvoltage Trip:	810V DC for drive ratings B003-B200.
Bus Undervoltage Trip:	388V DC for Base Driver/Power Supply Board. Firmware Versions 1.11-3.01. 456V DC for Base Driver/Power Supply Board. Firmware Version 1.01.
Line Transient Protection:	Line transients up to 5,000 volts peak, 320 Joules.
Logic Power Ride-Thru:	2 seconds or Longer. — subject to the integrity of user supplied external circuits.
Control Logic Noise: Immunity	Showering arc transients from 350 to 2,000 volts peak.

C003-C200 Input Power

Voltage:	500-575V AC ±10%.
Frequency:	48 to 62 Hz.
Phase:	3-phase.
AC Input Overvoltage Trip:	690V AC.
AC Input Undervoltage Trip:	343V AC.
Bus Overvoltage Trip:	975V DC.
Bus Undervoltage Trip:	485V DC.
Line Transient Protection:	Line transients up to 5,000 volts peak, 320 Joules.
Logic Power Ride-Thru:	2 seconds or Longer. — subject to the integrity of user supplied external circuits.
Control Logic Noise: Immunity	Showering arc transients from 350 to 2,000 volts peak.

Table 4.1 — B003-B200 Input Current and kVA

Amps In	Rating Code	kVA In 380V AC	kVA In 415V AC	kVA In 460V AC	Input Power Factor Displacement Angle	kW/kVA
5.7	B003	3.8	4.1	4.5	0.95	0.85
9.2	B005	6.1	6.6	7.3	0.95	0.85
13.3	B007	8.8	9.6	10.6	0.95	0.85
17.0	B010	11.2	12.0	14.0	0.95	0.85
25.0	B015	16.0	18.0	20.0	0.95	0.90
34.0	B020	22.0	24.0	27.0	0.95	0.90
42.0	B025	28.0	30.0	33.0	0.95	0.90
49.0	B030	32.0	35.0	39.0	0.95	0.90
61.0	B040	40.0	44.0	49.0	0.95	0.90
76.0	B050	50.0	55.0	61.0	0.95	0.90
122.0	B075	80.0	88.0	97.0	0.95	0.90
153.0	B100	101.0	110.0	122.0	0.95	0.90
184.0	B125	121.0	132.0	147.0	0.95	0.90
222.0	B150	146.0	160.0	177.0	0.95	0.90
296.0	B200	195.0	213.0	236.0	0.95	0.90

Table 4.2 — C003-C200 Input Current and kVA

Amps In	Rating Code	kVA In 500V AC	kVA In 575V AC	kVA In 600V AC	Input Power Factor Displacement Angle	kW/kVA
3.2	C003	2.8	3.2	3.2	.95	0.85
5.1	C005	4.4	5.1	5.1	.95	0.85
7.7	C007	6.7	7.7	7.7	.95	0.85
10.2	C010	8.9	10.2	10.2	.95	0.85
15.0	C015	13.0	15.0	15.0	.95	0.90
19.0	C020	17.0	19.0	19.0	.95	0.90
24.0	C025	21.0	24.0	24.0	.95	0.90
29.0	C030	25.0	29.0	29.0	.95	0.90
39.0	C040	33.0	38.0	38.0	.95	0.90
48.0	C050	42.0	48.0	48.0	.95	0.90
73.0	C075	63.0	73.0	73.0	.95	0.90
97.0	C100	84.0	96.0	96.0	.95	0.90
121.0	C125	105.0	121.0	121.0	.95	0.90
146.0	C150	127.0	145.0	145.0	.95	0.90
193.0	C200	167.0	192.0	192.0	.95	0.90

Output Power

Waveform:	Sine coded pulse width modulated waveform.
Voltage:	**B003-B200** 0 to applied input voltage, 380V AC, 415V AC, or 460V AC (maximum output voltage cannot exceed applied input voltage). **C003-C200** 0 to 575V AC (maximum output voltage cannot exceed applied input voltage).
Frequency Range:	0 to 250Hz with programmable minimum and maximum limits.
Frequency Resolution:	**Digital —** Preset speeds (serial interface or pulse train input) to 0.005Hz of set frequency within the minimum and maximum limits. **Analog —** Equal divisions between minimum and maximum limits to the nearest 0.005 Hz as a function of signal type. Local speed pot (MOD-FA2 only), 1003 divisions. Remote speed pot (TB2, Terminals 1, 2 and 3). 514 divisions for Main Control Board Firmware Versions 1.01 and 1.10. 633 divisions for Main Control Board Firmware Versions 1.11-2.01. 0 to 10V DC input (TB2, Terminals 4 and 5), 976 divisions. 4 to 20mA input (TB2, Terminals 4 and 6), 726 divisions.
Frequency Regulation:	Digital Frequency Source: 0.0013% of set frequency, 0 to 40°C ambient temperature range.
Volts-per-Hertz:	Fully programmable. – Minimum 1 to 14.3V/Hz through local programming. – Wider ranges available through optional programming.

Output Power (cont.)

DC Boost:	11 selectable values from 0 to 48V DC peak. – Adjustable from 0 to 115V DC through optional programming.
Accel/Decel:	Two independently programmable accel times. Two independently programmable decel times. Each time may be programmed over a range from 0 to 600 seconds.
Intermittent Overload Capability:	Programmable MOPC from 50 to 150% of rated output current for up to 1 minute maximum.
Inverse Time Overload Capability:	Designed to meet NEC and UL equivalent requirements. Adjustable timing from 50 to 115% of rated drive current (Main Control Board Firmware Version 1.10 limited to 100%).
Drive Overcurrent Trip:	180% of rated output current.
Ground Fault:	Detects drive output ground fault path by sensing unbalanced bus or input line currents.

Table 4.3 -- B003-B200 Output Current and kVA

Amps Out	Drive Rating	kVA Out 380V AC	kVA Out 415V AC	kVA Out 460V AC	Internal Chassis Component Heat Dissipation (BTU/hour) n	Heatsink Heat Dissipation (BTU/hour) n	Total Dissipation (BTU/hour) n	Minimum CFM Required n
6.0	B003	3.9	4.3	4.8	136	239	375	15
9.6	B005	6.3	6.9	7.6	171	307	477	25
13.0	B007	8.6	9.3	10.4	273	512	784	40
17.0	B010	11.2	12.2	13.5	341	682	1023	53
25.0	B015	16.5	18.0	20.0	443	1023	1466	76
33.0	B020	22.0	24.0	26.0	477	1364	1841	95
41.0	B025	27.0	29.0	33.0	614	1705	2319	120
48.0	B030	32.0	35.0	38.0	716	2046	2762	142
60.0	B040	39.0	43.0	48.0	938	2438	3376	175
75.0	B050	49.0	54.0	60.0	1125	2847	3973	205
120.0	B075	79.0	86.0	96.0	1705	5115	6820	352
150.0	B100	99.0	108.0	120.0	2046	7502	9548	492
180.0	B125	118.0	129.0	143.0	2387	8184	10571	545
218.0	B150	143.0	157.0	174.0	2728	10912	13640	703
290.0	B200	191.0	208.0	231.0	3069	13981	17050	880

Table 4.4 -- C003-C200 Output Current and kVA

Amps Out	Drive Rating	kVA Out 500V AC	kVA Out 575V AC	kVA Out 600V AC	Internal Chassis Component Heat Dissipation (BTU/hour) n	Heatsink Heat Dissipation (BTU/hour) n	Total Dissipation (BTU/hour) n	Minimum CFM Required n
4.3	C003	3.7	4.3	4.3	136	239	375	15
6.7	C005	5.8	6.7	6.7	171	307	477	25
9.9	C007	8.6	9.9	9.9	273	444	717	40
12.1	C010	10.5	12.1	12.1	341	512	853	45
19.0	C015	16.5	18.9	18.9	443	853	1296	60
24.0	C020	20.8	23.9	23.9	477	1023	1500	80
30.0	C025	26.0	29.9	29.9	614	1364	1978	105
35.0	C030	30.3	34.9	34.9	716	1535	2251	115
45.0	C040	39.0	44.8	44.8	938	1876	2814	145
57.0	C050	49.4	56.8	56.8	1125	2217	3342	175
85.0	C075	73.6	84.7	84.7	1705	4433	6138	320
109.0	C100	94.4	108.6	108.6	2046	5797	7843	405
138.0	C125	119.5	137.4	137.4	2387	6820	9207	475
158.0	C150	136.8	157.4	157.4	2728	8525	11253	580
210.0	C200	181.9	209.1	209.1	3069	10571	13640	703

n The above information is provided for reference only. For all ratings the user must verify that the selected enclosure will dissipate the total BTUs generated within the enclosure without allowing the internal ambient to rise above 50°C. Enclosure mounting and location must allow for the heatsink to extend outside the enclosure.

- When locating the drive allow a minimum clearance from other components of 4.0 inches (101.6 mm) on the top and bottom, 2.0 inches (50.8 mm) on either side.
- When mounting the drive, ensure that the heatsink fins are vertical.

With the heatsink exposed to the ambient, the drive will dissipate heat as listed in the Output Current Table above.

Required Control Inputs

As a minimum requirement for drive operation, the following five control inputs must be present to operate the drive:

Start

A momentary True input will start the drive. The drive will continue to run until a stop input is issued or a drive fault occurs. A start input may come from:

- The optional FA2, RP2 or RP3 control panel start pushbutton.
- A user supplied N.O. contact or start pushbutton connected to the optional L1, L2, or L3 Logic Interface Board. Refer to Appendix A — Logic Interface Options and the 1336-MOD-L1, L2, or L3 instruction manual.
- A user supplied start signal sent to the optional G2 Remote I/O Interface Board. Refer to the 1336-MOD-G2 instruction manual.

Stop

A momentary False input will stop the drive. A maintained True input will permit the drive to run or jog. A stop input may come from:

- The optional FA2, RP2 or RP3 control panel stop pushbutton.
- A user supplied maintained contact or stop pushbutton connected to the optional L1, L2, or L3 Logic Interface Board. Refer to Appendix A — Logic Interface Options and the 1336-MOD-L1, L2, or L3 instruction manual.
- A user supplied stop signal sent to the optional G2 Remote I/O Interface Board. Refer to the 1336-MOD-G2 instruction manual.
- The Main Control Board when Jumper J8 is installed between Pins 11 and 12. Refer to Chapter 6 — Wiring, page 6-16.

Enable

A maintained True input or a maintained closed contact will permit the drive to start, run, or jog. A momentary False input or an open contact will disable drive output. An enable input may come from:

- A user supplied maintained contact or switch connected to the optional L1, L2 or L3 Logic Interface Board. Refer to Appendix A — Logic Interface Options and the 1336-MOD-L1, L2 or L3 instruction manual.
- The Main Control Board when Jumper J9 is installed between Pins 7 and 8. Refer to Chapter 6 — Wiring, page 6-16.

Required Control Inputs (cont.)

Speed Reference

Speed reference sets the drive operating frequency. A speed reference input may come from:

- A Control Panel speed potentiometer.
- A user supplied 10kΩ remote speed potentiometer connected to terminal block TB2. Refer to Chapter 6 — Wiring.
- A 4-20mA analog signal connected to terminal block TB2. Refer to Chapter 6 — Wiring.
- A 0-10V DC analog signal connected to terminal block TB2. Refer to Chapter 6 — Wiring.
- A pulse train input signal connected to terminal block TB2. Refer to Chapter 6 — Wiring.
- One of seven preset speed signals connected to the optional L1, L2, or L3 Logic Interface Board, or the optional G2 Remote I/O Interface Board. Refer to Appendix A — Logic Interface Options and the 1336-MOD-L1, L2 or L3 instruction manual or the 1336-MOD-G2 instruction manual.

Auxiliary

A maintained True input or a maintained closed contact will permit the drive to start, run, or jog. A momentary False input or an open contact will disable drive output and generate Fault F02. An auxiliary input may come from:

- A user supplied maintained contact or switch connected to the optional L1, L2 or L3 Logic Interface Board. Refer to Appendix A — Logic Interface Options and the 1336-MOD-L1, L2, or L3 instruction manual.
- The Main Control Board when Jumper J9 is installed between Pins 9 and 10. Refer to Chapter 6 — Wiring, page 6-16.

Optional Control Inputs

Reverse

Reverse changes direction of motor rotation. Reverse inputs may come from:

- A Control Panel direction pushbutton.
- The optional L1, L2 or L3 Logic Interface Board. Refer to Appendix A — Logic Interface Options and the 1336-MOD-L1, L2 or L3 instruction manual.
- The optional G2 Remote I/O Interface Board. Refer to the 1336-MOD-G2 instruction manual.

Jog

Jog jogs the drive at a pre-programmed jog speed. Jog inputs may come from:

- A Control Panel jog pushbutton.
- The optional L1, L2 or L3 Logic Interface Board. Refer to Appendix A — Logic Interface Options and the 1336-MOD-L1, L2 or L3 instruction manual.
- The optional G2 Remote I/O Interface Board. Refer to the 1336-MOD-G2 instruction manual.

Speed Select

Speed select permits switching between two selected speed reference sources. Speed select inputs may come from:

- The optional L1, L2 or L3 Logic Interface Board. Refer to Appendix A — Logic Interface Options and the 1336-MOD-L1, L2 or L3 instruction manual.
- The optional G2 Remote I/O Interface Board. Refer to the 1336-MOD-G2 instruction manual.

2nd Accel/Decel

2^{nd} accel/decel permits switching between two internally programmed accel/decel rates. 2^{nd} accel/decel inputs may come from:

- The optional L1, L2 or L3 Logic Interface Board. Refer to Appendix A — Logic Interface Options and the 1336-MOD-L1, L2 or L3 instruction manual.
- The optional G2 Remote I/O Interface Board. Refer to the 1336-MOD-G2 instruction manual.

Load Requirements

A balanced 3-phase inductive motor load is typical. Other motor loads may require application assistance.

Contact Outputs

The following contact outputs are available as standard:

Run:	1 N.O. contact, closed when the drive is running.
At Speed:	1 N.O. contact, closed when the drive is at command speed (within 0.5% of maximum programmed speed), or the drive reaches the set point reference frequency programmed by Parameter 77.
Fault:	1 set of Form C contacts that change state on a drive fault or loss of power.
Drive Alarm:	1 set of Form C contacts that change state to indicate that the drive is operating outside of rated limits and that a fault is imminent. Drive Alarm Conditions are: • Drive output current is above 150% of rated current. • Drive output current is above the MOPC limit set by Parameter 36. • Bus voltage is above 110% of nominal input voltage. A continued rise in bus voltage may result in Parameter 11 Decel Frequency Hold affecting the decel ramp, or fault F05 Bus Overvoltage. • Bus voltage is below 85% of nominal input voltage. • Precharge not complete. • Parameter 14 Auto Restart is active.

Analog Outputs

0-5V DC output programmable to represent output frequency or percent of drive load current.

Drive Displays

Programming and Display Panels:	Display frequency and drive control source. May be toggled to program and display 60 drive parameters — 5-14, 16-50 and 72-86. Should a fault occur while the drive is running, the panel will display the fault code.
Bus Charged:	Internal neon display to indicate bus voltage is greater than 40V DC.

Programmable Parameters

The 1336 drive logic uses a set of 90 user parameters to select and control drive operation. Seventy-one of these parameters are accessible through any of the Programming and Display Panels. All 90 are accessible through the Serial Port.

Chapter 5

Installation

General Installation Requirements

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

- Wiring the 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.

The 1336 must be installed in an area where the following installation and environmental guidelines are met.

- Cabinet mounting is upright, leaving room for a minimum clearance of 4 inches (102 mm) on the top and bottom and 2 inches (51 mm) on the sides for proper ventilation.
- The drive is easily accessible for maintenance and troubleshooting.
- The rated altitude does not exceed 3,300 feet (1,000 meters).
- Vibration will be within the ratings outlined in Chapter 4 – Specifications.
- The ambient atmosphere contains no volatile or corrosive gas, vapors or dust.
- The relative humidity does not exceed 95% for all drive ratings.
- The ambient temperature for the drive heatsink is kept within 0 to +40°C for all open ratings.
- The ambient temperature for the chassis components is kept within 0 to +50°C.

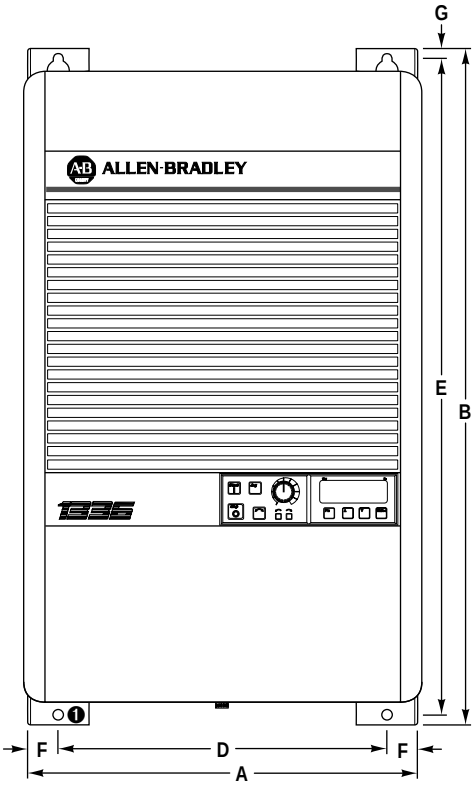
Important: An input transformer should not be required for normal drive operation. If the use of an input transformer is desired, only an isolation type transformer should be used.

Before actual installation, remove all packing material, wedges or braces from within and around the drive.

