

Important User Information

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

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

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

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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



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.



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

Summary of Changes

New/Updated Information

The information below summarizes the changes to the 1336 PLUS II User Manual since the last release.

Description of Change	Page(s)
TB1 info updated - D Frame	2-15 , B-18
Updated Parameters:	
[Load Loss Level]	6-26
[Phase Loss Level]	6-35
[Heatsink Temp]	6-39
[Drive Type]	6-42
New Parameters:	
[Motor OL Ret]	6-35
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Information and Precautions

Chapter 1 provides information on the general intent of this manual, gives an overall description of the 1336 PLUS II Adjustable Frequency AC Drive and provides a listing of key drive features.

Manual Objectives

This publication provides planning, installation, wiring and diagnostic information for the 1336 PLUS II Drive. To assure successful installation and operation, the material presented must be thoroughly read and understood before proceeding. Particular attention must be directed to the Attention and Important statements contained within.

For J Frame information, refer to publication 1336F-IN014.

Software Compatibility

Three-Phase Drive Rating ¹			Compatible with Version . . .	Frame Reference
200-240V	380-480V	500-600V		
0.37-0.75 kW 0.5-1 HP	0.37-1.2 kW 0.5-1.5 HP	–	1.0 & Up	A1
1.2-1.5 kW 1.5-2 HP	1.5-2.2 kW 2-3 HP	–	1.0 & Up	A2
2.2-3.7 kW 3-5 HP	3.7 kW 5 HP	–	1.0 & Up	A3
5.5 kW 7.5 HP	5.5-15 kW 7.5-20 HP	0.75-15 kW 1-20 HP	1.0 & Up	A4
5.5-11 kW 7.5-15 HP	11-22 kW 15-30 HP	–	1.0 & Up	B1/B2
15-22 kW 20-30 HP	30-45 kW 40-60 HP	18.5-45 kW 25-60 HP	1.0 & Up	C
30-45 kW 40-60 HP	45-112 kW 60-150 HP	56-93 kW 75-125 HP	1.0 & Up	D
56-93 kW 75-125 HP	112-187 kW 150-250 HP	112-224 kW 150-300 HP	1.0 & Up	E
–	187-336 kW 250-450 HP	261-298 kW 350-400 HP	1.0 & Up	F
–	187-448 kW 250-600 HP	224-448 kW 300-600 HP	1.0 & Up	G

¹ kW and HP are constant torque.

General Precautions



ATTENTION: This drive contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference A-B publication 8000-4.5.2, “Guarding Against Electrostatic Damage” or any other applicable ESD protection handbook.



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



ATTENTION: Only personnel familiar with the 1336 PLUS II Adjustable Frequency 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: To avoid a hazard of electric shock, verify that the voltage on the bus capacitors has discharged before performing any work on the drive. Measure the DC bus voltage at the + & - terminals of TB1. The voltage must be 0.0V DC.

Conventions Used in this Manual

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

- Parameter Names will appear in [brackets]
- Display Text will appear in “quotes”

Catalog Number Explanation

The diagram on the following page describes the 1336 PLUS II catalog numbering scheme.

1336F – BR

F30 – AA

– EN

– MODS

First Position

Bulletin Number

Second Position

Voltage

Letter	Voltages
AQ	200-240V AC or 310V DC
BR	380-480VAC or 513-620V DC
CW	500-600V AC or 775V DC
A	200-240V AC
B	380-480V AC
BP/BPR ^④	380-480V AC (F Frame)
BX	Special Rating
C	500-600V AC
CP/CPR ^④	500-600V AC (F Frame)
Q	310V DC
R	513-620V DC
RX	Special Rating
W	775V DC

Third Position

Nominal HP Rating

Refer to table below for ratings and possible voltage combinations.

Fourth Position

Enclosure Type

Code	Type
AA	IP 20 (NEMA 1)
AE	IP 20 (NEMA 1)/EMC
AF	IP 65 (NEMA 4) ^③
AJ	IP 54 (NEMA 12) ^③
AN	IP 00 (Open)

Fifth Position

Language Group^①

Code	Language
EN	English
FR	French
DE	German
IT	Italian
ES	Spanish
JP	Japanese ^⑤

Sixth Position

Options

Voltage and Nominal HP Rating Combinations

Code	Rating	AQ	BR	CW	A	B	BP/BPR	BX	C	CP/CPR	Q	R	RX	W
F05	0.37 (0.5)	●	●											
F07	0.56 (0.75)	●	●											
F10	0.75 (1)	●	●	●										
F15	1.2 (1.5)	●	●											
F20	1.5 (2)	●	●	●										
F30	2.2 (3)	●	●	●										
F50	3.7 (5)	●	●	●										
F75	5.5 (7.5)	●	●	●										
F100	7.5 (10)		●	●										
F150	11 (15)		●	●										
F200	15 (20)		●	●										
007	5.5 (7.5)				●						●			
010	7.5 (10)				●						●			
015	11 (15)				●	●					●	●		
020	15 (20)				●	●					●	●		
025	18.5 (25)				●	●			●		●	●		●
030	22 (30)				●	●			●		●	●		●
040	30 (40)				●	●		●			●	●	●	●
050	37 (50)				●	●		●			●	●	●	●
060	45 (60)				●	●		●	●		●	●	●	●
075	56 (75)				●	●			●		●	●	●	●
100	75 (100)				●	●			●		●	●	●	●
125	93 (125)				●	●			●		●	●	●	●
150	112 (150)					●		●	●		●	●	●	●
200	149 (200)					●			●		●	●	●	●
250	187 (250) ^②					●	●	●	●		●	●	●	●
300	224 (300) ^②					●	●		●		●	●	●	●
350	261 (350) ^②					●	●		●	●	●	●	●	●
400	298 (400) ^②					●	●		●	●	●	●	●	●
450	336 (450) ^②					●	●		●		●	●	●	●
500	373 (500) ^②					●			●		●	●	●	●
600	448 (600)					●			●		●	●	●	●

① Language must be specified to ensure shipment of appropriate User Manual.

② G Frame Standard Drives in enclosed construction are supplied through the *Configured Drives Program* and will have an "A" suffix after the HP rating.

③ D through G Frame drives in IP 65 (NEMA Type 4) and IP 54 (NEMA Type 12) configurations are supplied through the *Configured Drives Program*.

④ "xPR" has a "roll-in" type chassis. ⑤ Not available with v5.001 & later.

Code Description

Human Interface Module, Snap-In, IP20 (NEMA Type 1)

HASB	Snap-In Cradle/Blank Plate
HASP	Programmer Only
HCSP	Programmer Only & Upload/Download Capability
HAS1	Programmer/Controller w/Analog Pot
HCS1	Programmer/Controller w/Analog Pot & Upload/Download Capability
HAS2	Programmer/Controller w/Digital Pot
HCS2	Programmer/Controller w/Digital Pot & Upload/Download Capability

Human Interface Module, IP65/54 (NEMA Type 4/12)

HJP	Programmer Only
HJ2	Programmer/Controller w/Digital Pot

Communication Options – B Frame & Up (Adapter 6)

GM1	Single Point Remote I/O B Frame
GM2	RS-232/422/485, DF1 & DH485 B Frame
GM5	DeviceNet™
GM6	Enhanced DeviceNet™

Communication Options – All Frames (Adapter 1)

GMS1	GM1 with Snap-In Cradle
GMS2	GM2 with Snap-In Cradle
GMS5	GM5 with Snap-In Cradle
GMS6	GM6 with Snap-In Cradle

Control Interface Options

L4	TTL Contact
L4E	TTL Contact & Encoder Feedback
L7E	TTL Contact & Encoder Fdbck. for use with Encoder Loss Detection
L5	24V AC/DC
L5E	24V AC/DC & Encoder Feedback
L8E	24V AC/DC & Encoder Feedback for use with Encoder Loss Detection
L6	115V AC
L6E	115V AC & Encoder Feedback
L9E	115V AC & Encoder Feedback for use with Encoder Loss Detection

Analog Interface Options – Slot A

• Choose No More than One – Configurable Inputs/Outputs are 10V or 20mA

LA2	Two Isolated Configurable Inputs
LA6	One Isolated Bi-polar Input (±10V or ±20mA) and One Isolated Thermistor Input
LA7	One Isolated Bi-polar Input (±10V or ±20mA) and One Isolated Configurable Input

Analog Interface Options – Slot B

• Choose No More than One – Configurable Inputs/Outputs are 10V or 20mA

LA1	Single-ended, Non-isolated Configurable (including Pot) Input & 2 Single-ended, Non-isolated Outputs (1 - Configurable, 1 - 20mA)
LA3	Two Isolated Configurable Outputs
LA4	One Isolated Configurable Input & Output
LA5	Isolated Pulse Input, Non-isolated Pulse Output & Single-ended, Non-isolated Configurable Output

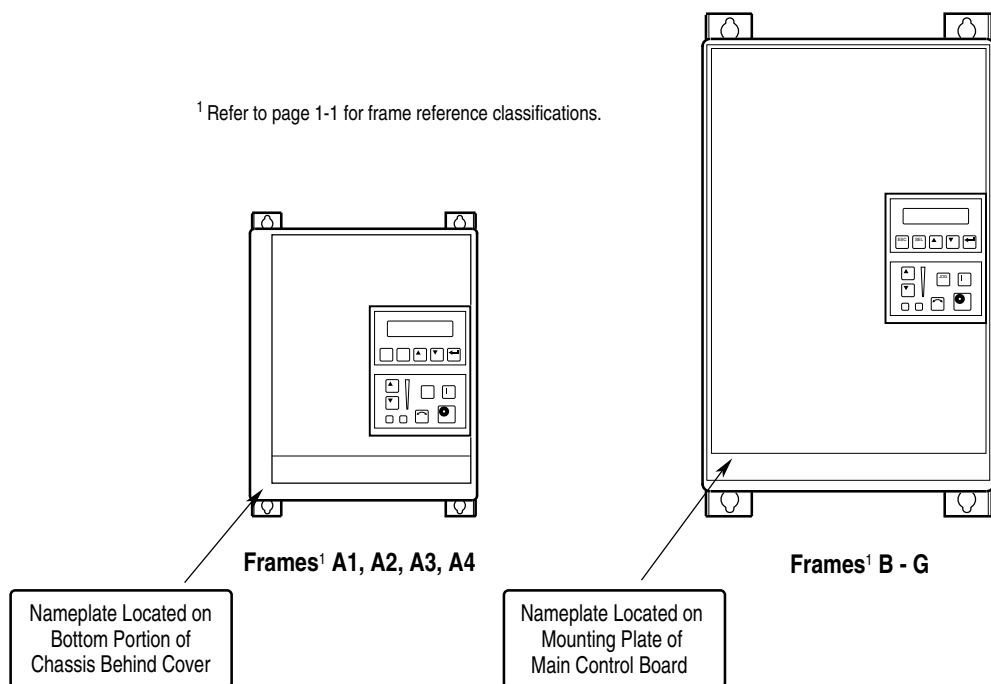
Common Mode Choke – F & G Frame (must be specified for F Frame)

CM	Internal Common Mode Choke (factory installed)
NCM	No Common Mode Choke

Nameplate Location

Figure 1.1
1336 PLUS II Nameplate Location

¹ Refer to page 1-1 for frame reference classifications.



Input Devices

Starting and Stopping the Motor



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

Repeated Application/Removal of Input Power



ATTENTION: The drive is intended to be controlled by control input signals that will start and stop the motor. A device that routinely disconnects then reapplies line power to the drive for the purpose of starting and stopping the motor is not recommended.

Bypass Contactors



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

- Wiring AC line to drive output or control terminals.
- Improper bypass or output circuits not approved by Allen-Bradley.
- Output circuits which do not connect directly to the motor.

Contact Allen-Bradley for assistance with application or wiring.

Electrical Interference - EMI/RFI

Immunity

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

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

Emission

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

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

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

Common mode chokes at the drive output can help reduce common mode noise on installations that do not use shielded cable. Common mode chokes can also be used on analog or communication cables. Refer to page [2-37](#) for further information.

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

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

RFI Filtering

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

If the cabling and installation recommendation precautions described in this manual are adhered to, it is unlikely that interference problems will occur when the drive is used with conventional industrial electronic circuits and systems. However, a filter may be required if there is a likelihood of sensitive devices or circuits being installed on the same AC supply.

Where it is essential that very low emission levels must be achieved or if conformity with standards is required the optional RFI filter must be used. Refer to *Appendix C* and instructions included with the filter for installation and grounding information.

CE Conformity

Refer to *Appendix C*.

Grounding

Refer to the grounding diagram on page [2-13](#). The drive must be connected to system ground at the power ground (PE) terminal provided on the power terminal block (TB1). Ground impedance must conform to the requirements of national and local industrial safety regulations (NEC, VDE 0160, BSI, etc.) and should be inspected and tested at appropriate and regular intervals.

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

Sensitive Circuits

It is essential to define the paths through which the high frequency ground currents flow. This will assure that sensitive circuits do not share a path with such current. Control and signal conductors should not be run near or parallel to power conductors.

Motor Cable

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

If shielded or armored cables are used, the shield/armor should also be grounded at both ends as described above.

Encoder & Communications Cabling

If encoder connections or communications cables are used, the wiring must be separated from power cabling. This can be accomplished with carefully routed, shielded cable (ground cable shield at the drive end only) or a separate steel conduit (grounded at both ends).

Discrete Control and Signal Wiring

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

If the control and signal wires are short, and contained within a cabinet which has no sensitive circuits, the use of shielded control and signal wiring may not be necessary, but is always recommended.

Shield Termination - TE (True Earth)

The TE terminal block (not available on A Frame drives) is used for all cable shields at the drive. It must be connected to an earth ground by a separate continuous lead. TE connections may exist on power and/or control terminal blocks to terminate shield cables for both power and control. Refer to [Figure 2.1](#) for locations.

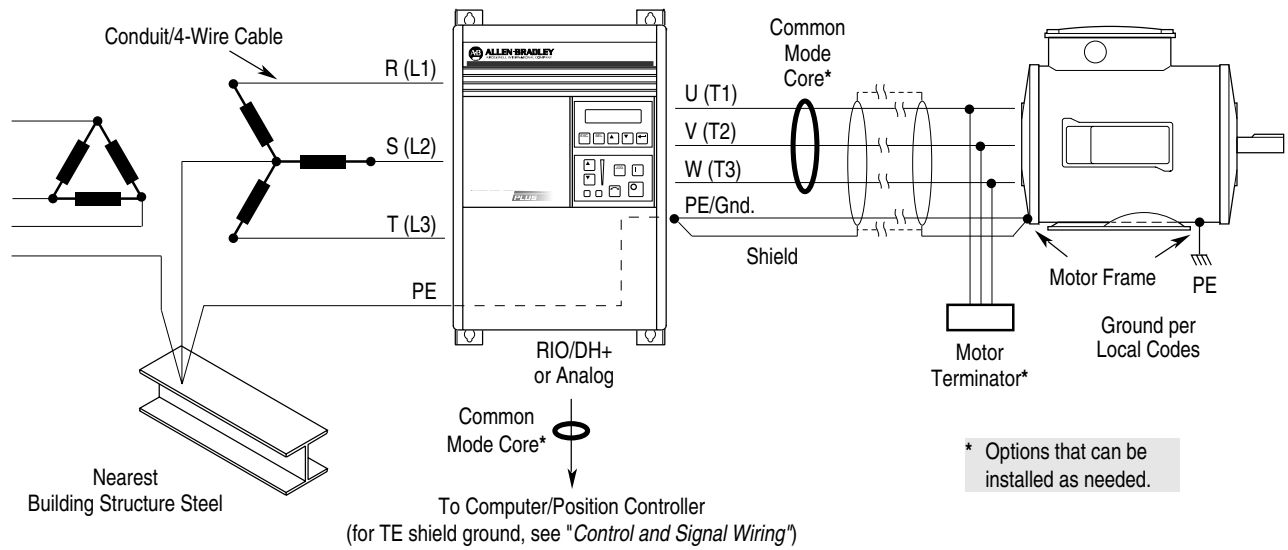
Safety Ground - PE (Potential Earth)

This is the safety ground required by code. This point must be connected to adjacent building steel (girder, joist) or a floor ground rod, provided grounding points comply with national or local electric code regulations. If a cabinet ground bus is used, refer to *Grounding* on page [2-11](#).

