ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Rockwell / Allen-Bradley 1336F-B020-AA-EN-HCS2-L5* at our website: *Click HERE*

Allen-Bradley

1336 REGEN

1336 REGEN Line Regeneration Package

User Manual

Firmware Version 3.xx

380-480V AC — 48-180A

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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) 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 International Corporation 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 International Corporation cannot assume responsibility or liability for actual use based on the examples and diagrams.

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

Reproduction of the contents of this manual, in whole or in part, without written permission of Rockwell International Corporation is prohibited.

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.

Attention statements help you to:

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

Important: Identifies information that is critical 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.

SCAN port is a trademark of Rockwell International Corporation.
PLC is a registered trademark of Rockwell International Corporation.
COLOR-KEYED is a registered trademark of Thomas & Betts Corporation.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Line Regeneration Package Overview

What This Publication Provides 1-1
What This Product Provides 1-1
1336 REGEN Line Regeneration Package Components 1-1
How to Choose a Mode of Operation 1-2
The Regenerative DC Bus Supply Mode 1-2
The Regenerative Brake Mode 1-3
Which 1336 REGEN Operating Mode is For Your Application? 1-3
1336 REGEN Frame Designations 1-4
Catalog Number Explanation 1-4
Nameplate Location 1-5
1336 REGEN B and C Frame Converter 1-5
Nameplate Location 1-6
1336 REGEN D Frame Converter 1-6
1336 REGEN B, C and D Frame Precharge Unit 1-7
Bulletin 1321 3% Line Reactors for Regenerative Brake Applications 1-8
Bulletin 1321 10% Line Reactors for Regenerative DC Bus Supply Applications 1-9

Regenerative DC Bus Supply Operation

Overview 2-1
General Precautions 2-1
Regenerative DC Bus Supply Layout 2-2
Regenerative DC Bus Supply Sizing 2-3
The 1336 REGEN Package 2-3
Input Power Conditioning 2-3
Input Fusing 2-4
Customer Supplied Fusing 2-4
1336 REGEN Precharge Fusing 2-4
380-480V AC Power Wiring 2-5
Unbalanced Distribution Systems 2-5
Ungrounded Distribution Systems 2-5
Grounding 2-6
Sensitive Circuits 2-6
TE (True Earth) Termination 2-6
PE (Power Earth) Termination 2-6
1321 10% Line Reactor 2-7
380-480V AC Power Connections 2-7
Precharge 2-8
Converter 2-9
380-480V AC Power Connection Specifications 2-11

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

120V AC Precharge and Converter Wiring 2-12
120V AC Current Requirements 2-12
120V AC Converter Connections 2-13
Converter 2-13
120V AC Precharge Connections 2-14
Precharge 2-14
120V AC Connection Specifications 2-14
Control and Signal Wiring 2-15
Sync Cable 2-15
Precharge Board 2-16
Converter Control Board 2-17
Control Board Connections 2-18
Cable Routing 2-18
Digital Input Signals 2-19
24V DC and 120VAC Circuits 2-19
External Fault 2-20
External Reset 2-20
Enable 2-20
Digital Output Signals 2-20
Interlocking 1336 REGEN Enable with AC Drive Enable 2-21
Adapter Definitions 2-22
Human Interface Module 2-23
HIM Description 2-23
HIM Removal 2-23
HIM Operation 2-23
Programming Flow Chart 2-24
Regenerative DC Bus Supply Startup 2-25
Overview 2-25
Initial Operation 2-26
Programming 2-28
Overview 2-28
Conventions 2-28
Parameter Descriptions 2-29

Regenerative Brake Operation

Overview 3-1
General Precautions 3-1
Regenerative Brake Layout 3-2
Power-up Sequence for Regenerative Brakes and B Frame AC Drives 3-3
Regenerative Brake Sizing 3-4
Additional Requirements 3-7
Parallel Regenerative Brakes 3-8

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Input Power Conditioning 3-8
Input Fusing 3-9
Customer Supplied Fusing 3-9
1336 REGEN Precharge Fusing 3-9
380-480V AC Power Wiring 3-10
Unbalanced Distribution Systems 3-10
Ungrounded Distribution Systems 3-10
Grounding 3-11
Sensitive Circuits 3-11
TE (True Earth) Termination 3-11
PE (Power Earth) Termination 3-11
380-480V AC Power Connections 3-12
1321 3% Line Reactor 3-12
Precharge 3-13
Converter 3-14
380-480V AC Power Connection Specifications 3-16
120V AC Precharge and Converter Wiring 3-17
120V AC Current Requirements 3-17
120V AC Converter Connections 3-18
120V AC Precharge Connections 3-19
120V AC Connection Specifications 3-19
Control and Signal Wiring 3-20
Sync Cable 3-20
Precharge 3-21
Precharge Board 3-21
Converter Control Board 3-22
Control Board Connections 3-23
Cable Routing 3-23
Digital Input Signals 3-24
24V DC and 120VAC Circuits 3-24
External Fault 3-25
External Reset 3-25
Enable 3-25
Digital Output Signals 3-25
Interlocking 1336 REGEN Enable with AC Drive Enable 3-26
Adapter Definitions 3-27
Human Interface Module 3-28
HIM Description 3-28
HIM Removal 3-28
HIM Operation 3-28
Programming Flow Chart 3-29
Regenerative Brake Startup 3-30
Overview 3-30
Initial Operation 3-31

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Programming 3-33
Overview 3-33
Conventions 3-33
Parameter Decriptions 3-34

Troubleshooting

Overview 4-1
Clearing a Fault 4-1
Troubleshooting 4-1
1336 REGEN Converter Control Board LED Indication 4-1
1336 REGEN Fault and Code Number 4-2

Dimensions and Weights

1336 REGEN B and C Frame Converter A-2
1336 REGEN D Frame Converter A-3
1336 REGEN B and C Frame Precharge Unit A-4
1336 REGEN D Frame Precharge Unit A-5
1321 48 and 78A 3% Line Reactor A-6
1321 180A 3% Line Reactor A-7
1321 48 and 78A 10% Line Reactor A-8
1321 180A 10% Line Reactor A-9
1321 Power Line Filter A-10
1336 REGEN B Frame Through-the-Back Heat Sink Mounting A-11
1336 REGEN C Frame Through-the-Back Heat Sink Mounting A-12
1336 REGEN D Frame Through-the-Back Heat Sink Mounting A-13

Specifications

Electrical B-1
Environmental B-1
Protection B-2
Heat Dissipation B-3
Altitude Derating B-3
Communications Format and Configuration B-3

Spare Parts Information

1336 REGEN Line Regeneration Package Spare Parts Information C-1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Line Regeneration Package Overview

What This Publication Provides

This publication provides layout, sizing, wiring, startup and diagnostic information for the 1336 REGEN Line Regeneration Package, including Converter, Precharge Unit, 1321 Line Reactor, and Line Filter (when required). To ensure 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.

What This Product Provides

The Allen-Bradley 1336 REGEN Line Regeneration Package is a line regenerative option for drives in the Allen-Bradley 1336 drive family. Line regeneration refers to the removal of energy from the common DC bus of one or more AC drives, back onto the three-phase AC utility line.

The 1336 REGEN Line Regeneration Package operates in two basic modes — **Regenerative DC Bus Supply** and **Regenerative Braking**. These two operating modes give the 1336 REGEN Line Regeneration Package the flexibility to handle a wide variety of applications.

1336 REGEN Line Regeneration Package Components

The 1336 REGEN Line Regeneration Package consists of two main pieces.

1. A Converter that transforms a three-phase AC input source into a DC output source.
2. A Precharge Unit that limits inrush current and provides AC line voltage phase and magnitude information to the converter.

In addition to these two components, a 1321 Line Reactor is required. The line reactor used for Regenerative Bus Supply applications is a custom design with a nominal impedance of 10%. Operation in the Regenerative DC Bus Supply Mode may also require the use of an additional power line filter, depending upon the AC line source impedance. Operation in the Regenerative Brake Mode requires the use of a line reactor with a nominal impedance of 3%. Figure 2.1 and Figure 3.1 show the basic layout differences between 1336 REGEN Regenerative DC Bus Supply and 1336 REGEN Regenerative Brake applications.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

How to Choose a Mode of Operation

Several characteristics influence the choice of an operating mode for a given application. The 1336 REGEN Line Regeneration Package can be used with any 380-480 volt drive in the 1336 family. The desired performance of the combined AC drive/Line Regeneration Package will dictate which mode of operation is best for an application. The choice of operating mode also affects the cost of implementation, since hardware requirements are different for the two modes of operation. The following discussion describes these two modes in detail and points the user to the best operating mode for several common applications.

The Regenerative DC Bus Supply Mode

In the Regenerative DC Bus Supply Mode, the 1336 REGEN Line Regeneration Package supplies both motoring and regenerative current to one or more common bus drives.

Important: A common bus drive is not a standard AC-input AC drive. Throughout this manual a “common bus drive” is defined as a 1336 family AC drive designed to be powered by a DC power source connected to a common DC bus.

When the net power requirement of the attached common bus drives demand motoring power, energy flows from the utility to the common DC bus.

When the net power requirement of the attached common bus drives demand regenerative power, energy flows from the common DC bus to the utility.

1. Precharge for all common bus drives on the common DC bus is accomplished through the 1336 REGEN Line Regeneration Package. As a result, three-phase AC power is not connected to the individual drives. Individual common bus drives do have separate precharge circuits however, to allow them to be connected to the powered DC bus.
2. Since the 1336 REGEN Line Regeneration Package supplies both motoring and regenerative current to the drives, the precharge, converter and line reactor must all be sized to handle the peak power requirements of the connected common bus drives in any quadrant of drive operation.
3. In the Regenerative DC Bus Supply Mode, the 1336 REGEN Converter operates as a PWM converter, creating sinusoidal input AC line currents under both motoring and regenerating conditions. Operation in this mode results in the additional benefit of very low harmonic current distortion that typically meets IEEE 519-1992 specifications.

Important: Refer to Chapter 2 for 1336 REGEN Regenerative DC Bus Supply applications including Installation, Setup and Programming information.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

How to Choose a Mode of Operation

The Regenerative Brake Mode

In the Regenerative Brake Mode, the 1336 REGEN Line Regeneration Package removes energy from the DC bus of a standard 1336 AC drive back to the utility.

1. When the connected AC drive is motoring, it receives energy directly from the three-phase AC line through its input terminals and diode bridge.
2. When the connected AC drive is regenerating, energy flows from the DC bus back to the three-phase utility through the 1336 REGEN Line Regeneration Package.

Precharge of the DC bus is accomplished simultaneously through the 1336 REGEN Precharge Unit and the precharge circuit of the 1336 AC drive. In the Regenerative Brake Mode, the 1336 REGEN Line Regeneration Package is not required to supply motoring current to the AC drive. Because of this, the 1336 REGEN Line Regeneration Package can be sized to provide whatever braking capability is needed by the application, independent of the total HP needed for motoring.

In the Regenerative Brake Mode, the 1336 REGEN Line Regeneration Package switches synchronously with the AC line voltage, but does not attempt to create sinusoidal input AC line currents with a PWM scheme. The resulting power factor is near unity. The AC line current harmonic spectrum resulting from the combination of an AC drive and a 1336 REGEN Line Regeneration Package operating in the Regenerative Brake Mode is nearly equal to that of a standard 1336 AC drive that is motoring.

Important: Refer to Chapter 3 for 1336 REGEN Regeneration Brake applications including Installation, Setup and Programming information.

Which 1336 REGEN Operating Mode is For Your Application?

Application Requirements	Regen DC Bus Supply Mode	Regen Brake Mode
Low Current Harmonics	X	
Multiple Drive Applications	X	
High Power Factor	❶	X
Equal Braking and Motoring HP	❶	X
Less Braking Than Motoring HP	❶	X
Single Drive Application	❶	X
Intermittent Braking or Low Braking Duty Cycle	❶	X

❶ The Regenerative Bus Supply Mode can also be used for these applications, but will result in a more complex hardware configuration and a higher total system cost. Regenerative Bus Supply operation requires a custom Bulletin 1321 10% line reactor, while Regenerative Brake operation requires a standard Bulletin 1321 3% line reactor. The mode of operation is selected by a parameter setting parameter 1 in the 1336 REGEN Converter. Refer to the Programming sections in Chapters 2 and 3 for additional details.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1336 REGEN Frame Designations

Allen-Bradley uses frame designations to identify the various sizes of standard and configured drives. Throughout this manual, frame sizes for 1336 REGEN Converter and Precharge Units may be used instead of AC input kW or Amp ratings.

1336 REGEN Converter Rating		
Frame Reference	AC Input kW	Amp Rating
B	38.4	48.2
C	62.3	78.2
D	143.7	180.4

1336 REGEN Precharge Rating		
Frame Reference	AC Input kW	Amp Rating
B	38.4	48.2
C	62.3	78.2
D	143.7	180.4

Catalog Number Explanation

The following diagram describes the 1336 REGEN Line Regeneration Package catalog numbering scheme. The Line Regeneration Package includes both the 1336REGEN Precharge and 1336 REGEN Converter. The appropriate line reactor — either 3% or 10% — is ordered separately,

1336 REGEN Line Regeneration Package Catalog Number Explanation

1336R	VB	180	AA	mods
First Position Bulletin Number	Second Position Voltage	Third Position Nominal Current Rating	Fourth Position Enclosure Type	Fifth Position Human Interface Module, IP 20 (NEMA Type 1)
	Letter Voltages	Code kW (Amps)	Code Type	Code Description
	VB 380-480V AC 3Ø 50/60 Hz	048 38.4 (48.2) 078 62.3 (78.2) 180 143.7 (180.4)	AA NEMA 1 (IP 20) AN Open (IP 00)	HAB Blank — No Functionality HAP Programmer Only

1336 REGEN Line Regeneration Package — Includes Converter (CNV) and Precharge (PRE)

	Nominal Brake Rating		IP 00 (Open) No Enclosure	IP 20 (NEMA Type 1) General Purpose
Frame	Input Amps	Output kW	Code	Code
B	48.2	38.4	VB048-AN	VB048-AA
C	78.2	62.3	VB078-AN	VB078-AA
D	180.4	143.7	VB180-AN	VB180-AA

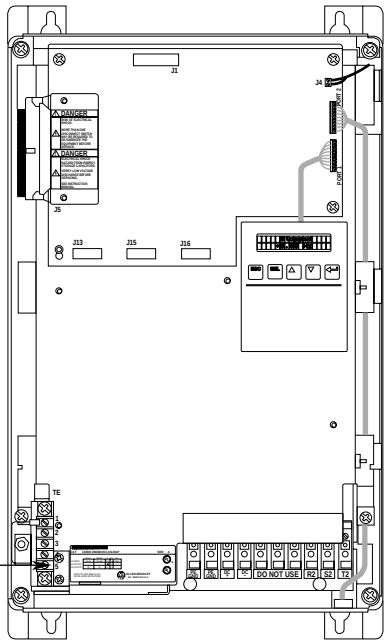
1321 Line Reactor — 380-480V AC

	3% Line Reactor for Regenerative Brake Applications				10% Line Reactor for DC Bus Supply Applications			
	IP 00 (Open) No Enclosure		IP 20 (NEMA Type 1) General Purpose		IP 00 (Open) No Enclosure		IP 20 (NEMA Type 1) General Purpose	
Bulletin Number	Cat. No.	Rated Amps	Cat. No.	Rated Amps	Cat. No.	Rated Amps	Cat. No.	Rated Amps
1321	-3R55-B	48	-3RA55-B	48	-3LR048-B	48	-3LRA048-B	48
	-3R100-B	78	-3RA100-B	78	-3LR078-B	78	-3LRA078-B	78
	-3R200-B	180	-3RA200-B	180	-3LR180-B	180	-3LRA180-B	180

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Nameplate Location

1336 REGEN B and C Frame Converter



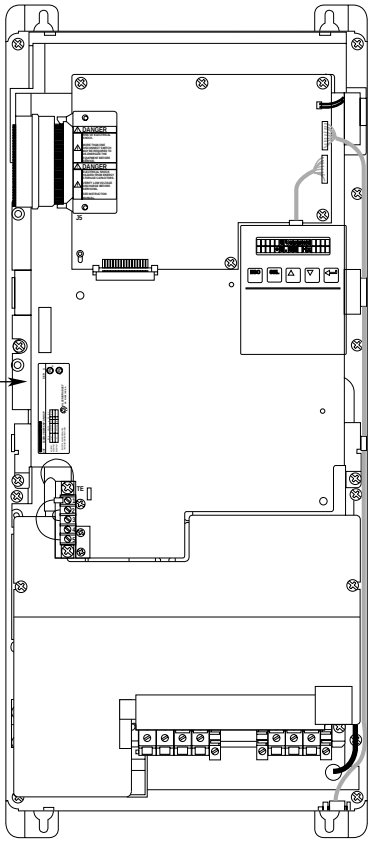
B Frame

CAT 1336R-VB048CNV-AN-HAP SER A

	K V A	VOLTS	A	PH	HZ
AC INPUT	32-40	380-480	48.2	3	50/60
AC OUTPUT	–	–	–	–	–
DC OUTPUT	38	735	52	–	–

REFER TO USER MANUAL FOR INSTALLATION INSTRUCTIONS

ALLEN-BRADLEY
AB MADE IN U.S.A.