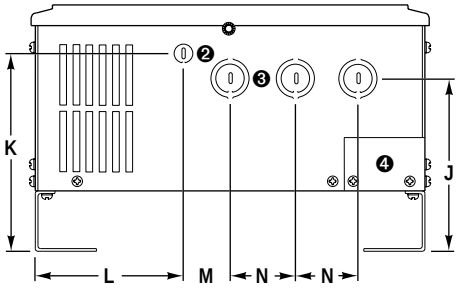
Dimensions, Weights and Conduit Entry Locations
B003-B010 and C003-C010
Open Chassis and NEMA Type 1 Enclosures

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

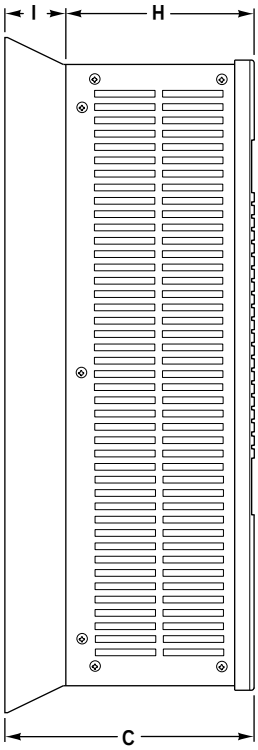
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Weight
Open Chassis	11.13 (283)	18.75 (477)	8.76 (223)	8.38 (213)	18.15 (461)	1.38 (35)	0.30 (8)	6.26 (159)	2.50 (63.5)	—	—	—	—	—	31.3 (14.2)
NEMA Type 1	11.13 (283)	18.75 (477)	8.76 (223)	8.38 (213)	18.15 (461)	1.38 (35)	0.30 (8)	6.26 (159)	2.50 (63.5)	3.50 (89)	4.38 (111)	3.44 (87)	1.25 (32)	1.88 (48)	36.3 (16.5)



(NEMA Type 1 –– Front)



(NEMA Type 1 –– Bottom)



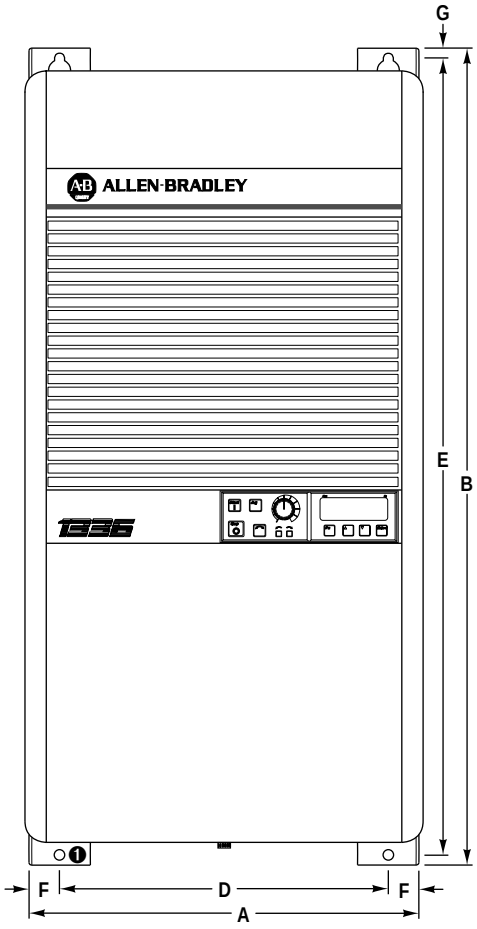
(NEMA Type 1 –– Side)

❶ Mounting Holes — 0.281" (7.13mm) Diameter
❷ Conduit Entry — 0.50" (13.0 mm) Diameter
❸ Conduit Entry — 0.75" (19.0 mm) Diameter and 1.00" (25.4 mm) Diameter
❹ 1336-MOD-S1 Serial Port Connector Cover Plate

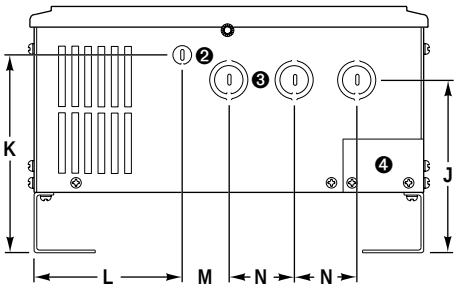
Dimensions, Weights and Conduit Entry Locations
B015-B020 and C015-C020
Open Chassis and NEMA Type 1 Enclosures

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

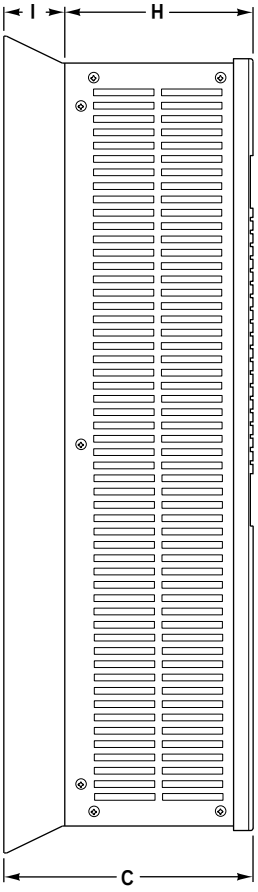
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Weight
Open Chassis	11.13 (283)	22.66 (576)	8.76 (223)	8.38 (213)	22.06 (560)	1.38 (35)	0.30 (8)	6.26 (159)	2.50 (63.5)	—	—	—	—	—	37.1 (16.8)
NEMA Type 1	11.13 (283)	22.66 (576)	8.76 (223)	8.38 (213)	22.06 (560)	1.38 (35)	0.30 (8)	6.26 (159)	2.50 (63.5)	3.50 (89)	4.38 (111)	3.44 (87)	1.25 (32)	1.88 (48)	43.1 (19.5)



(NEMA Type 1 –– Front)



(NEMA Type 1 –– Bottom)



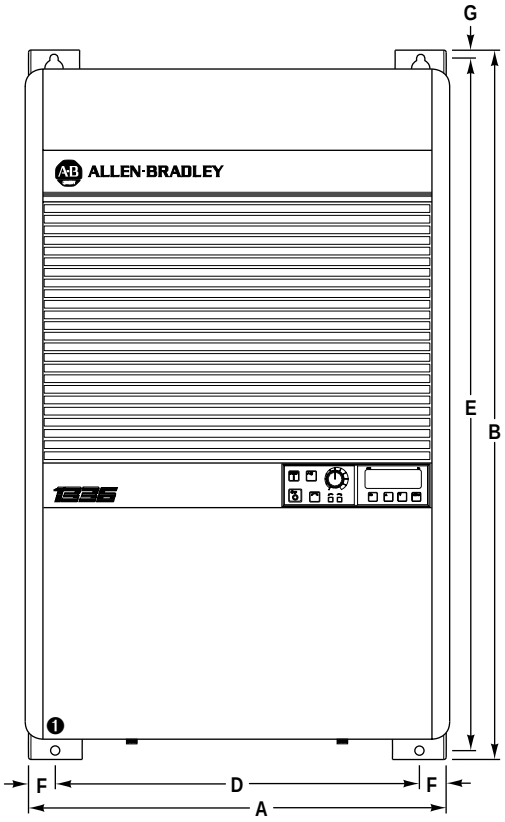
(NEMA Type 1 –– Side)

❶ Mounting Holes — 0.281" (7.13mm) Diameter
❷ Conduit Entry — 0.50" (13.0 mm) Diameter
❸ Conduit Entry — 0.75" (19.0 mm) Diameter and 1.00" (25.4 mm) Diameter
❹ 1336-MOD-S1 Serial Port Connector Cover Plate

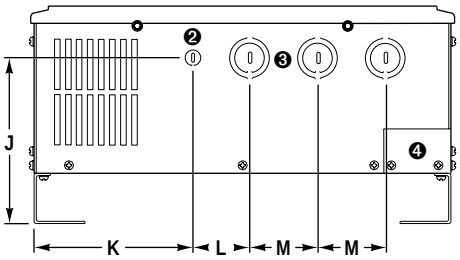
Dimensions, Weights and Conduit Entry Locations
B025-B030 and C025-C030
Open Chassis and NEMA Type 1 Enclosures

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

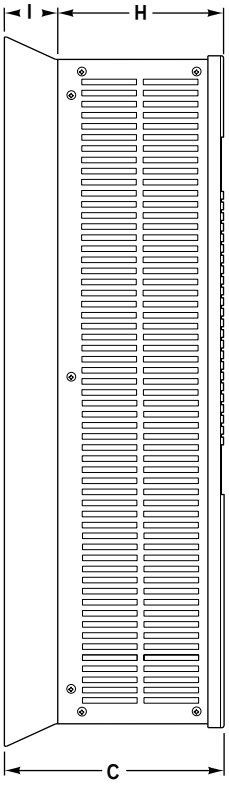
	A	B	C	D	E	F	G	H	I	J	K	L	M	Weight
Open Chassis	14.32 (364)	23.59 (599)	9.27 (235)	11.70 (297)	22.41 (570)	1.31 (33.3)	0.59 (15)	6.64 (159)	2.63 (67)	—	—	—	—	47.3 (21.5)
NEMA Type 1	14.32 (364)	23.59 (599)	9.27 (235)	11.70 (297)	22.41 (570)	1.31 (33.3)	0.59 (15)	6.64 (159)	2.63 (67)	4.38 (111)	4.19 (106)	1.88 (48)	2.62 (7)	54.3 (24.6)



(NEMA Type 1 –– Front)



(NEMA Type 1 –– Bottom)



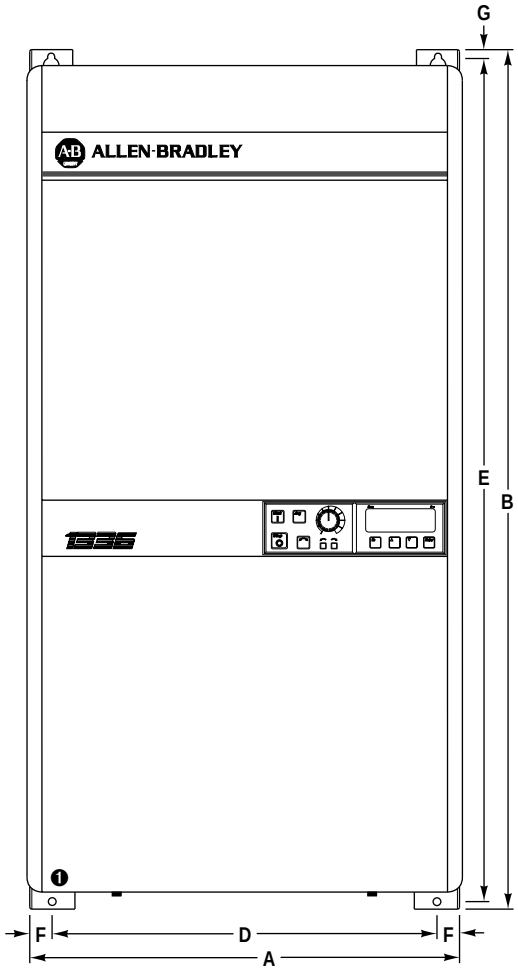
(NEMA Type 1 –– Side)

❶ Mounting Holes — 0.312" (7.92mm) Diameter
❷ Conduit Entry — 0.50" (13.0 mm) Diameter
❸ Conduit Entry — 1.00" (25.4 mm) Diameter and 1.25" (32.0 mm) Diameter
❹ 1336-MOD-S1 Serial Port Connector Cover Plate

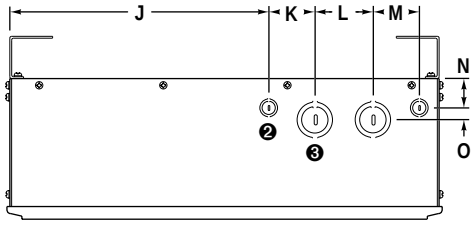
Dimensions, Weights and Conduit Entry Locations
B040-B050 and C040-C050
Open Chassis and NEMA Type 1 Enclosures

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

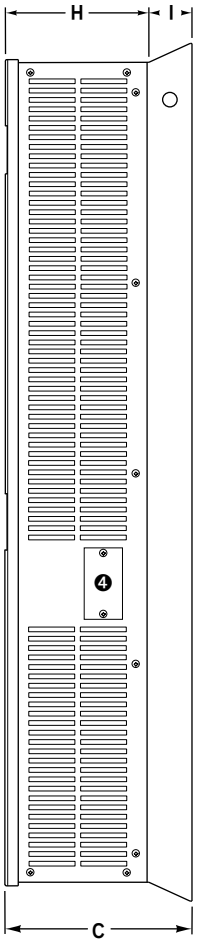
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Weight
Open Chassis	17.50 (445)	34.12 (867)	9.38 (238)	16.25 (413)	32.88 (835)	0.63 (16)	0.63 (16)	6.75 (172)	2.63 (67)	—	—	—	—	—	—	85.0 (38.3)
NEMA Type 1	17.50 (445)	34.12 (867)	9.38 (238)	16.25 (413)	32.88 (835)	0.63 (16)	0.63 (16)	6.75 (172)	2.63 (67)	9.68 (246)	2.06 (52)	2.75 (70)	2.06 (52)	1.50 (38)	.63 (16)	90.0 (40.5)



(NEMA Type 1 –– Front)



(NEMA Type 1 –– Top)



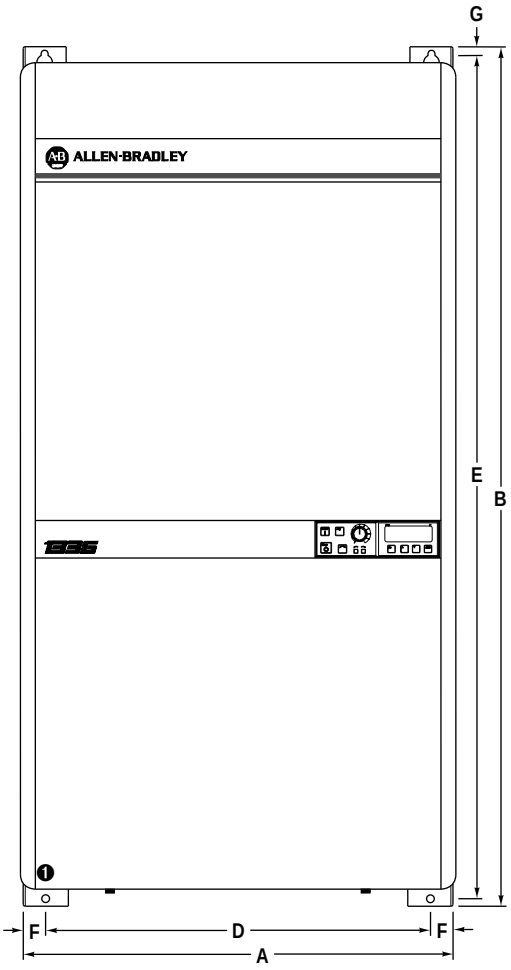
(NEMA Type 1 –– Side)

❶ Mounting Holes — 0.343" (8.71mm) Diameter
❷ Conduit Entry — 0.50" (13.0 mm) Diameter and 0.75" (19.0 mm) Diameter
❸ Conduit Entry — 1.00" (25.4 mm) Diameter and 1.50" (38.0 mm) Diameter
❹ 1336-MOD-S1 Serial Port Connector Cover Plate

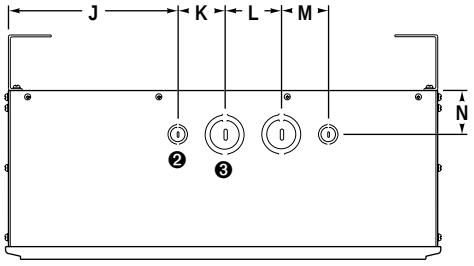
Dimensions, Weights and Conduit Entry Locations
B075-B0125 and C075-C0125
Open Chassis and NEMA Type 1 Enclosures

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

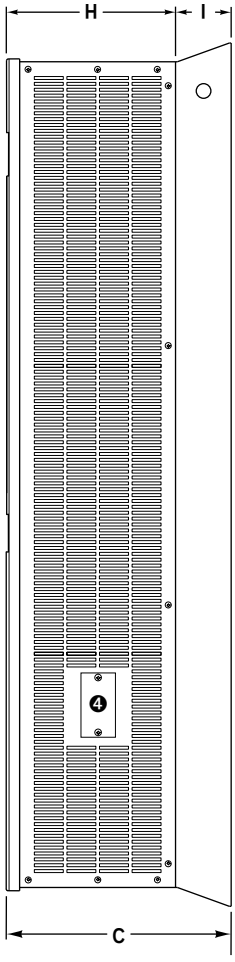
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Weight
Open Chassis	25.16 (639)	47.94 (1218)	13.80 (351)	23.88 (607)	46.82 (1189)	0.64 (16)	0.62 (16)	10.55 (268)	3.25 (83)	—	—	—	—	—	200 (91)
NEMA Type 1	25.16 (639)	47.94 (1218)	13.80 (351)	23.88 (607)	46.82 (1189)	0.64 (16)	0.62 (16)	10.55 (268)	3.25 (83)	9.75 (248)	2.75 (70)	3.00 (76)	2.50 (64)	2.48 (63)	220 (100)



(NEMA Type 1 –– Front)



(NEMA Type 1 –– Top)



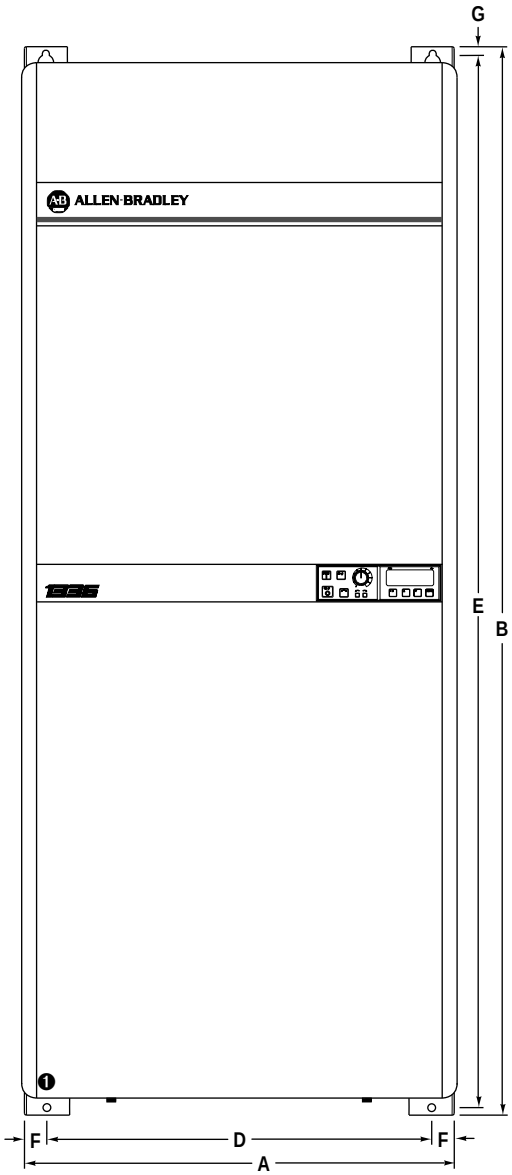
(NEMA Type 1 –– Side)

❶ Mounting Holes — 0.343" (8.71mm) Diameter
❷ Conduit Entry — 0.875" (22.0 mm) Diameter and 1.125" (29.0 mm) Diameter
❸ Conduit Entry — 1.375" (35.0 mm) Diameter and 1.968" (50.0 mm) Diameter
❹ 1336-MOD-S1 Serial Port Connector Cover Plate

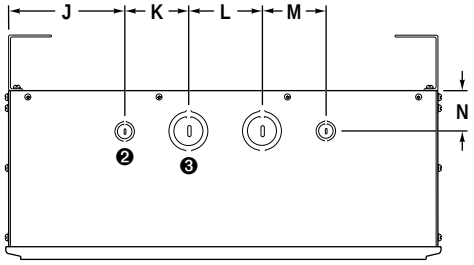
Dimensions, Weights and Conduit Entry Locations
B150-B200 and C150-C200
Open Chassis and NEMA Type 1 Enclosures

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

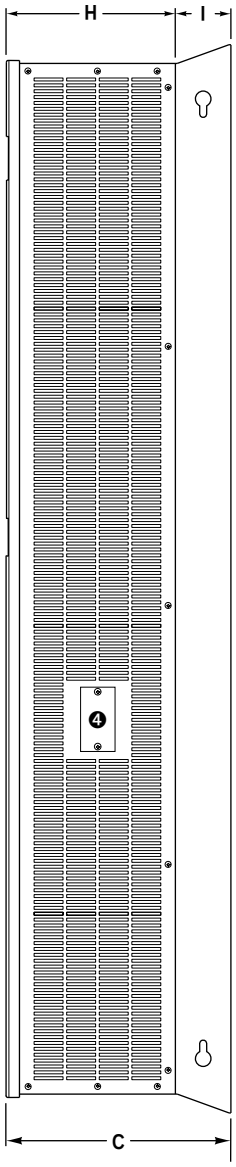
	A	B	C	D	E	F	G1	G2	H	I	J	K	L	M	N	Weight
Open Chassis	25.16 (639)	62.94 (1599)	17.50 (445)	23.92 (608)	61.82 (1570)	0.62 (16)	0.62 (16)	0.50 (13)	11.75 (299)	5.75 (146)	—	—	—	—	—	380 (171)
NEMA Type 1	25.16 (639)	62.94 (1599)	17.50 (445)	23.92 (608)	61.82 (1570)	0.62 (16)	0.62 (16)	0.50 (13)	11.75 (299)	5.75 (146)	4.06 (103)	6.75 (171)	7.75 (197)	3.88 (99)	3.12 (79)	450 (203)



(NEMA Type 1 –– Front)



(NEMA Type 1 –– Top)



(NEMA Type 1 –– Side)

❶ Mounting Holes — 0.343" (8.71mm) Diameter
❷ Conduit Entry — 0.875" (22.0 mm) Diameter and 1.125" (29.0 mm) Diameter
❸ Conduit Entry — 3.625" (92.0 mm) Diameter and 4.125" (105.0 mm) Diameter
❹ 1336-MOD-S1 Serial Port Connector Cover Plate

Dimensions, Weights and Conduit Entry Locations

B003-B030 and C003-C030
NEMA Type 4 (IP56) Enclosures

B003-B200 and C003-C200
NEMA Type 12 (IP54) Enclosures

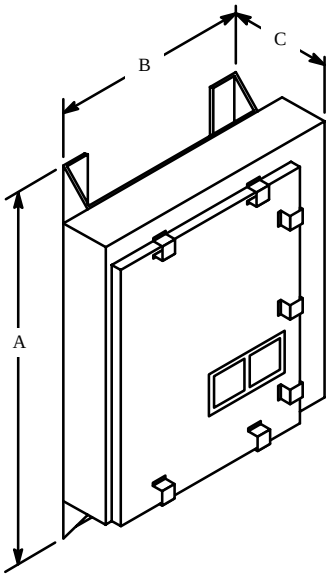
Nominal Dimensions and Weights in Inches (Millimeters) and Pounds (Kilograms)

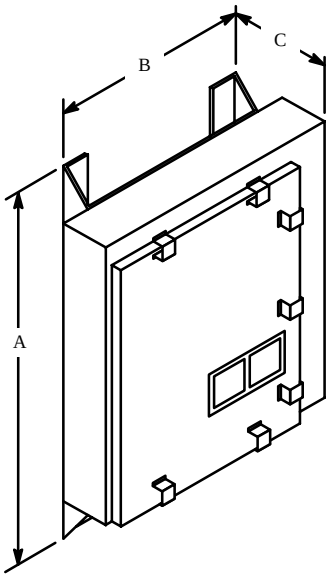
NEMA Type 4 (IP56)				
Drive Rating	A	B	C	Weight
B003-B010	32.00	18.00	12.75	
C003-C010	(813)	(457)	(324)	n
B015-B030	38.00	22.50	14.56	
B015-C030	(965)	(572)	(370)	n

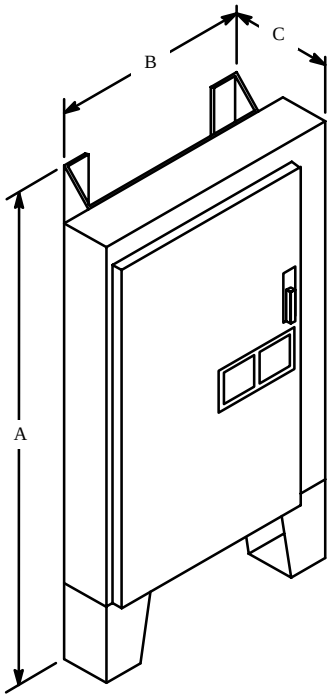
NEMA Type 12 (IP54)				
Drive Rating	A	B	C	Weight
B003-B010	32.00	18.00	12.75	
C003-C010	(813)	(457)	(324)	n
B015-B030	38.00	22.50	14.56	
C015-C030	(965)	(572)	(370)	n

NEMA Type 12 (IP54)				
Drive Rating	A	B	C	Weight
B040-B050	62.00	34.00	14.75	
C040-C050	(1575)	(864)	(375)	n
B075-B125	90.00	34.00	27.75	
C075-C125	(2286)	(864)	(705)	n
B150-B200	92.50	35.00	25.00	
C150-C200	(2360)	(889)	(635)	n

n Consult your nearest Allen-Bradley sales representative for information.