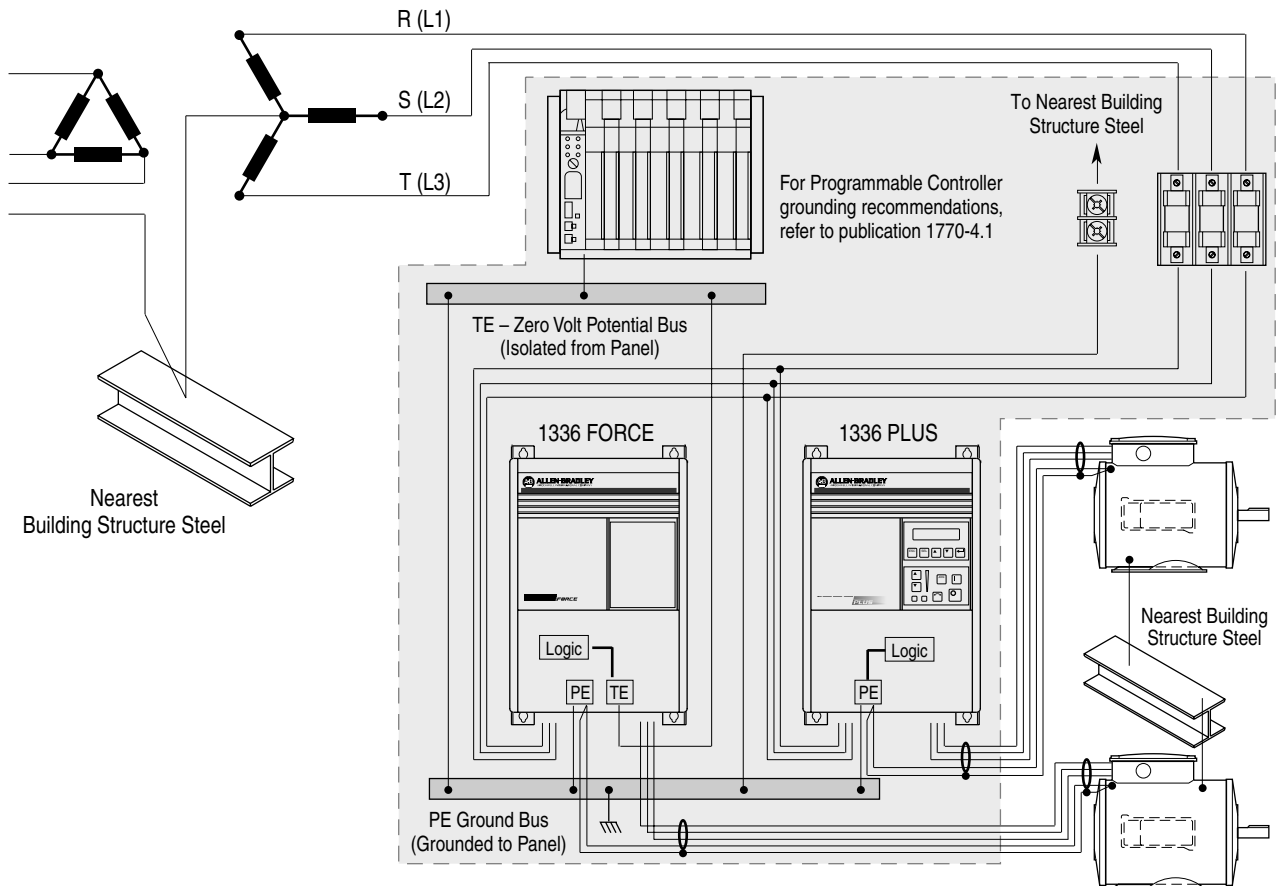
RFI Filter

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

General Grounding



Single-Point Grounding/Panel Layout



Important: Grounding requirements will vary with the drives being used. Drives with True Earth (TE) terminals must have a zero potential bus, separate from potential earth (PE) ground bus. Note that buses can be tied together at one point in the control cabinet or brought back separately to the building ground grid (tied within 3 meters (10 feet)).

Power Cabling

Input and output power connections are performed through terminal block, TB1 (see [Figure 2.1](#) for location).

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

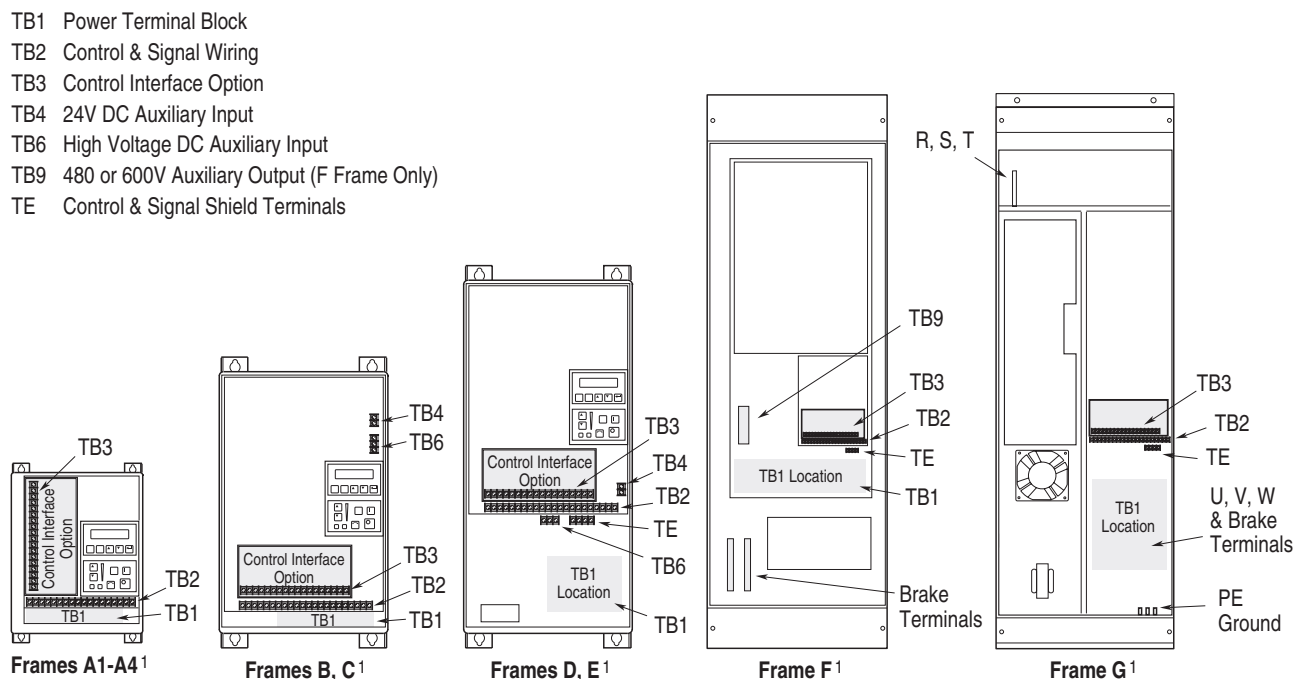
Table 2.C
TB1 Signals

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



ATTENTION: The National Codes and standards (NEC, VDE, BSI etc.) and local codes outline provisions for safely installing electrical equipment. Installation must comply with specifications regarding wire types, conductor sizes, branch circuit protection and disconnect devices. Failure to do so may result in personal injury and/or equipment damage.

Figure 2.1
Terminal Block Locations



¹ Refer to page 1-1 for frame reference classifications and Figure 2.2 for TB1 details.

Table 2.D
TB1 Specifications

Drive Frame Size	Max./Min. Wire Size ¹ <i>mm² (AWG)</i>	Maximum Torque <i>N-m (lb.-in.)</i>
A1-A4 (page 2-21)	5.3/0.8 (10/18)	1.81 (16)
B1 (page 2-21)	8.4/0.8 (8/18)	1.81 (16)
B2 (page 2-21)	13.3/0.5 (6/20)	1.70 (15)
C (page 2-21)	26.7/0.8 (3/18)	5.65 (50)
D (page 2-22) ^{3,4}	120.0/2.1 (4/0 /14) 67.4/2.1 (00/14) ²	6.00 (52) 6.00 (52)
E (page 2-22) ^{3,5}	253.0/2.1 (500 MCM/14)	10.00 (87)
F (page 2-23) ³	303.6/2.1 (600 MCM/14)	23.00 (200)
G (page 2-23) ³	303.6/2.1 (600 MCM/14)	23.00 (200)

¹ Wire sizes given are maximum/minimum sizes that TB1 will accept - these are not recommendations. Use Copper wire only. Wire gauge requirements and recommendations are based on 75 degree C. Do not reduce wire gauge when using higher temperature wire.

² Applies to 30 kW (40 HP) 200-240V, 45 & 56 kW (60 & 75 HP) 380-480V, 56 kW (75 HP) 500-600V drives only.

³ These configurations of TB1 are stud type terminations and require the use of lug type connectors to terminate field installed conductors. Lug kits are available for use with these configurations. Wire size used is determined by selecting the proper lug based on the drive catalog number. Refer to [Table 2.E](#).

⁴ One TE terminal is present – Max./Min. Wire Size is the same as other terminals.

⁵ Two TE terminals are present – Max./Min. Wire Size is the same as the D Frame terminal block.

Lug Kits

D, E, F and G Frame drives have stud type terminals and/or bus bars/bolts that require standard “crimp type” connectors for cable termination. Connectors such as T & B Color-Keyed® connectors (or equivalent) are recommended. The following table shows the lug selection for one possible cable choice. Connectors for each installation should be chosen based on desired cable sizes, the application requirements and all applicable national, state and local codes. See the minimum/maximum values for wire size per [Table 2.D](#)

Table 2.E
Lug Selection

Drive Catalog Number	AC Input R, S, T/Output U, V, W and PE		DC+/DC- ²		TE	
	Cable (per Phase) Qty. mm ² (AWG)	T&B Part No. ³ Qty. Number	Cable (per Phase) Qty. mm ² (AWG)	T&B Part No. ³ Qty. Number	Cable (per Phase) Qty. mm ² (AWG)	T&B Part No. ³ Qty. Number
1336F-A040	(1) 53.5 (1/0)	(8) 54153 ¹	(1) 13.3 (6)	(2) 54135 ¹	(1) 13.3 (6)	(1) 54135 ¹
1336F-A050	(1) 85.0 (3/0)	(8) 54163 ¹	(1) 13.3 (6)	(2) 54135 ¹	(1) 13.3 (6)	(1) 54135 ¹
1336F-A060	(1) 107.2 (4/0)	(8) 54168 ¹	(1) 13.3 (6)	(2) 54135 ¹	(1) 21.2 (4)	(1) 54139 ¹
1336F-A075	(2) 53.5 (1/0)	(8) 54109T (8) 54109B	(1) 33.6 (2)	(2) 54109	(1) 21.2 (4)	(1) 54139 ¹
1336F-A100	(2) 85.0 (3/0)	(8) 54111T (8) 54111B	(1) 42.4 (1)	(2) 54148	(1) 33.6 (2)	(1) 54142 ¹
1336F-A125	(2) 107.2 (4/0)	(8) 54112T (8) 54112B	(1) 67.4 (2/0)	(2) 54110	(1) 33.6 (2)	(1) 54142 ¹
1336F-B060	(1) 42.4 (1)	(8) 54147 ¹	(1) 8.4 (8)	(2) 54131 ¹	(1) 13.3 (6)	(1) 54135 ¹
1336F-B075	(1) 53.5 (1/0)	(8) 54153 ¹	(1) 13.3 (6)	(2) 54135 ¹	(1) 13.3 (6)	(1) 54135 ¹
1336F-B100	(1) 85.0 (3/0)	(8) 54163 ¹	(1) 13.3 (6)	(2) 54135 ¹	(1) 13.3 (6)	(1) 54135 ¹
1336F-B125	(1) 107.2 (4/0)	(8) 54168 ¹	(1) 26.7 (3)	(2) 54147 ¹	(1) 21.2 (4)	(1) 54139 ¹
1336F-BX150	(1) 107.2 (4/0)	(8) 54168 ¹	(1) 26.7 (3)	(2) 54147 ¹	(1) 21.2 (4)	(1) 54139 ¹
1336F-B150	(2) 53.5 (1/0)	(8) 54109T (8) 54109B	(1) 33.6 (2)	(2) 54110	(1) 21.2 (4)	(1) 54139 ¹
1336F-B200	(2) 85.0 (3/0)	(8) 54111T (8) 54111B	(1) 42.4 (1)	(2) 54148	(1) 26.7 (3)	(1) 54142 ¹
1336F-B250	(2) 107.2 (4/0)	(8) 54112T (8) 54112B	(1) 67.4 (2/0)	(2) 54110	(1) 33.6 (2)	(1) 54142 ¹
1336F-BX250	(3) 53.5 (1/0)	(24) 54109	(1) 67.4 (2/0)	(2) 54110	NA	NA
1336F-BP/BPR250	(3) 53.5 (1/0)	(24) 54109	(1) 67.4 (2/0)	(2) 54110	NA	NA
1336F-B300	(3) 67.4 (2/0)	(24) 54110	(1) 42.4 (1)	(2) 54148	NA	NA
1336F-BP/BPR300	(3) 67.4 (2/0)	(24) 54110	(1) 42.4 (1)	(2) 54148	NA	NA
1336F-B350	(3) 85.0 (3/0)	(24) 54111	(1) 42.4 (1)	(2) 54148	NA	NA
1336F-BP/BPR350	(3) 85.0 (3/0)	(24) 54111	(1) 42.4 (1)	(2) 54148	NA	NA
1336F-B400	(3) 107.2 (4/0)	(24) 54112	(1) 42.4 (1)	(2) 54148	NA	NA
1336F-BP/BPR400	(3) 107.2 (4/0)	(24) 54112	(1) 42.4 (1)	(2) 54148	NA	NA
1336F-B450	(3) 127.0 (250 MCM)	(24) 54174	(1) 42.4 (1)	(2) 54148	NA	NA
1336F-BP/BPR450	(3) 127.0 (250 MCM)	(24) 54174	(1) 42.4 (1)	(2) 54148	NA	NA
1336F-B500	(3) 152.0 (300 MCM)	(24) 54179	(1) 53.5 (1/0)	(2) 54109	NA	NA
1336F-B600	(3) 152.0 (300 MCM)	(24) 54179	(1) 53.5 (1/0)	(2) 54109	NA	NA
1336F-C075	(1) 33.6 (2)	(8) 54142 ¹	(1) 13.3 (6)	(2) 54135 ¹	(1) 8.4 (8)	(1) 54131 ¹
1336F-C100	(1) 53.5 (1/0)	(8) 54153 ¹	(1) 13.3 (6)	(2) 54135 ¹	(1) 13.3 (6)	(1) 54135 ¹
1336F-C125	(1) 67.4 (2/0)	(8) 54158 ¹	(1) 26.7 (3)	(2) 54147 ¹	(1) 13.3 (6)	(1) 54135 ¹
1336F-C150	(1) 107.2 (4/0)	(8) 54111	(1) 42.4 (1)	(2) 54148	(1) 13.3 (6)	(1) 54135 ¹
1336F-C200	(2) 67.4 (2/0)	(8) 54110T (8) 54110B	(1) 42.4 (1)	(2) 54148	(1) 26.7 (3)	(1) 54142 ¹
1336F-C250	(2) 85.0 (3/0)	(8) 54111T (8) 54111B	(1) 67.4 (2/0)	(2) 54110	(1) 26.7 (3)	(1) 54142 ¹
1336F-CX300	(3) 85.0 (3/0)	(16) 54111	Consult Factory		NA	NA
1336F-C300	(3) 85.0 (3/0)	(16) 54111			NA	NA
1336F-C350	(3) 53.5 (1/0)	(24) 54109			NA	NA
1336F-C400	(3) 67.4 (2/0)	(24) 54110			NA	NA
1336F-C450	(3) 85.0 (3/0)	(24) 54111			NA	NA
1336F-C500	(3) 107.2 (4/0)	(24) 54112			NA	NA
1336F-C600	(3) 127.0 (250 MCM)	(24) 54174			NA	NA

¹ 5/16" Stud. All other studs are 3/8".