C Frame

CAT 1336R-VB078CNV-AN-HAP SER A

	K V A	VOLTS	A	PH	HZ
AC INPUT	51-65	380-480	78.2	3	50/60
AC OUTPUT	–	–	–	–	–
DC OUTPUT	62	735	85	–	–

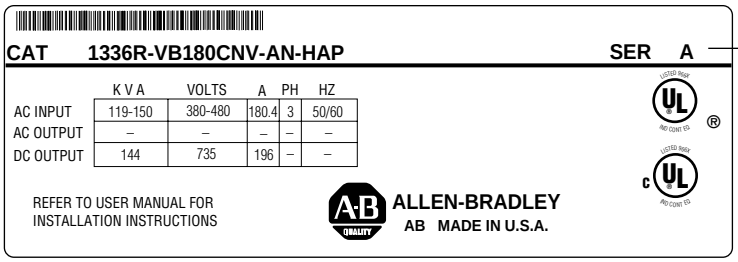
REFER TO USER MANUAL FOR INSTALLATION INSTRUCTIONS

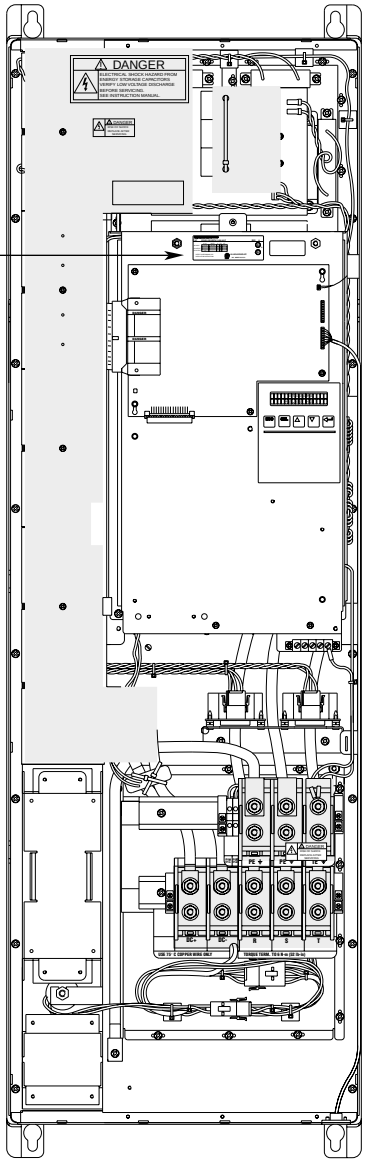
ALLEN-BRADLEY
AB MADE IN U.S.A.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Nameplate Location

1336 REGEN D Frame Converter





1336R	-VB			180CNV					-AN		-mods	
Cat. No.	**Voltage**			**Rating**					**Enclosure Type**		**HIM Type**	
1336R	Letter	AC Input Volts	DC Output Volts	Code	AC Input kVA	AC Input Amps	DC Output Amps	DC Output kVA	Code	Type	Code	Description
	-VB	380-480V AC 3Ø 50/60Hz	735V DC	**048**	32-40	48.2	52	38	**-AA**	IP 20 (NEMA Type 1)	**-HAB**	Blank — No Functionality
				078	51-65	78.2	85	62	**-AN**	IP 00 (Open)	**-HAP**	Programmer Only
				180	119-150	180.4	196	144				

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Nameplate Location

1336 REGEN B, C and D Frame Precharge Unit

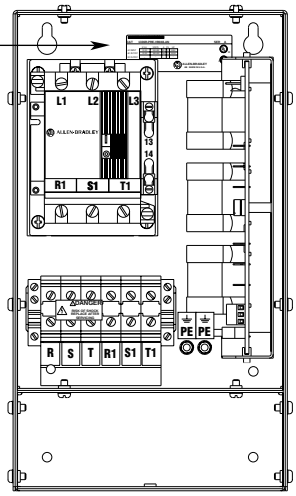
B Frame

CAT 1336R-VB048PRE-AN SER A

	K V A	VOLTS	A	PH	HZ
AC INPUT	32-40	380-480	48.2	3	50/60
AC OUTPUT	32-40	380-480	48.2	3	50/60
DC OUTPUT	–	–	–	–	–

REFER TO USER MANUAL FOR INSTALLATION INSTRUCTIONS

ALLEN-BRADLEY
AB MADE IN U.S.A.



C Frame

CAT 1336R-VB048PRE-AN SER A

	K V A	VOLTS	A	PH	HZ
AC INPUT	51-65	380-480	78.2	3	50/60
AC OUTPUT	51-65	380-480	78.2	3	50/60
DC OUTPUT	–	–	–	–	–

REFER TO USER MANUAL FOR INSTALLATION INSTRUCTIONS

ALLEN-BRADLEY
AB MADE IN U.S.A.

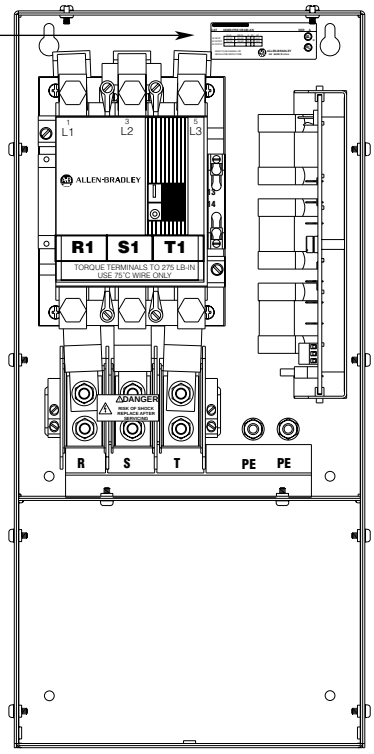
D Frame

CAT 1336R-VB048PRE-AN SER A

	K V A	VOLTS	A	PH	HZ
AC INPUT	119-150	380-480	180.4	3	50/60
AC OUTPUT	119-150	380-480	180.4	3	50/60
DC OUTPUT	–	–	–	–	–

REFER TO USER MANUAL FOR INSTALLATION INSTRUCTIONS

ALLEN-BRADLEY
AB MADE IN U.S.A.



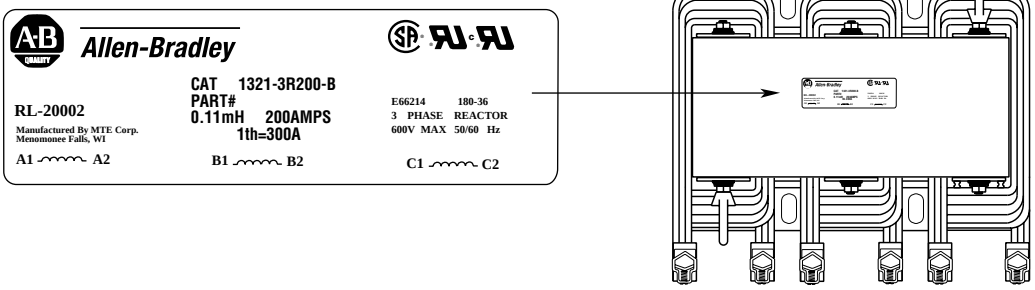
1336R	-VB			048PRE					-AN	
Cat. No.	**Voltage**			**Rating**					**Enclosure Type**	
1336R	Letter	AC Input Volts	AC Output Volts	Code	AC Input kVA	AC Input Amps	AC Output kVA	AC Output Amps	Code	Type
	-VB	380-480V AC 3Ø 50/60Hz	380-480V AC 3Ø 50/60Hz	**048**	32-40	48.2	32-40	48.2	**-AA**	IP 20 (NEMA Type 1)
				078	51-65	78.2	51-65	78.2	**-AN**	IP 00 (Open)
				180	119-150	180.4	119-150	180.4		

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

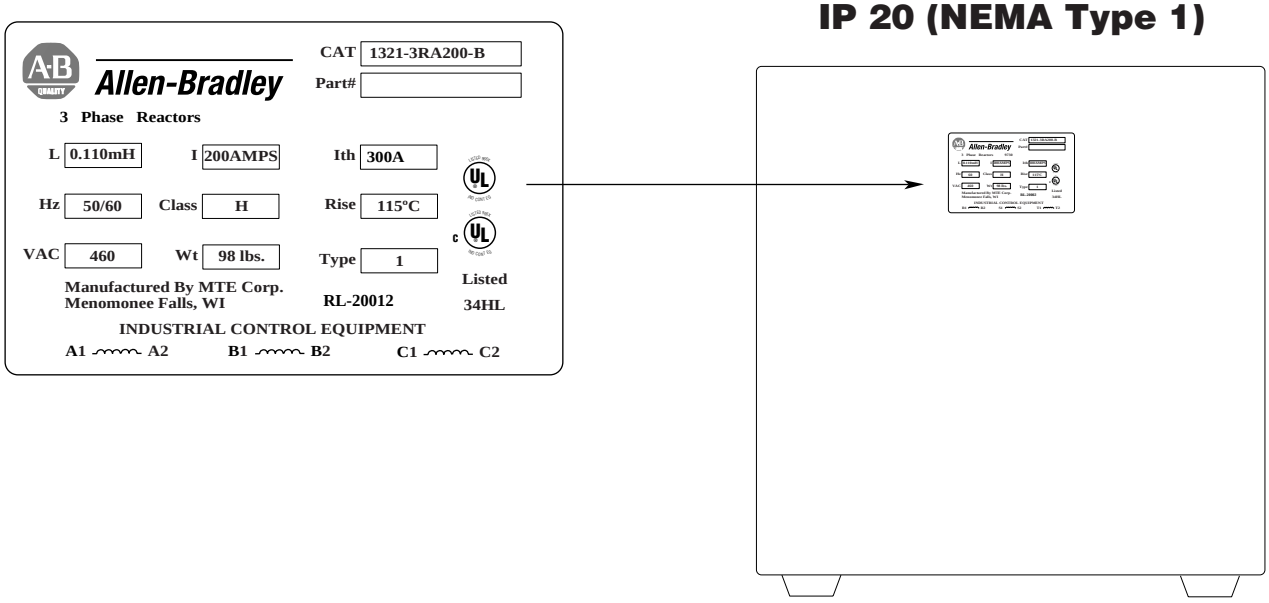
Nameplate Location

Bulletin 1321 3% Line Reactors for Regenerative Brake Applications

IP 00 (Open)



IP 20 (NEMA Type 1)



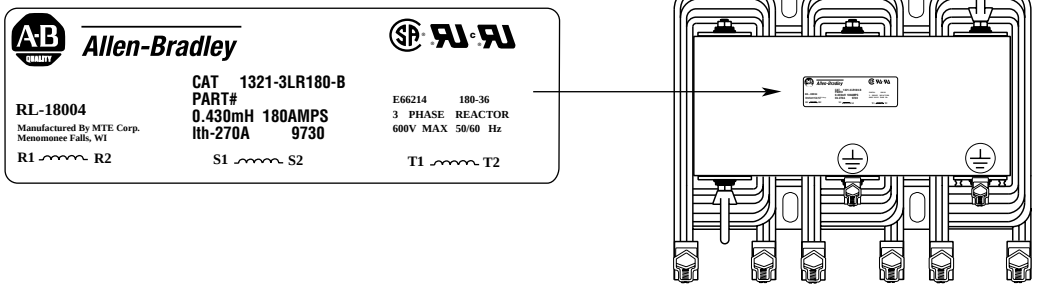
1321	-3RA		200			B	
Catalog Number	**Enclosure Type**		**Rating**			**Voltage**	
1321	Code	Type	Code	AC I/O Amps	Per Phase Inductance	Letter	AC Input/Output Volts
	-3R	IP 00 (Open)	**55**	48	0.50mH	**B**	380-480V AC 3Ø 50/60 Hz
	-3RA	IP 20 (NEMA Type 1)	**100**	78	0.30mH		
			200	180	0.110mH		

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

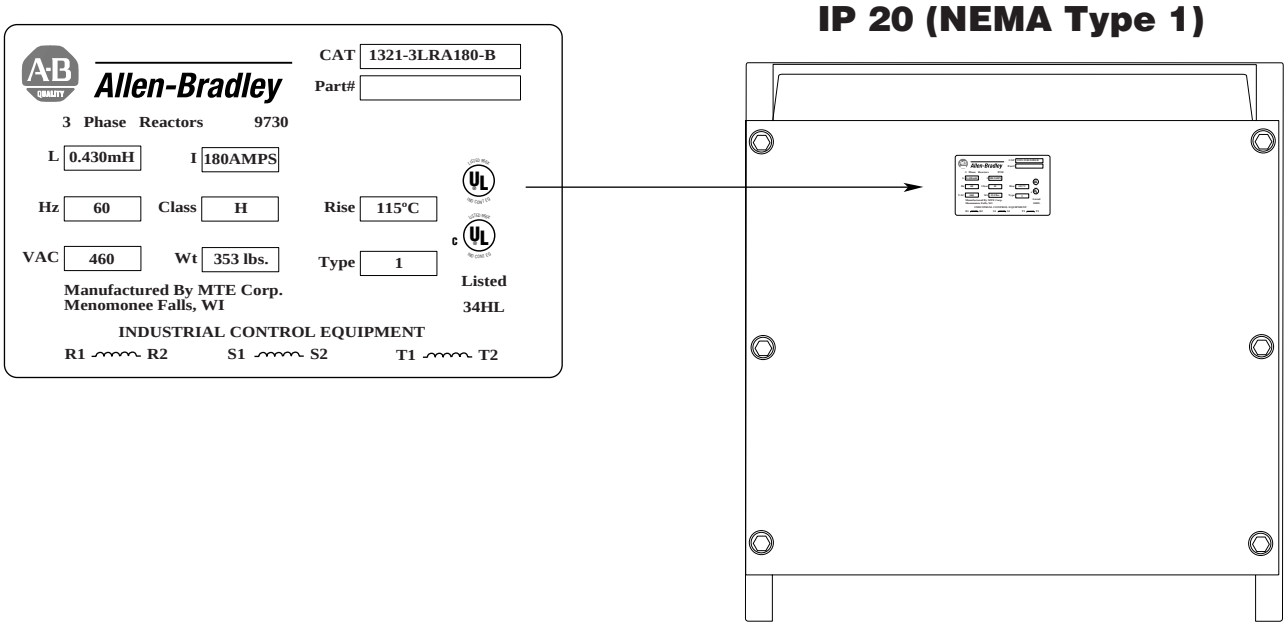
Nameplate Location

Bulletin 1321 10% Line Reactors for Regenerative DC Bus Supply Applications

IP 00 (Open)



IP 20 (NEMA Type 1)



1321	-3LRA		180			-B	
Catalog Number	**Enclosure Type**		**Rating**			**Voltage**	
1321	Code	Type	Code	AC I/O Amps	Per Phase Inductance	Letter	AC Input/Output Volts
	LR	IP 00 (Open)	**048**	48	1.6mH	**-B**	380-480VAC 3Ø 50/60Hz
	LRA	IP 20 (NEMA Type 1)	**078**	78	1.0mH		
			180	180	0.430mH		

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

End of Chapter

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative DC Bus Supply Operation

Overview

When properly sized, the 1336 REGEN Line Regenerative Package represents an amp rated package that can provide a DC bus to one or more common bus drives in the Regen DC Bus Supply mode.