Chapter 6

Wiring

General Wiring Procedures

ATTENTION: Do not proceed without reading the information on this page. Failure to understand procedures and hazards may result in personal injury or equipment damage.

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

- Wiring the 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.

1. The National Electrical Code requires that a circuit breaker or fusible disconnect switch be provided in the drive branch circuit. Providing drive input fusing alone is not sufficient to meet NEC guidelines. The 1336 does not provide this requirement. Selection of a branch circuit breaker or fusible disconnect should be based on the drive input current rating. Refer to the Terminal Block TB1 Wiring sections in this chapter for mandatory AC input fusing recommendations for drive short circuit protection.
2. The National Electrical Code and local regulations govern the installation and wiring of the 1336. All input and output power wiring, control wiring and conduit must be brought through the drive conduit entry holes provided on the enclosure. Connections to the drive must be made as shown in the following sections and in accordance with the drive nameplate, National Electrical Code requirements and any additional interconnection diagrams packed with the drive.
3. The voltage on each phase of the incoming line to the drive must match the drive input rating. Verify the drive rating by referring to the input voltage listed on the drive nameplate. If the incoming line voltage is out of this tolerance, equipment may be damaged or fail to operate.
4. If multiple drives are used, do not use common cabling for AC input or output leads. If multiconductor cable is used, separate 3-conductor input and output cable for each drive must be used.
5. All signal wiring must be run separate from power or control wiring. Verify that shielded cable and/or conduit is used if indicated on any interconnection diagrams or in the following sections. If shielded cable is required, shields must be grounded at the drive end only at one of the drive ground lugs provided.
6. Nearby relays, solenoids or brake coils can produce electrical noise transients and cause erratic drive behavior. Transient suppression networks must be added across the coils of these devices.

7. Since most startup difficulties result from incorrect wiring, every precaution should be taken to assure that the wiring is as indicated on the diagrams and information packed with the drive.

Input Power Conditioning

General

Typically the 1336 is suitable for direct connection to a correct voltage, 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 should be used.

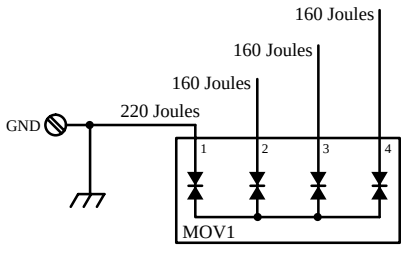
Ungrounded Distribution Systems

All 1336 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-ground connection of the MOV 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 MOV ratings may cause physical damage to the MOV.

Line-to-Line MOV Rating
Energy Rating = 320 Joules Turn On Voltage = 850-1000 volts

Line-to-Ground MOV Rating
Energy Rating = 380 Joules Turn On Voltage = 1500 volts



Wire Group Numbers

The following chart identifies general wire categories that will be encountered when installing the 1336 and other AC drives. Each category has an associated wire group number that is used in the following sections to identify the wire to be used. Application and signal examples along with the recommended type of cable for each group is provided. A matrix providing the recommended minimum spacing between different wire groups run in the same tray or separate conduit is also provided.

Wire Category	Wire Group	Application	Signal Example	Recommended Cable	For Tray: Recommended minimum spacing between different wire groups in the same tray For Conduit: Different wire groups must be run in separate conduit All Dimensions in Inches and (Millimeters)						
					Wire Group	Power 1	Power 2	Control 3	Control 4	Signal 5	Signal 6
Power	1	AC Power (> 600 V AC)	2.3 KV, 3∅ AC Lines	Per NEC Local Codes and Application Requirements	In Tray	9.00 (228.6)	9.00 (228.6)	9.00 (228.6)	9.00 (228.6)		
					Between Conduit	3.00 (76.2) Between Conduit					
	2	AC Power (to 600 V AC)	480V, 3∅ ❶ n	Per NEC Local Codes and Application Requirements	In Tray	9.00 (228.6)	9.00 (228.6)	6.00 (152.4)	6.00 (152.4)		
					Between Conduit	3.00 (76.2) Between Conduit					
Control	3	115VAC or 115V DC Logic	Relay Logic PLC I/O	Per NEC Local Codes and Application Requirements	In Tray	9.00 (228.6)	6.00 (152.4)	9.00 (228.6)	6.00 (152.4)		
		115V AC Power	Power Supplies Instruments		Between Conduit	3.00 (76.2) Between Conduit					
	4	24V AC or 24V DC Logic	PLC I/O	Per NEC Local Codes and Application Requirements	In Tray	9.00 (228.6)	6.00 (152.4)	6.00 (152.4)	9.00 (228.6)		
					Between Conduit	3.00 (76.2) Between Conduit					
Signal	5	Analog Signals DC Supplies	5-24V DC Supplies	Belden 8760 Belden 8770 Belden 9460	All signal wiring must be run in separate steel conduit. A wire tray is not suitable. The minimum spacing between conduit containing different wire groups is 3.00 inches (78.2 mm).						
		Digital (Low Speed)	Power Supplies TTL Logic Level								
	6	Digital (High Speed)	Pulse Train Input	Belden 8760 Belden 9460							

❶ Refer to precautions in General Wiring Procedures concerning multi-conductor cables.

Belden 8760 — 18 AWG, twisted pair, shielded.

Belden 8770 — 18 AWG, 3 conductor, shielded.

Belden 9460 — 18 AWG, twisted pair, shielded.

Note 1 Steel conduit is recommended for all 1336 power or control wiring and required for all 1336 signal wiring. All input and output power wiring, control wiring or conduit should be brought through the drive conduit entry holes provided. Use appropriate connectors to maintain the environmental rating of the enclosure.

Note 2 Spacing between wire groups is the recommended minimum for parallel runs of 200 feet or less.

Note 3 All shields for shielded cable must be grounded at the drive end only — Terminal 3 or 4 of TB2 — The other end must be insulated and remain floating. Shields for cables from one enclosure to another must be grounded only at the enclosure nearest the drive. If splicing of shielded cables is required, the shield must remain continuous and insulated from ground.

Note 4 AC and DC circuits must be run in separate conduit or trays.

Note 5 A voltage drop in motor leads may adversely affect motor starting and running performance. Installation and application requirements may dictate that larger wire sizes than indicated in the NEC guidelines be used.

Terminal Block TB1 Power Wiring

Input and output power connections are marked on terminal block TB1, a ten position terminal block on the drive backpanel. For maintenance and setup procedures, the drive may be operated without a motor connected.

Important:

1. The 1336 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 on the following pages. Branch circuit breakers or disconnect switches cannot provide this level of protection for drive components.
2. Each Bulletin 1336 must have its own dedicated input and output power leads. If multiconductor cable is used, separate 3-conductor input and output cable for each drive must be used.
3. For multimotor operation, the combined total of motor full load current must not exceed the rated output current of the drive.
4. Verify that the motor windings are properly connected to receive the full drive output voltage rating.
5. For drive ratings B003-B050 & C003-C050, two ground terminals have been provided at TB1. Either one of these terminals must be connected to earth ground or the ground of the building system.

   For drive ratings B075-B200 & C075-C200, one ground terminal that will accept two ground leads has been provided at TB1. Connect this terminal to earth ground or the ground of the building system.



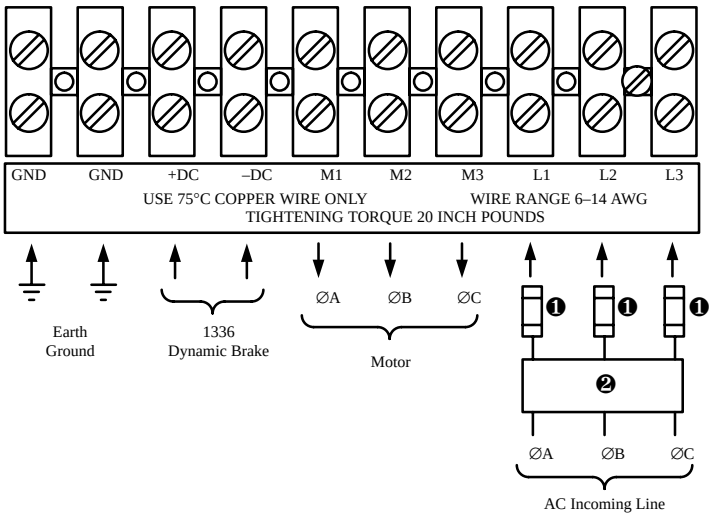
ATTENTION:

1. Any disconnecting means wired to drive output terminals M1, M2 and M3 must be capable of stopping the drive if opened during drive operation. If opened during drive operation, the drive will continue to produce output voltage into an open motor circuit causing a potential shock hazard.
2. The start/stop control circuitry in the 1336 includes solid-state components. If hazards due to accidental contact with moving machinery or unintentional flow of liquid, gas or solids exist, an additional hard wired 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.

   The 1336 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 must not be used. After a hard wired stop has been initiated, allow at least one minute before reapplying input power to the drive. The allowable number of hard wired start/stops are 3 cycles within a 5 minute period. Wait 10 minutes before attempting the next 3 hard wired stop cycle to allow the drive precharge resistors to cool.

Refer to codes and standards applicable to your particular system for specific requirements and additional information.

Terminal Block TB1 – B003-B030 & C003-C030 Power Wiring



❶ User supplied drive input fuses.

❷ Motor disconnecting means including branch circuit, short circuit, and ground fault protection.

GND

Chassis ground is used to connect the drive chassis to a common ground. The motor frame must also be connected to the same common ground. Either earth ground or the ground of the building system must be used. Refer to the motor manufacturer's guidelines for additional information.

+ DC, – DC

DC bus terminals are reserved for the 1336 dynamic brake option. Refer to the 1336 dynamic brake option instructions for installation and connection details.

M1, M2, M3

Connect the motor leads to these terminals.

L1, L2, L3

Input AC line Terminals L1, L2, L3 (∅A, ∅B, ∅C) are not phase sensitive.

For drives rated B003-B030, nominal input voltage is 380/415/460V AC ±10%, 3∅, 50/60Hz.

For drives rated C003-C030, nominal input voltage is 500 or 575V AC ±10%, 3∅, 50/60Hz.

Branch disconnect and short circuit protection is not part of the standard 1336 and must be supplied by the user. Drive input fuses are required to provide component protection against malfunction of electronic circuits.

Terminal Block TB1 – B003-B030 Power Wiring

Power Rating Code	Drive Output Current	Wire Group ❶	Maximum Wire Size ❷	Maximum Torque ❸
B003	6.0 Amps	2	6 AWG	20 In-lbs
B005	9.6 Amps	2	6 AWG	20 In-lbs
B007	13.0 Amps	2	6 AWG	20 In-lbs
B010	17.0 Amps	2	6 AWG	20 In-lbs
B015	25.0 Amps	2	6 AWG	20 In-lbs
B020	33.0 Amps	2	6 AWG	20 In-lbs
B025	41.0 Amps	2	6 AWG	20 In-lbs
B030	48.0 Amps	2	6 AWG	20 In-lbs

❶ Wire group number chart, page 6-3.

❷ 16 mm^2.

❸ 2.26 N-m.

Select from the following drive input fuses.

Drive Rating B003	Fuse Size 10A	Fuse Type KTK-R, JJS or Equivalent
Drive Rating B005	Fuse Size 15A	Fuse Type KTK-R, JJS or Equivalent
Drive Rating B007	Fuse Size 20A	Fuse Type KTK-R, JJS or Equivalent
Drive Rating B010	Fuse Size 25A	Fuse Type KTK-R, JJS or Equivalent
Drive Rating B015	Fuse Size 35A	Fuse Type A4J, JJS or Equivalent
Drive Rating B020	Fuse Size 45A	Fuse Type A4J, JJS or Equivalent
Drive Rating B025	Fuse Size 60A	Fuse Type A4J, JJS or Equivalent
Drive Rating B030	Fuse Size 70A	Fuse Type A4J, JJS or Equivalent

Terminal Block TB1 – C003-C030 Power Wiring

Power Rating Code	Drive Output Current	Wire Group ❶	Maximum Wire Size ❷	Maximum Torque ❸
C003	4.3 Amps	2	6 AWG	20 In-lbs
C005	6.7 Amps	2	6 AWG	20 In-lbs
C007	9.9 Amps	2	6 AWG	20 In-lbs
C010	12.1 Amps	2	6 AWG	20 In-lbs
C015	19.0 Amps	2	6 AWG	20 In-lbs
C020	24.0 Amps	2	6 AWG	20 In-lbs
C025	30.0 Amps	2	6 AWG	20 In-lbs
C030	35.0 Amps	2	6 AWG	20 In-lbs

❶ Wire group number chart, page 6-3.

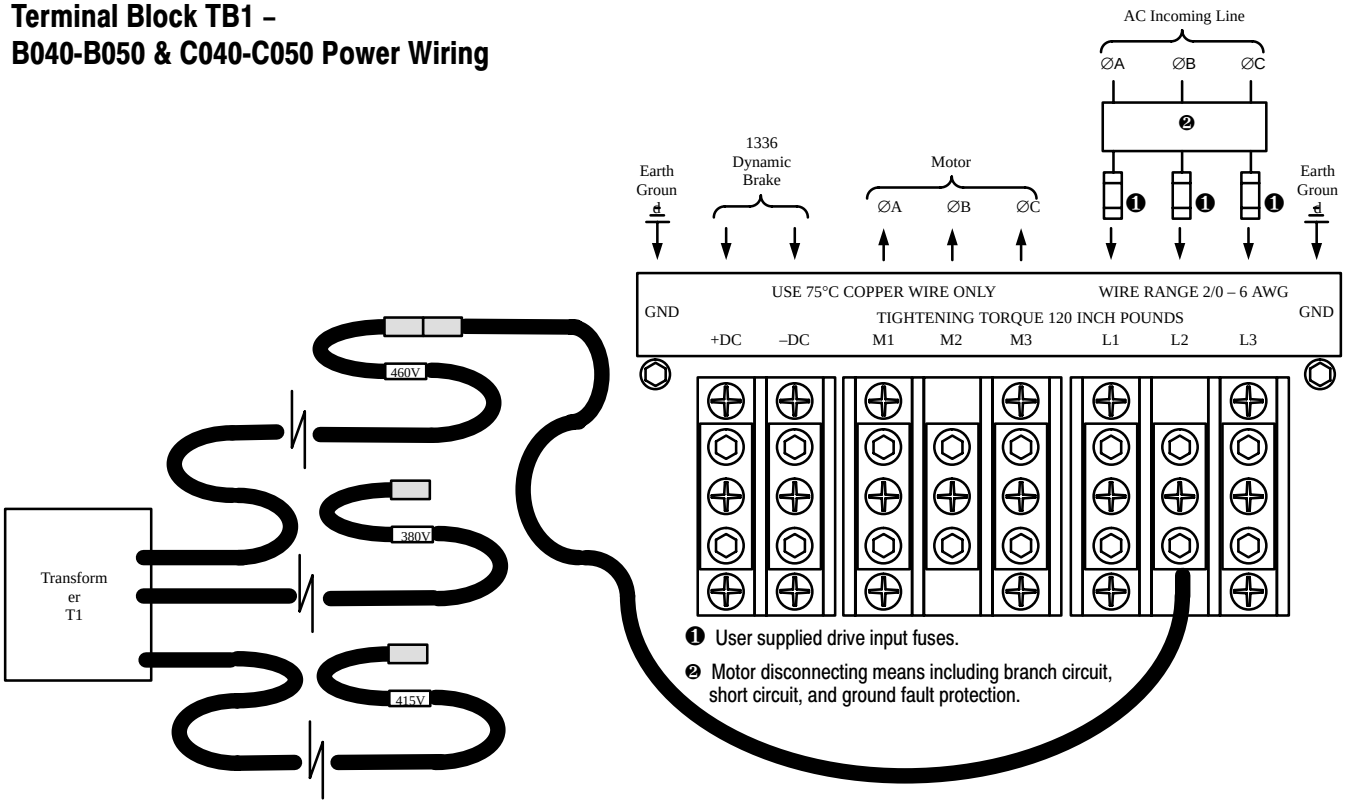
❷ 16 mm^2.

❸ 2.26 N-m.

Select from the following drive input fuses.

Drive Rating C003	Fuse Size 6A	Fuse Type KTK-R, JJS or Equivalent
Drive Rating C005	Fuse Size 6A	Fuse Type KTK-R, JJS or Equivalent
Drive Rating C007	Fuse Size 10A	Fuse Type KTK-R, JJS or Equivalent
Drive Rating C010	Fuse Size 15A	Fuse Type KTK-R, JJS or Equivalent
Drive Rating C015	Fuse Size 20A	Fuse Type A4J, JJS or Equivalent
Drive Rating C020	Fuse Size 25A	Fuse Type A4J, JJS or Equivalent
Drive Rating C025	Fuse Size 30A	Fuse Type A4J, JJS or Equivalent
Drive Rating C030	Fuse Size 35A	Fuse Type A4J, JJS or Equivalent

Terminal Block TB1 – B040-B050 & C040-C050 Power Wiring



GND

Chassis ground is used to connect the drive chassis to a common ground. The motor frame must also be connected to the same common ground. Either earth ground or the ground of the building system must be used. Refer to the motor manufacturer's guidelines for additional information.

+ DC, – DC

DC bus terminals are reserved for the 1336 dynamic brake option. Refer to the 1336 dynamic brake option instructions for installation and connection details.

M1, M2, M3

Connect the motor leads to these terminals.

L1, L2, L3

Input AC line Terminals L1, L2, L3 (∅A, ∅B, ∅C) are not phase sensitive.

For drives rated B040-B050, nominal input voltage is 380/415/460V AC ±10%, 3∅, 50/60Hz.

For drives rated C040-C050, nominal input voltage is 500 or 575V AC ±10%, 3∅, 50/60Hz.

Branch disconnect and short circuit protection is not part of the standard 1336 and must be supplied by the user. Drive input fuses are required to provide component protection against malfunction of electronic circuits.

Terminal Block TB1 – B040-B050 & C040-C050 Power Wiring (cont.)