² Lugs shown for DC+/- are based on dynamic brake sizing of 50% of (motor rating X 1.25). Select proper lugs based on required braking torque. Refer to 1336-5.64 or 1336-5.65 for additional information.

³ T & B COLOR-KEYED® Connectors require T & B WT117 or TBM-6 Crimper tool or equivalent. Lugs should be crimped according to manufacturer's tool instructions. If required, Rockwell Automation can supply lug kits for lugs shown above. Kits do not include crimping tools. Consult factory for kit information.

Motor Cables

A variety of cable types are acceptable for drive installations. For many installations, unshielded cable is adequate, provided it can be separated from sensitive circuits. As an approximate guide, allow a spacing of 0.3 meters (1 ft.) for every 10 meters (32.8 ft.) of length. In all cases, long parallel runs must be avoided. Do not use cable with an insulation thickness less than or equal to 15 mils (0.4 mm/0.015 in.).

The cable should be 4-conductor with the ground lead being connected directly to the drive ground terminal (PE) and the motor frame ground terminal. See table below.

Unshielded

THHN, THWN or similar wire is acceptable for drive installation in dry environments provided adequate free air space and/or conduit fill rates limits are provided. **Do not use THHN or similarly coated wire in wet areas.** Any wire chosen must have a minimum insulation thickness of 15 mils and should not have large variations in insulation concentricity.

Shielded/Armored Cable

Shielded cable is recommended if sensitive circuits or devices are connected or mounted to the machinery driven by the motor (see table).

Recommended Shielded Wire

Location	Rating/Type	Description
Standard (Option 1)	600V, 90°C (194°F) XHHW2/RHW-2 Anixter B209500- B209507, Belden 29501- 29507, or equivalent	- Four tinned copper conductors with XLP insulation. - Copper braid/aluminum foil combination shield and tinned copper drain wire. - PVC jacket.
Standard (Option 2)	Tray rated 600V, 90° C (194° F) RHH/RHW-2 Anixter OLF-7xxxx or equivalent	- Three tinned copper conductors with XLPE insulation. 5 mil single helical copper tape (25% overlap min.) with three bare copper grounds in contact with shield. - PVC jacket.
Class I & II; Division I & II	Tray rated 600V, 90° C (194° F) RHH/RHW-2 Anixter 7V-7xxxx-3G or equivalent	- Three bare copper conductors with XLPE insulation and impervious corrugated continuously welded aluminum armor. - Black sunlight resistant PVC jacket overall. - Three copper grounds on #10 AWG and smaller.

Conduit

If metal conduit is preferred for cable distribution, the following guidelines must be followed.

- Drives are normally mounted in cabinets and ground connections are made at a common ground point in the cabinet. Normal installation of conduit provides grounded connections to both the motor frame ground (junction box) and drive cabinet ground. These ground connections help minimize interference. This is a noise reduction recommendation only, and does not affect the requirements for safety grounding (refer to pages [2-11](#) and [2-12](#)).

- No more than three sets of motor leads can be routed through a single conduit. This will minimize “cross talk” that could reduce the effectiveness of the noise reduction methods described. If more than three drive/motor connections per conduit are required, shielded cable as described above must be used. If practical, each conduit should contain only one set of motor leads.



ATTENTION: To avoid a possible shock hazard caused by induced voltages, unused wires in the conduit must be grounded at both ends. For the same reason, if a drive sharing a conduit is being serviced or installed, all drives using this conduit should be disabled. This will eliminate the possible shock hazard from “cross coupled” drive motor leads.

Motor Lead Lengths

Installations with long cables to the motor may require the addition of output reactors or cable terminators to limit voltage reflections at the motor. Excessive cable charging current can also reduce the amount of current available to produce rated motor torque. Refer to Tables [2.F](#) and [2.G](#) for the maximum cable length allowed for various installation techniques. Shaded distances are restricted by cable capacitance charging current. The figure below demonstrates how total cable length is calculated. Failure to follow these guidelines can result in poor motor performance and nuisance drive overcurrent or overload tripping. For installations that exceed the recommended maximum lengths listed, contact the factory.

Please note that the cable lengths shown are guidelines. Your application may be restricted to a shorter cable length due to wire type, wire placement, line reactor and type of motor.

How to Measure Motor Cable Lengths Limited by Capacitance

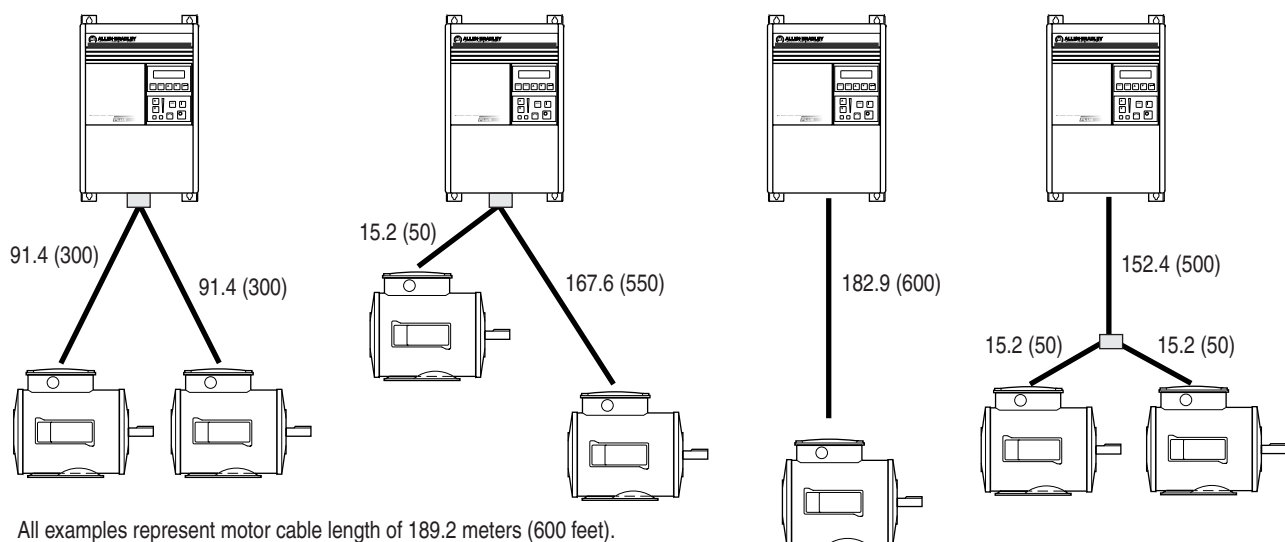


Table 2.F

Maximum Motor Cable Length Restrictions in meters (feet) - 380V-480V Drives¹

Drive Frame	Drive kW (HP)	Motor kW (HP)	No External Devices				w/1204-TFB2 Term.			w/1204-TFA1 Terminator					Reactor at Drive ²	
			Motor				Motor			Motor					Motor	
			A	B	1329	1600V or 1329R/L (1850V)	A or B		1329	A		B		1329	A	B or 1329
			Any Cable	Any Cable	Any Cable	Any Cable ⁶	Cable Type		Any Cable	Cable Type		Cable Type		Any Cable	Any Cable	Any Cable
							Shld. ³	Unshld.		Shld. ³	Unshld.	Shld. ³	Unshld.			
A1	0.37 (0.5)	0.37 (0.5)	12.2 (40)	33.5 (110)	91.4 (300)	91.4 (300)	Use 1204-TFA1			30.5 (100)	61.0 (200)	30.5 (100)	61.0 (200)	91.4 (300)	22.9 (75)	182.9 (600)
	0.75 (1)	0.75 (1)	12.2 (40)	33.5 (110)	91.4 (300)	91.4 (300)				30.5 (100)	30.5 (100)	30.5 (100)	30.5 (100)	91.4 (300)	22.9 (75)	182.9 (600)
		0.37 (0.5)	12.2 (40)	33.5 (110)	91.4 (300)	91.4 (300)				30.5 (100)	61.0 (200)	30.5 (100)	61.0 (200)	91.4 (300)	22.9 (75)	182.9 (600)
	1.2 (1.5)	1.2 (1.5)	12.2 (40)	33.5 (110)	91.4 (300)	91.4 (300)				30.5 (100)	30.5 (100)	61.0 (200)	61.0 (200)	91.4 (300)	22.9 (75)	182.9 (600)
		0.75 (1)	12.2 (40)	33.5 (110)	91.4 (300)	91.4 (300)				30.5 (100)	30.5 (100)	61.0 (200)	61.0 (200)	91.4 (300)	22.9 (75)	182.9 (600)
		0.37 (0.5)	12.2 (40)	33.5 (110)	114.3 (375)	121.9 (400)				30.5 (100)	30.5 (100)	61.0 (200)	61.0 (200)	121.9 (400)	22.9 (75)	182.9 (600)
A2	1.5 (2)	1.5 (2)	7.6 (25)	12.2 (40)	91.4 (300)	91.4 (300)	91.4 (300)	91.4 (300)	91.4 (300)	30.5 (100)	30.5 (100)	91.4 (300)	61.0 (200)	91.4 (300)	22.9 (75)	182.9 (600)
		1.2 (1.5)	7.6 (25)	12.2 (40)	114.3 (375)	182.9 (600)	91.4 (300)	182.9 (600)	182.9 (600)	30.5 (100)	30.5 (100)	91.4 (300)	61.0 (200)	182.9 (600)	22.9 (75)	182.9 (600)
		0.75 (1)	7.6 (25)	12.2 (40)	114.3 (375)	182.9 (600)	182.9 (600)	182.9 (600)	182.9 (600)	30.5 (100)	30.5 (100)	91.4 (300)	61.0 (200)	182.9 (600)	22.9 (75)	182.9 (600)
		0.37 (0.5)	7.6 (25)	12.2 (40)	114.3 (375)	182.9 (600)	182.9 (600)	182.9 (600)	182.9 (600)	30.5 (100)	30.5 (100)	91.4 (300)	61.0 (200)	182.9 (600)	22.9 (75)	182.9 (600)
	2.2 (3)	2.2 (3)	7.6 (25)	12.2 (40)	91.4 (300)	91.4 (300)	182.9 (600)	182.9 (600)	182.9 (600)	Use 1204-TFB2					22.9 (75)	182.9 (600)
		1.5 (2)	7.6 (25)	12.2 (40)	114.3 (375)	182.9 (600)	182.9 (600)	182.9 (600)	182.9 (600)						22.9 (75)	182.9 (600)
		0.75 (1)	7.6 (25)	12.2 (40)	114.3 (375)	182.9 (600)	182.9 (600)	182.9 (600)	182.9 (600)						22.9 (75)	182.9 (600)
		0.37 (0.5)	7.6 (25)	12.2 (40)	114.3 (375)	182.9 (600)	182.9 (600)	182.9 (600)	182.9 (600)						22.9 (75)	182.9 (600)
A3	3.7 (5)	3.7 (5)	7.6 (25)	12.2 (40)	114.3 (375)	182.9 (600)	182.9 (600)	182.9 (600)	182.9 (600)	Use 1204-TFB2					22.9 (75)	182.9 (600)
		2.2 (3)	7.6 (25)	12.2 (40)	114.3 (375)	Contact factory for advice on cable lengths over 182.9 (600).	182.9 (600)	182.9 (600)	182.9 (600)						22.9 (75)	182.9 (600)
		1.5 (2)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						22.9 (75)	182.9 (600)
		0.75 (1)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						22.9 (75)	182.9 (600)
		0.37 (0.5)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						22.9 (75)	182.9 (600)
A4	5.5-15 (7.5-20)	5.5-15 (7.5-20)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)	Use 1204-TFB2					24.4 (80)	182.9 (600)
B	11-22 (15-30)	11-22 (15-30)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						24.4 (80)	182.9 (600)
C	30-45 (X40-X60)	30-45 (40-60)	7.6 (25)	12.2 (40)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						76.2 (250)	182.9 (600)
D	45-112 (60-X150)	45-112 (60-150)	12.2 (40)	30.5 (100)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						61.0 (200)	182.9 (600)
E	112-187 (150-250)	112-187 (150-250)	12.2 (40)	53.3 (175)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						182.9 (600)	182.9 (600)
F	187-336 (250-450)	187-336 (250-450)	18.3 (60)	53.3 (175)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						182.9 (600)	182.9 (600)
G	187-448 (X250-600)	187-448 (250-600)	18.3 (60)	53.3 (175)	114.3 (375)		182.9 (600)	182.9 (600)	182.9 (600)						182.9 (600)	182.9 (600)

Type A Motor Characteristics: No phase paper or misplaced phase paper, lower quality insulation systems, corona inception voltages between 850 and 1000 volts.

Type B Motor Characteristics: Properly placed phase paper, medium quality insulation systems, corona inception voltages between 1000 and 1200 volts.

1329R/L Motors: These AC variable speed motors are "Control-Matched" for use with Allen-Bradley Drives. Each motor is designed to meet or exceed the requirements of the Federal Energy Act of 1992. All 1329R/L motors are optimized for variable speed operation and include premium inverter grade insulation systems which meet or exceed NEMA MG1, Part 31.40.4.2.