General Precautions

ATTENTION: Only personnel familiar with the 1336 REGEN Line Regeneration Package and associated equipment 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.

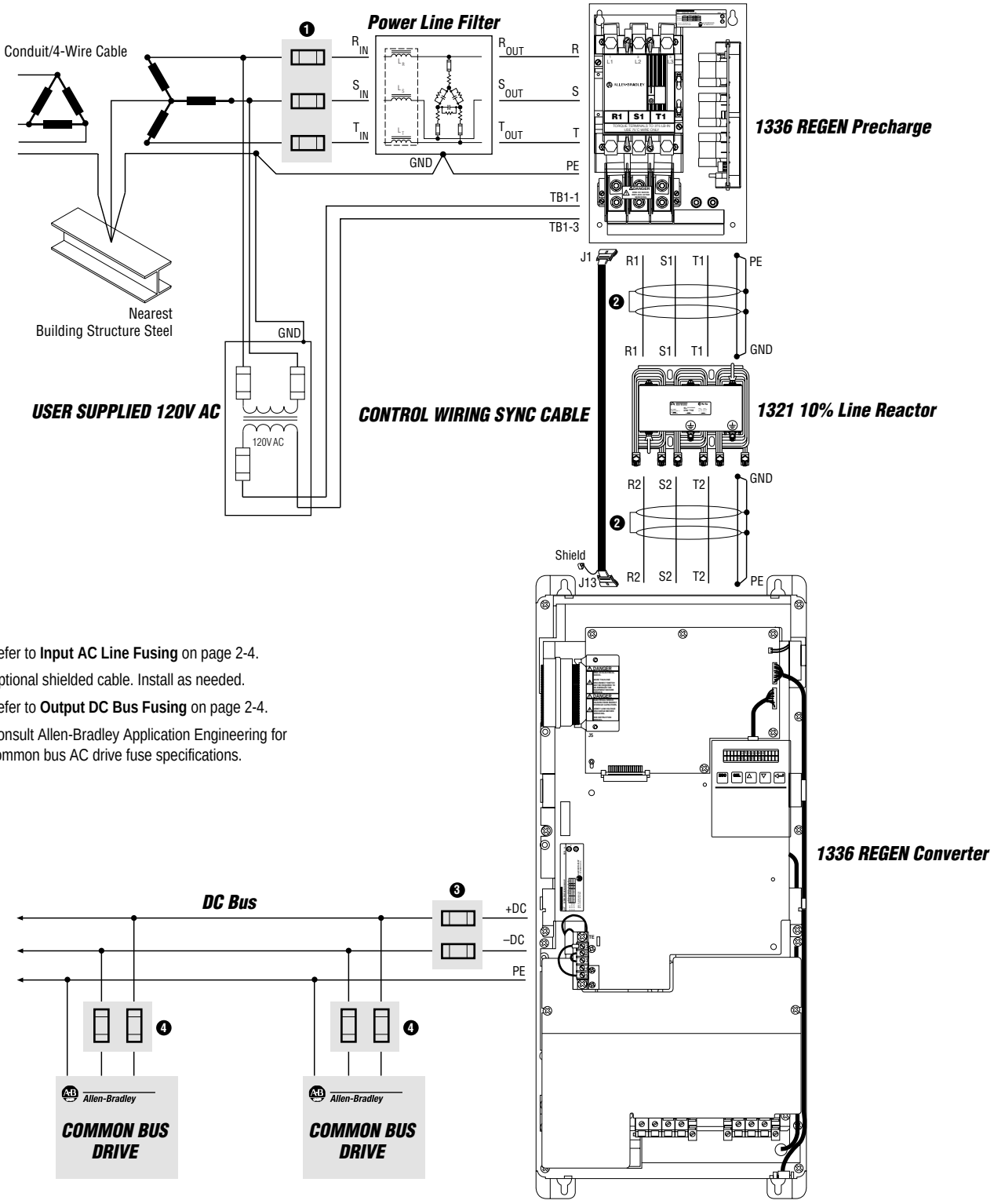
ATTENTION: Voltage distortion and possible component damage can result from the voltage divider effect between AC line source impedance and the 10% 1321 Line Reactor used with the 1336 REGEN Line Regeneration Package. An additional power line filter must be used to reduce AC line voltage distortion whenever source impedance is greater than 10% of the per phase impedance supplied by the 10% line reactor. If source impedance is unknown, the power line filter should be installed as a general precaution.

ATTENTION: This product and its associated equipment 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 publication 8000-4.5.2 "*Guarding Against Electrostatic Damage*" or any other applicable ESD protection handbook.

ATTENTION: The 1336 REGEN Line Regeneration Package is shipped from the factory with Parameter 1 **[Operational Mode]** set to the Regenerative Brake Mode of operation. For Regenerative DC Bus Supply applications, this parameter must be set to the Regenerative DC Bus Supply Mode as described in the Programming section of this chapter. Incorrectly applied or installed equipment can result in component damage or a reduction in product life. Wiring or application errors, such as incorrect or inadequate AC supply or excessive ambient temperatures may result in malfunction of the Line Regenerative Package.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative DC Bus Supply Layout



❶ Refer to **Input AC Line Fusing** on page 2-4.

❷ Optional shielded cable. Install as needed.

❸ Refer to **Output DC Bus Fusing** on page 2-4.

❹ Consult Allen-Bradley Application Engineering for common bus AC drive fuse specifications.

Figure 2.1 — Regenerative DC Bus Supply Layout

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative DC Bus Supply Sizing

The 1336 REGEN Package

The following steps should be taken to size the 1336 REGEN Package for Regenerative DC Bus Supply Operation.

1. The 1336 REGEN Converter, 1336 REGEN Precharge and 1321 10% Line Reactor must be sized as a package, with all components having the same nameplate amp rating.

2. The power capability of the 1336 REGEN Package must equal the maximum continuous power requirement of all common bus drives connected to the 1336 REGEN Package. Total drive power can be calculated as follows:

$$P_{TOTAL} = P_{DRIVE\ 1} + P_{DRIVE\ 2} + P_{DRIVE\ n}$$

$$\textit{Where}\ P_{DRIVE} = \frac{P_{MOTOR\ SHAFT}}{\text{MOTOR EFFICIENCY}}$$

3. The input amp rating of the 1336 REGEN Package must be greater than or equal to the AC line amps calculated using the following formula.

$$I_{INPUT} \geq \frac{P_{TOTAL}}{\sqrt{3} \times V_{L\text{-}L}}$$

Where $V_{L\text{-}L}$ = The RMS Line-to-Line AC Input Voltage

Input Power Conditioning

ATTENTION: The National Codes and standards (NEC, CENELEC, etc.) and local codes outline the 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.

In general, 1336 REGEN equipment is suitable for direct connection to a correct voltage AC line.

If the AC input power system does not have a neutral or one phase referenced to ground as detailed under **Ungrounded Distribution Systems**, an isolation transformer with the neutral of the secondary grounded is highly recommended. If the line-to-ground voltages on any phase exceed 125% of the nominal line-to-line voltage, an isolation transformer with the neutral of the secondary grounded is highly recommended.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Input Fusing

ATTENTION: 1336 REGEN equipment does not provide input power short circuit fusing. Branch circuit breakers or disconnect switches cannot provide this level of protection for converter and precharge unit components. Specifications for the recommended fuse size and type to provide input power protection against short circuits at the Converter or Precharge Unit is listed below.

Customer Supplied Fusing

Based on the maximum 1336 REGEN Package voltage rating, the following customer supplied fuses are recommended.

ATTENTION: To guard against personal injury and/or equipment damage caused by improper fusing, use only the recommended line fuses specified.

Gould Shamut A70QS must be used for all 1336 REGEN Line Regeneration Packages.		**380-480V AC Rating**	
	Catalog Number	**Input AC Line Fusing**	**Output DC Bus Fusing**
	1336R-VB048	**70A**	**100A**
	1336R-VB078	**125A**	**150A**
	1336R-VB180	**250A**	**350A**

1336 REGEN Precharge Fusing

The 1336 REGEN Precharge Circuit Board is internally fused to protect precharge components. When replacing 1336 REGEN Precharge Unit fuses F1, F2 & F3 (shown in Figure 2.12), use only the type and size specified below.

Catalog Number	**380-480V AC Rating**
1336R-VB048PRE	FNQ-R4, 600V
1336R-VB078PRE	FNQ-R4, 600V
1336R-VB180PRE	FNQ-R8, 600V

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

380-480V AC Power Wiring

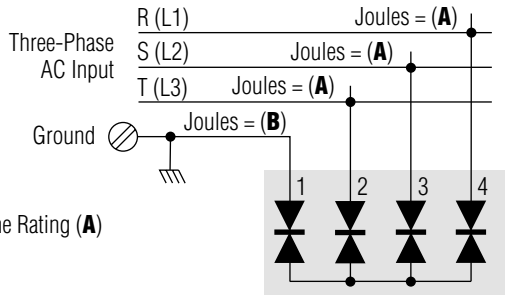
Unbalanced Distribution Systems

The 1336 REGEN Package is designed to operate on 3Ø supply systems whose line voltages are symmetrical. Surge suppression devices are included to protect the drive from lightning induced overvoltages between line and ground. Where the potential exists for abnormally high phase-to-ground voltages (in excess of 125% of nominal), or where the supply ground is tied to another system or equipment that could cause the ground potential to vary with operation, suitable isolation is required for the equipment. Where this potential exists, an isolation transformer with the neutral of the secondary grounded, is strongly recommended.

Ungrounded Distribution Systems

All precharge units are equipped with MOVs (Metal Oxide Varistors) that provide voltage surge protection plus phase-to-phase and phase-to-ground protection 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 MOV connection could become a continuous current path to ground (energy ratings are listed below). Exceeding the published line-to-line and line-to-ground voltage ratings listed in the **Specifications** may cause physical damage to the MOV.



Line-to-Line MOV Rating
Energy Rating = 2 x Line-to-Line Rating (**A**)
= 2 x 140
= 280 Joules

Line-to-Ground MOV Rating
Energy Rating = Line-to-Line (**A**) + Line-Ground (**B**)
= 140 + 220
= 360 Joules

Figure 2.2 — Ungrounded Distribution System

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

380-480V AC Power Wiring

Grounding

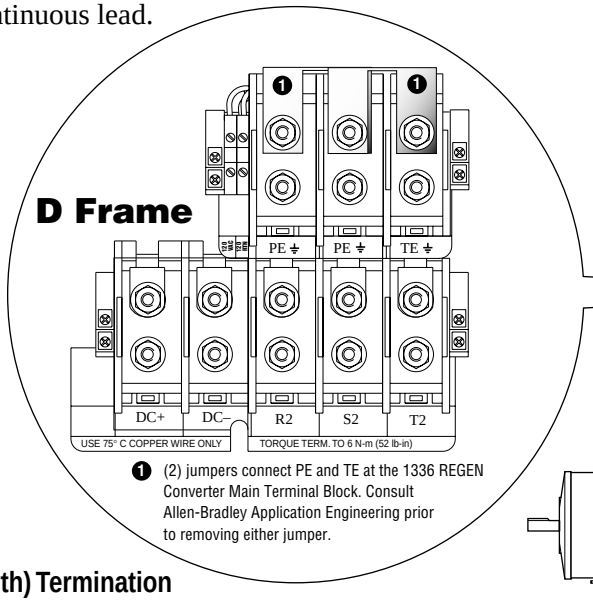
All 1336 REGEN components must be connected to system ground at the PE power ground terminal provided. Ground impedance must conform to the requirements of national and local industrial safety regulations (NEC, VDE 0160, BSI, etc.), and should be inspected and tested at appropriate intervals. In any 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 paths through which high frequency ground currents flow to ensure that sensitive circuits do not share a path with these currents. Control and signal conductors should not be run near or parallel to power conductors.

TE (True Earth) Termination

The converter's TE terminals are used for all control signal shields internal to the 1336 REGEN Converter and must be connected to the converter's TE terminals by a separate continuous lead.



PE (Power Earth) Termination

A safety ground is required by code. This point must be connected to adjacent building steel or a floor ground rod provided grounding points comply with NEC and local regulations.

Figure 2.3 — Regenerative DC Bus Supply Grounding

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

380-480V AC Power Wiring

380-480V AC Power Connections

380-480V AC input and output power connections are made as shown in Figure 2.4 through Figure 2.8.

LINE FILTER		PRECHARGE UNIT		LINE REACTOR		CONVERTER
Input Term.	Output Term.	Input Term.	Output Term.	Input Term.	Output Term.	Input Term.
R_{IN}	R_{OUT}	R	R1	R1	R2	R2
S_{IN}	S_{OUT}	S	S1	S1	S2	S2
T_{IN}	T_{OUT}	T	T1	T1	T2	T2

ATTENTION: 1336 REGEN equipment will not be properly synchronized unless correct Filter-to-Precharge-to-Line Reactor-to-Converter AC power connections are maintained. Failure to maintain correct phase-related connections will result in equipment malfunction and/or failure.