B040-B050 Fan Transformer Wiring

Drives rated B040-B050 are shipped from the factory with Fan Transformer T1 connected for 460V operation. Fan Transformer T1 has three leads marked 460V, 380V and 415V, each terminated by a keyed connector. For 380 or 415V drive operation, the Fan Transformer lead at L2 must be unplugged and reconnected as shown on the previous page.

C040-C050 Fan Transformer Wiring

For drives rated C040-C050, reconnection of fan transformer T1 is not required for 500 or 600V AC operation.

Terminal Block TB1 – B040-B050 Power Wiring

Power Rating Code	Drive Output Current	Wire Group ❶	Maximum Wire Size ❷	Maximum Torque ❸
B040	60 Amps	2	2/0 AWG	120 In-lbs
B050	75 Amps	2	2/0 AWG	120 In-lbs

❶ Wire group number chart, page 6-3.

❷ 70 mm^2.

❸ 13.56 N-m.

Select from the following drive input fuses when using branch circuit protection.

Drive Rating B040	Fuse Size 80A	Fuse Type A4J, JJS or Equivalent
Drive Rating B050	Fuse Size 100A	Fuse Type A4J, JJS or Equivalent

Terminal Block TB1 – C040-C050 Power Wiring

Power Rating Code	Drive Output Current	Wire Group ❶	Maximum Wire Size ❷	Maximum Torque ❸
C040	45 Amps	2	2/0 AWG	120 In-lbs
C050	57 Amps	2	2/0 AWG	120 In-lbs

❶ Wire group number chart, page 6-3.

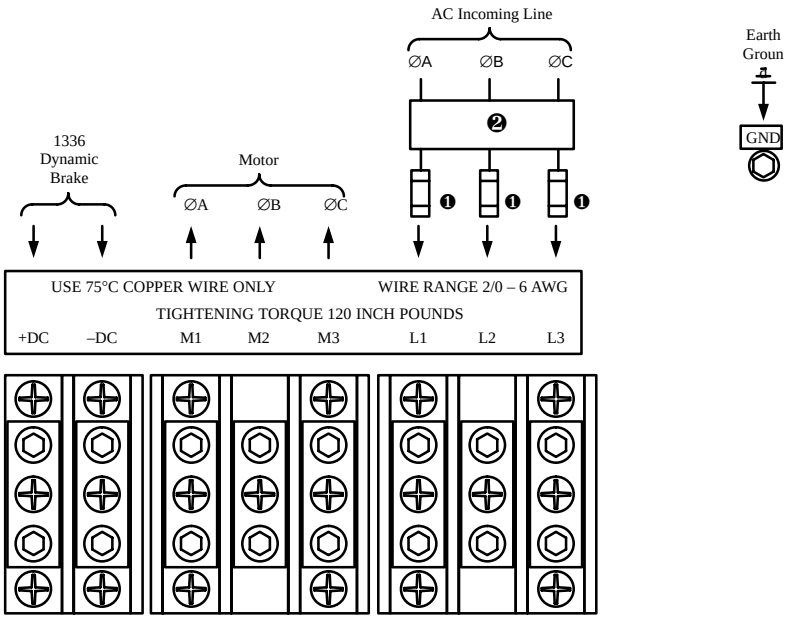
❷ 70 mm^2.

❸ 13.56 N-m.

Select from the following drive input fuses when using branch circuit protection.

Drive Rating C040	Fuse Size 45A	Fuse Type A4J, JJS or Equivalent
Drive Rating C050	Fuse Size 60A	Fuse Type A4J, JJS or Equivalent

Terminal Block TB1 – B075 & C075 Power Wiring



❶ User supplied drive input fuses.

❷ Motor disconnecting means including branch circuit, short circuit, and ground fault protection.

GND

Chassis ground is used to connect the drive chassis to a common ground. The motor frame must also be connected to the same common ground. Either earth ground or the ground of the building system must be used. Refer to the motor manufacturer's guidelines for additional information.

+ DC, – DC

DC bus terminals are reserved for the 1336 dynamic brake option. Refer to the 1336 dynamic brake option instructions for installation and connection details.

M1, M2, M3

Connect the motor leads to these terminals.

L1, L2, L3

Input AC line Terminals L1, L2, L3 (∅A, ∅B, ∅C) are not phase sensitive.

For drives rated B075, nominal input voltage is 380/415/460V AC ±10%, 3∅, 50/60 Hz.

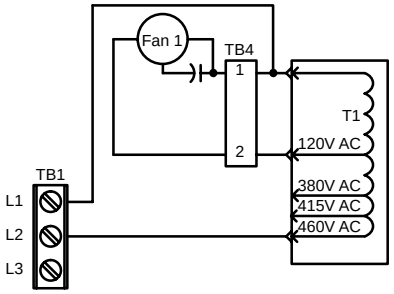
For drives rated C075, nominal input voltage is 500 or 575V AC ±10%, 3∅, 50/60 Hz.

Branch disconnect and short circuit protection is not part of the standard 1336 and must be supplied by the user. Drive input fuses are required to provide component protection against malfunction of electronic circuits.

Terminal Block TB1 – B075 & C075 Power Wiring (cont.)

B075 Fan Transformer Wiring

Drives rated B075 are shipped from the factory with Fan Transformer T1 connected for 460V operation. Fan Transformer T1 has three tab connections marked 460V, 380V and 415V. For 380 or 415V drive operation, the Fan Transformer lead at transformer T1 must be unplugged and reconnected.



C075 Fan Transformer Wiring

For drives rated C075, reconnection of Fan Transformer T1 is not required for 500 or 575V AC operation.

Terminal Block TB1 – B075 Power Wiring

Power Rating Code	Drive Output Current	Wire Group ❶	Maximum Wire Size ❷	Maximum Torque ❸
B075	120 Amps	2	2/0 AWG	120 In-lbs

❶ Wire group number chart, page 6-3.

❷ 70 mm^2.

❸ 13.56 N-m.

Select from the following drive input fuses when using branch circuit protection.

Drive Rating B075	Fuse Size 150A	Fuse Type A4J, JJS or Equivalent

Terminal Block TB1 – C075 Power Wiring

Power Rating Code	Drive Output Current	Wire Group ❶	Maximum Wire Size ❷	Maximum Torque ❸
C075	85 Amps	2	2/0 AWG	120 In-lbs

❶ Wire group number chart, page 6-3.

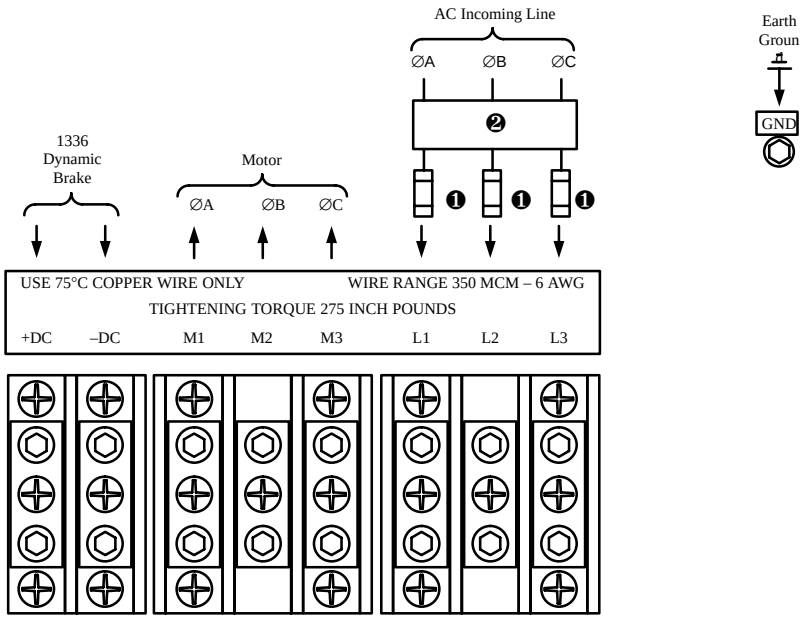
❷ 70 mm^2.

❸ 13.56 N-m.

Select from the following drive input fuses when using branch circuit protection.

Drive Rating C075	Fuse Size 90A	Fuse Type A4J, JJS or Equivalent

Terminal Block TB1 – B100-B125 & C100-C125 Power Wiring



❶ User supplied drive input fuses.

❷ Motor disconnecting means including branch circuit, short circuit, and ground fault protection.

GND

Chassis ground is used to connect the drive chassis to a common ground. The motor frame must also be connected to the same common ground. Either earth ground or the ground of the building system must be used. Refer to the motor manufacturer's guidelines for additional information.

+ DC, – DC

DC bus terminals are reserved for the 1336 dynamic brake option. Refer to the 1336 dynamic brake option instructions for installation and connection details.

M1, M2, M3

Connect the motor leads to these terminals.

L1, L2, L3

Input AC line Terminals L1, L2, L3 (∅A, ∅B, ∅C) are not phase sensitive.

For drives rated B100-B125, nominal input voltage is 380/415/460V AC ±10%, 3∅, 50/60 Hz.

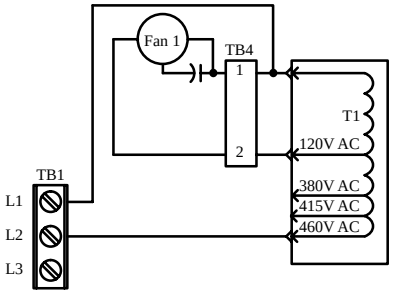
For drives rated C100-C125, nominal input voltage is 500 or 575V AC ±10%, 3∅, 50/60 Hz.

Branch disconnect and short circuit protection is not part of the standard 1336 and must be supplied by the user. Drive input fuses are required to provide component protection against malfunction of electronic circuits.

Terminal Block TB1 – B100-B125 & C100-C125 Power Wiring (cont.)

B100-B125 Fan Transformer Wiring

Drives rated B100-B125 are shipped from the factory with Fan Transformer T1 connected for 460V operation. Fan Transformer T1 has three tab connections marked 460V, 380V and 415V. For 380 or 415V drive operation, the Fan Transformer lead at transformer T1 must be unplugged and reconnected.



C100-C125 Fan Transformer Wiring

For drives rated C100-C125, reconnection of Fan Transformer T1 is not required for 500 or 575V AC operation.

Terminal Block TB1 – B100-B125 Power Wiring

Power Rating Code	Drive Output Current	Wire Group ❶	Maximum Wire Size ❷	Maximum Torque ❸
B100	150 Amps	2	350 MCM	275 In-lbs
B125	180 Amps	2	350 MCM	275 In-lbs

❶ Wire group number chart, page 6-3.

❷ 185 mm^2.

❸ 31.08 N-m.

Select from the following drive input fuses when using branch circuit protection.

Drive Rating B100	Fuse Size 200A	Fuse Type A4J, JJS or Equivalent
Drive Rating B125	Fuse Size 250A	Fuse Type A4J, JJS or Equivalent

Terminal Block TB1 – C100-C125 Power Wiring

Power Rating Code	Drive Output Current	Wire Group ❶	Maximum Wire Size ❷	Maximum Torque ❸
C100	109 Amps	2	350 MCM	275 In-lbs
C125	138 Amps	2	350 MCM	275 In-lbs

❶ Wire group number chart, page 6-3.

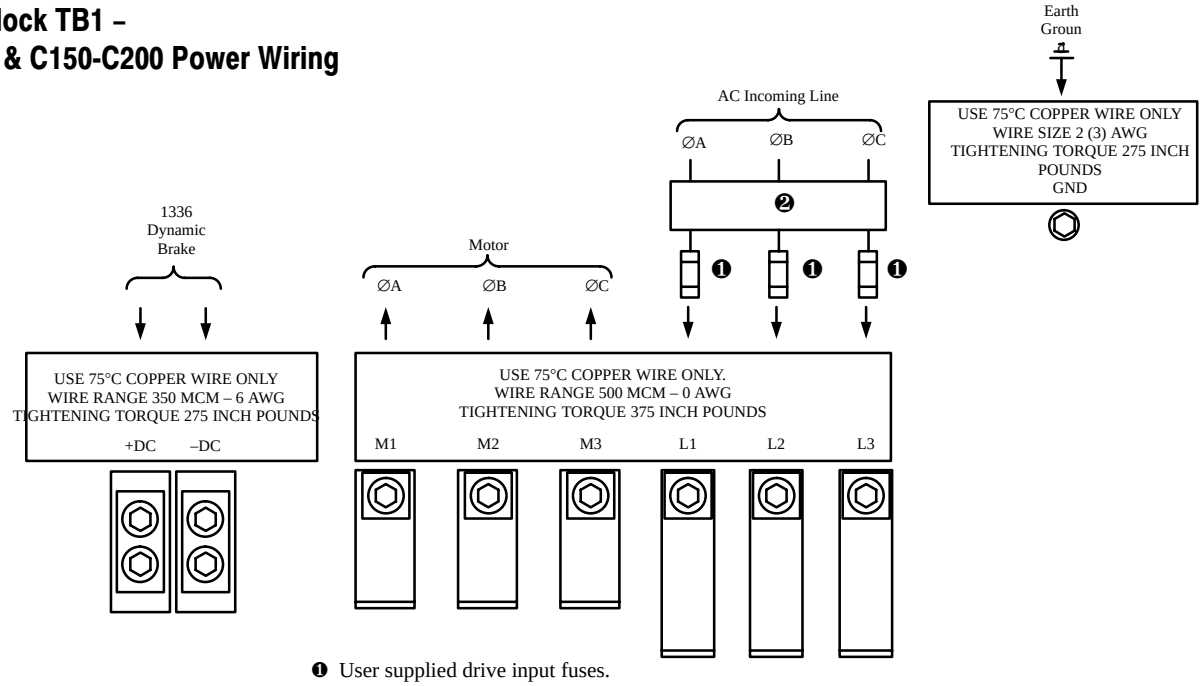
❷ 185 mm^2.

❸ 31.08 N-m.

Select from the following drive input fuses when using branch circuit protection.

Drive Rating C100	Fuse Size 125A	Fuse Type A4J, JJS or Equivalent
Drive Rating C125	Fuse Size 150A	Fuse Type A4J, JJS or Equivalent

Terminal Block TB1 – B150-B200 & C150-C200 Power Wiring



❶ User supplied drive input fuses.

❷ Motor disconnecting means including branch circuit, short circuit, and ground fault protection.

GND

Chassis ground is used to connect the drive chassis to a common ground. The motor frame must also be connected to the same common ground. Either earth ground or the ground of the building system must be used. Refer to the motor manufacturer's guidelines for additional information.

+ DC, – DC

DC bus terminals are reserved for the 1336 dynamic brake option. Refer to the 1336 dynamic brake option instructions for installation and connection details.

M1, M2, M3

Connect the motor leads to these terminals.

ATTENTION: A hazard of potential damage to drive output power components exists if there is insufficient load inductance to permit the drive short circuit protection function to be effective. Sufficient load inductance is provided by one of the following:

- Load reactors of 10mH connected to each motor lead.
- Motor leads with a minimum length of 40 feet (12.2 meters) between the drive and the motor.

Terminal Block TB1 – B150-B200 & C150-C200 Power Wiring (cont.)

L1, L2, L3

Input AC line Terminals L1, L2, L3 (∅A, ∅B, ∅C) are not ∅ sensitive.

For drives rated B150-B200, nominal input voltage is 380/415/460V AC ±10%, 3∅, 50/60 Hz.

For drives rated C150-C200, nominal input voltage is 500 or 575V AC ±10%, 3∅, 50/60 Hz.

Branch disconnect and short circuit protection is not part of the standard 1336 and must be supplied by the user. Drive input fuses are required to provide component protection against malfunction of electronic circuits.

Terminal Block TB1 – B150-B200 Power Wiring

Power Rating Code	Drive Output Current	Wire Group ❶	+DC and –DC Terminal Block Maximum Wire Size ❷	+DC and –DC Terminal Block Maximum Torque ❸	M1-M3 Terminal Block Maximum Wire Size ❹	M1-M3 Terminal Block Maximum Torque ❺
B150	218 Amps	2	350 MCM	275 In-lbs	500 MCM	375 In-lbs
B200	290 Amps	2	350 MCM	275 In-lbs	500 MCM	375 In-lbs

❶ Wire group number chart, page 6-3.

❷ 185 mm^2.

❸ 31.08 N-m.

❹ 240 mm^2.

❺ 42.38 N-m.

Select from the following drive input fuses when using branch circuit protection.

Drive Rating B150	Fuse Size 300A	Fuse Type A4J, JJS or Equivalent
Drive Rating B200	Fuse Size 400A	Fuse Type A4J, JJS or Equivalent

Terminal Block TB1 – C150-C200 Power Wiring

Power Rating Code	Drive Output Current	Wire Group ❶	+DC and –DC Terminal Block Maximum Wire Size ❷	+DC and –DC Terminal Block Maximum Torque ❸	M1-M3 Terminal Block Maximum Wire Size ❹	M1-M3 Terminal Block Maximum Torque ❺
C150	158 Amps	2	350 MCM	275 In-lbs	500 MCM	375 In-lbs
C200	210 Amps	2	350 MCM	275 In-lbs	500 MCM	375 In-lbs

❶ Wire group number chart, page 6-3.

❷ 185 mm^2.

❸ 31.08 N-m.

❹ 240 mm^2.

❺ 42.38 N-m.

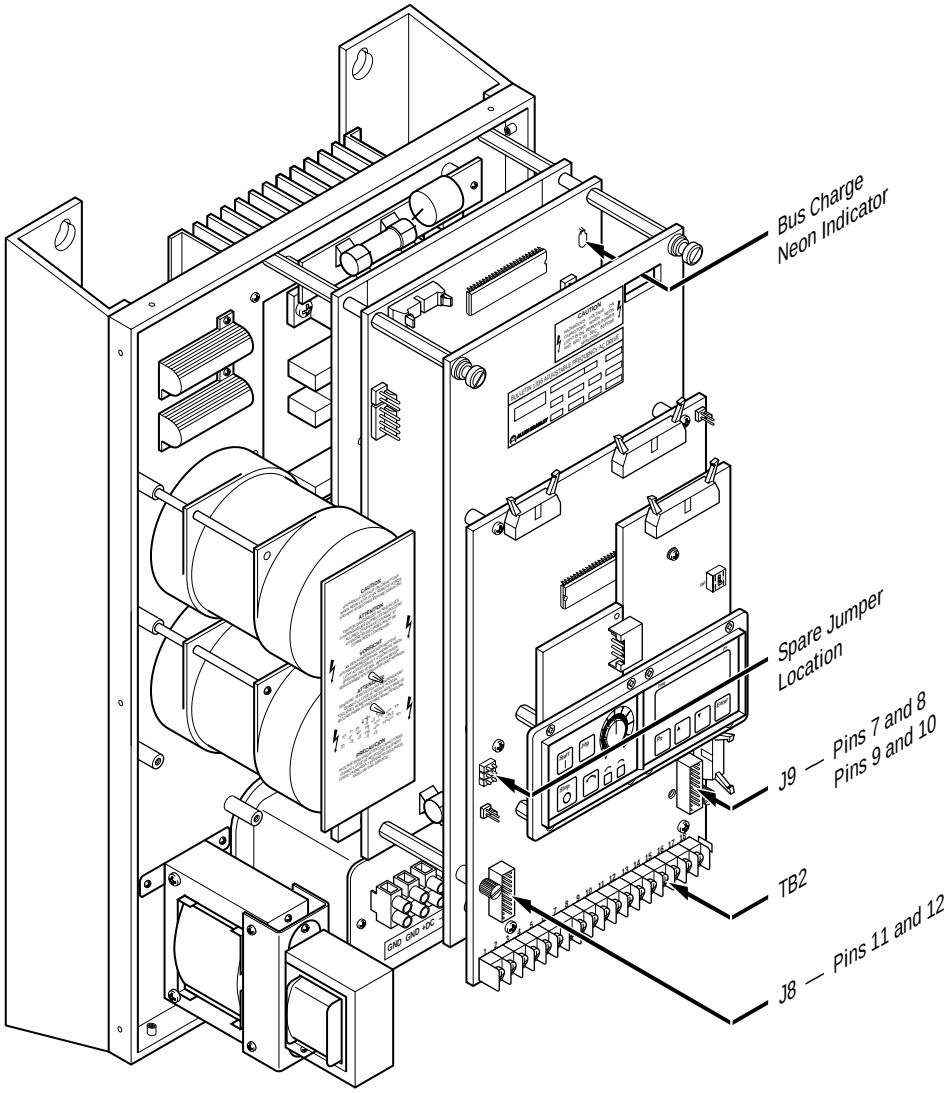
Select from the following drive input fuses when using branch circuit protection.