Table 2.G

Maximum Motor Cable Length Restrictions in meters (feet) - 500V-600V Drives⁴

Drive Frame	Drive kW (HP)	Motor kW (HP)	No External Devices			w/1204-TFB2 Terminator			w/1204-TFA1 Terminator			Reactor at Drive ²		
			Motor			Motor			Motor			Motor		
			A	B	1329R/L Motors ⁵	A	B	1600V or 1329R/L (1850V) ⁵	A	B	1600V or 1329R/L (1850V) ⁵	A	B	1600V or 1329R/L (1850V) ⁵
			Any Cable	Any Cable	Any Cable	Any Cable	Any Cable	Any Cable	Any Cable	Any Cable	Any Cable	Any Cable	Any Cable	Any Cable
A4	0.75 (1)	0.75 (1)	NR	NR	NA	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)	Not Recommended		
		0.37 (0.5)	NR	NR	NA	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
	1.5 (2)	1.5 (2)	NR	NR	NA	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		1.2 (1.5)	NR	NR	NA	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		0.75 (1)	NR	NR	182.9 (600)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		0.37 (0.5)	NR	NR	182.9 (600)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
	2.2 (3)	2.2 (3)	NR	NR	NA	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		1.5 (2)	NR	NR	NA	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		0.75 (1)	NR	NR	182.9 (600)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		0.37 (0.5)	NR	NR	182.9 (600)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
	3.7 (5)	3.7 (5)	NR	NR	NA	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		2.2 (3)	NR	NR	NA	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		1.5 (2)	NR	NR	182.9 (600)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		0.75 (1)	NR	NR	182.9 (600)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		0.37 (0.5)	NR	NR	182.9 (600)	NR	182.9 (600)	335.3 (1100)	NR	61.0 (200)	182.9 (600)			
		5.5-15 (7.5-20)	NR	9.1 (30)	182.9 (600)	91.4 (300)	182.9 (600)	182.9 (600)	NR	61.0 (200)	182.9 (600)	30.5 (100)	91.4 (300)	182.9 (600)
C	18.5-45 (25-60)	18.5-45 (25-60)	NR	9.1 (30)	182.9 (600)	91.4 (300)	182.9 (600)	182.9 (600)	NR	61.0 (200)	182.9 (600)	30.5 (100)	91.4 (300)	182.9 (600)
D	56-93 (75-125)	56-93 (75-125)	NR	9.1 (30)	182.9 (600)	91.4 (300)	182.9 (600)	182.9 (600)	NR	61.0 (200)	182.9 (600)	61.0 (200)	91.4 (300)	182.9 (600)
E	112-224 (150-X300)	112-224 (150-X300)	NR	9.1 (30)	182.9 (600)	91.4 (300)	182.9 (600)	182.9 (600)	NR	61.0 (200)	182.9 (600)	182.9 (600)	182.9 (600)	182.9 (600)
F	261-298 (350-400)	261-298 (350-400)	NR	9.1 (30)	182.9 (600)	91.4 (300)	182.9 (600)	182.9 (600)	NR	61.0 (200)	182.9 (600)	182.9 (600)	182.9 (600)	182.9 (600)
G	224-448 (300-600)	224-448 (300-600)	NR	9.1 (30)	182.9 (600)	91.4 (300)	182.9 (600)	182.9 (600)	NR	61.0 (200)	182.9 (600)	182.9 (600)	182.9 (600)	182.9 (600)

NR = Not Recommended

NA = Not Available at time of printing

¹ Values shown are for 480V nominal input voltage, drive carrier frequency of 2 kHz and ambient temperature at the motor of 40 degrees C. Consult factory regarding operation at carrier frequencies above 2 kHz. Multiply values by 0.85 for high line conditions. For input voltages of 380, 400 or 415V AC, multiply the table values by 1.25, 1.20 or 1.15, respectively.

² A 3% reactor reduces motor and cable stress but may cause a degradation of motor waveform quality. Reactors must have a turn-turn insulation rating of 2100 volts or higher.

³ Includes wire in conduit.

⁴ Values shown are for nominal input voltage and drive carrier frequency of 2 kHz. Consult factory regarding operation at carrier frequencies above 2 kHz. Multiply values by 0.85 for high line conditions.

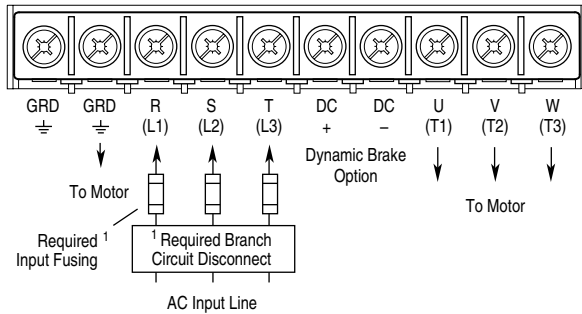
⁵ When used on 600V systems, 1329R/L motors have a corona inception voltage rating of approximately 1850V.

⁶ These distance restrictions are due to charging of cable capacitance and may vary from application to application.

Figure 2.2
Terminal Block TB1

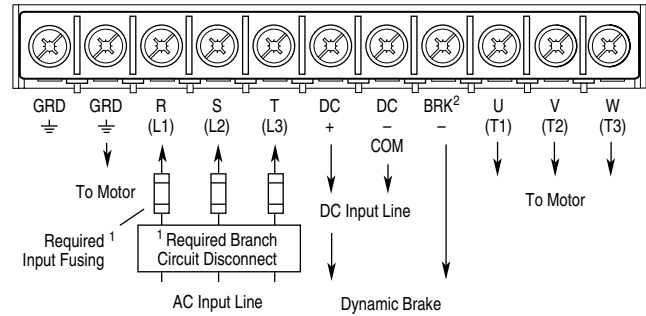
A1-A3 Frame

200-240V, 0.37-3.7 kW (0.5-5 HP) Terminal Designations
380-480V, 0.37-3.7 kW (0.5-5 HP) Terminal Designations



A4 Frame

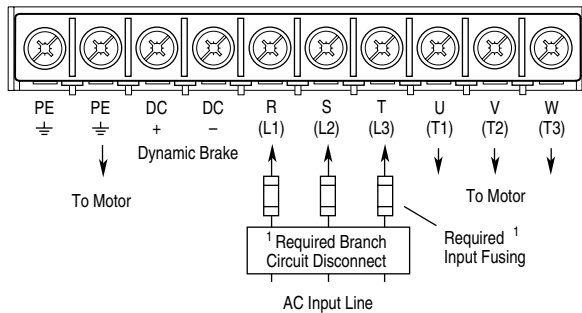
380-480V, 5.5-15 kW (7.5-20 HP) Terminal Designations
500-600V, 0.75-15 kW (1-20 HP) Terminal Designations



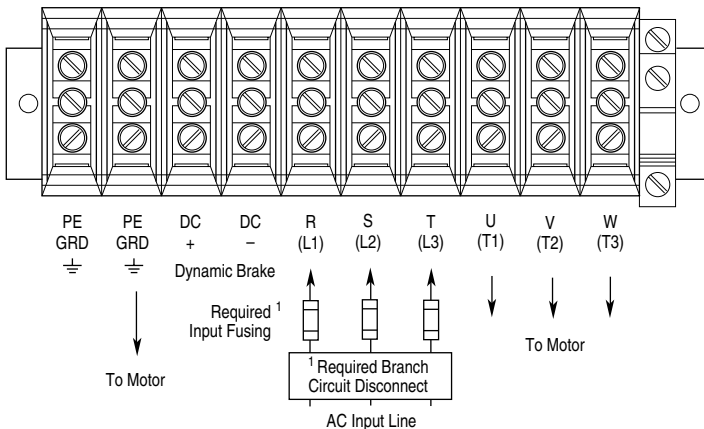
Important: A brake malfunction will occur if the Dynamic Brake is connected to "DC - COM"

B1 Frame

200-240V, 5.5 kW (7.5 HP) Terminal Designations
380-480V, 11 kW (15 HP) Terminal Designations

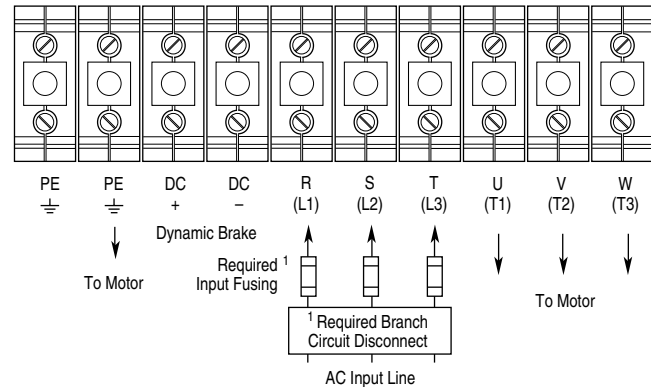


200-240V, 15-22 kW (20-30 HP) Terminal Designations
380-480V, 30-45 kW (40-60 HP) Terminal Designations
500-600V, 18.5-45 kW (25-60 HP) Terminal Designations



B2 Frame

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



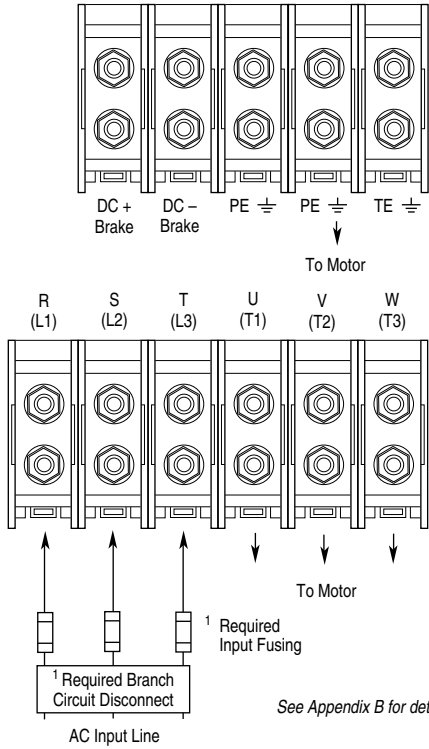
C Frame

¹ User supplied.

² Terminal located separately on Series A Drives.

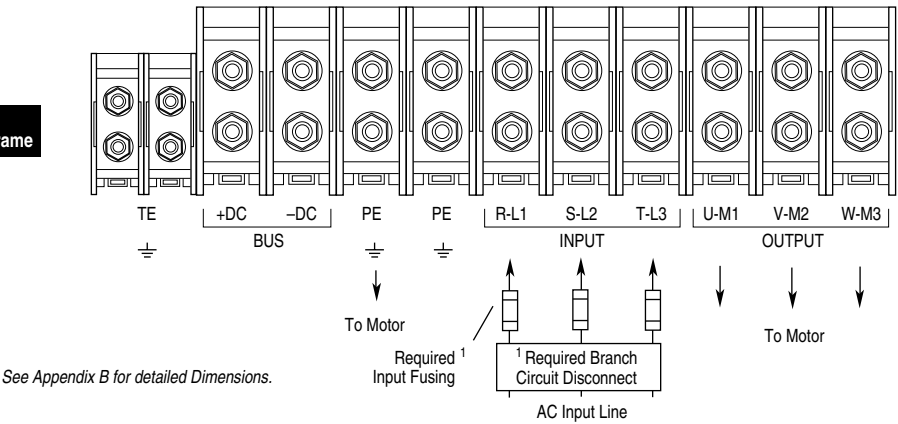
200-240V, 30-45 kW (40-60 HP) Terminal Designations
380-480V, 45-112 kW (60-150 HP) Terminal Designations
500-600V, 56-93 kW (75-125 HP) Terminal Designations

D Frame



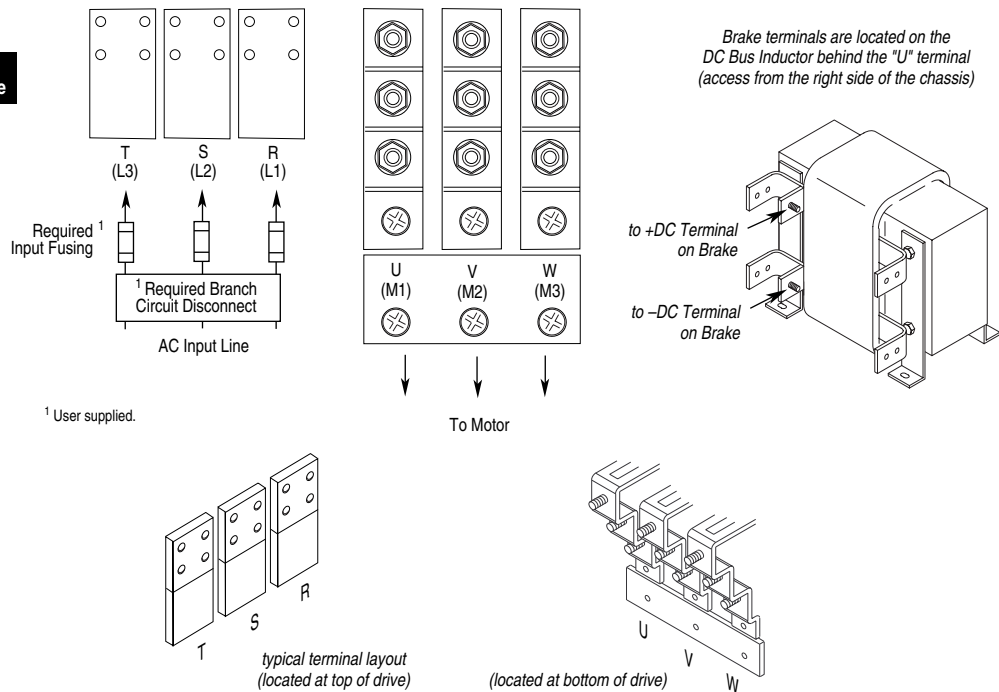
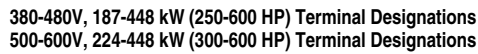
200-240V, 56-93 kW (75-125 HP) Terminal Designations
380-480V, 112-187 kW (150-250 HP) Terminal Designations
500-600V, 112-224 kW (150-300 HP) Terminal Designations

E Frame



¹ User supplied.

F Frame



Control and Signal Wiring

General Wiring Information

General requirements for analog signal wire include: stranded copper 0.750-0.283 mm² (18-22 AWG), twisted-pair, 100% shield with drain wire, 300V minimum insulation rating and a temperature rating suitable for the application (not less than 60 degrees C.) The recommended **signal (analog I/O)** wire is:

- Belden 8760/9460 (or equiv.) – 0.750 mm² (18 AWG), twisted pair, shielded.
- Belden 8770 (or equiv.) – 0.750 mm² (18 AWG), 3 conductor, shielded for remote pot only.

The recommended wire for **encoder or pulse inputs/outputs** is:

- Lengths less than or equal to 30 meters (98 feet)
Belden 9730 (or equiv.) – 0.196 mm² (24 AWG), individually shielded.
- Lengths greater than 30 meters (98 feet)
Belden 9773 (or equiv.) – 0.750 mm² (18 AWG), twisted pair, shielded.

Signal Connections

If the drive control connections are to be linked to an electronic circuit or device, the common or 0V line should, if possible, be grounded at the device (source) end only.

Important: Signal Common - User speed reference signals are terminated to logic common at TB2, terminal 5. This puts the negative (or common) side of these signals at earth ground potential. Control schemes must be examined for possible conflicts with this type of grounding scheme.

Shield Termination - TE (True Earth)

The TE terminal block (not available on A Frame drives) provides a terminating point for signal wiring shields. A Frame drives can use TB2, terminal 5 for signal wiring shield termination. Refer to [Figure 2.1](#) for location.

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

Cable Routing

If unshielded cable is used, signal circuits should not run parallel to motor cables or unfiltered supply cables with a spacing less than 0.3 meters (1 foot). Cable tray metal dividers or separate conduit should be used.

Important: When user installed control and signal wiring with an insulation rating of less than 600V is used, this wiring must be routed inside the drive enclosure and separated from any other wiring and/or uninsulated live parts.

Auxiliary Inputs - TB4, TB6

Terminal blocks TB4 and TB6 (B Frame drives & up) allow the drive power supplies to be operated from an external voltage source. Both terminal blocks are located on the Base Driver Board and are accessible from the front of the drive. See [Figure 2.1](#) for locations.