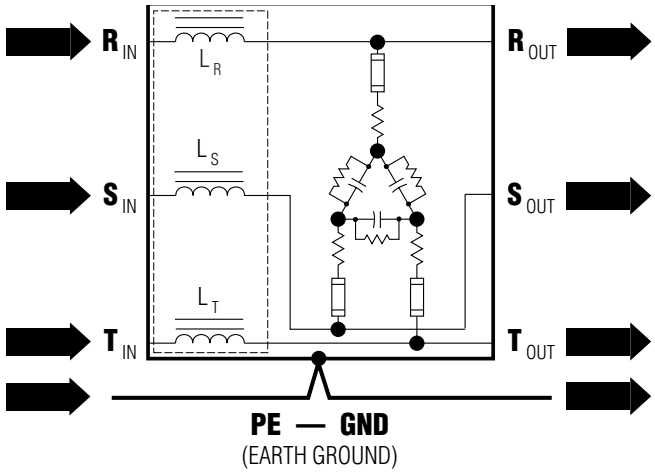


Figure 2.4 — 380-480V AC Power Line Filter Connections

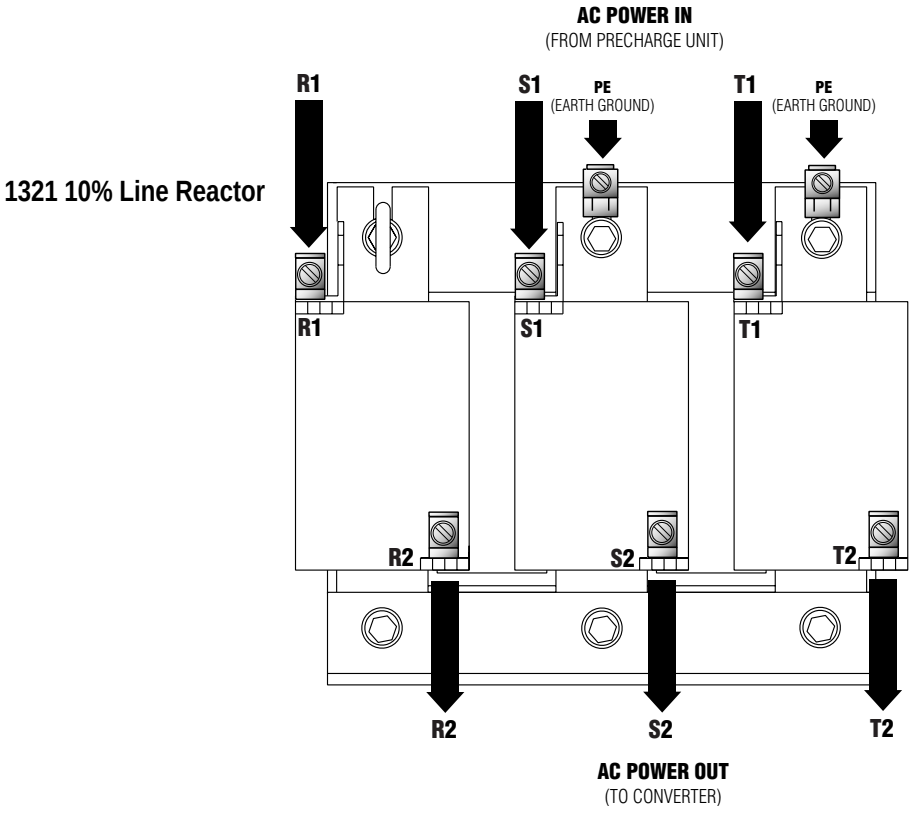
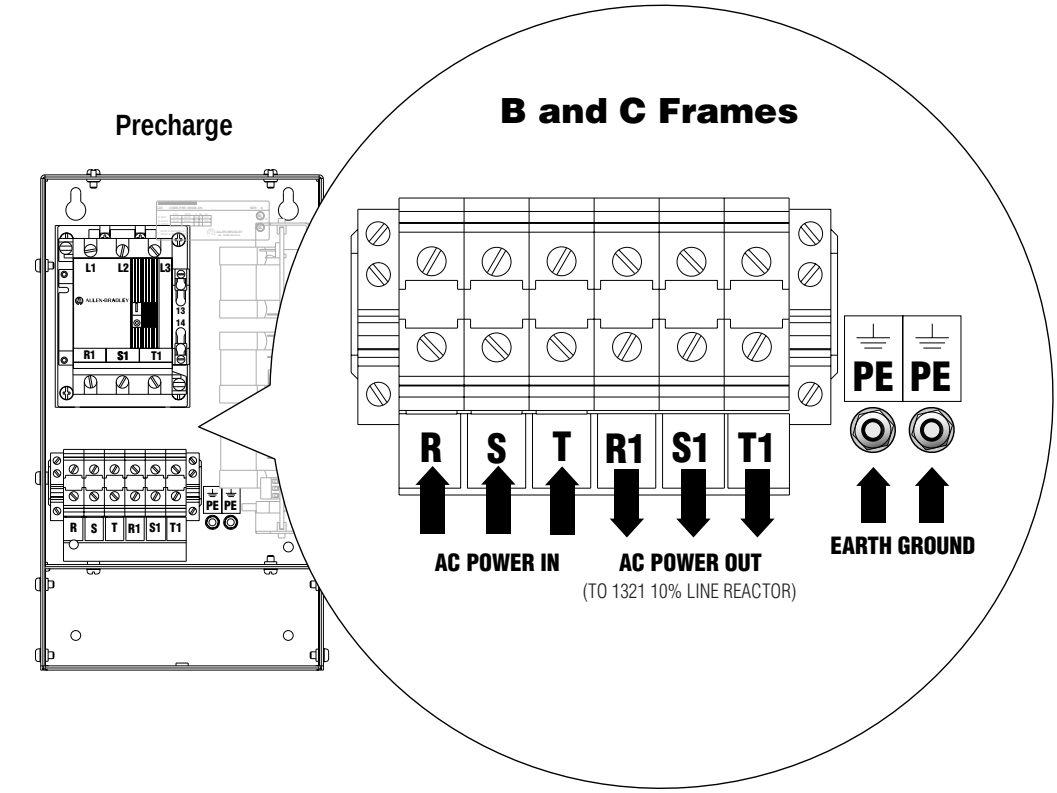


Figure 2.5 — 380-480V AC 1321 10% Line Reactor Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

380-480V AC Power Wiring



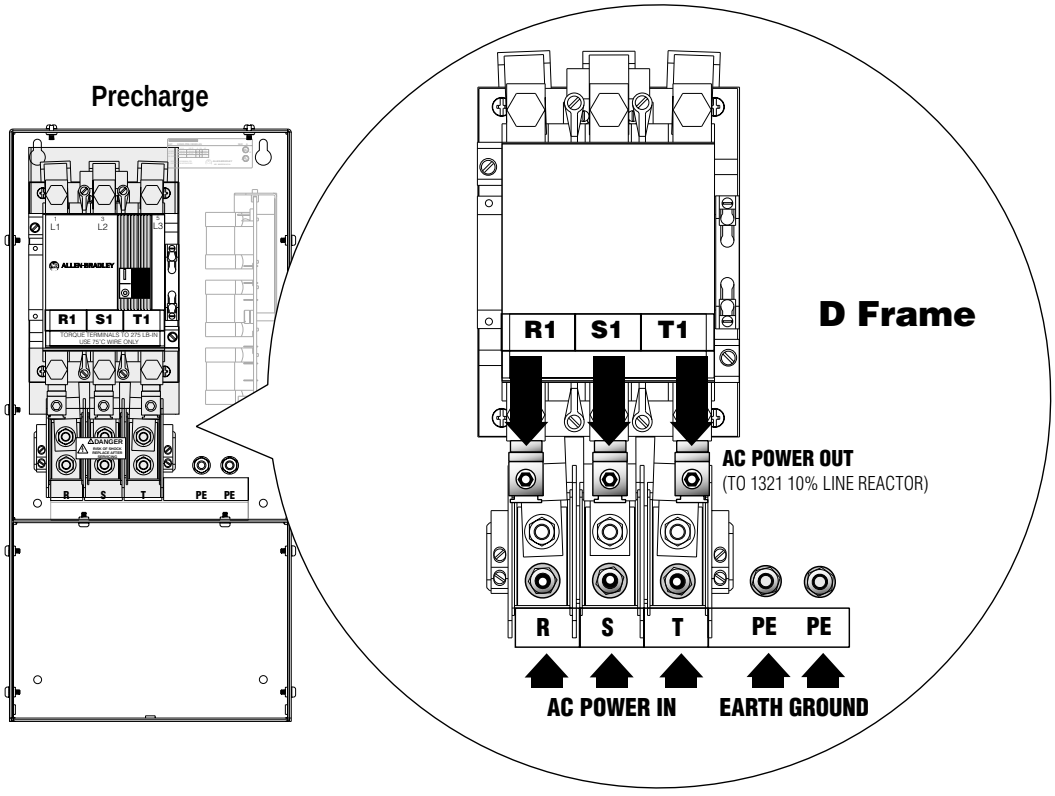


Figure 2.6 — 380-480V AC Precharge Unit Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

380-480V AC Power Wiring

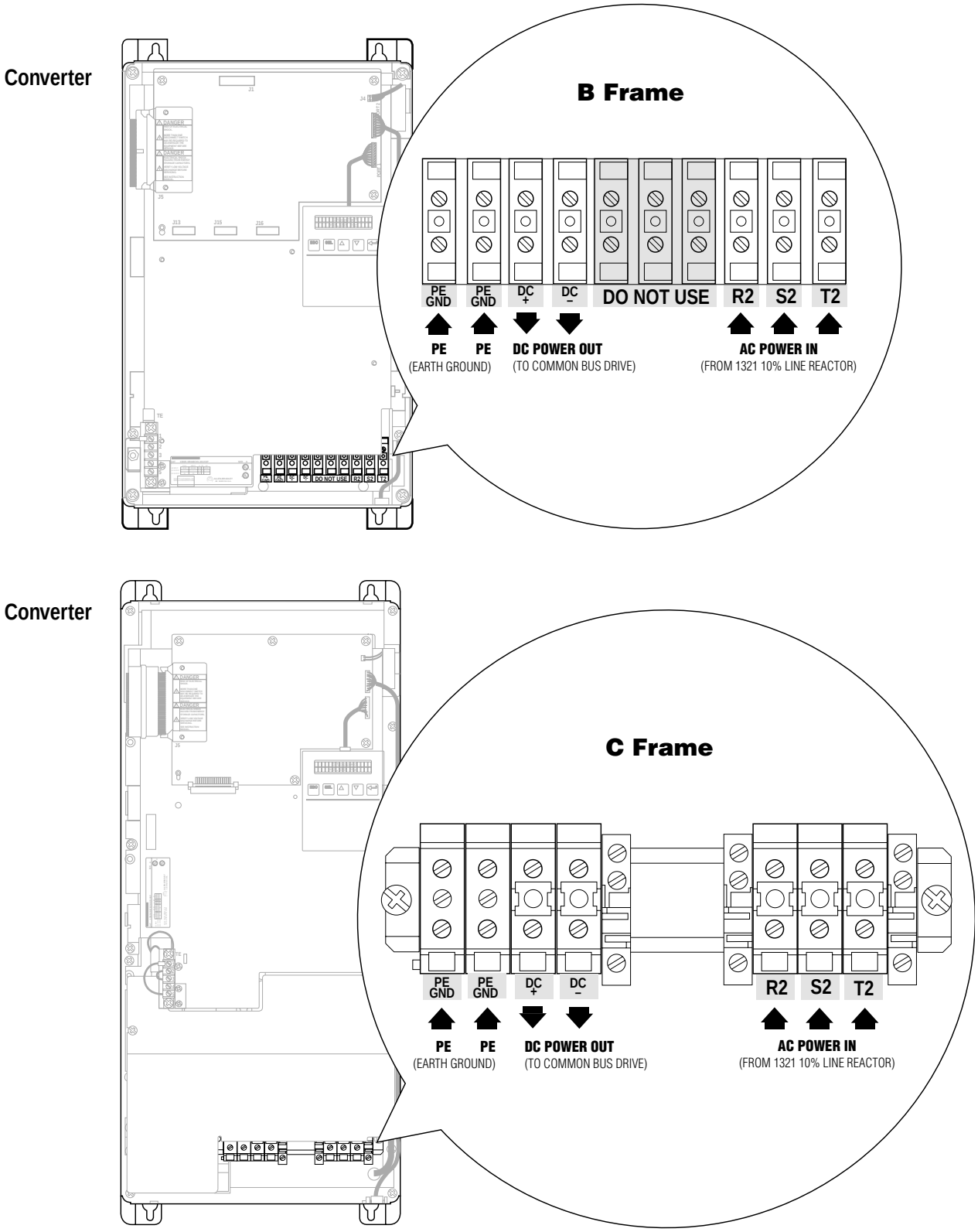
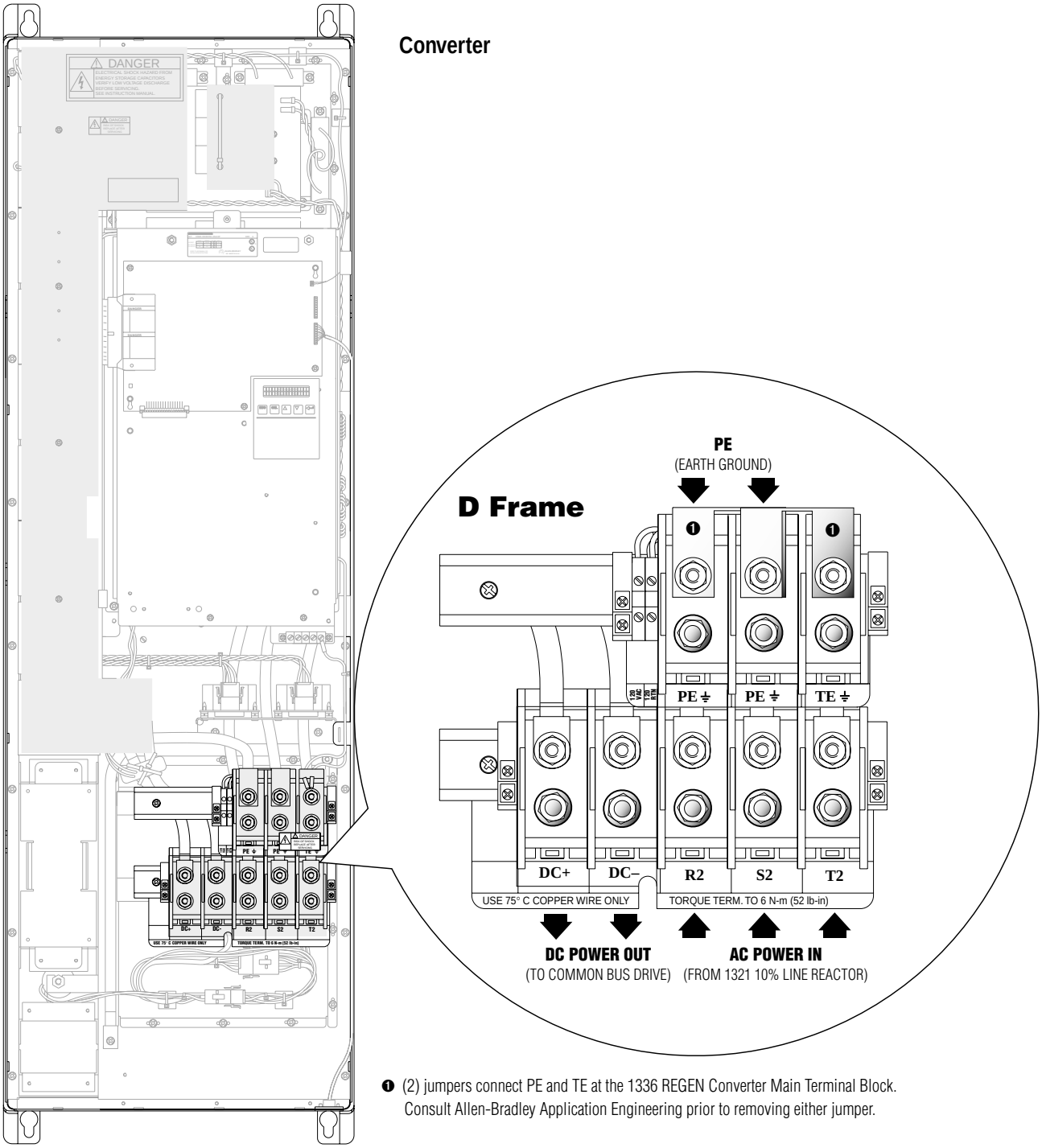


Figure 2.7 — B and C Frame 380-480V AC Converter Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

380-480V AC Power Wiring



❶ (2) jumpers connect PE and TE at the 1336 REGEN Converter Main Terminal Block. Consult Allen-Bradley Application Engineering prior to removing either jumper.