Drive Rating C150	Fuse Size 175A	Fuse Type A4J, JJS or Equivalent
Drive Rating C200	Fuse Size 250A	Fuse Type A4J, JJS or Equivalent

Terminal Block TB2 and TB3 – Control and Signal Wiring

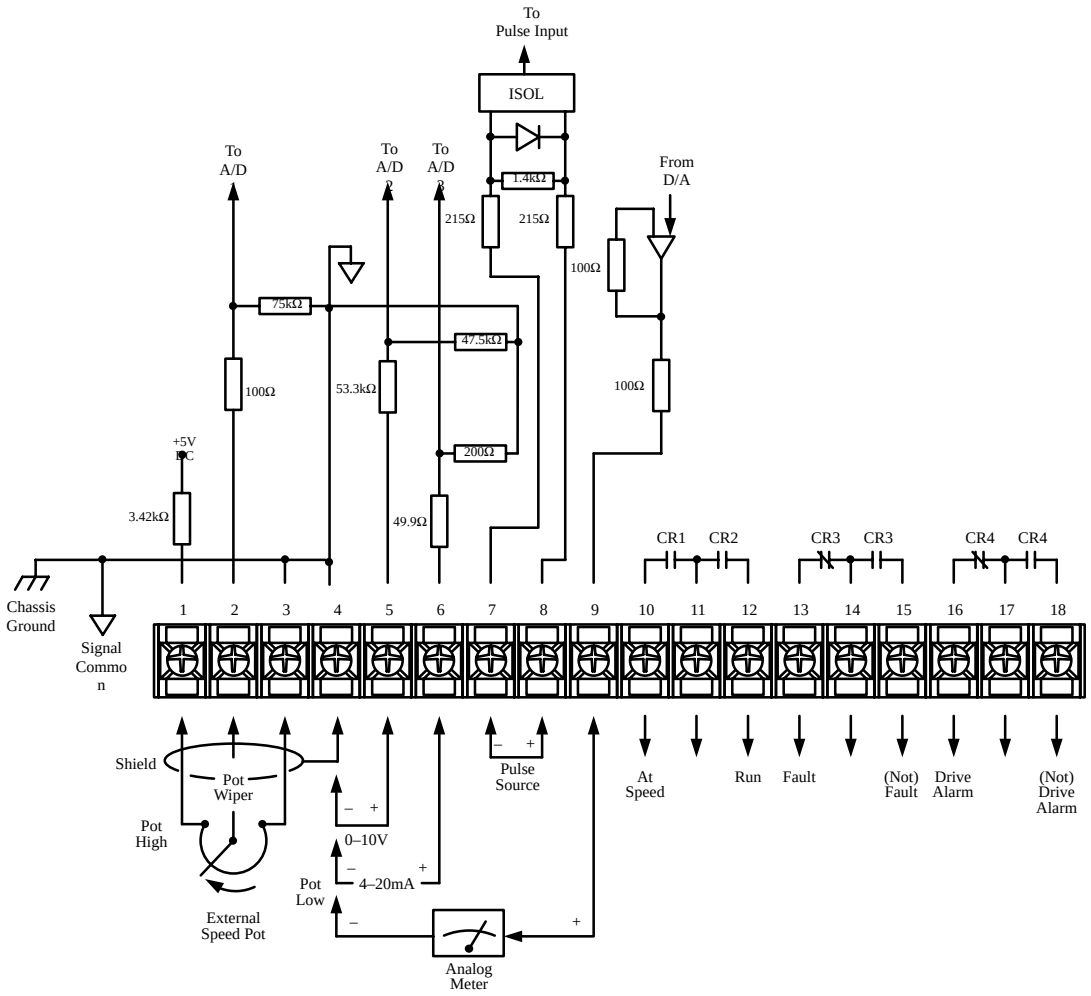
Terminal block TB2 is located at the bottom of the Main Control Board. TB2 is an eighteen position terminal block with markings of 1 to 18.

Terminal block TB3 is a twelve position terminal block located on optional interface boards L1, L2 or L3 directly above terminal block TB2. If either L1, L2 or L3 is present, refer to Appendix A — Logic Interface Options for wiring details.



Terminal Block TB2 Control and Signal Wiring

The drive is capable of operating from an optional Local or Remote Control Panel with minimum connections to terminal block TB2. When required, external operator elements may be connected to provide additional drive control. Additional drive control functions and status outputs are also available for use at TB2 as detailed on the following pages.



	Signal	Wire Group ❶	Maximum Wire Size ❷	Recommended Torque ❸
Terminals 1, 2, 3	External Speed Potentiometer	5	14 AWG	7 In-Lbs
Terminals 3 and 4	Signal Common	5	14 AWG	7 In-Lbs
Terminals 5, Signal Common	0-10V DC	5	14 AWG	7 In-Lbs
Terminals 6, Signal Common	4-20mA	5	14 AWG	7 In-Lbs
Terminals 7 and 8	Pulse Train	6	14 AWG	7 In-Lbs
Terminals 9, Signal Common	Meter Output	5	14 AWG	7 In-Lbs
Terminals 10 and 11	At Speed Contact	3	14 AWG	7 In-Lbs
Terminals 11 and 12	Run Contact	3	14 AWG	7 In-Lbs
Terminals 13, 14, 15	Fault Contacts	3	14 AWG	7 In-Lbs
Terminals 16, 17, 18	Drive Alarm Contacts	3	14 AWG	7 In-Lbs

❶ Wire group number chart, page 6-3.

❷ 2.50 mm^2.

❸ .79 N-m.

Terminal Block TB2 – Control and Signal Wiring (cont.)

Important: Control functions affected by drive parameter programming and selection are indicated on the following pages. Refer to the 1336 Programming Manual to verify that the drive is programmed to meet your requirements.

Terminal 1

Potentiometer High

Full CW or high side external potentiometer connection.

Terminal 2

Potentiometer Wiper

Wiper external potentiometer connection.

Terminal 3

Potentiometer Low

Full CCW or low side external potentiometer connection

These terminals are provided for connecting a remote 10kΩ potentiometer. The potentiometer frequency control is the range between drive minimum and maximum frequency settings.

For drives with Main Control Board Firmware Version 1.0. or 1.10, the frequency resolution is the range divided by 514, but no less than 0.005Hz.

For drives with Main Control Board Firmware Version 1.11-3.01, the frequency resolution is the range divided by 633, but no less than 0.005Hz.

Terminals 1, 2, 3

Open Circuit Detection

For drives with Main Control Board Firmware Version 1.01 or 1.11-3.01, drive logic is capable of detecting an open circuit potentiometer input at TB2, Terminal 3. Drive logic will detect an open circuit at the potentiometer low input only if the potentiometer wiper remains connected to Terminal 2 and pot high is connected to Terminal 1.

For drives with Main Control Board Firmware Version 1.01, drive logic is not capable of detecting an open circuit at TB2, Terminal 3.

Terminals 3 and 4

Signal Common

These terminals are provided to terminate both minus and drive common signals to TB2. Terminals 3 or 4 are also used to terminate any shields for cables connected to TB2.

Terminal Block TB2 – Control and Signal Wiring (cont.)

ATTENTION: Signal common is internally connected to chassis ground. User minus or user common connections to signal common must be capable of accepting this. If earth ground or cable shields are used as signal current paths, signals may be degraded.

Terminal 5 and Signal Common

0-10V DC Input

This terminal is provided to terminate a 0 to +10V DC speed reference signal. Parameter 84 sets the 0-10V DC signal to be either directly or inversely proportional. The minus signal is terminated at Terminals 3 or 4. The input impedance from Terminal 5 to either 3 or 4 is approximately 100kΩ. The range of frequency control is between the minimum and maximum drive frequency settings. The frequency resolution is the range divided by 976 (but no less than 0.005Hz). Refer to the 1336 Programming Manual for details.

ATTENTION: Unexpected machine acceleration can cause injury or death.

If Parameter 84 is enabled, a loss of the 0-10V DC reference signal at drive terminal block TB2 will allow the drive to immediately accelerate to the maximum frequency set by Parameter 19.

Ensure that all control connection integrity is maintained and routinely inspected.

ATTENTION: Terminal 5 of TB2 is internally protected from reverse polarity signals or input signals rising above 12V DC. If reverse polarity or voltage levels are maintained above 12V DC, signals may be degraded and component damage may result.

Terminal Block TB2 – Control and Signal Wiring (cont.)

Terminal 6 and Signal Common

4-20 mA Input

This terminal is provided to terminate a +4 to 20mA DC speed reference signal. Parameter 84 sets the 4-20mA signal to be either directly or inversely proportional. The minus signal is terminated at Terminals 3 or 4. The input impedance from Terminal 6 to either 3 or 4 is approximately 250Ω. The range of frequency control is between the minimum and maximum drive frequency settings. The frequency resolution is the range divided by 726 (but no less than 0.005Hz). Refer to the 1336 Programming Manual for additional details.

ATTENTION: Unexpected machine acceleration can cause injury or death.

If Parameter 84 is enabled, a loss of the 4-20mA reference signal at drive terminal block TB2 will allow the drive to immediately accelerate to the maximum frequency set by Parameter 19.

Ensure that all control connection integrity is maintained and routinely inspected.

ATTENTION: Terminal 6 of TB2 is internally protected from reverse polarity signals and input signals rising above 24mA. If reverse polarity or current levels are maintained above 24mA, signals may be degraded resulting in damage to the drive or connected equipment.

Terminal Block TB2 – Control and Signal Wiring (cont.)

Terminals 7 and 8

Pulse Source Input

These terminals are optically isolated and are provided to terminate a pulse train signal to the drive (Terminal 8+, Terminal 7–). When selected, the drive output frequency will be the pulse rate at Terminal 8 divided by the setting of Parameter 46, the Pulse Scale Factor. Refer to the 1336 Programming Manual for details.

Example:

Pulse Scale Factor = 64 (factory setting)

For the drive to generate a 60 Hz drive output, the pulse rate at Terminal 8 must be 60 x 64 or 3,840 pulse- per-second.

Maximum pulse input frequency =
250 (max freq) x 255 (max scale factor) = 63,750 pulse- per-second.

Pulse Source Requirements

- The drive minimum and maximum frequency setting will limit the output frequency to these settings if the pulse train results in a frequency outside that band.
- The pulse train must be an externally powered square wave, TTL logic level signal.
- At the +5V DC or high state, the signal source must produce a voltage from 4 to 5.5V DC capable of 16mA.
- At the 0 volts state the voltage must drop to 0.4V DC or less.



ATTENTION: If reverse polarity or voltage levels are maintained above +12V DC, signals may be degraded and component damage may result.

Terminals 9 and Signal Common

Analog Meter Output

This terminal provides a 0 to +5V DC signal that may be used with a user supplied analog meter. The load impedance of the meter must be 500Ω or higher. Parameter 25 sets the supply signal to be proportional to either drive output frequency or percent of load current. The minus signal is terminated at Terminals 3 or 4. The output is proportional to the signal selected reaching +5V DC at the maximum frequency setting or 150% of current.

Important: The displayed load current is an approximate value calculated from drive internal feedback. Motor characteristics will affect the accuracy of the load current indication.

Terminal Block TB2 – Control and Signal Wiring (cont.)

Terminals 10 and 11

At Speed

These terminals allow an internal drive supplied at speed contact to be used in external circuits. Parameter 77 allows the at speed contact to be programmed to change state within ±0.5% of maximum speed for one of two conditions — When the drive reaches command speed or when the drive reaches a programmed set point reference frequency. The contact is isolated from logic and other drive circuitry.

Resistive rating: 120V AC or 30V DC, 5.0 amps

Inductive rating: 120V AC or 30V DC, 2.0 amps

Terminals 11 and 12

Run

These terminals allow an internal drive supplied run contact to be used in external circuits. The N.O. contact closes when the drive is running and opens when the drive is stopped and not generating any output to the connected load. The contact is isolated from logic and other drive circuitry.

Resistive rating: 120V AC or 30V DC, 5.0 amps

Inductive rating: 120 V AC or 30V DC, 2.0 amps

Terminals 13, 14, 15

Fault

These terminals allow internal drive supplied fault contacts to be used in external circuits. The contacts are shown in the de-energized (faulted) state. When the drive is powered up and no fault is present, the contacts will change state, 13 to 14 will open, 14 to 15 will close.

Both the N.C. and N.O. contacts will change state
(13 to 14 will close, 14 to 15 will open) when the drive has detected a Fault or power is removed from the drive.

Resistive rating: 120V AC or 30V DC, 5.0 amps

Inductive rating: 120 V AC or 30V DC, 2.0 amps

Terminal Block TB2 – Control and Signal Wiring (cont.)

Terminals 16, 17, 18

Drive Alarm

These terminals allow internal drive supplied alarm contacts to be used in external circuits. The contacts are shown in the de-energized (alarm) state. When the drive is powered up and no alarm is present, the contacts will change state: 16 to 17 will open, 17 to 18 will close.

Both the N.C. and N.O. contacts will change state
(16 to 17 will close, 17 to 18 will open) when the drive has detected an alarm or power is removed from the drive.

Resistive rating: 120V AC or 30V DC, 5.0 amps

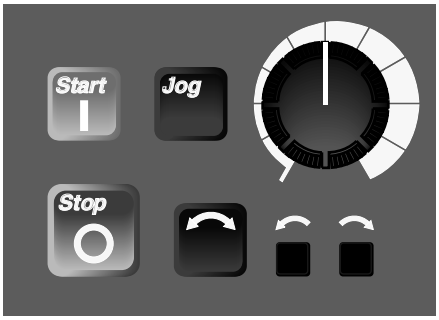
Inductive rating: 120 V AC or 30V DC, 2.0 amps

Drive Alarm Conditions are:

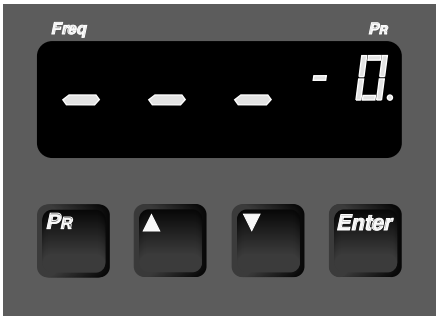
- Drive output current is above 150% of rated current.
- Drive output current is above the MOPC limit set by Parameter 36.
- Bus voltage is above 110% of nominal input voltage. A continued rise in bus voltage may result in Parameter 11 Decel Frequency Hold affecting the decel ramp, or fault F05 Bus Overvoltage.
- Bus voltage is below 85% of nominal input voltage.
- Precharge not complete.
- Parameter 14 Auto Restart is active.

Chapter 7

Operation



Control Panel



Programming and Display Panel

Important: 1336 Control Panels are not intended to replace or be considered a suitable alternative for an operator control station for all applications. If two-wire control is installed, option L1, L2 or L3 must also be installed. With two-wire control, the stop pushbutton on all Control Panels will allow the drive to restart once the button is released. Refer to codes and standards applicable to your particular system for specific requirements and additional information.

Drive Restart

Important: The 1336 drive may be programmed to avoid responding to unintentional start commands. The stop input to the drive must first be false, then returned to true to restart the drive:

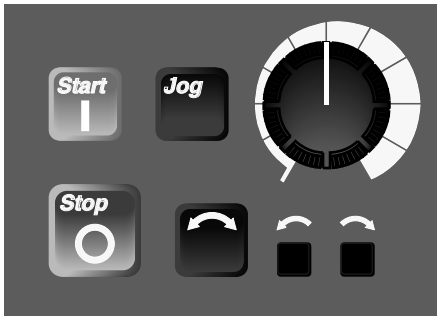
- When exiting programming at the Programming and Display Panel.
- After a power-on reset fault has occurred, if Parameter 14 is set to **0**.
  - F01 power-on reset is displayed when power is first applied to the drive and when a fault is cleared.
  - If Parameter 14 is set to **1** and Option L1, L2 or L3 is installed to provide two-wire control, cycling a stop input is not required after reapplying power or clearing a fault.

If this sequence is not followed, the drive will fault and display F11. When Parameter 14 is set to 0, the stop command must be repeated twice, once to clear the fault, then again to reset drive logic once the fault has been cleared.

A stop input is any valid stop signal that the drive receives. Valid stop inputs are:

- The Stop pushbutton on a Control Panel — As shown on the following page.
- The stop input wired to TB3 at Terminal 20 — As explained in Appendix A, Logic Interface Options.
- When serial communications is used, writing to Parameter 51 to clear the fault, then setting the stop bit of the serial input control word in Parameter 57 — As explained in the 1336 Programming Manual.

Local or Remote Control Panel



ATTENTION: Unexpected machine motion can cause injury or death. Do not use a Local or Remote Control Panel with option L1, L2, or L3 in any 2-wire start/stop control application.

A maintained start command or 2-wire control between terminals 19 and 20 of TB3 on option L1, L2 or L3 will affect Control Panel stop pushbutton operation. The drive will automatically restart after the Control Panel stop pushbutton is depressed and released.

Local or Remote Control Panel (cont.)

To allow Control Panel control:

- The Start pushbutton requires that Parameter 21 be set to on 1.
- The Jog pushbutton requires that Parameter 23 be set to on **1**.
- The direction pushbutton requires that Parameter 22 be set to on **1**.
- The speed potentiometer is dependent upon the programming of Parameters 5 and 6 and the status of speed select. Speed select is controlled by TB3, Terminal 27 or serial programming. Refer to Chapter 8 — Speed Selection for additional details.



Pressing the Start pushbutton will initiate drive operation and accelerate the drive to the selected speed if:

Parameter 21 is set to on **1**.



The Stop pushbutton remains operational when stop devices are connected to Control and Signal Wiring Terminal Block TB2, unless Option L1, L2 or L3 is installed, and two-wired control has also been installed. Pressing the stop pushbutton will initiate the stop sequence and the drive will cause the motor to:

- Coast-to-stop if Parameter 10 is set to **0**.
- Brake-to-stop by DC injection if Parameter 10 is set to **1**.
- Ramp-to-stop if Parameter 10 is set to **2**.

If the drive has stopped due to a fault, pressing the Stop pushbutton will only clear the display and reset the drive, not correct the fault.



Pressing the Jog pushbutton will jog the drive if:

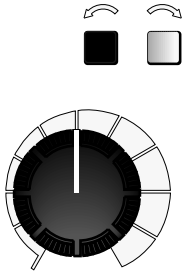
Parameter 23 is set to (on) **1** .



Pressing the direction pushbutton will cause the motor to ramp down to zero, then ramp up to set speed in the opposite direction if:

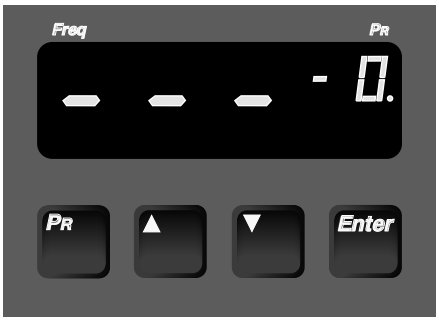
Parameter 22 is set to (on) **1**.

When power is applied to the drive, one of these two lights will be lit to indicate the selected direction of motor rotation.



Turning the speed potentiometer will adjust or set drive output frequency if the speed pot has been selected and is functional.

Programming and Display Panel

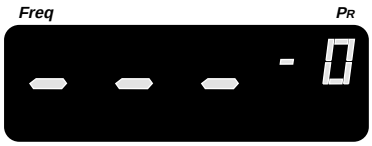


All Programming and Display Panels provide a means of displaying different drive status conditions while providing pushbutton control for selected viewing and parameter programming.

The Freq display is a three character display that shows:

Standby Status Display

The standby status of the drive when it is waiting for a drive start or jog command.



Output Frequency Display

The drive output frequency appears when the drive is running.



Fault Display

Fault codes appear if the drive detects a fault condition.



Parameter Programming Display

Parameter values appear when viewing or programming drive parameters.



Operating Display

The Pr display is a two character display that shows the frequency source when the drive is in Standby, Jog or Running.



- **– 0** Control Panel speed pot
- **– 1** 0 to +10V input
- **– 2** 4-20mA input
- **– 3** Pulse train input
- **– 4** Serial input
- **– 5** TB2 speed pot input
- **– 6** Jog selected
- **– 7** Preset Speed 1
- **– 8** Preset Speed 2
- **– 9** Preset Speed 3 or if Parameter 72 is set to **1**, Preset Speeds 4-7

Important: No dash indicates a parameter number rather than a frequency source.