TB4 can be used to externally power the low voltage power supply, allowing operation of drive control functions in the absence of bus voltage. Applying proper voltage to TB4 (see [Table 2.J](#)) provides +5V, $\pm 15V$ and isolated 12V outputs for:

- Main Control Board (Control Interface Boards, RIO Board, etc.)
- SCANport™ (HIM, etc.)
- Encoder(s)
- LEMS
- Precharge
- Any DC fans in the drive

TB6 can be used to externally power the high voltage power supply which provides inverter IGBT drive voltage and the low voltage necessary to power the low voltage power supply. This allows operation of the drive in the absence of bus voltage.

The maximum and minimum wire size accepted by TB4 is 2.1 and 0.06 mm² (14 and 30 AWG). Wire sizes for TB6 are 5.3 and 0.06 mm² (10 and 30 AWG). Use Copper wire Only with a minimum temperature rating of 75 degrees C. Do not reduce wire gauge when using higher temperature wire. Maximum torque for both terminal blocks is 0.57 N-m (5 lb.-in.).

Table 2.J
Power Supply Input Requirements¹

Terminal Block	Drive Type	Input Voltage	Average Current	Peak Current
TB4-1 (+) TB4-2 (-)	All	22-28V DC ²	2.25A	5.00A
TB6	230V AC	200-375V DC ³	0.50A	1.00A
	380-480V AC	400-750V DC ³	0.25A	0.50A
	500-600V AC	400-925V DC ³	0.25A	0.50A

¹ The power source used to drive a power supply must be capable of providing the peak current at startup. A "flat" current or power limit is acceptable, but a foldback current limit may trip at startup, never allowing the supply to start.

² Must be supplied from a Class 2 Limited Power Source.

³ Must be supplied from a source that is provided with transient voltage surge suppression such that transients are suppressed to 6000V peak maximum or less.

Auxiliary Output - TB9

The 480V or 600V (depending on the input voltage to the drive) output terminal block (TB9) is only available on F Frame Drives. This terminal block provides a three-phase, high voltage connection from the load side of the AC input line fuses. Normally this connection is used to power an external control transformer (user supplied) or other auxiliary circuit. Refer to [Figure 2.1](#) for location.

Important: Depending on the circuitry connected, additional fusing may be required.



ATTENTION: The installation of auxiliary circuits must comply with the national codes and standards (NEC, VDE, BSA, etc.) and local codes regarding wire type, conductor sizes, branch circuit protection and disconnect devices. Failure to do so may result in personal injury and/or equipment damage.

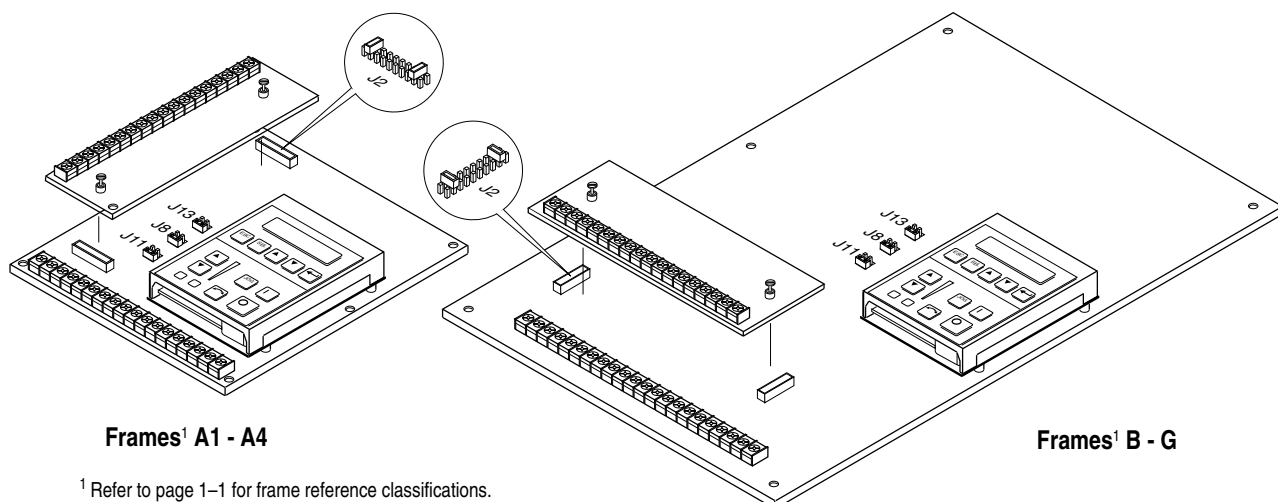
The auxiliary circuit can be utilized to a maximum current capacity of 8 amperes RMS.

The maximum and minimum wire size accepted by TB9 is 4.0 and 0.8 mm² (12 and 18 AWG). Use Copper wire Only with a minimum temperature rating of 75 degrees C. Do not reduce wire gauge when using higher temperature wire. Maximum torque is 0.90-1.81 N-m (8-16 lb.-in.).

Control Interface Board Installation and Removal

Important: If the Control Interface Board is being installed, Main Control Board jumpers at pins 3 & 4 and 17 & 18 of J2 must be removed and the proper [Input Mode] selected. If this board is removed, these jumpers must be reinstalled and the [Input Mode] parameter must be programmed to “Status (1).”

Figure 2.7
Jumper Locations

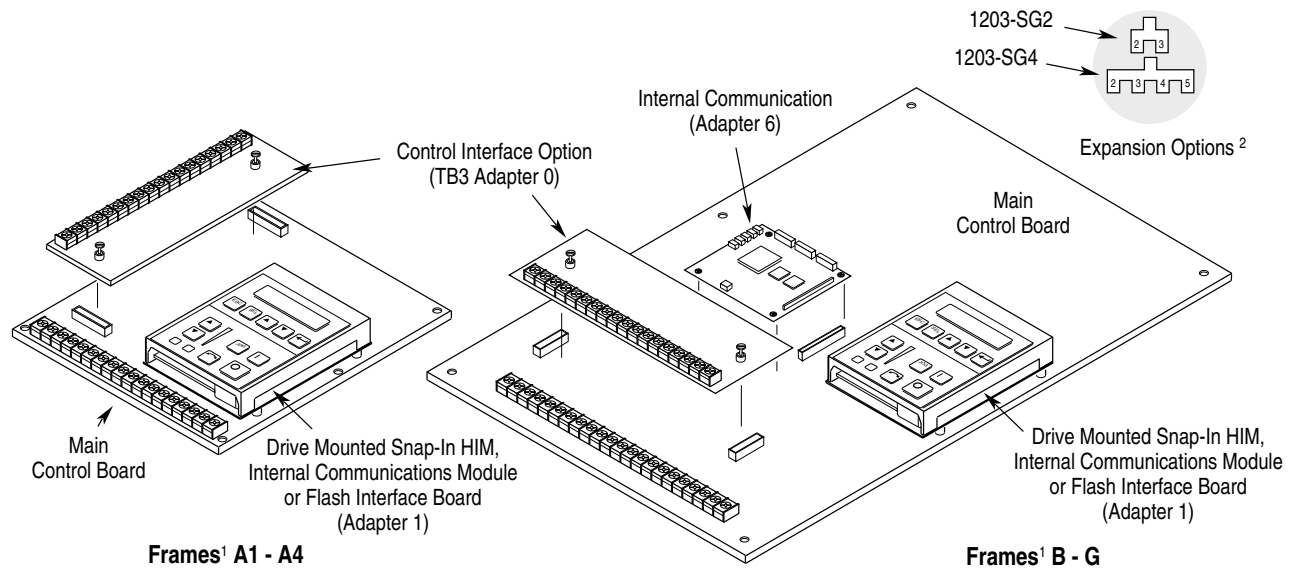


¹ Refer to page 1-1 for frame reference classifications.

Adapter Definitions

Serial communication devices such as the Human Interface Module that are connected to the drive are identified by SCANport serial communications as Adapters. Depending on the drive and options ordered, a number of different adapters are available as shown in [Figure 2.8](#). [Figure 2.9](#) shows the maximum distance allowed between devices.

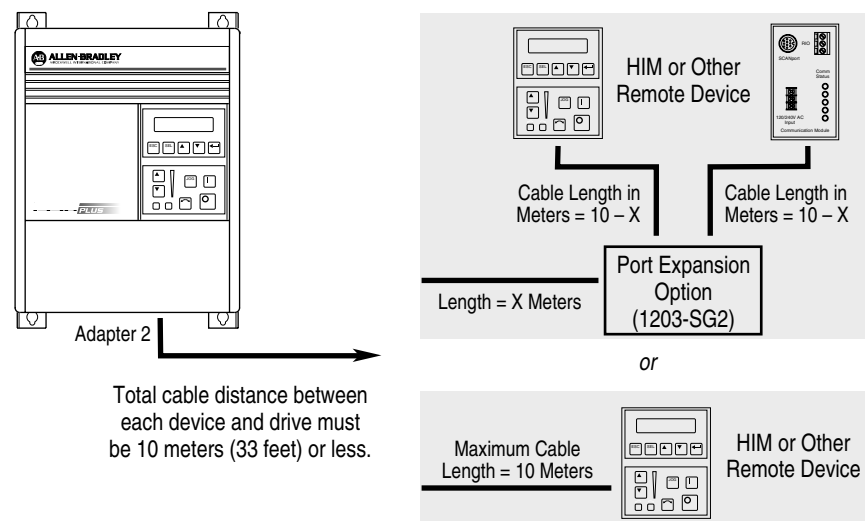
Figure 2.8
Adapter Locations



¹ Refer to page 1-1 for frame reference classifications.

² Communications Port for remote HIM/communication options (Adapter 2) or Expansion Options (Adapters 2, 3, 4, 5) is located on the bottom of the enclosure (bottom of Main Control Board Mounting Plate for frames F-G).

Figure 2.9
Remote Device Distances



End of Chapter

Human Interface Module

Chapter 3 describes the various controls and indicators found on the optional Human Interface Modules (HIMs). The material presented in this chapter must be understood to perform the start-up procedure in Chapter 5.

HIM Description

When a **drive mounted** “snap-in” HIM is supplied, it will be connected as Adapter 1 (see *Adapter Definitions* in Chapter 2) and visible from the front of the drive. This HIM should not be removed while drive power is applied.

A **handheld** HIM can be connected to the drive (using a 1202-Cxx Option Cable) as Adapter 2, 3, 4 or 5 (see *Adapter Definitions* in Chapter 2). This type of HIM can be removed while drive power is applied. Refer to [“Control Status” on page 3–6](#) and [“Handheld HIM Operation” on page 3–13](#) for further information.

The HIM can be divided into two sections; Display Panel and Control Panel. The Display Panel provides a means of programming the drive and viewing the various operating parameters. The Control Panel allows different drive functions to be controlled. Refer to [Figure 3.1](#), [Figure 3.2](#) and the sections that follow for a description of the panels.

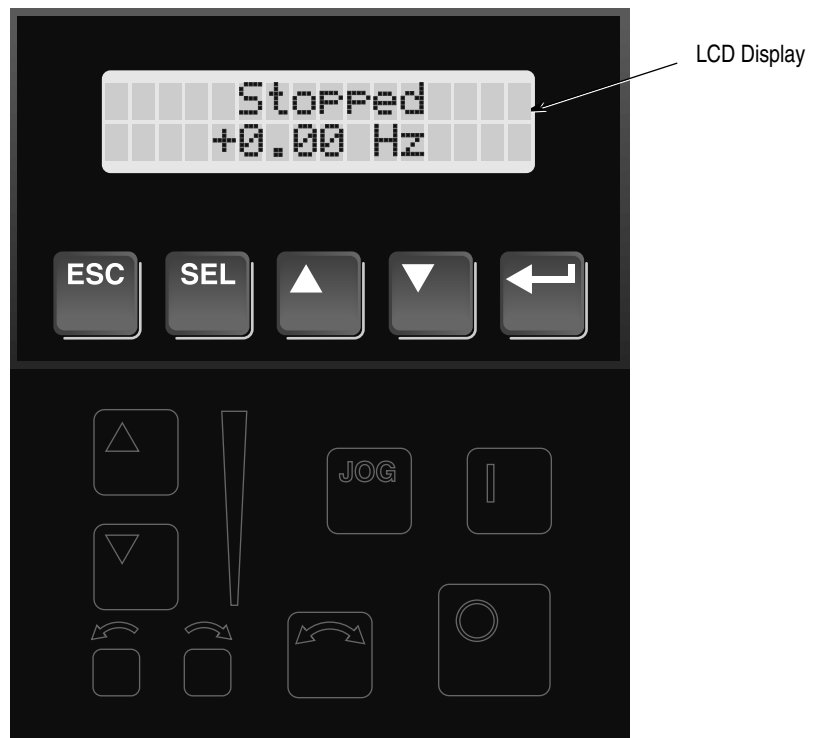


ATTENTION: When a drive mounted “snap-in” HIM is not supplied on enclosed NEMA Type 1 (IP 20) drives, the blank cover plate (option HASB) must be installed to close the opening in the front cover of the enclosure. Failure to install the blank cover plate allows access to electrically live parts which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

When a drive mounted “snap-in” HIM is supplied with enclosed NEMA Type 1 (IP 20) drives, but has been removed, the blank cover plate must be installed in place of the HIM.

Important: The operation of some HIM functions will depend upon drive parameter settings. The default parameter values allow full HIM functionality.

Figure 3.1
HIM Display Panel



Display Panel Key Descriptions



Escape

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



Select

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



or



Increment/Decrement

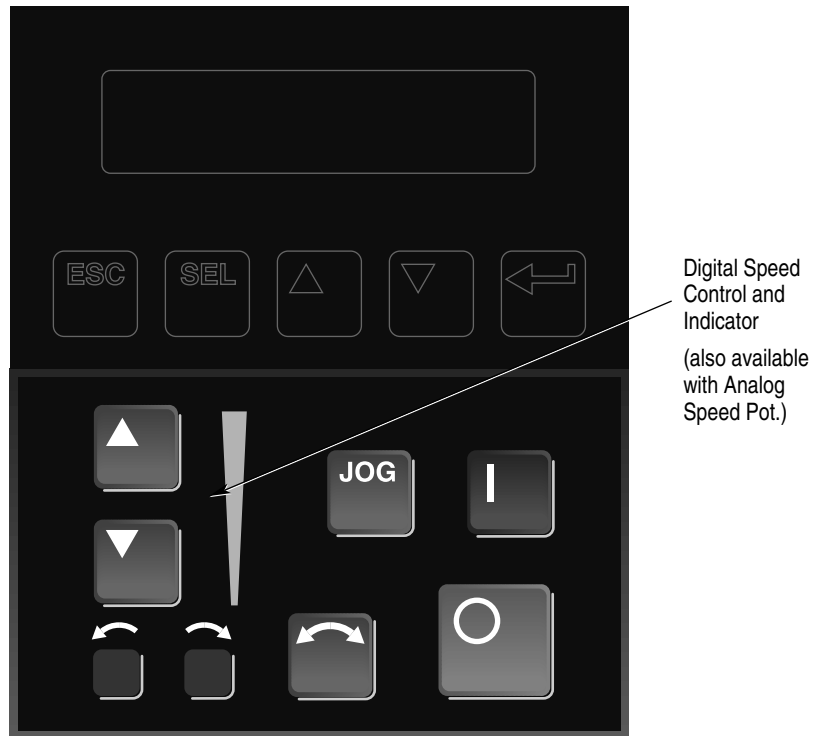
These keys are used to increment and decrement a value or scroll through different groups or parameters. Pressing both keys simultaneously while the Process or Password Display is shown, will save that display as the startup display.