Figure 2.8 — D Frame 380-480V AC Converter Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

380-480V AC Power Wiring

380-480V AC Power Connection Specifications

1. Use 75ºC Copper Wire Only.
2. Listed wires sizes are maximum/minimum wire sizes that the terminals will accept — Not recommendations.

1336 REGEN POWER LINE FILTER RATING	MAX/MIN WIRE SIZE mm^2 (AWG)	MAX TORQUE N-m (lb-in)
48A	13.3/0.5 (6/20) — Single Conductor	1.70 (15)
78A	26.7/0.8 (3/18) — Single Conductor	5.65 (50)
180A	127.0/2.1 (250MCM/14) — Single Conductor 67.4/2.1 (00/14) — Double Conductor	6.00 (52)

1336 REGEN PRECHARGE UNIT RATING	MAX/MIN WIRE SIZE mm^2 (AWG)	MAX TORQUE N-m (lb-in)
B Frame	13.3/0.5 (6/20) — Single Conductor	1.70 (15)
C Frame	26.7/0.8 (3/18) — Single Conductor	5.65 (50)
D Frame	127.0/2.1 (250MCM/14) — Single Conductor 67.4/2.1 (00/14) — Double Conductor	6.00 (52)

1321 10% LINE REACTOR CAT. NO.	MAX/MIN WIRE SIZE mm^2 (AWG)	MAX TORQUE N-m (lb-in)
-3LR048-B and -3LRA048-B	13.3/0.5 (6/20) — Single Conductor	1.70 (15)
-3LR078-B and -3LRA078-B	26.7/0.8 (3/18) — Single Conductor	5.65 (50)
-3LR180-B and -3LRA180-B	127.0/2.1 (250MCM/14) — Single Conductor 67.4/2.1 (00/14) — Double Conductor	6.00 (52)

1336 REGEN CONVERTER RATING	MAX/MIN WIRE SIZE mm^2 (AWG)	MAX TORQUE N-m (lb-in)
B Frame	13.3/0.5 (6/20) — Single Conductor	1.70 (15)
C Frame	26.7/0.8 (3/18) — Single Conductor	5.65 (50)
D Frame	127.0/2.1 (250MCM/14) — Single Conductor 67.4/2.1 (00/14) — Double Conductor	6.00 (52)

3. Input power connections to D frame Precharge Units and input/output power connections to D frame Converters are stud type terminations or bus bar bolts that require the use of lug type connectors to terminate field installed conductors. Lugs used with these connections are listed below.

Catalog Number	PRECHARGE INPUT R, S, T & PE CONVERTER INPUT R2, S2, T2 & PE CONVERTER OUTPUT DC+ & DC–	T & B Part Number ❶
	Cable (per phase) Qty. mm^2 (AWG)	Qty. P/N
1336R-VB180	(1) 107.2 (4/0)	(10) 54168 ❷

❶ 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.

❷ 5/16" stud. All other termination studs are 3/8".

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

120V AC Precharge and Converter Wiring

ATTENTION: 1336 REGEN equipment does not provide 120V AC short circuit fusing. Branch circuit breakers or disconnect switches cannot provide this level of protection for converter and precharge unit components. Short circuit fusing should be sized and typed in accordance with National Codes and standards (NEC, CENELEC, etc.) and any additional local codes.

120V AC Current Requirements

1336 REGEN LINE REGENERATION PACKAGE CAT. NO.	PRECHARGE CONTACTOR		CONVERTER FAN	
	Inrush Amps	S.S. Amps	Inrush Amps	S.S. Amps
1336R-VB048 1336R-VB078	3A	0.3A	—	—
1336R-VB180	7A	0.7A	5A	0.8A

120V AC is required by the 1336 REGEN Precharge Contactor and 1336 REGEN D Frame Converter fan. 120V AC must be derived from the same AC power supply source used for all 1336 REGEN equipment and taken at the AC Power Input, or, before the Power Line Filter if used.

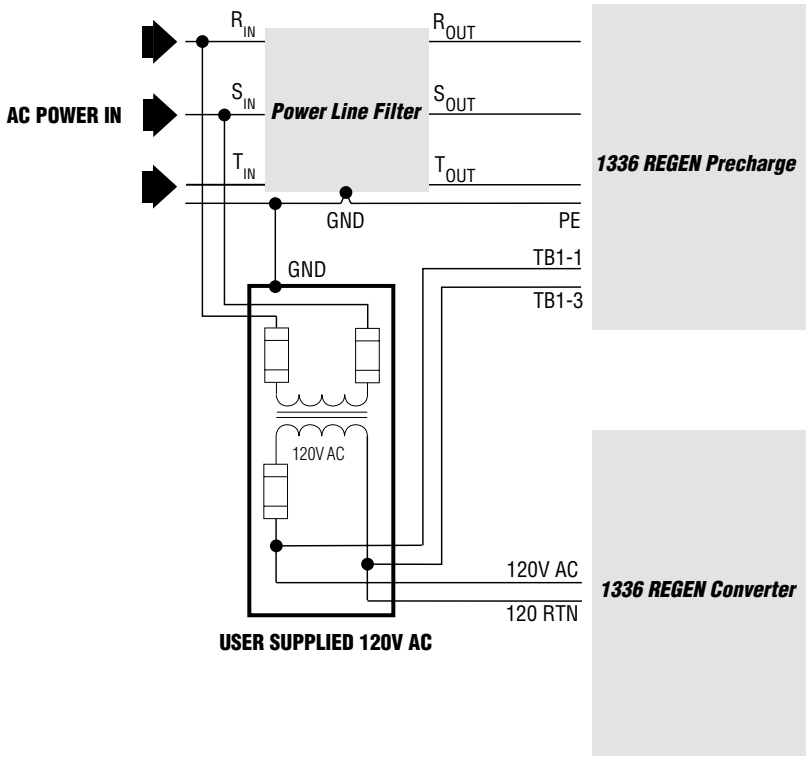


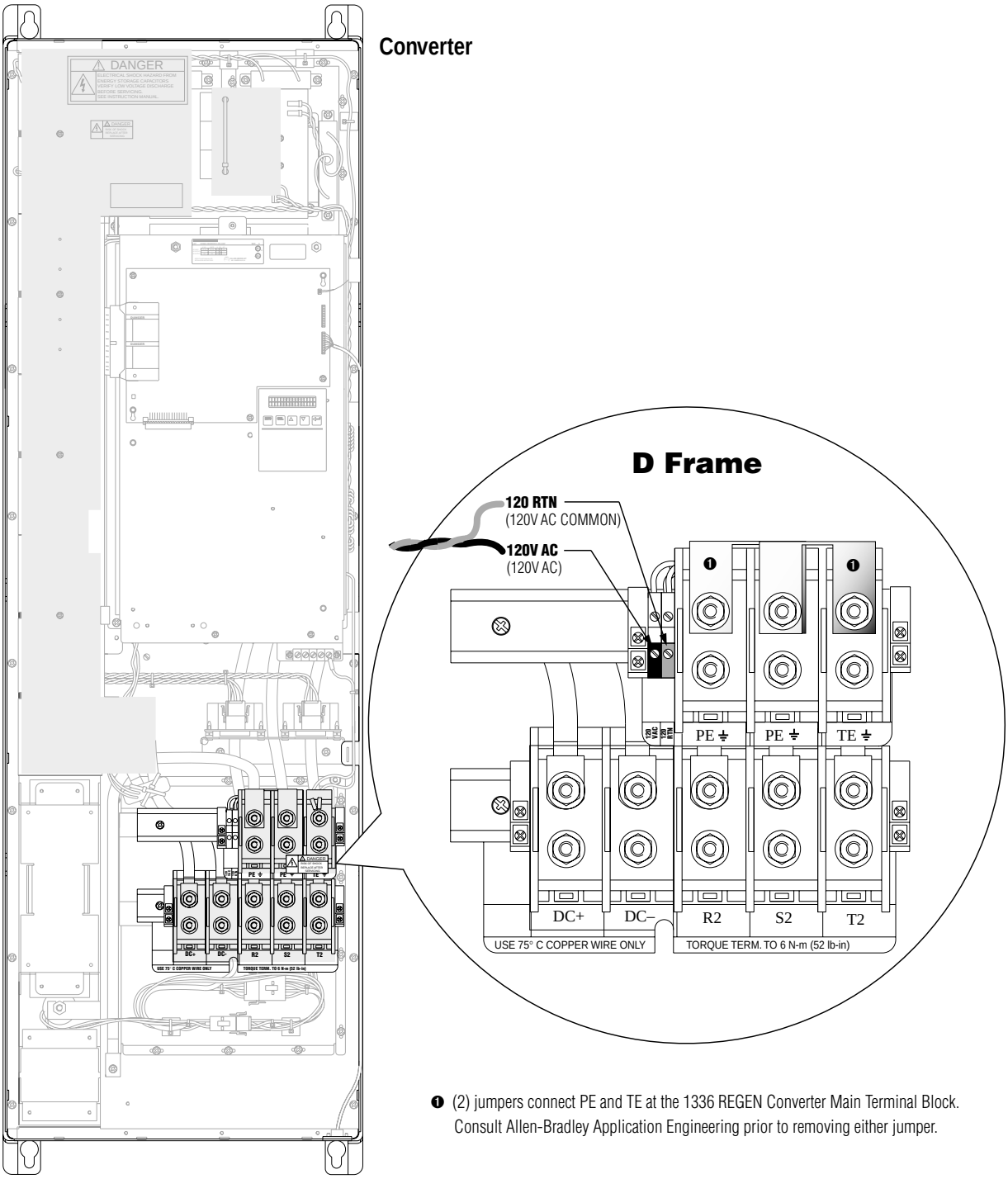
Figure 2.9 — 120V AC Precharge and Converter Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

120V AC Precharge and Converter Wiring

120V AC Converter Connections

120V AC input and output power connections are made to D Frame Converters as shown below.



❶ (2) jumpers connect PE and TE at the 1336 REGEN Converter Main Terminal Block. Consult Allen-Bradley Application Engineering prior to removing either jumper.

Figure 2.10 — 120V AC D Frame Converter Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

120V AC Precharge and Converter Wiring

120V AC Precharge Connections

120V AC input and output connections are made to B-D Frame Precharge Units as shown below.

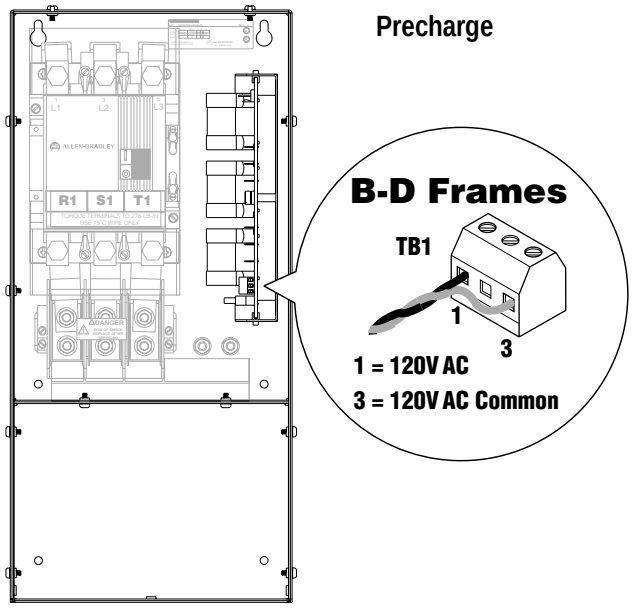


Figure 2.11 — 120V AC Precharge Unit Connections

120V AC Connection Specifications

1. Use 75ºC Copper Wire Only.

2. Listed wires sizes are maximum/minimum wire sizes that the terminals will accept — Not recommendations.

1336 REGEN PRECHARGE UNIT RATING	MAX/MIN WIRE SIZE mm^2 (AWG)	MAX TORQUE N-m (lb-in)
B-D Frames	2.1/0.30 (14/22)	0.90-1.13 (8-10)

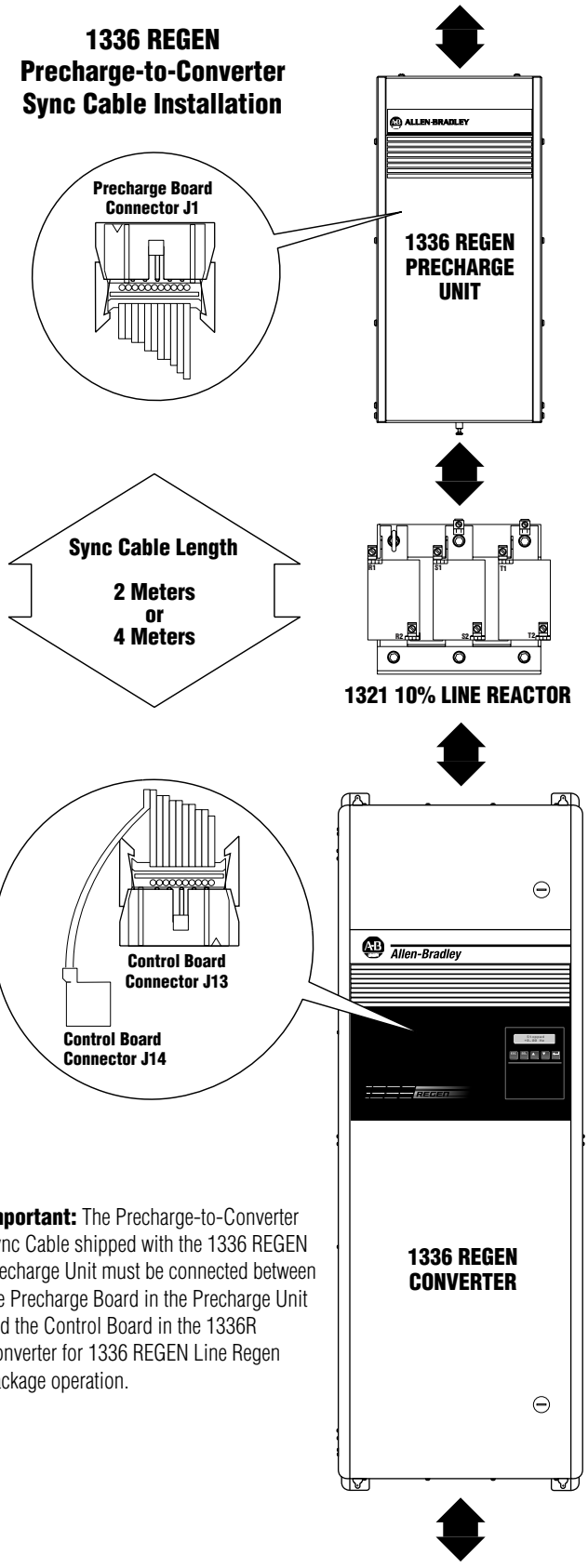
1336 REGEN CONVERTER RATING	MAX/MIN WIRE SIZE mm^2 (AWG)	MAX TORQUE N-m (lb-in)
D Frame	2.1/0.30 (14/22)	0.90-1.13 (8-10)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Control and Signal Wiring

Sync Cable

The sync cable that is shipped with the 1336 REGEN Precharge unit connects the required startup, diagnostic and control signals between the 1336 REGEN Converter Control Board and the 1336 REGEN Precharge Board. The ribbon cable shield provided at the converter end must be connected to the Control Board Shield Connector J14 as shown in Figure 2.13 to maintain signal integrity.