Parameter Viewing Display

The parameter number appears when viewing parameters.



Parameter Programming

A decimal point appears if parameter programming has been selected and is allowed. If the programming function is locked out, check switch SW1 on the Local Display and Programming Panel Card, option FA2. The switch must be set to C1 to allow parameter programming.



Fault Display

Two dashes appear if a fault has occurred.



Special Display — Enable Loss

All dashes appear if an enable loss has occurred.



Chapter 8

Speed Selection

Speed Source Priority

The 1336 drive can receive speed or frequency commands from a number of sources. These sources have been given various priorities so that speed source selection may be defined and understood. The numbered speed sources shown below are listed by priority and how they are selected.

Priority 1 – Jog Speed

Jog may be selected if the drive is not running. Jog is selected by a Local or Remote Control Panel Jog pushbutton, Terminal 22 of TB3, or by serial input programming from an Allen-Bradley PLC. All Programming and Display Panels will display Pr = **-6** when jog is selected.

Priority 2 – Preset Speed 1-7

Preset speeds are selected by combinations of inputs at Terminals 24 and 26 of TB3 or by serial input programming from an Allen-Bradley PLC.



All Programming and Display Panels will display:

Pr = **- 7** when preset Speed 1 is selected.

Pr = **- 8** when preset Speed 2 is selected.

Pr = **- 9** when preset Speed 3 is selected or if Parameter 72 is set to 1, preset Speed 4, 5, 6 or 7.

Priority 3 – Speed Select Input Is True – Parameter 6

The speed source programmed by Parameter 6 will be selected when the speed select input at Terminal 27 is true. Parameter 6 may be programmed for one of the following six sources:



Pr = **- 0** if Parameter 6 = 0, Control Panel speed potentiometer

Pr = **- 1** if Parameter 6 = 1, 0-10V DC input.

Pr = **- 2** if Parameter 6 = 2, 4-20mA input.

Pr = **- 3** if Parameter 6 = 3, pulse train input.

Pr = **- 4** if Parameter 6 = 4, serial input.

Pr = **- 5** if Parameter 6 = 5, remote speed potentiometer input.

Priority 4 – Speed Select Input Is False – Parameter 5

The speed source programmed by Parameter 5 will be selected when the speed select input at Terminal 27 is false. The speed source programmed by Parameter 5 will be the default speed source, the lowest speed source priority. Parameter 5 may be programmed for one of the following six sources:



Pr = **- 0** if Parameter 5 = 0, Control Panel speed potentiometer.

Pr = **- 1** if Parameter 5 = 1, 0-10V DC input.

Pr = **- 2** if Parameter 5 = 2, 4-20mA input.

Pr = **- 3** if Parameter 5 = 3, pulse train input.

Pr = **- 4** if Parameter 5 = 4, serial input.

Pr = **- 5** if Parameter 5 = 5, remote speed potentiometer input.

Chapter 9

Startup

The following startup procedure is written for users who have a Control Panel and a Programming & Display Panel installed and who are not using a 2-wire drive control scheme. For users without a Control Panel and a Programming & Display Panel, respective external commands and signals must be substituted to simulate their operation.

ATTENTION: Power must be applied to the drive with the cover removed to perform certain startup procedures. Voltages on many components are at incoming line potential or bus voltage. To avoid electric shock hazard or damage to equipment, do not touch any drive component other than those specified in the startup procedure.

ATTENTION: Become familiar with the equipment and read through the wiring, speed selection and adjustment sections before attempting to perform the startup procedures. Adjustments may be required to meet specific load characteristics or operator preference.

Exercise extreme care when performing any task on the drive. Failure to do so may result in electric shock or equipment damage.

As shown on page 6-16, a bus charge neon indicator at the top of the 1336 has been provided to provide visual indication that bus voltage is present. Bus voltage may be verified by using a voltmeter and measuring the voltage between +DC and –DC on terminal block TB1. Do not attempt to service the drive until the neon indicator has extinguished and the bus voltage has discharged to zero volts.

Important:

1. Power must be applied to the drive when viewing or changing 1336 parameters. Previous programming may effect the drive status when power is applied in Step 7.
2. If option L1, L2 or L3 is installed, remote start circuits may be connected to TB3 on the Interface Board. Confirm that all circuits are in a de-energized state before applying power.
3. If option L1, L2 or L3 is installed, user supplied voltages may exist at TB3 on the interface board even when power is not applied to the drive.
4. If you cannot complete a procedure, refer to Chapter 10 — Fault Codes immediately. Do not proceed. Determine the cause of the problem and correct the problem first, then return to the startup procedure.

Initial Operation – Motor Disconnected

Step 1

Verify that AC line power at the disconnect device is within the rated value of the drive. Drive nameplate and alternate voltage ratings are listed in Chapter 2 — Drive and Option Identification.

Step 2

Remove and lock out all incoming power to the drive. Remove the drive cover and disconnect motor leads from drive terminals M1, M2 and M3.

Step 3

If one of the following optional interface boards is installed:

1336-MOD-L1
1336-MOD-L2
1336-MOD-L3

- Verify that interface input connections to the board match the voltage rating of the board.
- Verify that enable and auxiliary interlock inputs are provided.

Step 4

If option L1, L2 or L3 is not installed, verify that the three spare jumpers provided with the drive are installed correctly at connectors J8 and J9.

Control Board connector J8 — Pins 11 and 12 jumpered

Control Board connector J9 — Pins 7 and 8 jumpered
Pins 9 and 10 jumpered

Step 5

Confirm that all other optional inputs are connected to their correct terminals and are secure.

Step 6

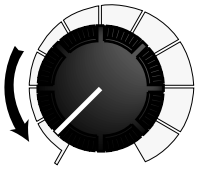
Replace the drive cover and tighten all thumbscrews.

Initial Operation – Motor Disconnected (cont.)

Important: The remaining steps in this start up procedure are based on factory parameter settings. If the drive has been previously commissioned, parameter settings may not be compatible with this start up procedure. Drive status and fault conditions will be unpredictable when power is first applied in Step 7.

To obtain the proper results, initially change all parameter values to their factory settings. As you proceed through the steps, change each parameter to the setting that you require.

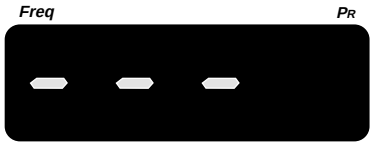
Step 7



Turn the Control Panel speed pot fully counterclockwise. Apply power to the drive.

The Programming and Display Panel should light and display F01, then after 3 seconds – – – . If any fault code is displayed after 3 seconds, record the fault and immediately remove power, then determine the fault source.





Step 8



Use the Programming and Display Panel to view each of the 71 drive parameters. Verify that each parameter is the value you require. If parameter values must be changed, refer to Chapter 1 — Local Programming, in the 1336 Programming Manual. After all parameters have been checked, return to the operating display by simultaneously pressing the ▲ and ▼ pushbuttons.

Initial Operation – Motor Disconnected (cont.)

Step 9a

The P_R portion of the Programming and Display Panel will indicate the speed source currently being used. Verify that the drive will accept the required speed reference sources.



Are preset speeds to be used?

No – Go to Step 9b.

Yes – Select preset Speed 1.
Display must be **- 7**.

Select preset Speed 2.
Display must be **- 8**.

Select preset Speed 3.
Display must be **- 9**.

Select preset Speed 4.
Display must be **- 9**.

Select preset Speed 5.
Display must be **- 9**.

Select preset Speed 6.
Display must be **- 9**.

Select preset Speed 7.
Display must be **- 9**.

Open all preset speed inputs.

Initial Operation – Motor Disconnected (cont.)

Step 9b

Speed select allows switching between one of two speed references. Is the speed select function being used?

No – Go to Step 9c.

Yes – Close the speed select input. The display will show the speed source programmed in Parameter 6. Parameter 6 may be one of the following values.



Pr = **- 0** if Parameter 6 = 0, Control Panel speed potentiometer.

Pr = **- 1** if Parameter 6 = 1, 0-10V DC input.

Pr = **- 2** if Parameter 6 = 2, 4-20mA input.

Pr = **- 3** if Parameter 6 = 3, pulse train input.

Pr = **- 4** if Parameter 6 = 4, serial input.

Pr = **- 5** if Parameter 6 = 5, remote speed potentiometer input.

Check Parameter 84 – Analog Inverse.

If set to **1** (On), the 0-10V DC or 4-20mA input signals at Terminal Block TB2 in the drive will produce an inverse speed signal.

A 0V DC or 4mA signal will produce maximum drive output frequency as set by Parameter 19. A 10V DC or 20mA signal will produce minimum drive output frequency as set by Parameter 16.

Initial Operation – Motor Disconnected (cont.)

Step 9c

The default selection or the speed source selected with the speed select open is the source programmed in Parameter 5. Parameter 5 may be one of the following values:



Pr = **- 0** if Parameter 5 = 0, Control Panel speed potentiometer

Pr = **- 1** if Parameter 5 = 1, 0-10V DC input.

Pr = **- 2** if Parameter 5 = 2, 4-20mA input.

Pr = **- 3** if Parameter 5 = 3, pulse train input.

Pr = **- 4** if Parameter 5 = 4, serial input.

Pr = **- 5** if Parameter 5 = 5, remote speed potentiometer input.

Check Parameter 84 – Analog Inverse.

If set to **1** (On), the 0-10V DC or 4-20mA input signals at Terminal Block TB2 in the drive will produce an inverse speed signal.

A 0V DC or 4mA signal will produce maximum drive output frequency as set by Parameter 19. A 10V DC or 20mA signal will produce minimum drive output frequency as set by Parameter 16.

Step 10

For convenience, the control elements on the Control Panel should be active.

Verify or change the following parameters:

Set Parameter 5, Frequency Select = **0** (Control Panel speed pot active).

Set Parameter 21, Local Run = **1** (allow Control Panel run control).

For local reversing, set Parameter 22, Local Reverse = **1** (allow Control Panel reverse control).

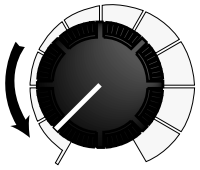
If jog is desired, set Parameter 23, Local Jog = **1** (allow Control Panel jog control).

Return to the operating mode.

Initial Operation – Motor Disconnected (cont.)

Step 11

With the Control Panel speed pot active (Pr display = **- 0**), turn the speed pot fully counterclockwise.





Reset the drive by pressing the Stop pushbutton.

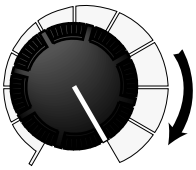


Press the Start pushbutton and start the drive.

The drive will ramp to the minimum speed set by Parameter 16.

Important: If a dwell frequency is programmed, the drive will first jump to the dwell frequency for the dwell time, then ramp to the minimum frequency value set by Parameter 16.

Step 12

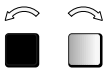


While the drive is running, turn the local speed pot fully clockwise. The drive will ramp to the maximum output frequency value set by Parameter 19.

Step 13



Press the direction pushbutton.



If reversing is active (Parameter 22 = **1**), the drive will ramp to zero speed, then ramp to maximum speed as indicated on the display panel. The LEDs on the Control Panel will switch to the selected direction of rotation.

If reversing is not active (Parameter 22 = **0**), pressing the direction pushbutton will not change drive direction, and the same directional LED on the Control Panel will remain lit.

Initial Operation – Motor Disconnected (cont.)

Step 14



While the drive is running, open the Enable Signal at TB3, Terminal 30. The drive will stop and display the Enable Lost Code – – – - -.

Restore the enable signal.

Step 15 Auxiliary Interlock Check



Restart the drive. With the drive running, open the auxiliary interlock signal at TB3, Terminal 28. The drive will stop and display the Enable Fault F02 – –.





Restore the auxiliary signal and reset the drive by pressing the Stop pushbutton twice.

Step 16 Jog Check



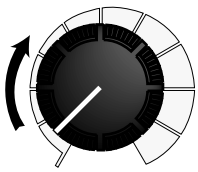
With the drive reset but not running, press and hold the Jog pushbutton on the Control Panel.

If the Jog function is active (Parameter 23 = **1**), the drive will start and ramp to jog speed.

If the Jog function is not active (Parameter 23 = **0**), the drive will not start.

Step 17 Skip Frequencies





Start the drive and slowly progress through the drive frequency range by turning the Control Panel speed pot clockwise.

If skip frequencies are programmed, verify that the drive cannot be set to a skip frequency but will remain above or below the skip frequency as set by the Skip frequency range.

If skip frequencies are not programmed, verify that the drive will not skip any frequencies in the drive operating range.

Initial Operation
– Motor Disconnected (cont.)

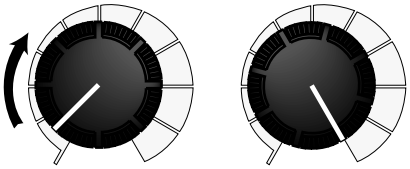
Step 18 Preset Frequencies

If preset frequencies are not to be used, go to Step 19.

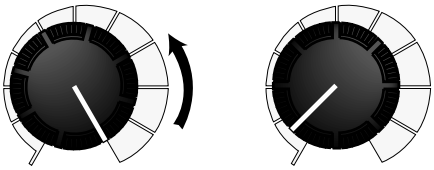
If Preset Frequencies 1-3 are used, set Parameter 72 (Activate Parameters 73-76) to **0** (Off). With the drive running, select each of the preset frequencies by closing the inputs at Terminals 24 and 26 of TB3. As each preset frequency is selected, the drive will ramp to that frequency and remain there until the next frequency is selected.

If Preset Frequencies 4-7 are used, set Parameter 72 (Activate Parameters 73-76) to **1** (On) and repeat the procedure.

Step 19 Accel and Decel Times



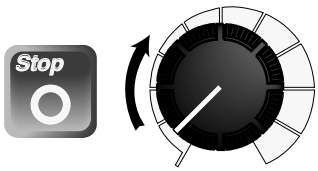
Estimate the time required for the motor to accelerate and decelerate between Minimum Frequency (Parameter 16) and Maximum Frequency (Parameter 19). With the drive running and controlled by the Control Panel speed pot, check the accel time by turning the speed pot from fully counterclockwise to fully clockwise.



Check the decel time by turning the speed pot from fully clockwise to fully counterclockwise.

If the second accel and decel times are to be used (Parameters 30 and 31), repeat the above procedure using the second accel and decel times.

Step 20



Stop the drive and remove input power to the drive. When the local displays are no longer lit, remove the drive cover and verify that the DC bus neon indicator is not lit and that the bus voltage at terminals +DC and -DC on the power terminal block is zero. Reconnect the motor leads to the drive and replace the drive cover. Set the Control Panel speed pot fully counterclockwise.

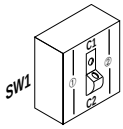
Initial Operation – Motor Connected

ATTENTION: The following steps may cause motor rotation in an unknown direction. To guard against equipment damage, always disconnect the motor from the load before proceeding.

Step 21

Reapply power to the drive.

Minimize the possibility of incorrect motor rotation by changing the following parameters.



If the chassis mounted Local Programming and Display Panel is installed, check that SW1 is in the C1 position to enable programming.



Press Pr to enter the programming mode and change:

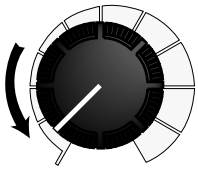
Parameter 16, minimum frequency, to **0**

Parameter 43, dwell frequency, to **0**.



Simultaneously press ▲ and ▼ to return to the operating mode.

Step 22



Before starting the drive, select the forward direction of rotation and turn the Control Panel speed pot fully counterclockwise.



Start the drive and slowly turn the speed pot until the motor begins to turn. Check the direction of motor rotation, then stop the drive.

If the direction of rotation is correct, go to Step 23.

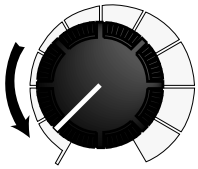
If the direction of motor rotation is incorrect:

- **Remove input power**, wait until the displays are no longer lit, then remove the drive cover.
- Verify that the bus is fully discharged and that the bus voltage at terminals +DC and -DC on the power terminal block is zero.
- Interchange any two of the three motor leads at TB1 – M1, M2 or M3.
- Replace the cover, reapply power to the drive, then repeat Step 22 for correct motor rotation.

Initial Operation – Motor Connected (cont.)

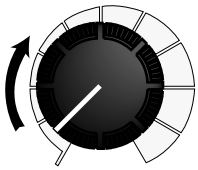
Step 23

Turn the Control Panel speed pot fully counterclockwise.



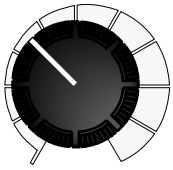


Start the drive.



Slowly increase motor speed and check for proper motor operation throughout the speed range of the drive.

Step 24



With the drive operating at 1/4 speed or greater:



Stop the drive and verify that the stopping mode selected by Parameter 10 occurs.

Step 25



Stop the drive.



Press Pr to enter the programming mode and reset the parameters in Step 21 and any other parameters that were changed during the setup procedure.

Review each parameter description in the Programming Manual. Determine the value required for the application and set the parameter. Make a record of any “estimated” values.



Press ▲ and ▼ simultaneously to return to the operating mode.

Initial Operation – Motor Connected (cont.)

Step 26

If the drive is to receive control signals and data from a programmable controller via the MOD-G2 Remote I/O communication option, the programmable controller must be tested with the motor disconnected from the load.

Prepare all drive control signal interfaces and Remote I/O option for programmable controller operation. Refer to Remote I/O Instruction Manual.

Reset appropriate drive control parameters 5-50 and 72-86. Particular attention must be given to Parameter 22 – Local Reverse and Parameter 84 – Analog Inverse.

Apply power and test the program. Observe drive operation and correct all communications, drive operation and equipment malfunction default problems immediately.

After achieving proper operation, record all parameter values in the Programming Manual.

Step 27



ATTENTION: To avoid hazards of electrical shock or injury from moving equipment, product or process ingredients:

- Alert all personnel.
- Install all guards.
- Check operation of all safety devices.
- Be prepared to stop the motor immediately.

Disconnect and lock-out all power. Connect the motor to the load.

Before applying power, review the parameter descriptions in the Programming Manual. Each parameter may have a significant effect on fundamental drive and motor operation regardless of the control method used.

Initial Operation – Motor Connected (cont.)

Step 27 (cont.)

Apply power. Prepare to operate the drive and motor under actual control and load conditions. It is desirable to begin at low torque and speed.



Start the motor and run the machine or process to determine if parameter settings are acceptable for the application.



Stop the motor.



Press Pr to enter the programming mode if changes in parameter values are necessary. Refer to the Programming Manual each time a change is made to a parameter. Record each setting and the corresponding drive, motor, and machine behavior (or process deviation) for future reference.



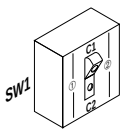
Simultaneously press ▲ and ▼ to return to the operating mode.

After achieving satisfactory operation, record all final parameter values in the Programming Manual.

Step 28



Stop the drive. Disconnect and lock-out all power.



If the chassis mounted Local Programming and Display Panel is installed, the programming ability may be disabled by setting SW1 to C2. This concludes the initial startup procedure.

Chapter 10

Fault Codes

Up to 37 fault codes may be displayed for the 1336. In each instance, a Fault may be reset by cycling power to the drive, or if Parameter 39 is set to **1**, by pressing the Stop pushbutton. Resetting a Fault will not correct the problem. Corrective action must be taken prior to resetting the fault.

2-Position Mode Display Area



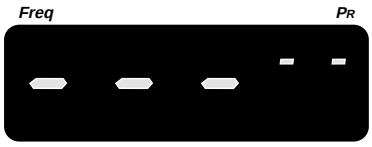
The two character PR display is not used as part of the fault code display. However, it may be used to indicate the loss of enable.

3-Position Fault Code Display Area



The three character Freq display is used to indicate the fault code acronym. The fault acronym will be displayed until a drive reset is initiated.

Special Display – Enable Fault



The enable interlock is open. The enable interlock is:

Jumper 7-8 of J9 on the Main Control Board if interface option L1, L2, L3 is not installed.

Terminal 30 of TB3 if interface option L1, L2, L3 is installed.

Special Test – Input Reset



This is not a fault but a code that is displayed each time the drive is powered up or when a fault is cleared. It indicates that drive logic is being reset to initial conditions.