Enter

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

Figure 3.2
HIM Control Panel



Control Panel Key Descriptions



Start

The Start key will initiate drive operation if no other control devices are sending a Stop command. This key can be disabled by the [Logic Mask] or [Start Mask].



Stop

If the drive is running, pressing the Stop key will cause the drive to stop, using the selected stop mode. Refer to the [Stop Select 1] and [Stop Select 2] parameters in Chapter 6.

If the drive has stopped due to a fault, pressing this key will clear the fault and reset the drive. Refer to the [Flt Clear Mode], [Logic Mask] and [Fault Mask] parameters.



Jog

When pressed, jog will be initiated at the frequency set by the [Jog Frequency] parameter, if no other control devices are sending a Stop command. Releasing the key will cause the drive to stop, using the selected stop mode. Refer to [Stop Select 1], [Stop Select 2], [Logic Mask] and [Jog Mask].

Control Panel Key Descriptions *(Continued)*



Change Direction

Pressing this key will cause the drive to ramp down to zero Hertz and then ramp up to set speed in the opposite direction. The appropriate Direction Indicator will illuminate to indicate the direction of motor rotation. Refer to [Logic Mask] and [Direction Mask].



Direction LEDs (Indicators)

The appropriate LED will illuminate continuously to indicate the commanded direction of rotation. If the second LED is flashing, the drive has been commanded to change direction, but is still decelerating.



Up/Down Arrows *(only available with digital speed control)*

Pressing these keys will increase or decrease the HIM frequency command. An indication of this command will be shown on the visual Speed Indicator. The drive will run at this command if the HIM is the selected frequency reference. See [Freq Select 1] and [Freq Select 2].



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

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



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

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

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

HIM Operation

When power is first applied to the drive, the HIM will cycle through a series of displays. These displays will show drive name, HIM ID number and communication status. Upon completion, the Status Display (see [Figure 3.3](#)) will be shown. This display shows the current status of the drive (i.e. “Stopped,” “Running,” etc.) or any faults that may be present (refer to Chapter 7 for fault information). The Status Display can be replaced by the Process Display or Password Login menu on all HIMS, except Series A below version 3.0. See appropriate sections on the following pages for more information.

Specifications and Supplemental Information

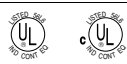
Specifications

Protection

	<u>200-240V Drive</u>	<u>380-480V Drive</u>	<u>500-600V Drive</u>
AC Input Overvoltage Trip:	285V AC	570V AC	690V AC
AC Input Undervoltage Trip:	138V AC	280V AC	343V AC
Bus Overvoltage Trip:	405V DC	810V DC	1013V DC
Bus Undervoltage Trip:	200V DC	400V DC	498V DC
Nominal Bus Voltage:	324V DC	648V DC	810V DC
Heat Sink Thermistor:	Monitored by microprocessor overtemp trip.		
Drive Overcurrent Trip			
Software Current Limit:	20 to 160% of VT rated current.		
Hardware Current Limit:	180 to 250% of VT rated current (dependent on drive rating).		
Instantaneous Current Limit:	220 to 300% of VT rated current (dependent on drive rating).		
Line transients:	up to 6000 volts peak per IEEE C62.41-1991.		
Control Logic Noise Immunity:	Showering arc transients up to 1500 volts peak ² .		
Power Ride-Thru:	15 milliseconds at full load.		
Logic Control Ride-Thru:	0.5 seconds minimum, 2 seconds typical.		
Ground Fault Trip:	Phase-to-ground on drive output.		
Short Circuit Trip:	Phase-to-phase on drive output.		

Environment

Altitude:	1000 m (3300 ft) max. without derating.
Ambient Operating Temperature	
IP00, Open:	0 to 50 degrees C (32 to 122 degrees F).
IP20, NEMA Type 1 Enclosed:	0 to 40 degrees C (32 to 104 degrees F).
IP54, NEMA Type 12 Enclosed:	0 to 40 degrees C (32 to 104 degrees F).
IP65, NEMA Type 4 Enclosed:	0 to 40 degrees C (32 to 104 degrees F).
Storage Temperature (all constructions):	–40 to 70 degrees C (–40 to 158 degrees F).
Atmosphere	Important: Drive must not be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the drive is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.
Relative Humidity:	5 to 95% non-condensing.
Shock:	15G peak for 11ms duration (±1.0ms).
Vibration:	0.006 inches (0.152 mm) displacement, 1G peak.
Agency Certification:	

U.L. Listed CSA Certified	
Marked for all applicable directives ¹	
Emissions	EN 50081-1 EN 50081-2 EN 55011 Class A EN 55011 Class B EN 61800-3
Immunity	EN 50082-1 EN 50082-2 IEC 801-1, 2, 3, 4, 6, 8 per EN 50082-1, 2 EN 61800-3
Low Voltage	EN 60204-1 PREN 50178

¹ Note: Installation guidelines called out in *Appendix C* **must** be adhered to.

² Applied noise impulses may be counted in addition to the standard pulse train causing erroneously high [Pulse Freq] readings.

Electrical

Input Data

Voltage Tolerance:	-10% of minimum, +10% of maximum.
Frequency Tolerance:	47-63 Hz.
Input Phases:	Three-phase input provides full rating for all drives. Single-phase operation is possible for A & B Frame drives at a derating of 50%.

Displacement Power Factor

A1-A3 Frame Drives:	0.80 standard, 0.95 with optional inductor.
A4 Frame & Up Drives:	0.95 standard.

Efficiency: 97.5% at rated amps, nominal line volts.

Max. Short Circuit Current Rating: **Installations per U.S. NEC/UL/CSA**

Using Specified Fuses	200,000A
Using Specified HMCP Breakers	Per "Max. Short Circuit Amps" column in Table 2.A , specific to each rating.

Using Specified HMCP Breakers with Current Limiter Option	200,000A
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IEC Installations per IEC947

Using Specified 140 Devices	Per "Rated Service Short Circuit Capability" column in Table 2.A , specific to each rating.
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Control

Method:	Sine coded PWM with programmable carrier frequency. Ratings apply to all drives (refer to the <i>Derating Guidelines</i> on page A-5).
A & B Frame Drives	2-8 kHz. Drive rating based on 4 kHz (see pg. 1-1 for frame info).
C & D Frame Drives	2-6 kHz. Drive rating based on 4 kHz (see pg. 1-1 for frame info).
E Frame Drives & Up	2-6 kHz. Drive rating based on 2 kHz (see pg. 1-1 for frame info).
Output Voltage Range:	0 to rated voltage.
Output Frequency Range:	0 to 400 Hz.
Frequency Accuracy	
Digital Input:	Within $\pm 0.01\%$ of set output frequency.
Analog Input:	Within $\pm 0.4\%$ of maximum output frequency.
Selectable Motor Control:	Sensorless Vector with full tuning. Standard V/Hz with full custom capability.
Accel/Decel:	Two independently programmable accel and decel times. Each time may be programmed from 0 - 3600 seconds in 0.1 second increments ¹ .
Intermittent Overload:	Constant Torque - 150% of rated output for 1 minute. Variable Torque - 115% of rated output for 1 minute.
Current Limit Capability:	Proactive Current Limit programmable from 20 to 160% of rated output current. Independently programmable proportional and integral gain.
Inverse Time Overload Cap.	Class 10 protection with speed sensitive response. Investigated by U.L. to comply with N.E.C. Article 430. U.L. File E59272, volume 4/6.

¹ 0.1 second increments using a HIM or 0.01 with serial communications.

Input/Output Ratings

Each 1336 PLUS II Drive has constant and variable torque capabilities. The listings on the next page provide input & output current and kVA ratings.

Note: Drive ratings are at nominal values. See *Derating Guidelines* on page [A-5](#).

Cat. No.	Constant Torque				Cat. No.	Variable Torque				Cat. No.	Variable Torque			
	Input kVA	Input Amps	Output kVA	Output Amps		Input kVA	Input Amps	Output kVA	Output Amps		Input kVA	Input Amps	Output kVA	Output Amps
200-240V DRIVES					240V DRIVES					400V DRIVES				
AQF05	1.1	2.8	0.9	2.3	1.1	2.8	0.9	2.3						
AQF07	1.4	3.5	1.2	3.0	1.4	3.5	1.2	3.0						
AQF10	2.2	5.4	1.8	4.5	2.2	5.4	1.8	4.5						
AQF15	2.9	7.3	2.4	6.0	2.9	7.3	2.4	6.0						
AQF20	3.9	9.7	3.2	8.0	3.9	9.7	3.2	8.0						
AQF30	5.7	14.3	4.8	12	5.7	14.3	4.8	12						
AQF50	8.5	21.3	7.2	18	8.5	21.3	7.2	18						
AQF75	9.0	22.6	8.8	22	9.0	22.6	8.8	22						
A007	8-10	23	8.8	22	10	23	8.8	22						
A010	12-14	35	14	34	14	35	14	34						
A015	17-20	49	19	48	20	49	19	48						
A020	22-26	63	26	65	26	63	26	65						
A025	26-31	75	31	77	31	75	31	77						
A030	27-33	79	32	80	33	79	32	80						
A040	41-49	119	48	120	49	119	48	120						
A050	52-62	149	60	150	62	149	60	150						
A060	62-74	178	72	180	74	178	72	180						
A075	82-99	238	96	240	99	238	96	240						
A100	100-120	289	116	291	120	289	116	291						
A125	112-134	322	129	325	134	322	129	325						
380-480V DRIVES					480V DRIVES					400V DRIVES				
BRF05	0.9-1.0	1.3	0.9	1.1	1.1	1.4	1.0	1.2	0.9	1.4	1.0	1.33		
BRF07	1.3-1.6	2.0	1.3	1.6	1.7	2.1	1.4	1.7	1.4	2.1	1.4	1.89		
BRF10	1.7-2.1	2.6	1.7	2.1	2.2	2.8	1.8	2.3	1.8	2.8	1.8	2.55		
BRF15	2.2-2.6	3.3	2.2	2.8	2.8	3.5	2.4	3.0	2.3	3.5	2.4	3.33		
BRF20	3.0-3.7	4.6	3.0	3.8	3.8	4.8	3.2	4.0	3.2	4.8	3.2	4.44		
BRF30	4.2-5.1	6.4	4.2	5.3	5.7	7.2	4.8	6.0	4.7	7.2	4.8	6.66		
BRF50	6.6-8.0	10.0	6.7	8.4	8.5	10.7	7.2	9.0	7.0	10.7	7.2	9.99		
BRF75	8.9-11.3	13.6	10.6	13.3	13.0	15.7	12.3	15.4	10.3	15.7	12.3	19.43		
BRF100	10.8-13.6	16.4	12.8	16.1	18.6	22.4	17.5	22	14.7	22.4	17.5	22.00		
BRF150	16.1-20.4	24.5	19.1	24	20.4	24.5	19.1	24	16.1	24.5	19.1	24.00		
BRF200	18.0-23.0	28	22	27	23	28	22	27	18	28	22	27.75		
B015	16-21	25	19	24.2	23	28	22	27	18	28	22	29.97		
B020	21-26	32	25	31	29	35	27	34	23	35	27	37.74		
B025	26-33	40	31	39	36	43	33	42	28	43	33	46.62		
B030	30-38	46	36	45	41	49	38	48	32	49	38	53.28		
BX040	40-50	61	47	59	50	61	47	59	40	61	47	66.60		
B040	38-48	58	48	60	52	63	52	65	41	63	52	72.15		
B050	48-60	73	60	75	62	75	61	77	49	75	61	83.25		
BX060 ¹	62	75	61	77	62	75	61	77	62	75	61	85.47		
B060	54-68	82	68	85	77	93	76	96	61	93	76	106.56		
B075	69-87	105	84	106	99	119	96	120	78	119	96	133.20		
B100	90-114	137	110	138	124	149	120	150	98	149	120	166.50		
B125	113-143	172	138	173	148	178	143	180	117	178	143	199.80		
BX150	148	178	143	180	148	178	143	180	148	178	143	199.80		
B150	130-164	197	159	199	198	238	191	240	157	238	191	266.40		
B200	172-217	261	210	263	241	290	233	292	191	290	233	324.12		
B250	212-268	322	259	325	268	322	259	325	212	322	259	360.75		
BP/BPR250	212-268	322	259	325	297	357	287	360	235	357	287	399.60		
BX250	212-268	322	259	325	297	357	287	360	228	347	279	399.60		
B300	235-297	357	287	360	350	421	339	425	261	397	319	471.75		
BP/BPR300	235-297	357	287	360	350	421	339	425	277	421	339	471.75		
B350	277-350	421	339	425	392	471	378	475	294	446	359	527.25		
BP/BPR350	277-350	421	339	425	392	471	378	475	310	471	378	527.25		
B400	310-392	471	387	475	433	521	418	525	326	496	398	582.75		
BP/BPR400	310-392	471	378	475	438	527	424	532	347	527	424	532.05		
B450	343-433	521	418	525	486	585	470	590	372	565	454	654.90		
BP/BPR450	347-438	527	424	532	438	527	424	532	347	527	424	532.00		
B500	385-486	585	470	590	552	664	534	670	437	664	534	743.70		
B600	437-552	664	534	670	552	664	534	670	437	664	534	743.70		
500-600V DRIVES					600V DRIVES									
CWF10	2.1-2.5	2.4	2.1	2.0	2.5	2.4	2.1	2.0						
CWF20	4.2-5.0	4.8	4.2	4.0	5.0	4.8	4.2	4.0						
CWF30	6.2-7.5	7.2	6.2	6.0	7.5	7.2	6.2	6.0						
CWF50	8.3-10.0	9.6	8.3	8.0	10.0	9.6	8.3	8.0						
CWF75	9.0-11.0	10.0	10.0	10.0	11.0	10.0	10.0	10.0						
CWF100	11.0-13.0	12.0	12.0	12.0	13.0	12.0	12.0	12.0						
CWF150	17.0-20.0	19.0	19.0	19.0	20.0	19.0	19.0	19.0						
CWF200	21.0-26.0	25.0	24.0	24.0	26.0	25.0	24.0	24.0						
C025	27-32	31	30	30	32	31	30	30						
C030	31-37	36	35	35	37	36	35	35						
C040	38-45	44	45	45	45	44	45	45						
C050	48-57	55	57	57	57	55	57	57						
C060	52-62	60	62	62	62	60	62	62						
C075	73-88	84	85	85	88	84	85	85						
C100	94-112	108	109	109	112	108	109	109						
C125	118-142	137	137	138	142	137	137	138						
C150	144-173	167	167	168	173	167	167	168						
C200	217-261	251	251	252	261	251	251	252						
C250	244-293	282	283	284	293	282	283	284						
CX300	256-307	295	297	298	307	295	297	298						
C300	258-309	297	299	300	309	297	299	300						
C350	301-361	347	349	350	361	347	349	350						
CP/CPR350	301-361	347	349	350	361	347	349	350						
C400	343-412	397	398	400	412	397	398	400						
CP/CPR400	343-412	397	398	400	412	397	398	400						
C450	386-464	446	448	450	464	446	448	450						
C500	429-515	496	498	500	515	496	498	500						
C600	515-618	595	598	600	618	595	598	600						

¹ 480 Volts Only.

User Supplied Enclosures

1336 PLUS II drives installed in user supplied enclosures may be mounted within an enclosure or may be mounted to allow the heat sink to extend outside the enclosure. Use the information below in combination with the enclosure manufacturer's guidelines for sizing.