Important: The Precharge-to-Converter Sync Cable shipped with the 1336 REGEN Precharge Unit must be connected between the Precharge Board in the Precharge Unit and the Control Board in the 1336R Converter for 1336 REGEN Line Regen Package operation.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Control and Signal Wiring

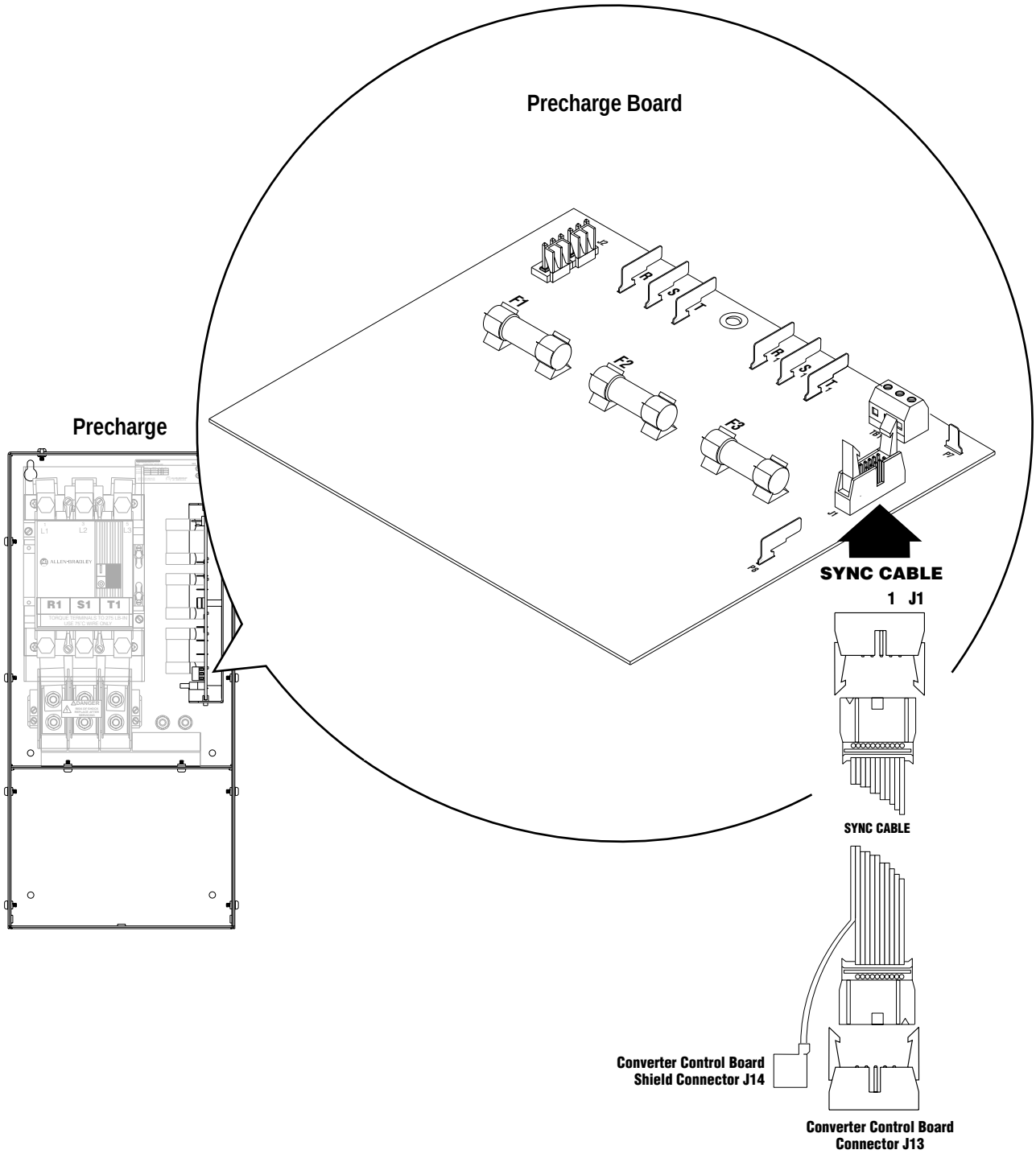


Figure 2.12 — Precharge Unit Precharge Board Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Control and Signal Wiring

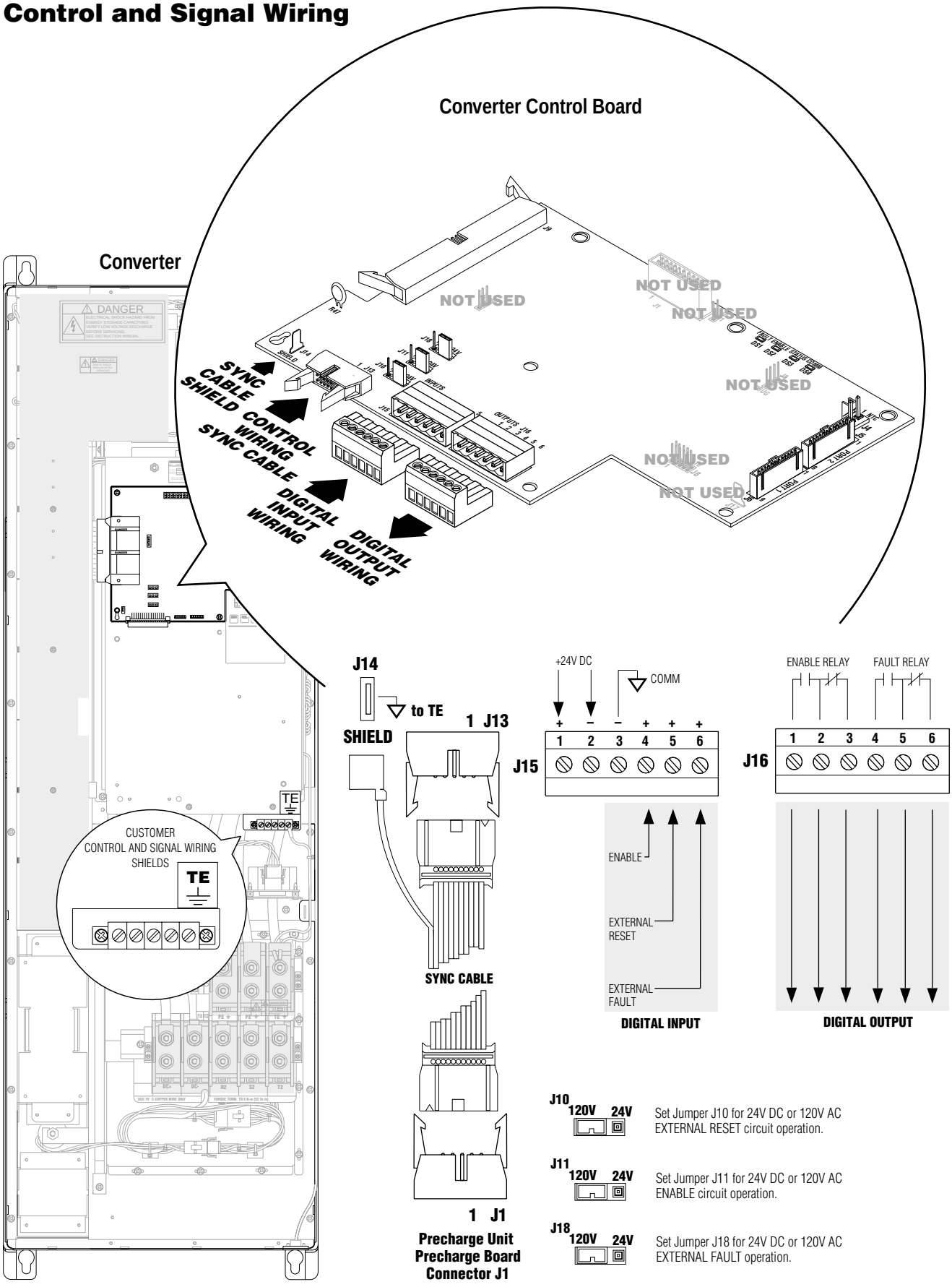


Figure 2.13 — Converter Control Board Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Control and Signal Wiring

Control Board Connections

All customer control and signal wiring is made to quick-connect terminal blocks J15 and J16.

The maximum/minimum wire sizes accepted by J15 & J16 is 3.3/0.6 mm^2 (12/30 AWG). Maximum torque is 0.79 N-m (7 lb.-in.). Recommended control/signal wire is:

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

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

Important: Signal common (DGND) puts the common or negative side of the signal at earth ground potential. Control schemes must be examined for possible conflicts.

All customer control and signal wiring shields are terminated at the TE terminal block shown on the previous page.

Cable Routing

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

Important: If user installed control and signal wiring with an insulation rating of less than 600V is used, route the wiring inside the converter enclosure such that is it separate from any other wiring or uninsulated live parts.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Control and Signal Wiring

Digital Input Signals

ATTENTION: Ensure that all jumpers on the 1336 REGEN Converter Control Board are set correctly prior to applying AC power to the board. Applying 120V AC to the digital inputs when jumpers J10, J11 or J18 are set to 24V DC will permanently damage the Converter Control Board.

Important: Customer **EXTERNAL FAULT** and **ENABLE** circuits must be connected to J15 and at logic high for the 1336 REGEN Converter to operate.

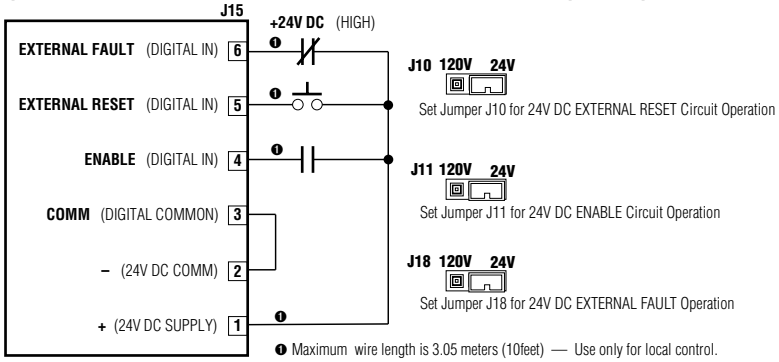
1336 REGEN Converter digital inputs are designed for operation at either 24V DC or 120V AC. Digital input signal circuits must be capable of operating with high = true logic. For 24V DC operation, +24V DC is available from the 1336 REGEN Converter Control Board. For 120V AC operation, a separate 120V AC user supply is required.

24V DC and 120VAC Circuits

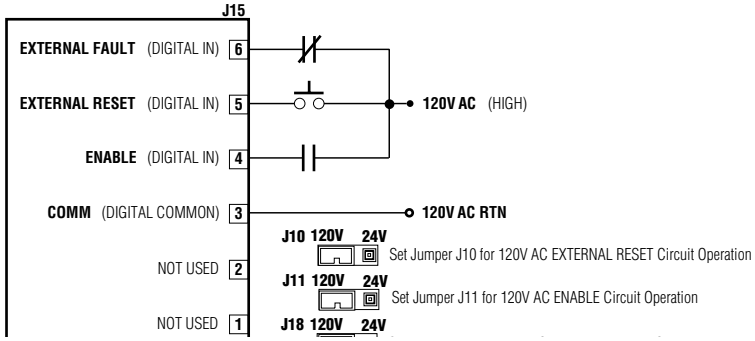
IN THE LOW STATE . . .	MUST GENERATE A VOLTAGE OF NO MORE THAN . . .	AND LEAKAGE CURRENT MUST BE LESS THAN . . .
24V DC Circuits	8V DC	1.5mA Into a 2.5kΩ Load
120V AC Circuits	30V AC	10mA Into a 6.5kΩ Load

IN THE HIGH STATE . . .	MUST GENERATE A VOLTAGE OF . . .	AND SOURCE CURRENT MUST BE AT LEAST . . .
24V DC Circuits	20-26V DC	10mA
120V AC Circuits	81-132V AC	20mA

24V DC Operation
Contacts are Shown in the Unpowered State
(or in the Powered State with no Enable or External Fault present)



120V AC Operation
Contacts are Shown in the Unpowered State
(or in the Powered State with no Enable or External Fault present)



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Control and Signal Wiring

Important: Fuse R47 is self-resetting and will open should a low impedance or short circuit occur at J15 during 24V DC operation. Should a fault occur, allow (1) minute after removal of power from the Converter Control Board for R47 to cool before reapplying power.

Important: For Regenerative DC Bus Supply applications, the 1336 REGEN Line Regeneration Package will be used with one or more common bus drives. It is recommend that the fault relay on the 1336 REGEN Converter Control board be interconnected into the common bus drive(s) control logic. This will allow coordination the Regenerative DC Bus Supply faults with the common bus drive.

External Fault

Allows a customer supplied external signal to be wired into the 1336 REGEN Converter. Opening this contact issues an external fault command, disabling the converter.

External Reset

Resets the 1336 REGEN Converter when closed. If the converter has faulted, closing this contact clears the fault and resets the converter.