Auxiliary Fault



The auxiliary input interlock is open. The auxiliary interlock is:

Jumper 9-10 of J9 on the Main Control Board if interface option L1, L2, L3 is not installed.

Terminal 28 of TB3 if interface option L1, L2 L3 is installed.

Power Loss



Occurs only if Parameter 40 is set to **0** and input power is interrupted for 0.2 seconds. Monitor the incoming AC line for low voltage or line power interruption.

Bus Undervoltage



Occurs when the DC bus drops below:

388V DC for drives with Base Driver/Power Supply Board Firmware Versions 1.11, 1.13, 1.14 or 3.01.

456V DC for drives with Base Driver/Power Supply Board Firmware Versions 1.01.

Monitor the incoming AC line for low voltage or line power interruptions.

Bus Overvoltage



Occurs when the DC bus rises above:

810V DC for drive ratings B003-B200.

975V DC for drive ratings C003-C200.

May be caused by high line voltage or excessive regeneration from the motor. Monitor the AC line for high line voltage or transient conditions. If caused by motor regeneration, extended decel time or dynamic braking may be required.

Motor Stalled



Indicates that the drive has not been able to change output frequency for:

4 seconds for drives with Base Driver/Power Supply Board Firmware Versions 1.11, 1.13, 1.14 or 2.01.

10 seconds for drives with Base Driver/Power Supply Board Firmware Versions 1.01.

Conditions sensed are:

Excessive Current
The motor is drawing excessive current (over 150%). The motor load is excessive and will not allow the drive to accelerate to set speed. A longer accel time or a reduced load may be required.

Bus Voltage Rise
The bus voltage has risen to 110% of nominal bus voltage. This indicates a regeneration condition that will not let the drive decelerate to a lower frequency. A longer decel time or dynamic braking may be required.

Motor Overload



The drive output current has exceeded the % of current set by Overload Current Parameter 38 for some period of time. The time is dependent on the level of current above the set value. The fastest time is 150% of Parameter 38 for one minute. This indicates an excessive motor load that must be reduced to the value programmed by Parameter 38.

Over Temperature



Drive logic has detected an open temperature switch on the drive heatsink indicating that drive heatsink temperature is above 100°C. Check for blocked or dirty heatsink fins. Check that the ambient temperature has not exceeded 40°C. For B010 or C010 units and larger units, check the operation of the drive cooling fan.

Open Potentiometer



An open potentiometer circuit has been detected. Check the external potentiometer circuit at TB2, Terminals 1, 2 and 3 for an open circuit.

Serial Error



This Fault indicates a break in communications between the drive and the 1336-MOD-G2 Remote I/O Board. This fault is sensed only after the drive is powered up and has sensed the presence of the Remote I/O Board by establishing a communications link to the board.

Operator Error



Logic has detected incompatible parameters.
Verify the drive reset sequence after exiting the programming mode when using a Programming and Display Panel.

Check Parameter 14. If set to **0**, the stop input must be cycled once to generate code F01, then again after power-on-reset is complete to reset the drive.
Verify that Parameters 10 and 42 are compatible with Parameter 41.

Parameter 10, Stop Select, and Parameter 42, Slip Compensation, must be compatible with Parameter 41, Motor Type, as detailed in the 1336 Programming Manual.

Overcurrent



The drive has exceeded 180% of its current rating. Check for a short circuit at the drive output or excessive load conditions at the motor.

Ground Fault



A current path to earth ground has been detected at one or more of the drive output terminals. Check the motor and external wiring to the drive output terminals for a grounded condition.

U VW Output Short



A short circuit has been detected between two or more of the drive output terminals. Check the motor and external wiring to the drive output terminals for a shorted condition.

V UW Output Short



A short circuit has been detected between two or more of the drive output terminals. Check the motor and external wiring to the drive output terminals for a shorted condition.

W UV Output Short



A short circuit has been detected between two or more of the drive output terminals. Check the motor and external wiring to the drive output terminals for a shorted condition.

Negative Phase Transistor Short



A shorted drive transistor has been detected. Check drive output transistors, both upper and lower portions of each transistor, for a shorted condition.

Positive Phase Transistor Short



A shorted drive transistor has been detected. Check drive output transistors, both upper and lower portions of each transistor, for a shorted condition.

Precharge Open



An error has been detected in the precharge circuit that does not allow precharge to occur. Check the precharge circuit.

Clear Jammed



A fault has been detected originating from the Base Driver/Power Supply Board. Check all wire and cable connections to the Base Driver/Power Supply Board. Replace the Base Driver/Power Supply Board if required.

PWM Check



A fault has been detected originating from the Base Driver/Power Supply Board. Check all wire and cable connections to the Base Driver/Power Supply Board. Replace the Base Driver/Power Supply Board if required.

Drive Reset



A fault has been detected originating from the Base Driver/Power Supply Board. Check all wire and cable connections to the Base Driver/Power Supply Board. Replace the Base Driver/Power Supply Board if required.

Loop Overrun



A fault has been detected originating from the Base Driver/Power Supply Board. Check all wire and cable connections to the Base Driver/Power Supply Board. Replace the Base Driver/Power Supply Board if required.

Motor Mode



A fault has been detected originating from the Base Driver/Power Supply Board. Check all wire and cable connections to the Base Driver/Power Supply Board. Replace the Base Driver/Power Supply Board if required.

Overspeed



A fault has been detected originating from the Base Driver/Power Supply Board. Check all wire and cable connections to the Base Driver/Power Supply Board. Replace the Base Driver/Power Supply Board if required.

Power Mode



A fault has been detected originating from the Base Driver/Power Supply Board. Check all wire and cable connections to the Base Driver/Power Supply Board. Replace the Base Driver/Power Supply Board if required.

PWM Loss



A fault has been detected originating from the Base Driver/Power Supply Board. Check all wire and cable connections to the Base Driver/Power Supply Board. Replace the Base Driver/Power Supply Board if required.

Slave Timeout



A fault has been detected originating from the Base Driver/Power Supply Board. Check all wire and cable connections to the Base Driver/Power Supply Board. Replace the Base Driver/Power Supply Board if required.

Hertz Error



The drive cannot find a valid frequency. Check the combinations of skip frequencies to see if they completely overlap the minimum to maximum frequency range. Check that Minimum Frequency, Parameter 16, is less than Maximum Frequency, Parameter 19.

Hertz Select



A fault has been detected originating from the Main Control Board. Check all wire and cable connections to the Main Control Board. Replace the Main Control Board if required.

Master Timeout



A communication fault has been detected between the Main Control Board and the Base Driver/Power Supply Board. Check the cable connections between the boards. Replace the Main Control Board or Base Driver/Power Supply Board if required.

EEPROM Error



A fault has been detected originating from the Main Control Board. Check all wire and cable connections to the Main Control Board. Replace the Main Control Board if required.

Retries Exceeded



The number of drive restart attempts set by Parameter 85 has been exceeded. The fault must be cleared and the drive manually reset by cycling power to the drive.

Boost Error



An attempt has been made to set Parameter 83 (Run Boost) to a value greater than Parameter 48 (Start Boost).

Negative Slope



Logic has detected a negative slope on the V/Hz curve.
Compare Parameters 18 and 50.

Parameter 18, Base Voltage, must be equal to or greater than Parameter 50, Break Volts.
Compare Parameters 48 and 50

Parameter 50, Break Volts, must be equal to or greater than Parameter 48, Start Boost.

Diagnostic Current Limit



The drive has reached 150% of rated output current — The drive's hardware current limit while Parameter 82 (Amp Limit Fault Enable) was on.

P-Jump Error



An attempt has been made to enable both P-Jump and Slip Compensation.

Parameters 78-80 are used to program a custom drive output waveform (a P-jump waveform) for specific applications. Parameter 78 (Traverse Period) will enable Parameters 79 and 80 if set to a value other than **0.0**.

Parameter 42 is used to program slip compensation. Slip compensation is active whenever Parameter 42 is set to a value other than **0.0** and cannot be used if a P-jump waveform has been programmed.

Appendix A

Logic Interface Options

1336-MOD-L1 +5V DC TTL Logic Contact Closure Interface Board

The Contact Closure Interface Board provides a means of interfacing various signals and commands to the 1336 drive by using contact closures. The board is self-powered and does not require a separate user power source. Plug in connectors on the Interface Board allow it to be plugged directly into connectors on the Main Control Board. Two mounting thumb screws secure the board in place.

ATTENTION: If the Contact Closure Interface Board is to replace either the 1336-MOD-L2 or 1336-MOD-L3, external circuits must be reconfigured to operate at the +5V DC logic potentials supplied by the board. The application of either +24V DC or 115V AC to the Contact Closure Interface Board will damage both the Interface Board and the Main Control Board.

Operation

Each of the twelve terminals on the board are defined as being either a user command input signal or interface common.

When an open circuit is present between a terminal and interface common, a +5V DC potential will exist. This represents the not selected state or high = False.

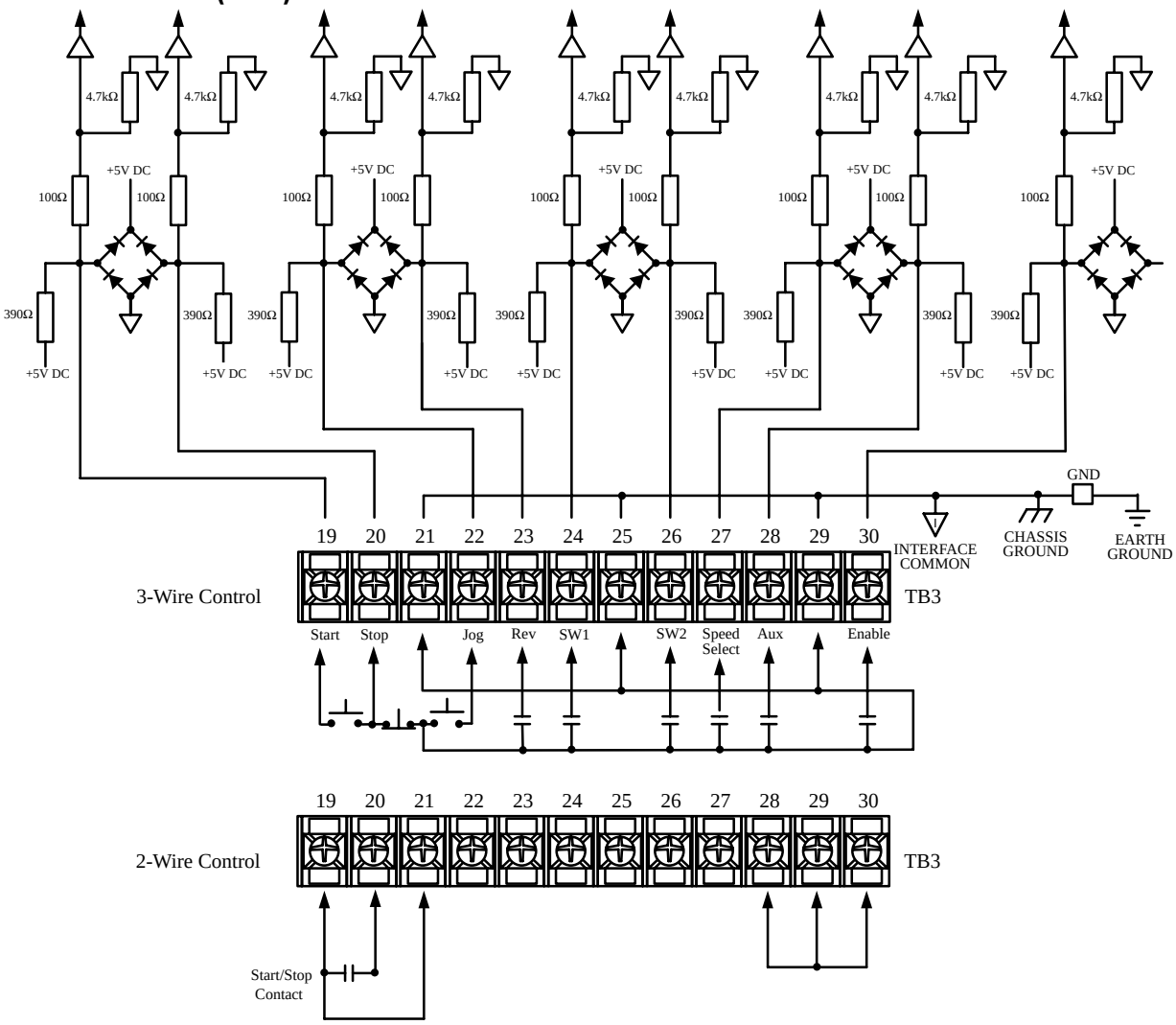
When a closed circuit is present between a terminal and interface common, the input will go low to approximately zero volts or true. When the input signal is pulled low to interface common, a sinking current of 15-20mA will flow.

Requirements

Circuits used with the Contact Closure Interface Board must meet the following criteria:

- Circuits must be capable of operating with low = True logic.
- In the low state, external circuits must be capable of a sinking current of approximately 20mA to pull the terminal voltage to 0.4V DC or less.
- In the high state, external circuits must allow the terminal voltage to rise to a voltage of 2.5-5V DC.

1336-MOD-L1
+5V DC TTL Logic Contact Closure Interface Board (cont.)



	Signal	Wire Group ❶	Maximum Wire Size ❷	Recommended Torque ❸
Terminal 19, Interface Common	Start	5	14 AWG	7 In-Lbs
Terminal 20, Interface Common	Stop ❹	5	14 AWG	7 In-Lbs
Terminals 21, 25, 29	Interface Common	5	14 AWG	7 In-Lbs
Terminal 22, Interface Common	Jog	5	14 AWG	7 In-Lbs
Terminal 23, Interface Common	Reverse	5	14 AWG	7 In-Lbs
Terminal 24, Interface Common	SW1	5	14 AWG	7 In-Lbs
Terminal 26, Interface Common	SW2	5	14 AWG	7 In-Lbs
Terminal 27, Interface Common	Speed Select	5	14 AWG	7 In-Lbs
Terminal 28, Interface Common	Auxiliary ❹	5	14 AWG	7 In-Lbs
Terminal 30, Interface Common	Enable ❹	5	14 AWG	7 In-Lbs

❶ Wire group number chart, page 6-3.

❷ $2.5mm^2$.

❸ .79N-m.

❹ This signal must be present to permit the drive to operate from any control source.

1336-MOD-L1 +5V DC TTL Logic Contact Closure Interface Board (cont.)

Important: Control functions affected by drive parameter programming and selection are indicated on the following pages. Refer to the 1336 Programming Manual to verify that the drive is programmed to meet your requirements.

If two-wire control is installed, option L1, L2 or L3 must also be installed. The 2-wire scheme allows a fault to be cleared by cycling the start/stop contact if the following is true:

- Parameter 14 = **1**
- Parameter 39 = **1**

If Parameter 14 is not set to “1”, the drive can remain in an “F11” loop. Power must then be cycled in order to clear the fault.



ATTENTION: Unexpected machine motion can cause injury or death. Do not use a Local or Remote Control Panel with option L1, L2, or L3 in any 2-wire start/stop control application.

A maintained start command or 2-wire control between terminals 19 and 20 of TB3 on option L1, L2 or L3 will affect Control Panel stop pushbutton operation. The drive will automatically restart after the Control Panel stop pushbutton is depressed and released.

**1336-MOD-L1
+5V DC TTL Logic Contact
Closure Interface Board (cont.)**

Terminal 19 and Interface Common

Start

Momentary True = Start
False = Continue Last State

This input will command the drive to start if all hardwired interlocks are closed. The drive will continue to run until a stop command is received, an interlock is opened, or a fault is detected. A maintained True state is not required to keep the drive running but is permitted. A False state is required to allow the drive to respond to a momentary stop input.

Terminal 20 and Interface Common

(This signal must be maintained as True to permit the drive to operate from any control source.)

Stop

Maintained True = Not stop

Momentary False = Stop

Stop must be a maintained True input to permit the drive to start and run. A momentary False input of 20mS or more or any other drive stop command will initiate a drive stop sequence as programmed by Parameter 10, Stop Select.

Terminals 21, 25, 29

Interface Common

Terminals 21, 25 and 29 are specifically used to terminate both minus or interface common signals to TB3. For the 1336-MOD-L1 Interface Board, Terminals 21, 25 and 29 are also internally connected to drive signal common, chassis ground, and earth ground.

**1336-MOD-L1
+5V DC TTL Logic Contact
Closure Interface Board (cont.)**

Terminal 22 and Interface Common

Jog

True = Jog

False = Interrupt Jog and Allow Other Functions

This input will jog the drive if it is not running and interlocks permit. As long as interlocks permit and the jog command remains True, the drive will continue to run at the programmed jog frequency.

Terminal 23 and Interface Common

Reverse

Maintained True = Reverse

Maintained False = Forward

Parameter 22 enables the direction of drive rotation to be controlled by an input at Terminal 23. A maintained False will select the forward direction, a maintained True the reverse direction.

Terminal 24 and Interface Common

SW1

True = SW1 Function Selected

False = SW1 Function Not Selected

Parameters 26-31 and 72-76 define the SW1 function.

Terminal 26 and Interface Common

SW2

True = SW2 Function Selected

False = SW2 Function Not Selected

Parameters 26-31 and 72-76 define the SW2 function.

1336-MOD-L1
+5V DC TTL Logic Contact Closure Interface Board (cont.)

Terminal 27 and Interface Common

Speed Select

True = Select Parameter 6, Frequency Select 2

False = Select Parameter 5, Frequency Select 1

The drive speed reference can come from a variety of sources. Refer to Chapter 8 — Speed Selection for details.

Terminal 28 and Interface Common

(This signal must be maintained as True to permit the drive to operate from any control source.)

Auxiliary

Maintained True = Auxiliary Interlocks Are Closed

False = Auxiliary Interlocks Are Open

Auxiliary allows the drive to be interlocked using external interlocks. The interlocks must be closed and this input True to permit the drive to operate. When an interlock opens and the input is False for 20mS or longer, the drive will initiate a programmed stop sequence and generate Fault F02.

Terminal 30 And Interface Common

(This signal must be maintained as True to permit the drive to operate from any control source.)

Enable

Maintained True = Drive Enabled

False = Disable Drive

Enable must be a maintained True input to permit the drive to run and jog the motor. If this input is False for 20mS or longer, drive operating capabilities are not permitted and drive outputs are disabled forcing the motor to coast-to-stop. Power however, is not be removed from the drive's control logic and drive programming can still be accessed.

1336-MOD-L2 +24V DC Logic Interface Board

The +24V DC Logic Interface Board provides a means of interfacing various signals and commands to the 1336 drive using +24V DC signals. A +24V DC power source must be supplied by the user for the board to operate. Plug in connectors on the +24V DC Interface Board allow it to be plugged directly into connectors on the Main Control Board. Two mounting thumb screws secure the board in place.



ATTENTION: If the +24V DC Interface Board is to replace either the 1336-MOD-L1 or 1336-MOD-L3, external circuits must be reconfigured to operate at the +24V DC logic potentials required by the board. The application of either +5V DC or 115V AC to the +24V DC Interface Board will damage both the +24V DC Interface Board and the Main Control Board.

Operation

Each of the twelve terminals on the board are defined as being either a user command input signal or interface common.

When a closed circuit is present between a terminal and interface common, a +20 to +26V DC potential will exist. This represents the selected state or high = True.