Cat No.	Base Derate Amps ¹	Derate Curve ^{2, 3}	Heat Dissipation Drive Watts ^{2, 3, 4}	Heat Sink Watts ²	Total Watts ²
200-240V DRIVES					
AQF05	2.3	Figure A	13	15	28
AQF07	3.0	Figure A	15	21	36
AQF10	4.5	Figure A	17	32	49
AQF15	6.0	Figure A	21	42	63
AQF20	8.0	Figure A	25	56	81
AQF30	12	Figure A	33	72	105
AQF50	18	Figure A	42	116	158
AQF75	22	Figure A	58	186	244
A007	27	No Derate	156	486	642
A010	34	Figure B	200	721	921
A015	48	Figure D	205	819	1024
A020	65	No Derate	210	933	1143
A025	77	No Derate	215	1110	1325
A030	80	No Derate	220	1110	1330
A040	120	Figure G	361	1708	2069
A050	150	Figure H	426	1944	2370
A060	180	Figure J	522	2664	3186
A075	240	Figure L	606	2769	3375
A100	291	Figure M	755	3700	4455
A125	325	Figure N	902	4100	5002
380-480V DRIVES					
BRF05	1.2	Figure A	12	9	21
BRF07	1.7	Figure A	13	15	28
BRF10	2.3	Figure A	15	20	35
BRF15	3.0	Figure A	16	27	43
BRF20	4.0	Figure A	19	36	55
BRF30	6.0	Figure A	23	54	77
BRF50	9.0	Figure A	29	84	113
BRF75	15.4	Figure A	58	186	244
BRF100	22.0	Figure A	68	232	300
BRF150	24.0	Figure A	88	332	420
BRF200	27.0	Figure A	96	356	452
B015	27	No Derate	117	486	603
B020	34	Figure B	140	628	768
B025	42	Figure C	141	720	861
B030	48	Figure D	141	820	961
BX040	59	Figure E	175	933	1108
B040	65	Figure E	175	933	1108
B050	77	Figure F	193	1110	1303
BX060	77	Figure F	193	1110	1303
B060	96	No Derate	361	1708	2069
B075	120	Figure G	361	1708	2069
B100	150	Figure H	426	1944	2370
B125	180	Figure J	522	2664	3186
BX150	180	Figure J	606	2769	3375
B150	240	Figure L	606	2769	3375
B200	292	Figure M	755	3700	4455
B250	325	Figure N	902	4100	5002
BP/BPR250 ⁶	322	Figure O	491	4658	5149
BX250	360	No Derate	902	4100	5002
B300 ⁵	425	No Derate	1005	4805	5810
BP/BPR300 ⁶	357	Figure P	619	5342	5961
B350 ⁵	475	No Derate	1055	5455	6510
BP/BPR350 ⁶	421	Figure Q	733	6039	6772
B400 ⁵	525	No Derate	1295	6175	7470
BP/BPR400 ⁶	471	Figure R	793	6329	7122
B450 ⁵	590	No Derate	1335	6875	8210
BP/BPR450 ⁶	527	Figure S	931	7000	7931
B500 ⁵	670	Figure T	1395	7525	8920
B600 ⁵	670	Figure T	1485	8767	10252
500-600V DRIVES					
CWF10	2.4	Figure U	25	29	54
CWF20	4.8	Figure U	29	57	86
CWF30	7.2	Figure U	32	87	119
CWF50	9.6	Figure U	35	117	152
CWF75	10	Figure U	38	148	186
CWF100	12	Figure U	41	177	218
CWF150	19	Figure U	52	286	338
CWF200	24	Figure U	60	358	418
C025	30	No Derate	141	492	633
C030	35	No Derate	141	526	667
C040	45	No Derate	175	678	853
C050	57	No Derate	193	899	1092
C060	62	No Derate	193	981	1174
C075	85	Figure G	361	1533	1894
C100	109	Figure J	426	1978	2404
C125	138	Figure K	522	2162	2683
C150	168	Figure V	606	2315	2921
C200	252	Figure W	755	3065	3820
C250	284	Figure X	890	3625	4515
CX300	300	Figure Y	940	3990	4930
C300 ⁵	300	Figure AB & AC	926	5015	5941
C350 ⁵	350	Figure AB & AC	1000	5935	6935
CP/CPR350	350	Figure Z	580	6125	6705
C400 ⁵	400	Figure AB & AC	1430	7120	8550
CP/CPR400	400	Figure AA	711	7000	7711
C450 ⁵	450	Figure AB & AC	1465	8020	9485
C500 ⁵	500	Figure AB & AC	1500	8925	10425
C600 ⁵	600	Figure AB & AC	1610	10767	12377

¹ Base Derate Amps are based on nominal voltage (240, 480 or 600V). If input voltage exceeds Drive Rating, Drive Output must be derated. Refer to [Figure AE](#).

² Rating is at 4 kHz (2 kHz for 224-448 kW/300-600 HP, 500-600V). If carrier frequencies above 4 kHz are selected, drive rating must be derated. See [Figure A-AC](#).

³ Drive Ambient Temperature Rating is 40° C. If ambient exceeds 40° C, the drive must be derated. Refer to [Figure A-AC](#).

⁴ Drive Rating is based on altitudes of 1,000 m (3,000 ft) or less. If installed at higher altitude, drive must be derated. Refer to [Figure AD](#).

⁵ **Important:** Two (2) 725 CFM fans are required if an open type drive is mounted in a user supplied enclosure.

⁶ **Important:** 1336F-BPRxxx - two (2) 450 CFM fans are required if an open type drive is mounted in a user supplied enclosure.

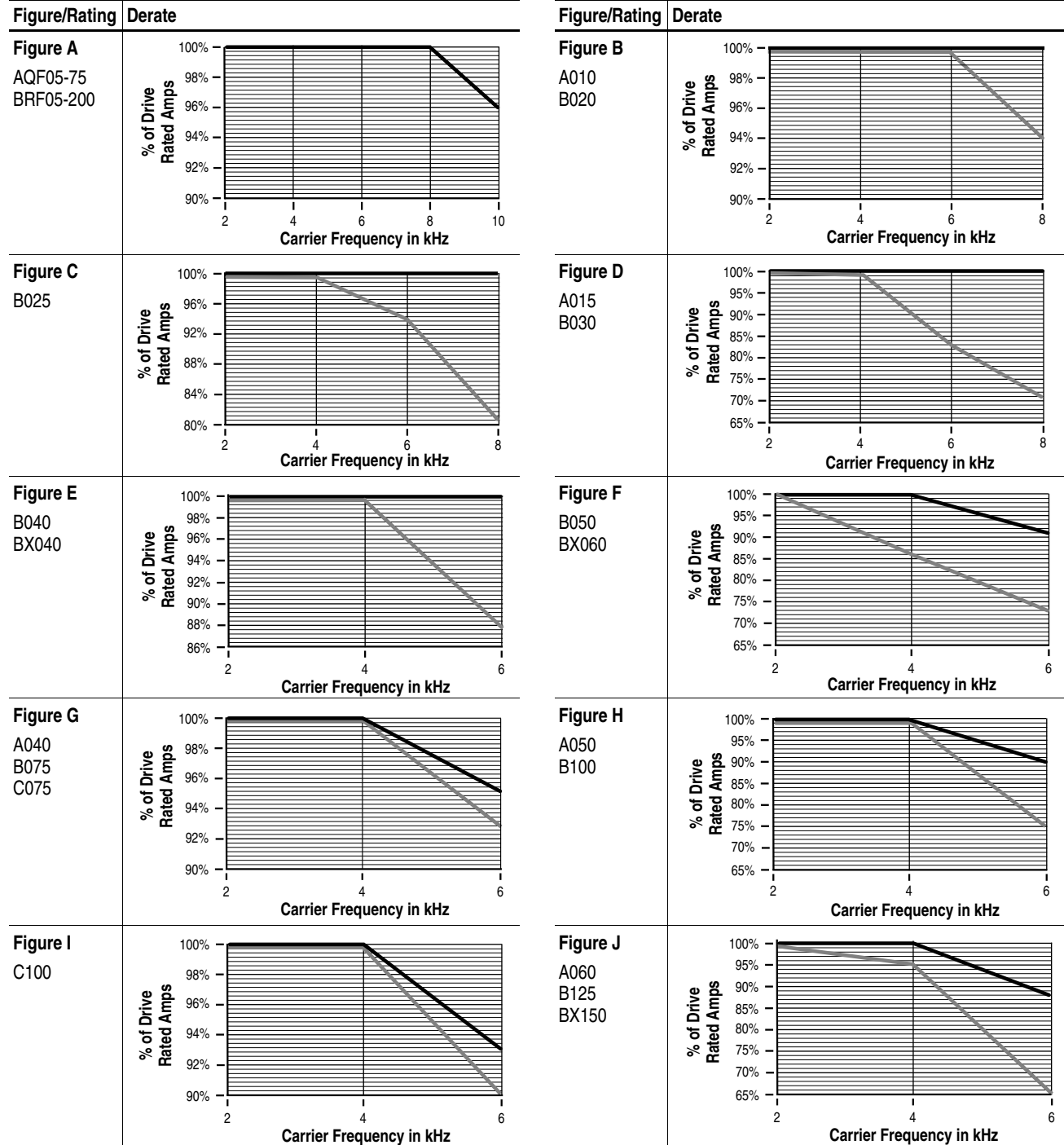
Derating Guidelines

Drive ratings can be affected by a number of factors. If more than one factor exists, derating percentages must be multiplied. For example, if a 42 Amp drive (B025) running at 8 kHz is installed at a 2,000 m (6,600 ft.) altitude and has a 2% high input line voltage, the actual amp rating will be:

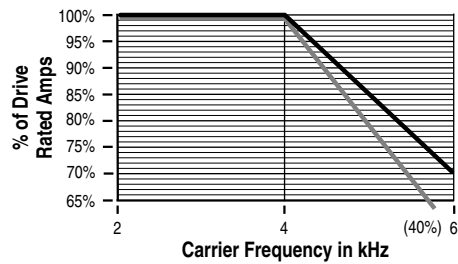
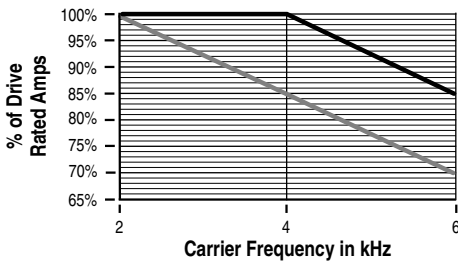
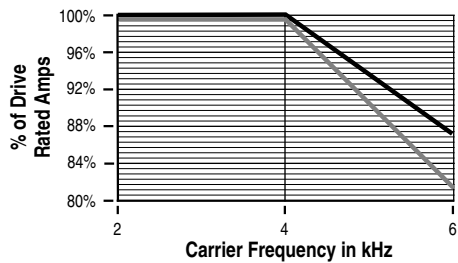
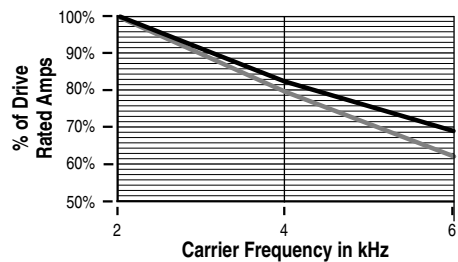
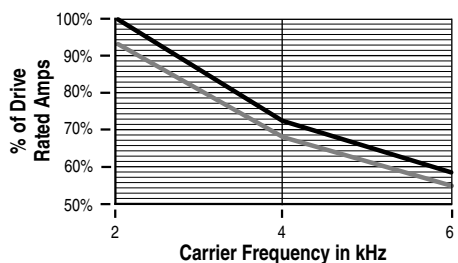
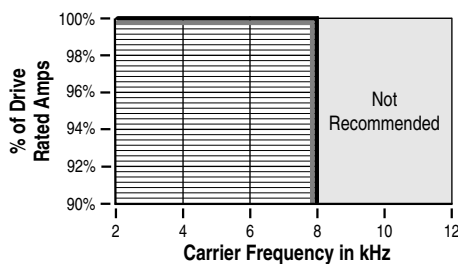
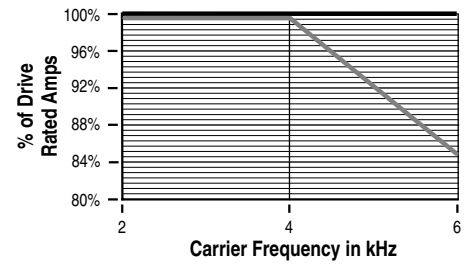
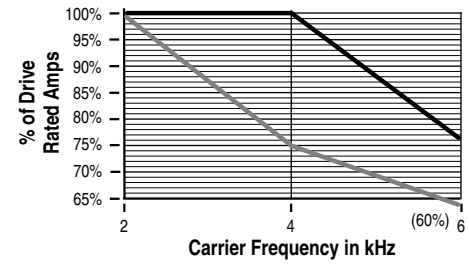
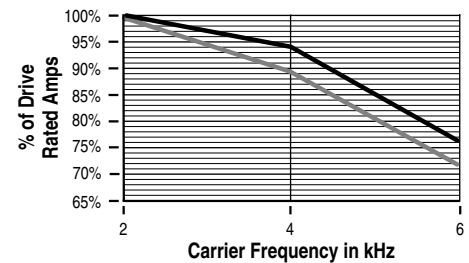
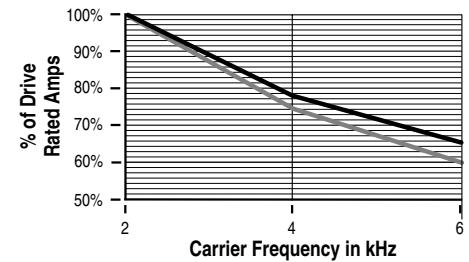
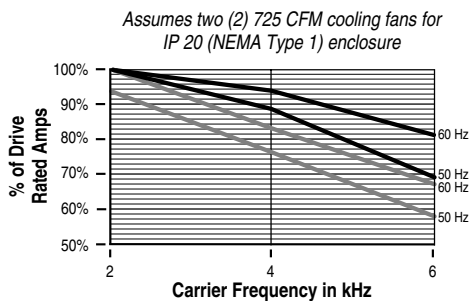
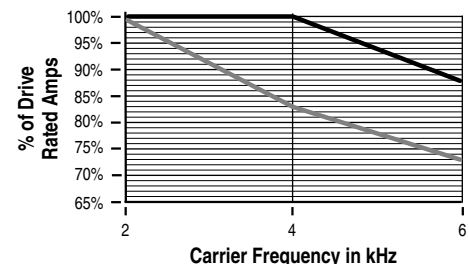
$$42 \times 94\% \text{ Altitude Derate} \times 96\% \text{ High Line Derate} = 37.9 \text{ Amps}$$

Ambient Temperature / Carrier Frequency

— Standard Rating for Enclosed Drive in 40°C Ambient & Open Drive in 50°C Ambient. — Derating Factor for Enclosed Drive in Ambient between 41°C & 50°C.



— Standard Rating for Enclosed Drive in 40°C Ambient & Open Drive in 50°C Ambient. — Derating Factor for Enclosed Drive in Ambient between 41°C & 50°C.