Enable

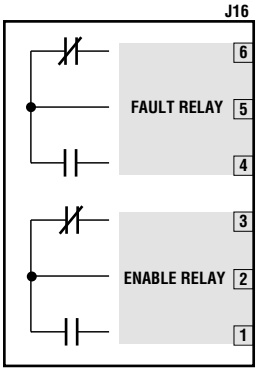
For the 1336 REGEN Converter to modulate, an enable signal must be present at J15 on the 1336 REGEN Converter Control Board. Opening this contact disables the converter. When this contact is closed, the Enable LED on the Control Board will be lit.

Digital Output Signals

(2) form C, N.O./N.C. output relays are available at J16 on the 1336 REGEN Control Board to provide external warning or fault change-of-state signals.

Resistive Rating = 120V AC/30V DC, 5.0A
Inductive Rating = 120V AC/30V DC, 2.0A

Contacts are Shown in the Unpowered State



Fault Output - The fault output is used to indicate that the 1336 REGEN Converter is faulted with either an internal or external fault.
Note: The unpowered state of the fault relay is the opposite of the faulted state—or the unpowered state of the fault relay indicates an unfaulted condition.

Enable Output - The enable output indicates that the 1336 REGEN Converter is modulating. An enable signal must be present on J15 and the 1336 REGEN Converter must not be faulted for the enable output to be active.

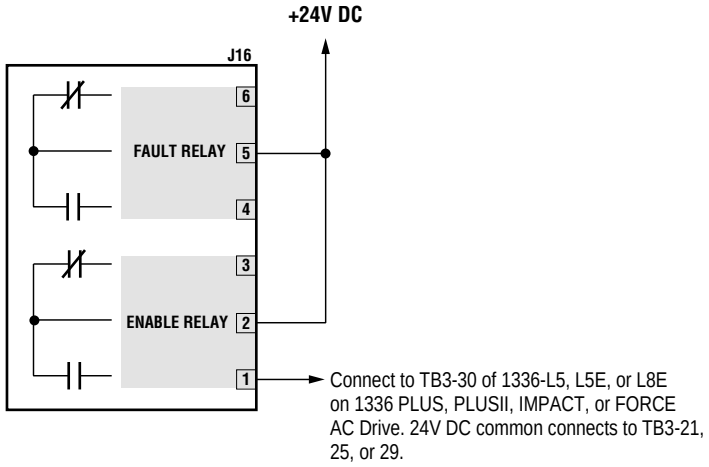
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Control and Signal Wiring

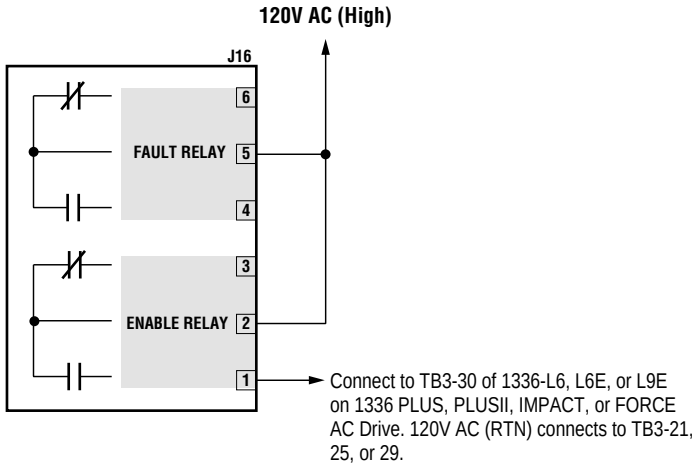
Interlocking 1336 REGEN Enable with AC Drive Enable

It may be desirable to interlock the 1336 REGEN Enable Output with the Enable Input on the connected 1336 PLUS, 1336 PLUSII, 1336 IMPACT or 1336 FORCE AC drive. This will keep the AC drive from starting if the 1336 REGEN Converter is not enabled, and will also remove the Enable signal from the AC drive if the 1336 REGEN Converter is faulted. If the Enable signals are not interlocked, the AC drive may fault on bus overvoltage when attempting to regenerate.

24V DC Operation



120V AC Operation



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Adapter Definitions

Serial communication devices such as the HIM that are connected to the 1336 REGEN Converter are identified by SCANport serial communications as adapters. Depending on the communications options ordered, a number of different adapters are available.

When the Converter mounted Programming Only HIM is supplied, it is connected as adapter 1 as detailed in Figure 2.14. Figure 2.14 also shows the maximum distance allowed between devices.

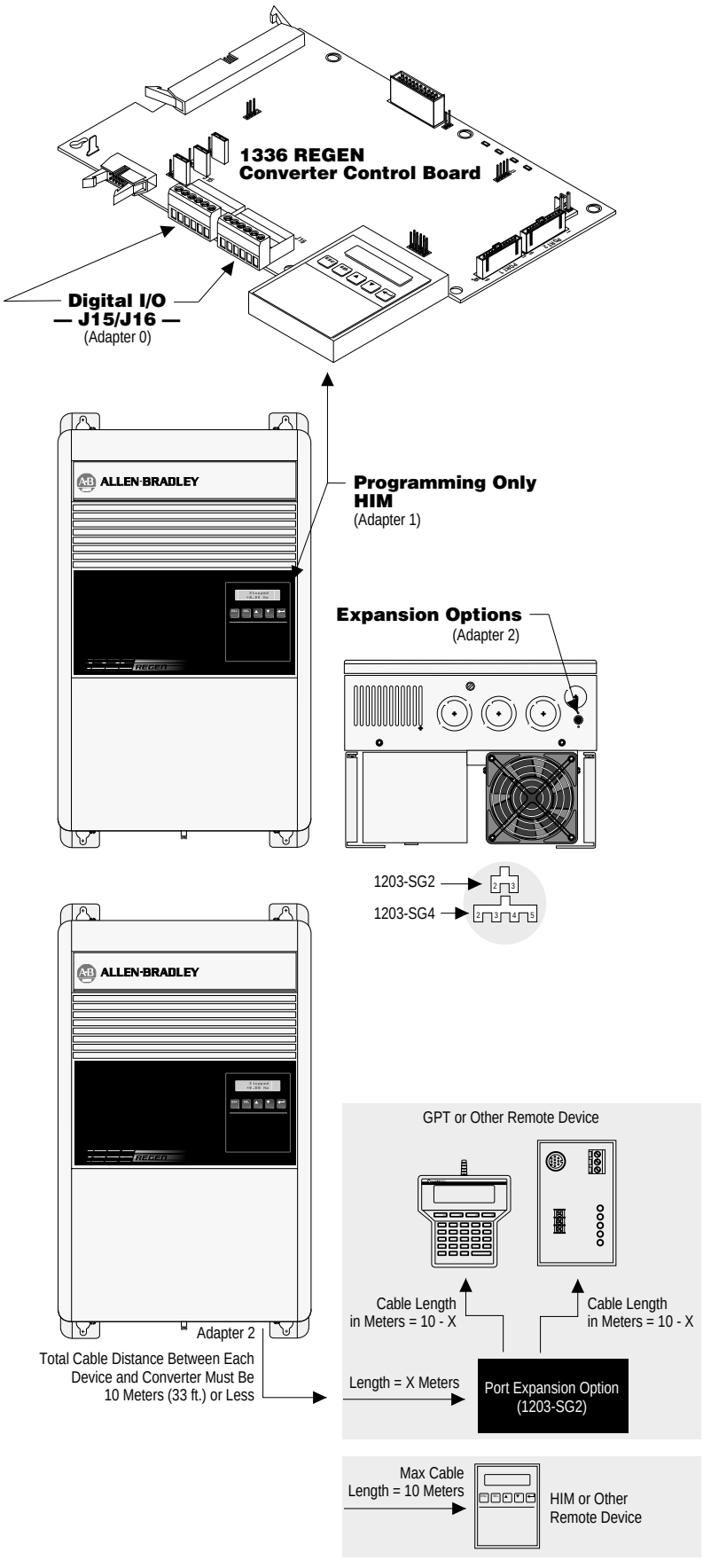


Figure 2.14 — Adapter Definitions

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Human Interface Module

HIM Description

When the converter mounted HIM is supplied, it will be connected as Adapter 1 and visible from the front of the converter.

The display panel provides a means of programming the 1336 REGEN Converter and viewing the various operating parameters

Important: If a Control Panel HIM is connected to the 1336 REGEN Converter, only the Start key and Stop key on the control panel will be functional — The Start key will send an Enable command to the Converter, the Stop key will send a Not Enable command to the Converter.

ATTENTION: When a HIM is not supplied on enclosed NEMA Type 1 (IP 20) 1336 REGEN Controllers, the blank cover plate (option HAB) must be installed to close the opening in the front cover of the enclosure. Failure to install the blank cover plate allows access to electrically live parts which may result in personnel injury and/or equipment damage.

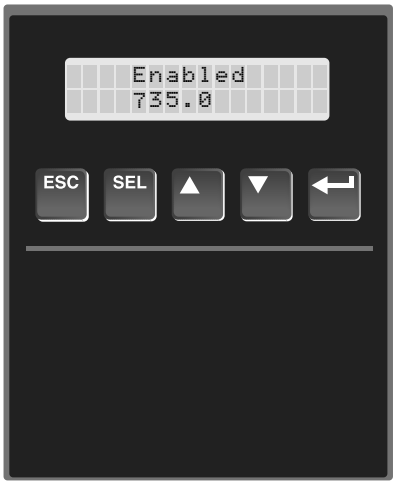
When a HIM is supplied with enclosed NEMA Type 1 (IP 20) 1336 REGEN Converters but has been removed from its mounting cradle for remote operation, the blank cover plate must be installed in its place.

HIM Removal

For handheld operation, the module can be removed and located up to 10 meters (33 feet) from the 1336 REGEN Converter.

ATTENTION: Some voltages present behind the 1336 REGEN Converter front cover are at incoming line potential. To avoid an electric shock hazard, use extreme caution when removing/replacing the HIM.

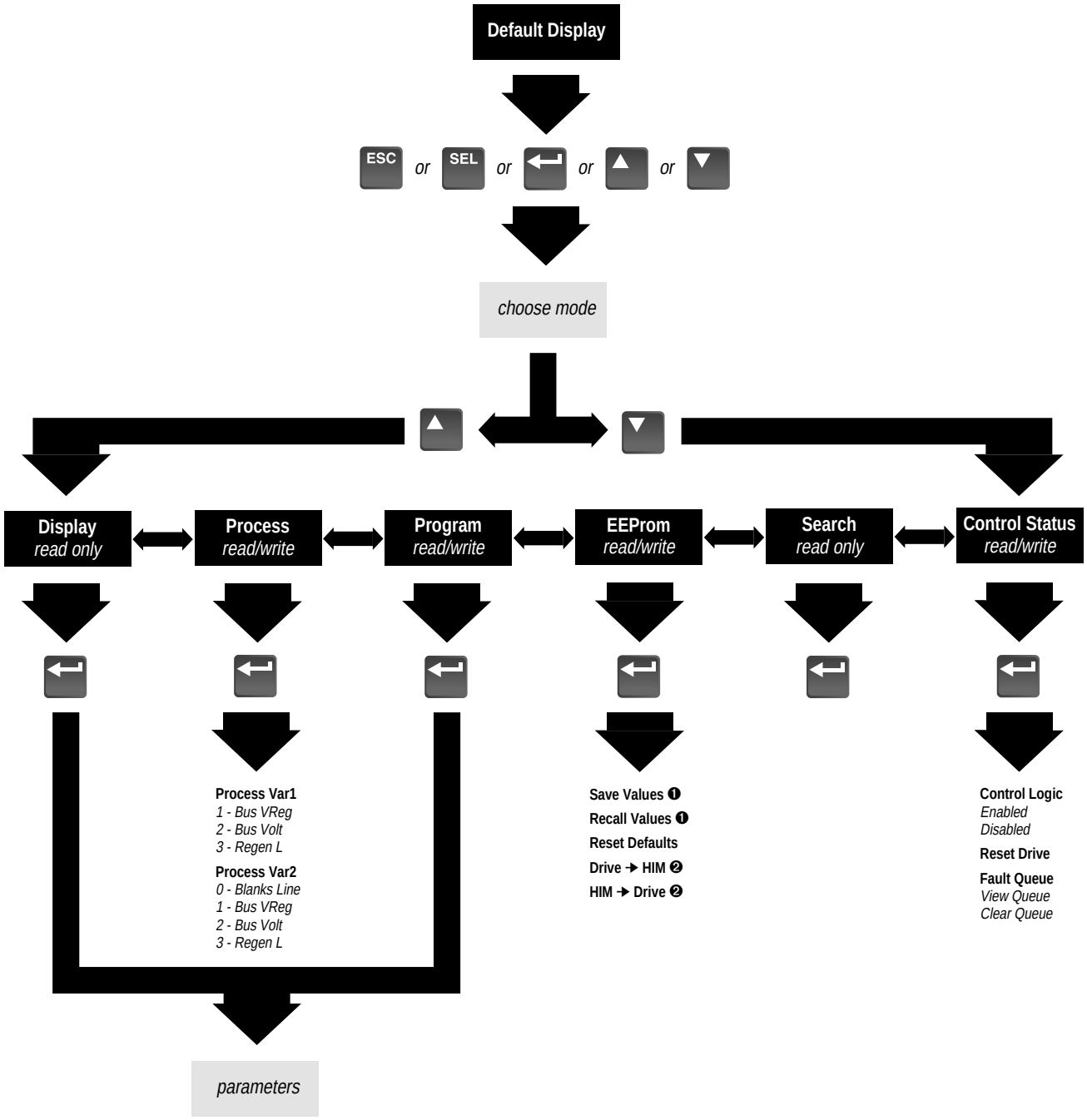
HIM Operation



ESC	**ESCape** When pressed, the escape key will cause the programming system to go back one level in the menu tree.
SEL	**SELect** Pressing the select key alternately causes the top or bottom line of the display to become active. The flashing first character indicates which line is active.
▲ ▼	**Increment/Decrement** These keys are used to increment and decrement a value or scroll though different parameters.
↵	**Enter** When pressed, a 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 to be chosen.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Programming Flow Chart



❶ Reserved for future use.

❷ HIM will indicate Drive, but download will be to or from 1336 REGEN Converter.

Figure 2.15 — HIM Startup Programming

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative DC Bus Supply Startup

Overview

The following procedure describes how to startup the 1336 REGEN Line Regeneration Package and connected common bus drive when used for Regenerative DC bus supply applications. Included are typical checks to assure proper operation. The selection information contained in Chapter 1 must be read and understood before proceeding.

Important: The 1336 REGEN Package has been shipped from the factory with Parameter 1 set to the Regenerative Brake Mode of operation. For Regenerative DC Bus Supply applications, this parameter must be reset as described in “Operational Mode” on page 2-29. For the majority of applications there should be no need to adjust any other parameters. Should utility or load conditions deviate from the “normal” conditions listed in the Specifications in Appendix B, the following parameters have been provided to allow adjustments to factory settings.

The following startup procedure is written for users who have a Human Interface Module (HIM) installed. For users without a HIM, respective external commands and signals must be substituted to simulate their operation.



ATTENTION: Power must be applied to the 1336 REGEN Package to perform the following startup procedure. Some of the voltages present are at incoming line potential. To avoid electric shock hazard or damage to equipment, only qualified service personnel should perform the following procedure. Thoroughly read and understand the procedure before beginning. If an event does not occur while performing this procedure, Do Not Proceed. Remove power by opening the branch circuit disconnect device and correct the malfunction before proceeding.