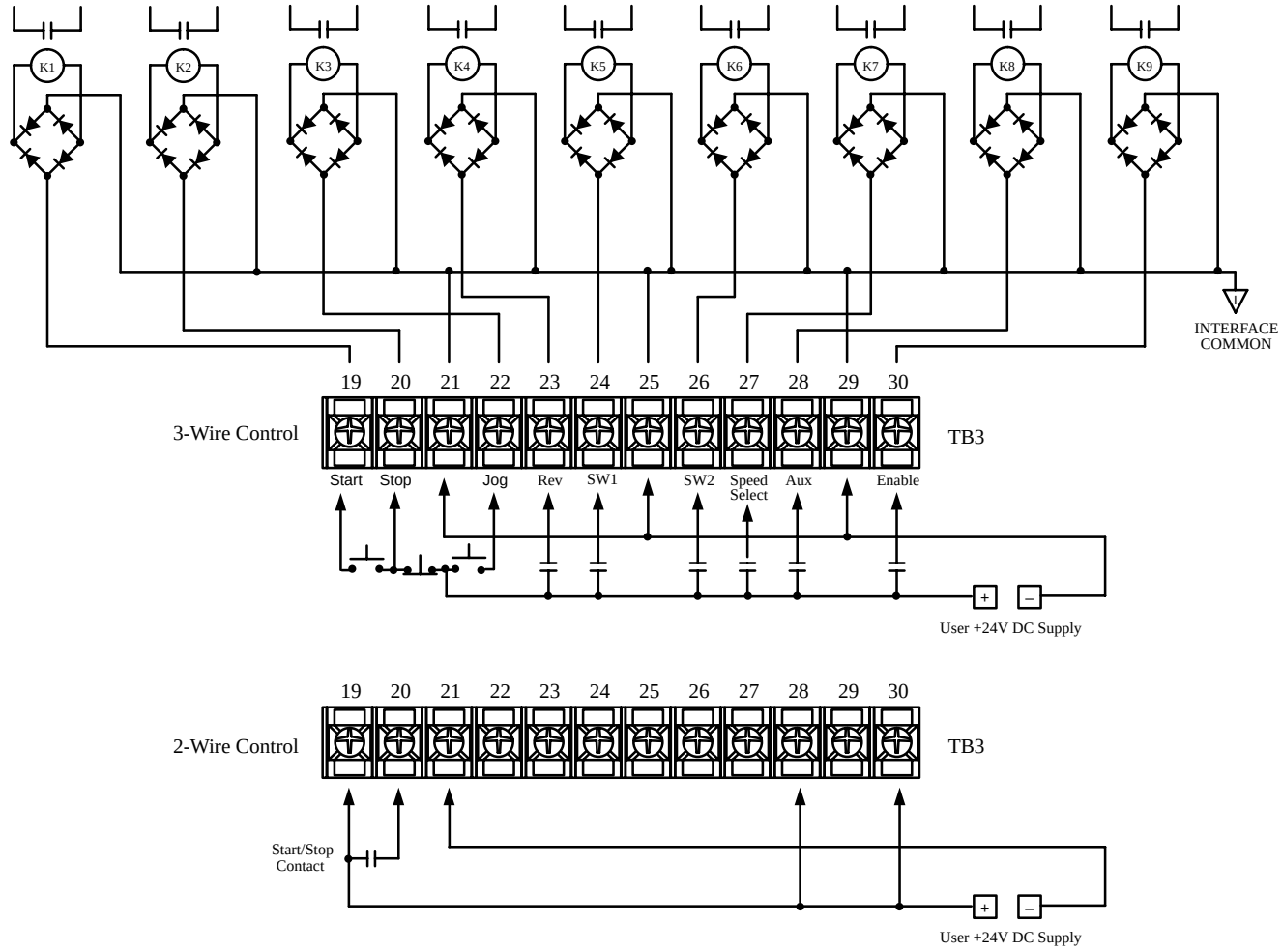
When an open circuit is present between a terminal and interface common, the input will go lower to a False state.

Requirements

Circuits used with the +24V DC Logic Interface Board must meet the following criteria:

- Circuits must be capable of operating with high = True logic.
- In the low state, circuits must generate a voltage of no more than 3.0V DC. The leakage current must be less than 1mA into a 2.8kΩ load.
- In the high state, circuits must generate a voltage of +20 to +26V DC and source a current of approximately 8.5mA for each input.

1336-MOD-L2 +24V DC
Logic Interface Board (cont.)



	Signal	Wire Group ❶	Maximum Wire Size ❷	Recommended Torque ❸
Terminal 19, Interface Common	Start	4	14 AWG	7 In-Lbs
Terminal 20, Interface Common	Stop ❹	4	14 AWG	7 In-Lbs
Terminals 21, 25, 29	Interface Common	4	14 AWG	7 In-Lbs
Terminal 22, Interface Common	Jog	4	14 AWG	7 In-Lbs
Terminal 23, Interface Common	Reverse	4	14 AWG	7 In-Lbs
Terminal 24, Interface Common	SW1	4	14 AWG	7 In-Lbs
Terminal 26, Interface Common	SW2	4	14 AWG	7 In-Lbs
Terminal 27, Interface Common	Speed Select	4	14 AWG	7 In-Lbs
Terminal 28, Interface Common	Auxiliary ❹	4	14 AWG	7 In-Lbs
Terminal 30, Interface Common	Enable ❹	4	14 AWG	7 In-Lbs

❶ Wire group number chart, page 6-3.

❷ 2.5mm^2.

❸ .79N-m.

❹ This signal must be present to permit the drive to operate from any control source.

1336-MOD-L2 +24V DC Logic Interface Board (cont.)

Important: Control functions affected by drive Parameter programming and selection are indicated on the following pages. Refer to the 1336 Programming Manual to verify that the drive is programmed to meet your requirements.

If two-wire control is installed, option L1, L2 or L3 must also be installed. The 2-wire scheme allows a fault to be cleared by cycling the start/stop contact if the following is true:

- Parameter 14 = **1**
- Parameter 39 = **1**

If Parameter 14 is not set to “1”, the drive can remain in an “F11” loop. Power must then be cycled in order to clear the fault.



ATTENTION: Unexpected machine motion can cause injury or death. Do not use a Local or Remote Control Panel with option L1, L2, or L3 in any 2-wire start/stop control application.

A maintained start command or 2-wire control between terminals 19 and 20 of TB3 on option L1, L2 or L3 will affect Control Panel stop pushbutton operation. The drive will automatically restart after the Control Panel stop pushbutton is depressed and released.

Terminal 19 and Interface Common

Start

Momentary True = Start

False = Continue Last State

This input will command the drive to start if all hardwired interlocks are closed. The drive will continue to run until a stop command is received, an interlock is opened, or a fault is detected. A maintained True state is not required to keep the drive running but is permitted. A False state is required to allow the drive to respond to a momentary stop input.

1336-MOD-L2 +24V DC Logic Interface Board (cont.)

Terminal 20 and Interface Common

(This signal must be maintained as True to permit the drive to operate from any control source.)

Stop

Maintained True = Not stop

Momentary False = Stop

Stop must be a maintained True input to permit the drive to start and run. A momentary False input of 20mS or more or any other drive stop command will initiate a drive stop sequence as programmed by Parameter 10, Stop Select.

Terminals 21, 25, 29 Interface Common

Terminals 21, 25 and 29 are specifically used to terminate both minus or interface common signals to TB3. For the 1336-MOD-L2 +24V DC Logic Interface Board, Terminals 21, 25 and 29 are isolated from drive signal common, chassis ground, and earth ground.

Terminal 22 and Interface Common

Jog

True = Jog

False = Interrupt Jog and Allow Other Functions

This input will jog the drive if it is not running and interlocks permit. As long as interlocks permit and the jog command remains True, the drive will continue to run at the programmed jog frequency.

Terminal 23 and Interface Common

Reverse

Maintained True = Reverse

Maintained False = Forward

Parameter 22 enables the direction of drive rotation to be controlled by an input at Terminal 23. A maintained False will select the forward direction, a maintained True the reverse direction.

1336-MOD-L2 +24V DC Logic Interface Board (cont.)

Terminal 24 and Interface Common

SW1

True = SW1 Function Selected

False = SW1 function not selected

Parameters 26-31 and 72-76 define the SW1 function.

Terminal 26 and Interface Common

SW2

True = SW2 Function Selected

False = SW2 Function Not Selected

Parameters 26-31 and 72-76 define the SW2 function.

Terminal 27 and Interface Common

Speed Select

True = Select Parameter 6, Frequency Select 2

False = Select Parameter 5, Frequency Select 1

The drive speed reference can come from a variety of sources. Refer to Chapter 8 — Speed Selection for details.

Terminal 28 and Interface Common

(This signal must be maintained as True to permit the drive to operate from any control source.)

Auxiliary

Maintained True = Auxiliary Interlocks Are Closed

False = Auxiliary Interlocks Are Open

Auxiliary allows the drive to be interlocked using external interlocks. The interlocks must be closed and this input True to permit the drive to operate. When an interlock opens and the input is False for 20mS or longer, the drive will initiate a programmed stop sequence and generate Fault F02.

1336-MOD-L2 +24V DC Logic Interface Board (cont.)

Terminal 30 and Interface Common

(This signal must be maintained as True to permit the drive to operate from any control source.)

Enable

Maintained True = Drive Enabled

False = Disable Drive

Enable must be a maintained True input to permit the drive to run and jog the motor. If this input is False for 20mS or longer, drive operating capabilities are not permitted and drive outputs are disabled forcing the motor to coast-to-stop. Power however, is not be removed from the drive's control logic and drive programming can still be accessed.

1336-MOD-L3 115V AC Logic Interface Board

The 115V AC Logic Interface Board provides a means of interfacing various signals and commands to the 1336 drive using 115V AC signals. A 115V AC power source must be supplied by the user for the board to operate. Plug in connectors on the 115V AC Interface Board allow it to be plugged directly into connectors on the Main Control Board. Two mounting thumb screws secure the board in place.



ATTENTION: If the 115V AC Interface Board is to replace either the 1336-MOD-L1 or 1336-MOD-L2, external circuits must be reconfigured to operate at the 115V AC logic potentials required by the board. The application of either +5V DC or +24V AC to the 115V AC Interface Board will damage both the 115V AC Interface Board and the Main Control Board

Operation

Each of the twelve terminals on the board are defined as being either a user command input signal or interface common.

When a closed circuit is present between a terminal and interface common, a 115V AC potential will exist. This represents the selected state or high = True.

When an open circuit is present between a terminal and interface common, the input will go lower to a False state.

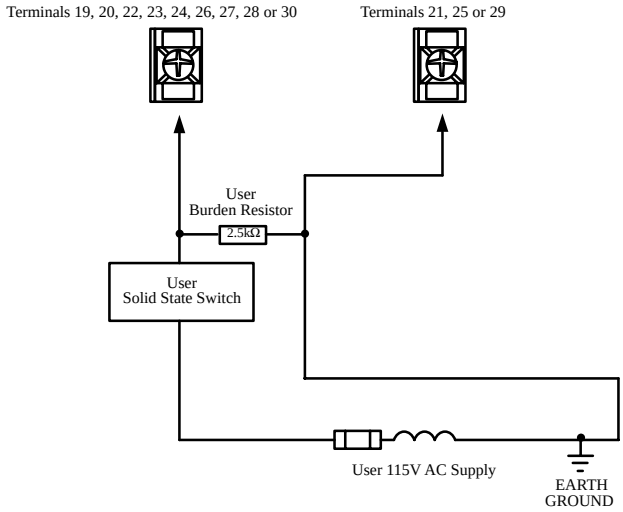
Requirements

Circuits used with the 115V AC Logic Interface Board must meet the following criteria:

- Circuits must be capable of operating with high = True logic.
- In the low state, circuits must generate a voltage of no more than 10.0V AC. The leakage current must be less than 1mA into a 13kΩ load.
- In the high state, circuits must generate a voltage of 115V AC ±10% and source a current of approximately 8.5mA for each input.

If solid state switches are used, the leakage current rating of the switch must be verified. In some instances a burden resistor may be required in the switch circuit to help ensure correct circuit operation.

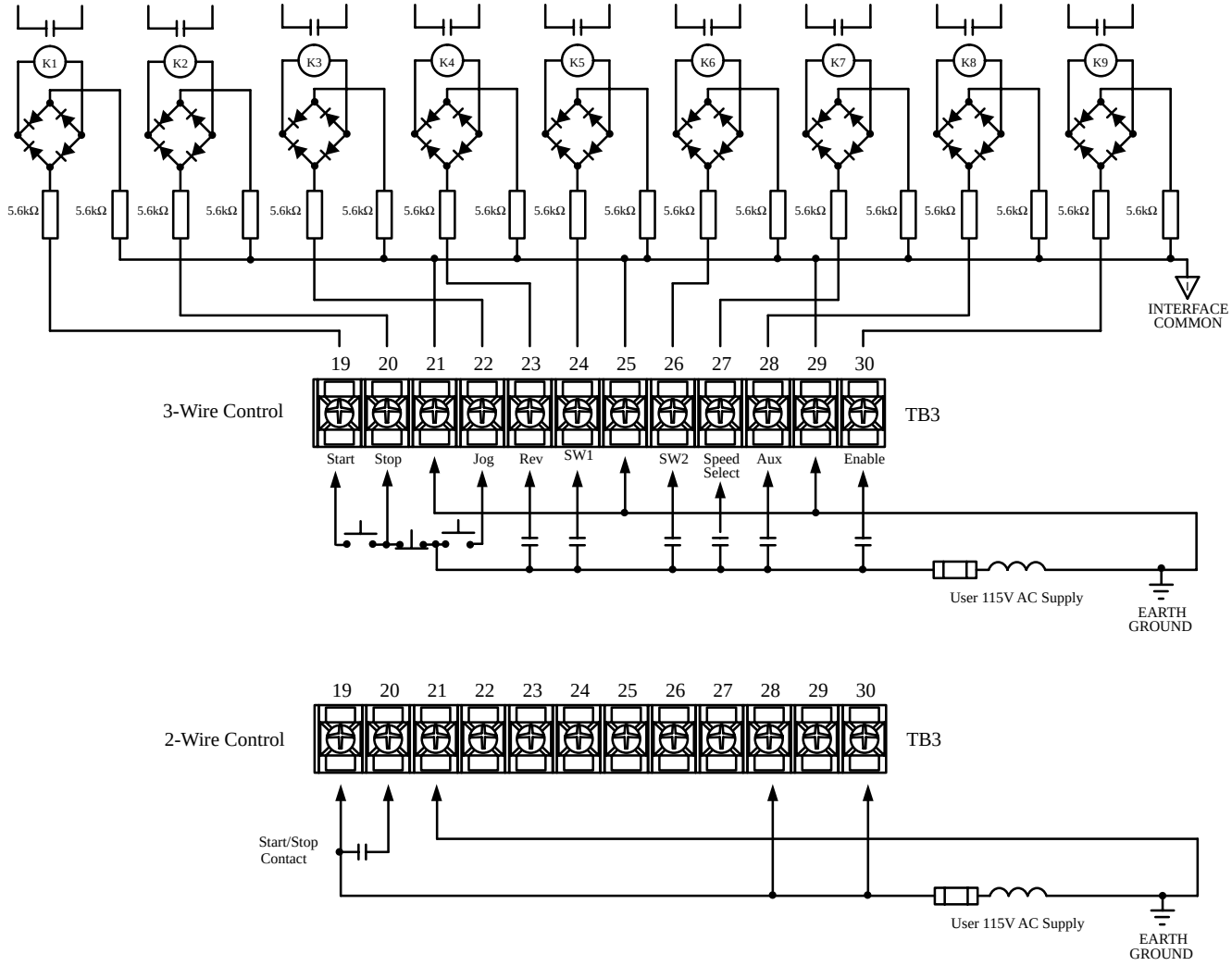
- For solid state switches with a leakage current less than 1mA, a burden resistor is not required.
- For solid state switches with a leakage current rating of 1-5mA, a 2.5kΩ, 10W burden resistor must be used in each solid state switch circuit.



- For solid state switches with a leakage current rating greater than 5mA, contact your nearest Allen–Bradley Drives Distributor of Sales Office for assistance.

ATTENTION: Burden resistors are physically hot when solid-stated switches are energized. This is a normal operating condition. Touching the resistors can cause burns or injury.

1336-MOD-L3 115V AC Logic Interface Board (cont.)



	Signal	Wire Group ❶	Maximum Wire Size ❷	Recommended Torque ❸
Terminal 19, Interface Common	Start	3	14 AWG	7 In-Lbs
Terminal 20, Interface Common	Stop ❹	3	14 AWG	7 In-Lbs
Terminals 21, 25, 29	Interface Common	3	14 AWG	7 In-Lbs
Terminal 22, Interface Common	Jog	3	14 AWG	7 In-Lbs
Terminal 23, Interface Common	Reverse	3	14 AWG	7 In-Lbs
Terminal 24, Interface Common	SW1	3	14 AWG	7 In-Lbs
Terminal 26, Interface Common	SW2	3	14 AWG	7 In-Lbs
Terminal 27, Interface Common	Speed Select	3	14 AWG	7 In-Lbs
Terminal 28, Interface Common	Auxiliary ❹	3	14 AWG	7 In-Lbs
Terminal 30, Interface Common	Enable ❹	3	14 AWG	7 In-Lbs

❶ Wire group number chart, page 6-3.

❷ 2.5mm^2.

❸ .79N-m.

❹ This signal must be present to permit the drive to operate from any control source.

1336-MOD-L3 115V AC Logic Interface Board

Important: Control functions affected by drive Parameter programming and selection are indicated on the following pages. Refer to the 1336 Programming Manual to verify that the drive is programmed to meet your requirements.

If two-wire control is installed, option L1, L2 or L3 must also be installed. The 2-wire scheme allows a fault to be cleared by cycling the start/stop contact if the following is true:

- Parameter 14 = **1**
- Parameter 39 = **1**

If Parameter 14 is not set to "1", the drive can remain in an "F11" loop. Power must then be cycled in order to clear the fault.

ATTENTION: Unexpected machine motion can cause injury or death. Do not use a Local or Remote Control Panel with option L1, L2, or L3 in any 2-wire start/stop control application.

A maintained start command or 2-wire control between terminals 19 and 20 of TB3 on option L1, L2 or L3 will affect Control Panel stop pushbutton operation. The drive will automatically restart after the Control Panel stop pushbutton is depressed and released.

Terminal 19 and Interface Common

Start

Momentary True = Start

False = Continue Last State

This input will command the drive to start if all hardwired interlocks are closed. The drive will continue to run until a stop command is received, an interlock is opened, or a fault is detected. A maintained True state is not required to keep the drive running but is permitted. A False state is required to allow the drive to respond to a momentary stop input.

Terminal 20 and Interface Common

(This signal must be maintained as True to permit the drive to operate from any control source.)

Stop

Maintained True = Not Stop

Momentary False = Stop

Stop must be a maintained True input to permit the drive to start and run. A momentary False of 90mS or more or any other drive stop command will initiate a drive stop sequence as programmed by Parameter 10, Stop Select.

1336-MOD-L3 115V AC Logic Interface Board

Terminals 21, 25, 29

Interface Common

Terminals 21, 25 and 29 are used to terminate both minus or interface common signals to TB3. Terminals 21, 25 and 29 are also used to terminate any shields for cables connected to TB3. For the 1336-MOD-L3 115V AC Logic Interface Board, Terminals 21, 25 and 29 are isolated from drive signal common, chassis ground, and earth ground.

Terminal 22 and Interface Common

Jog

True = Jog

False = Interrupt Jog and Allow Other Functions

This input will jog the drive if it is not running and interlocks permit. As long as interlocks permit and the jog command remains True, the drive will continue to run at the programmed jog frequency.

Terminal 23 and Interface Common

Reverse

Maintained True = Reverse

Maintained False = Forward

Parameter 22 enables the direction of drive rotation to be controlled by an input at Terminal 23. A maintained False will select the forward direction, a maintained true the reverse direction.

Terminal 24 and Interface Common

SW1

True = SW1 Function Selected

False = SW1 Function Not Selected

Parameters 26-31 and 72-76 define the SW1 function.

Terminal 26 and Interface Common

SW2

True = SW2 Function Selected

False = SW2 Function Not Selected

Parameters 26-31 and 72-76 define the SW2 function.

1336-MOD-L3 115V AC Logic Interface Board

Terminal 27 and Interface Common

Speed Select

True = Select Parameter 6, Frequency Select 2

False = Select Parameter 5, Frequency Select 1

The drive speed reference can come from a variety of sources. Refer to Chapter 8 — Speed Selection for details.

Terminal 28 and Interface Common

(This signal must be maintained as True to permit the drive to operate from any control source.)

Auxiliary

Maintained True = Auxiliary Interlocks Are Closed

False = Auxiliary Interlocks Are Open

Auxiliary allows the drive to be interlocked using external interlocks. The interlocks must be closed and this input True to permit the drive to operate. When an interlock opens and the input is False for 90mS or longer, the drive will initiate a programmed stop sequence and generate Fault F02.

Terminal 30 and Interface Common

(This signal must be maintained as True to permit the drive to operate from any control source.)

Enable

Maintained True = Drive Enabled

False = Disable Drive

Enable must be a maintained True input to permit the drive to run and jog the motor. If this input is False for 20mS or longer, drive operating capabilities are not permitted and drive outputs are disabled forcing the motor to coast-to-stop. Power however, is not be removed from the drive's control logic and drive programming can still be accessed.

Rockwell Automation

Allen-Bradley

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