Figure/Rating Derate**Figure K**
C125**Figure M**
A100, B200**Figure O**
BP250
BPR250**Figure Q**
BP350
BPR350**Figure S**
BP450
BPR450**Figure U**
CWF10-200**Figure/Rating** Derate**Figure L**
A075, B150**Figure N**
A125
B250**Figure P**
BP300
BPR300**Figure R**
BP400
BPR400**Figure T**
B500
B600**Figure V**
C150

CE Conformity

Low Voltage Directive

The following low voltage directives apply:

- EN 60204-1
- PREN 50178

EMC Directive

This apparatus is tested to meet Council Directive 89/336 Electromagnetic Compatibility (EMC) using a technical construction file and the following standards:

- EN 50081-1, -2 - Generic Emission Standard
- EN 50082-1, -2 - Generic Immunity Standard

Declarations of Conformity to the European Union Directives are available. Please contact your Allen-Bradley Sales Representative.

Marked for all applicable directives ¹	
Emissions	EN 50081-1 EN 50081-2 EN 55011 Class A EN 55011 Class B EN 61800-3
Immunity	EN 50082-1 EN 50082-2 IEC 801-1, 2, 3, 4, 6, 8 per EN 50082-1, 2 EN 61800-3
Low Voltage	EN 60204-1 PREN 50178



¹ Note: Installation guidelines stated below must be adhered to.

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

Requirements for Conforming Installation

The following six items **are required** for CE conformance:

1. Standard 1336 PLUS II Drive 0.37-448kW (0.5-600HP) CE compatible (Series D or higher).
2. Factory installed EMC enclosure (-AE option) or field installed EMC Enclosure Kit (1336x-AEx - see page [C-3](#)).
3. Filter as called out below.
4. Grounding as shown on page [C-4](#).
5. Input power (source to filter) and output power (filter to drive & drive to motor) wiring must be braided, shielded cable with a coverage of 75% or better, metal conduit or other with equivalent or better attenuation, mounted with appropriate connectors. For shielded cable it is recommended to use a compact strain relief connector with double saddle clamp for filter and drive input and compact strain relief connector with EMI protection for motor output.
6. Control (I/O) and signal wiring must be in conduit or have shielding with equivalent attenuation.

Filter

Filter Selection

Filter Catalog Number	Filter Series	Mounting See . . .	Power Dissipation	Three-Phase Volts	Used with . . .	Frame Reference
1336-RFB-7-AA	A	Figure C.1	4.5 Watts	200-240V 380-480V	1336F-AQF05 - AQF10 1336F-BRF05 - BRF20	A1 A1-A2
1336-RFB-7-A	B	Figure C.1 or Figure C.2	2 Watts	200-240V 380-480V	1336F-AQF05 - AQF10 1336F-BRF05 - BRF20	A1 A1-A2
1336-RFB-16-AA	A	Figure C.1	9 Watts	200-240V 380-480V	1336F-AQF15 - AQF20 1336F-BRF30 - BRF50	A2 A2-A3
1336-RFB-16-A	B	Figure C.1 or Figure C.2	9.5 Watts	200-240V 380-480V	1336F-AQF15 - AQF20 1336F-BRF30 - BRF50	A2 A2-A3
1336-RFB-30-A	A	Figure C.1	14 Watts	200-240V	1336F-AQF30 - AQF50	A3
1336-RFB-30-A4	A	Figure C.2	35 Watts	380-480V	1336F-BRF75 - BRF200	A4
1336-RFB-27-B	A	Figure C.2	30 Watts	200-240V 380-480V	1336F-A007 1336F-B007 - B015	B B
1336-RFB-48-B	A	Figure C.2	56 Watts	200-240V 380-480V	1336F-A010 - A015 1336F-B020 - B030	B B
1336-RFB-80-C	A	Figure C.2	71 Watts	200-240V 380-480V	1336F-A020 - A030 1336F-BX040 - BX060	C C
1336-RFB-150-D	A	Figure C.3 or Figure C.4	90 Watts	200-240V 380-480V	1336F-A040 - A050 1336F-B060 - B100	D D
1336-RFB-180-D	A	Figure C.3 or Figure C.4	125 Watts	200-240V 380-480V	1336F-A060 1336F-B125 - BX150	D D
1336-RFB-340-E	A	Figure C.3 or Figure C.4	60 Watts	200-240V 380-480V	1336F-A075 - A125 1336F-B150 - B250	E E
1336-RFB-475-G	A	Figure C.5	61 Watts	380-480V	1336F-BP/BPR250 - BP/BPR350 1336F-BX250 - B350	F G
1336-RFB-590-G	A	Figure C.5	94 Watts	380-480V	1336F-BP/BPR400 - BP/BPR450 1336F-B400 - B450	F G
1336-RFB-670-G	A	Figure C.5	121 Watts	380-480V	1336F-B500 - B600	G

EMC Enclosure Kit Selection

Frame Reference	Enclosure Kit Catalog Number		
	200-240V Rating	380-480V Rating	500-600V Rating
A1, A2, A3	1336F-AE3	1336F-AE3	–
A4	1336F-AE2	1336F-AE2	1336F-AE2
B	1336F-AE4	1336F-AE4	1336F-AE4
C	1336F-AE5	1336F-AE5	1336F-AE5
D	1336F-AE6	1336F-AE6	1336F-AE6
E	1336F-AE7	1336F-AE7	1336F-AE7

RFI Filter Installation

Important: Refer to the instructions supplied with the filter for details.

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

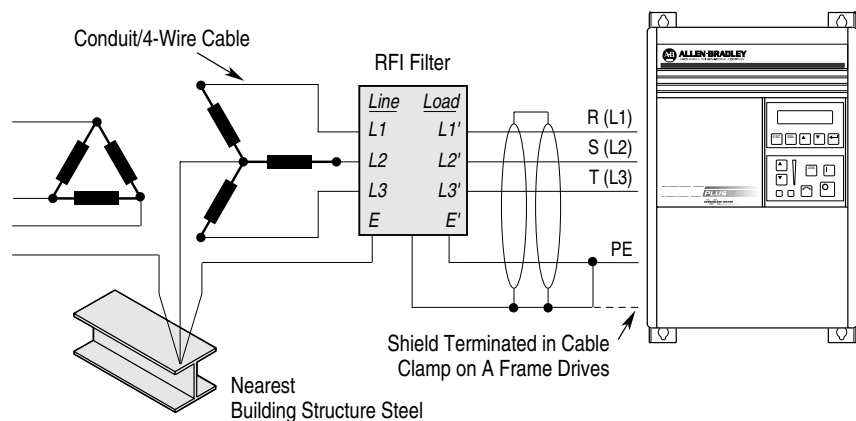
RFI Filter Leakage Current

The RFI filter may cause ground leakage currents. Therefore a solid ground connection must be provided as shown below.



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

Electrical Configuration



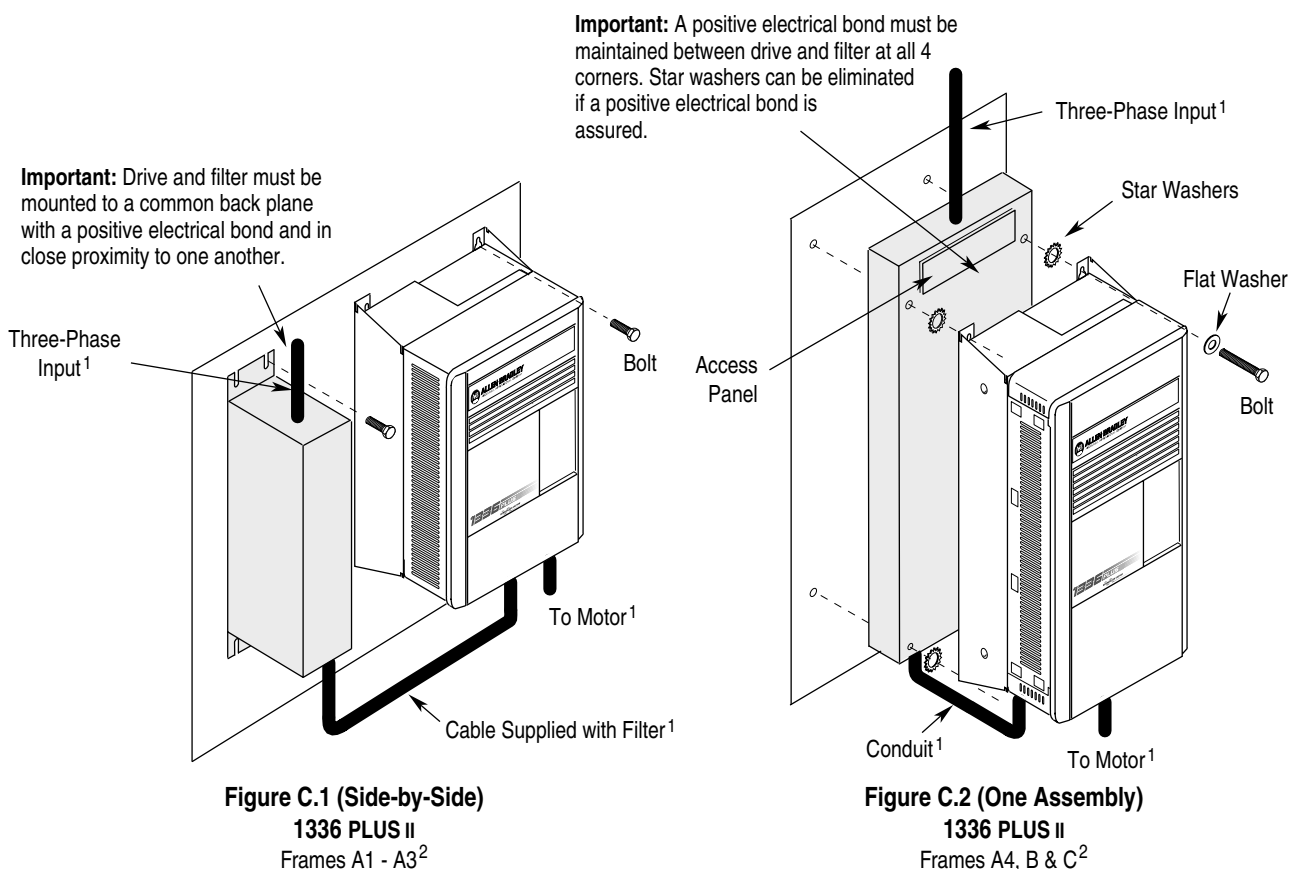
Grounding

RFI Filter Grounding

Important: Using the optional RFI filter may result in relatively high ground leakage currents. Surge suppression devices are also incorporated into the filter. Therefore, the filter must be permanently installed and solidly grounded (bonded) to the building power distribution ground. Ensure that the incoming supply neutral is solidly connected (bonded) to the same building power distribution ground.

Grounding must not rely on flexible cables and should not include any form of plug or socket that would permit inadvertent disconnection. Some local codes may require redundant ground connections. The integrity of all connections should be periodically checked.

Mechanical Configuration



¹ Input power (source to filter) and output power (filter to drive and drive to motor) wiring must be in conduit or have shielding/armor with equivalent attenuation. Shielding/armor must be bonded to the metal bottom plate. See requirements 5 & 6 on page [C-2](#).

² Refer to the Filter Selection table on page [C-2](#) for frame references and corresponding catalog numbers.

Filter Mounting (continued)

Important: Drive and filter must be mounted to a common back plane with a positive electrical bond. Spacing is determined by Conduit Box.

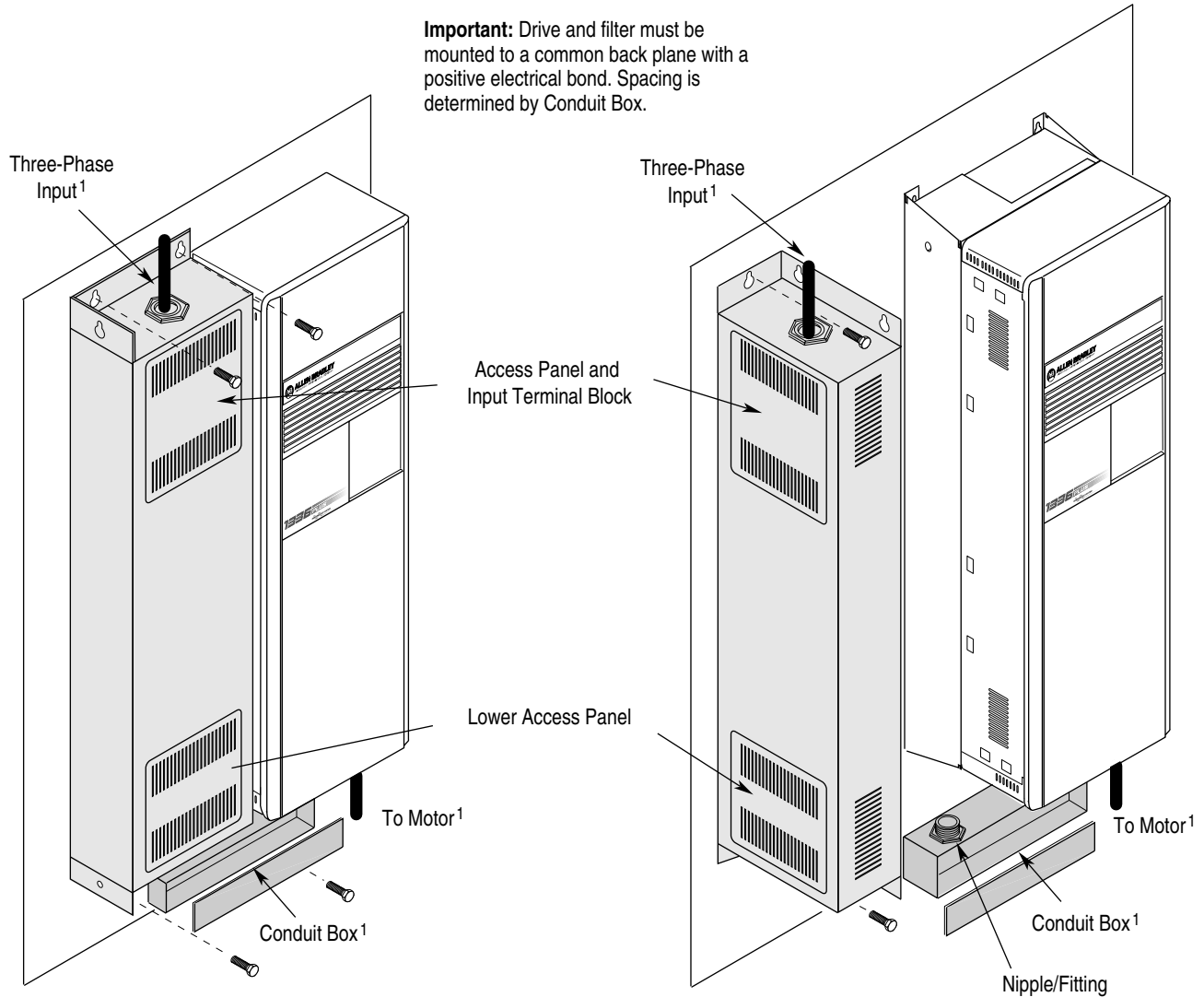


Figure C.3
1336 PLUS II
(Through-the-Wall Mounting)
 Frames D & E ²

Figure C.4
1336 PLUS II
(Conventional Mounting)
 Frames D & E ²

¹ Input power (source to filter) and output power (filter to drive and drive to motor) wiring must be in conduit or have shielding/armor with equivalent attenuation. Shielding/armor must be bonded to the metal bottom plate. See requirements 5 & 6 on page C-2.

² Refer to the Filter Selection table on page C-2 for frame references and corresponding catalog numbers.