Important: Power must be applied to the 1336 REGEN Package when viewing or changing parameters. Previous programming of the 1336 REGEN Converter will effect operation when power is applied.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative DC Bus Supply Startup

Initial Operation

Important: For Regenerative DC Bus Supply applications, the 1336 REGEN Line Regeneration Package will be used with one or more common bus drives (see Figure 2.1). It is recommend that the fault relay on the 1336 REGEN Converter Control board be interconnected into the common bus drive(s) control logic. This will allow coordination the Regenerative DC Bus Supply faults with the common bus drive.

1. Verify that AC line power at the disconnect device is within the rated value of the 1336 REGEN Package.

2. Verify that the digital inputs are configured as described in the Control and Signal Wiring section. Ensure that jumpers J10, J11 & J18 on the 1336 REGEN Converter Control Board are set correctly.

3. Set the converter logic to Not Enabled by presenting a logic "low" at terminal 4 of J15.

4. Confirm that all other control inputs and outputs are connected to the correct terminals and are secure and de-energized. In addition, confirm that the external fault circuit is closed.

5. Replace all 1336 REGEN Package covers.

6. Apply AC power and control voltages to the Regenerative DC Bus Supply System. The 1336 REGEN Converter HIM display should light and display a status of

```
Not Enabled
   650.0 VOLT
```

If the system detects a fault, a brief statement will be shown on the display. Record this information, remove all power and correct the source of the fault before proceeding. Refer to Chapter 4 for fault descriptions and troubleshooting.

The remaining steps in this procedure are based on factory default settings. If the 1336 REGEN Package has been previously operated, parameter settings may have been changed and may not be compatible with this startup procedure or application.

Important: To obtain proper results, the 1336 REGEN Package must be set to Not Enabled and it's parameters reset to factory defaults.

Setting parameters to factory defaults with the 1336 REGEN Line Regeneration Package set to Enabled will result in an EEProm error. Setting the converter logic to Not Enabled by presenting a logic "low" at terminal 4 of J15 will clear the error and restore the

```
Not Enabled
   650.0 VOLT
```

screen.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative DC Bus Supply Startup

7. From the status display, press Enter or any other key.

```
Choose Mode
Display
```
will be displayed.

8. Press the Up or Down until
```
Choose Mode
EEProm
```
is displayed.

9. Press Enter

10. Press the Up or Down until
```
EEProm
Reset Defaults
```
is displayed.

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

12. Press ESC once to exit back to the status display.

After the parameters have been restored to their factory settings, the status display will show
```
Not Enabled
650.0 VOLT
```
To Enable the converter, present a logic “high” to terminal 4 of J15.

At the factory default settings, the 1336 REGEN Package is programmed for 460V AC line power and set to the Regenerative Brake mode of operation.

- For 380V AC operation, set Bit 2 of P-1 **[Operational Mode]** to 1.
- For Regenerative DC Bus Supply operation, DC bus voltage can be set at a fixed value or can vary with AC line voltage:

  a. **Fixed Bus Voltage Operation**

  To operate with a fixed bus voltage, set Bit 0 of P-1 **[Operational Mode]** to 0 and adjust the value of P-6 **[Bus Voltage Reference]** to the desired value.

  b. **Variable Bus Voltage Operation**

  To operate with a bus voltage that varies with AC line voltage, set Bit 0 of P-1 **[Operational Mode]** to 1. The 1336 REGEN Converter will adjust the DC bus voltage to the lowest voltage possible while still maintaining unity power factor and low current harmonics on the AC line.

  No other parameter changes are necessary.

To view a parameter other than P-5 **[Bus Volts Act.]** on the HIM display, P-28 **[HIM Display Prm]** may be changed. Setting P-28 to a different parameter number will display that parameter’s value on line 2 of the status display.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Programming

Overview

The 1336 REGEN Line Regeneration Package is designed so that factory default parameter settings allow it to operate satisfactorily under a wide variety of load and utility conditions.

Important: The 1336 REGEN Package has been shipped from the factory with Parameter 1 set to the Regenerative Brake Mode of operation. For Regenerative DC Bus Supply applications, this parameter must be reset as described in “Operational Mode” on page 2-29.

With the exception of Parameter 1, for the majority of applications there should be no need to adjust parameters. Should utility or load conditions deviate from the “normal” conditions listed in the Specifications, the following parameters have been provided to allow adjustments to factory settings.

Conventions

- Only parameters that are used in the Regenerative DC Bus Supply mode of operation are listed in this chapter.
- Some parameters can be modified when the 1336 REGEN converter is enabled. Other parameters can be modified only when the 1336 REGEN is not enabled.
- `Parameter Names` appear in the display in the left column. If mentioned in text, they will be shown in **[brackets]**.
- The **Parameter No.** is a unique number assigned to each of the 1336 REGEN Package parameters.
- The **Display Units** are units shown on the HIM — Bits, Amps, Volts, Percentages or Numbers.
- The **Parameter Type** heading indicates whether or not the parameter is read/write or read only. If read/write, whether or not it can be changed while the converter is enabled.
- The **Factory Default** value is the value set at the factory. In most circumstances this value should be sufficient for the application.
- The **Min/Max Value** is the lowest/highest setting for the parameter.
- **Drive Units** are internal units used to scale values properly when reading or writing to the converter.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

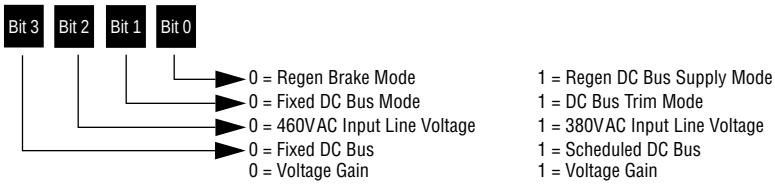
Programming

```
Operational Mode
XXXX0000        1
```

Parameter No.	1
Display Units	bits
Parameter Type	Read/Write
Factory Default	XXXXX000
Regen Brake Mode	
Min/Max Value	N/A
Drive Units	000 = 0_{bin}

Operational Mode

Sets the 1336 REGEN Line Regeneration Package mode of operation. The modes are defined by the last (3) bits of a 16 bit word. To set the mode, first stop the 1336 REGEN Converter, set the mode, then re-enable the converter.



Important: If the **[Operational Mode]** is reset while the 1336 REGEN Converter is enabled, a System Mode Change Fault will occur. Issuing a reset command will clear the fault and reset the converter.

```
Rated Current
   00.0 AMPS    2
```

Parameter No.	2
Display Units	Amps
Parameter Type	Read Only
Drive Units	1 = 0.1A

Rated AC Line Current

Displays the rated AC line current of the 1336 REGEN Converter.

```
Line Current
    +100 %      3
```

Parameter No.	3
Display Units	%
Min/Max Value	-200/200
Parameter Type	Read Only
Drive Units	100 = 4096

AC Line Current

Displays the actual I_q AC line current in percent of rated AC line current. Positive values indicate motoring — Negative values indicate regeneration.

```
Peak Load
    +100 %      4
```

Parameter No.	4
Display Units	%
Min/Max Value	-200/200
Parameter Type	Read Only
Drive Units	100 = 4096

Peak Load

Displays the peak motoring or regenerating current in percent of rated AC current. The peak value is held for five seconds. Positive values indicate motoring — Negative values indicate regenerating.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Programming

```
Bus Volts Act.
  735.0 VOLT   5
```

Actual Bus Voltage

Displays the actual voltage on the DC bus in DC volts.

Parameter No.	5
Display Units	Volts
Parameter Type	Read Only
Drive Units	1 = 0.1V

```
Bus VReg Ref.
  735.0 VOLT   6
```

Bus Voltage Reference

This parameter sets the DC bus voltage. It allows the DC Bus voltage to be set to 2-18% higher than the DC Base volts while the 1336 REGEN Converter is enabled.

- For 380VAC input Line Regeneration Packages, DC_{BASE} volts = 537V.
  For 460VAC input Line Regeneration Packages, DC_{BASE} volts = 650V.

Important: This parameter is effective only in the Fixed DC Bus Mode.

Parameter No.	6
Display Units	Volts
Parameter Type	Read/Write
Factory Default	380VAC Input = 607V 460VAC Input = 735V
Min/Max Value	380VAC Input = 548/634V 460VAC Input = 663/767V
Drive Units	100 = 4096

```
Bus VReg KP
  1.00       7
```

Proportional Gain

This parameter sets the proportional gain for the PI DC Bus Voltage Regulator, and may be set while the 1336 REGEN Converter is enabled. Increasing the gain increases the response speed of the DC Bus Voltage Regulator, but may also cause the bus voltage to overshoot.

Parameter No.	7
Display Units	Number
Parameter Type	Read/Write
Factory Default	1.00
Min/Max Value	0.50/2.00
Drive Units	1.00 = 4096

```
Bus VReg KI
  1.00       8
```

Integral Gain

This parameter sets the integral gain for the PI DC Bus Voltage Regulator, and may be set while the 1336 REGEN Converter is enabled. Increasing the gain increases the response speed of the DC Bus Voltage Regulator, but may also cause the bus voltage to overshoot.

Parameter No.	8
Display Units	Number
Parameter Type	Read/Write
Factory Default	1.00
Min/Max Value	0.50/2.00
Drive Units	1.00 = 4096

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Programming

```
Motoring Cur Lim
   +150 %     12
```

Parameter No.	12
Display Units	%
Parameter Type	Read/Write
Factory Default	150%
Min/Max Value	0/150
Drive Units	100 = 4096

Motoring Current Limit

Sets the actual positive or motoring I_q AC line current limit in percent of P-2 **[Rated AC Line Current]**.

Important: The 1336 REGEN Converter cannot be enabled for the **[Motoring Cur Lim]** to be changed.

```
Regen Curr Limit
   -150 %     13
```

Parameter No.	13
Display Units	%
Parameter Type	Read/Write
Factory Default	-150%
Min/Max Value	-150/0
Drive Units	100 = 4096

Regen Current Limit

Sets the actual negative or regenerating AC line current limit in percent of P-2 **[Rated AC Line Current]**.

Important: The 1336 REGEN Converter cannot be enabled for the **[Regen Curr Limit]** to be changed.

```
IOC SW Trip
   192 %     14
```

Parameter No.	14
Display Units	%
Parameter Type	Read/Write
Factory Default	192% I_{RATE} ❶
Min/Max Value	100/200% I_{RATE} ❶
Drive Units	100 = 4096

Instantaneous Overcurrent Trip Level

This parameter sets the software trip point for the **Instantaneous SW Overcurrent Fault** in percent of P-2 **[Rated AC Line Current]**.

❶ I_{RATE} Amps = the rated nameplate current of the 1336 REGEN Converter **[Rated AC Line Current]**.

Important: The 1336 REGEN Converter cannot be enabled for the **[IOC SW Trip]** to be changed.

```
Volt Trp Fltr BW
    9.8      15
```

Parameter No.	15
Display Units	Hz
Parameter Type	Read/Write
Factory Default	9.8
Min/Max Value	0.5/100
Drive Units	1.0 = 4096

Voltage Feedback Filter Bandwidth

This parameter sets the bandwidth of a first order filter used for AC line voltage feedback. Increasing the bandwidth can help avoid nuisance trips due to short term AC line overvoltage or undervoltage conditions.

Important: The 1336 REGEN Converter cannot be enabled for the **[Volt Trp Fltr BW]** to be changed.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Programming

```
BOV SW Trip
   130 %    16
```

Parameter No.	16
Display Units	%
Parameter Type	Read/Write
Factory Default	130% DC_{BASE} ❶
Min/Max Value	120/135% DC_{BASE} ❶
Drive Units	100 = 4096

DC Bus Overvoltage Trip Level

This parameter sets the software over voltage trip point of the DC bus. The 1336 REGEN Converter is factory set to prevent it from operating when DC bus voltage is 30% above DC_{BASE} volts.

❶ For 380V AC input Line Regeneration Packages, DC_{BASE} volts = 537V.
For 460V AC input Line Regeneration Packages, DC_{BASE} volts = 650V.

```
BUV SW Trip
    60 %    17
```

Parameter No.	17
Display Units	%
Parameter Type	Read/Write
Factory Default	60% DC_{BASE} ❶
Min/Max Value	50/100% DC_{BASE} ❶
Drive Units	100 = 4096

DC Bus Undervoltage Trip Level

This parameter sets the software under voltage trip point of the DC bus. The 1336 REGEN Converter is factory set to prevent it from operating when DC bus voltage is less than 60% of DC_{BASE} volts.

❶ For 380V AC input Line Regeneration Packages, DC_{BASE} volts = 537V.
For 460V AC input Line Regeneration Packages, DC_{BASE} volts = 650V.

```
LOV Trip 1
   115 %    18
```

Parameter No.	18
Display Units	%
Parameter Type	Read/Write
Factory Default	115% AC_{BASE} ❶
Min/Max Value	110/130% AC_{BASE} ❶
Drive Units	100 = 4096

AC Line Overvoltage Trip Level 1 (Not Enabled)

This parameter sets a software over voltage trip point that is active when the 1336 REGEN Converter is not enabled. The 1336 REGEN Converter is factory set to prevent it from being enabled when the input AC line voltage is 15% above the AC_{BASE} volts.

❶ For 380V AC input Line Regeneration Packages, AC_{BASE} volts = 380V.
For 460V AC input Line Regeneration Packages, AC_{BASE} volts = 460V.

Important: The 1336 REGEN Converter cannot be enabled for the **[LOV Trip 1]** to be changed.

```
LOV Trip 2
   130 %    19
```

Parameter No.	19
Display Units	%
Parameter Type	Read/Write
Factory Default	130% AC_{BASE} ❶
Min/Max Value	120/135% AC_{BASE} ❶
Drive Units	100 = 4096

AC Line Overvoltage Trip Level 2 (Enabled)

This parameter sets a second software over voltage trip point that is active when the 1336 REGEN Converter is enabled. The 1336 REGEN Converter is factory set to trip if the input AC line voltage is 30% above the AC_{BASE} volts.

❶ For 380V AC input Line Regeneration Packages, AC_{BASE} volts = 380V.
For 460V AC input Line Regeneration Packages, AC_{BASE} volts = 460V.

Important: The 1336 REGEN Converter cannot be enabled for the **[LOV Trip 2]** to be changed.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Programming

```
LUV Trip 1
   85 %    20
```

Parameter No.	20
Display Units	%
Parameter Type	Read/Write
Factory Default	85% AC_{BASE} ❶
Min/Max Value	75/90% AC_{BASE} ❶
Drive Units	100 = 4096

AC Line Undervoltage Trip Level 1 (Not Enabled)

This parameter sets a software under voltage trip point that is active when the 1336 REGEN Converter is not enabled. The 1336 REGEN Converter is factory set to prevent it from being enabled when the input AC line voltage is less than 85% of the AC_{BASE} volts.

❶ For 380V AC input Line Regeneration Packages, AC_{BASE} volts = 380V.
For 460V AC input Line Regeneration Packages, AC_{BASE} volts = 460V.

Important: The 1336 REGEN Converter cannot be enabled for the **[LUV Trip 1]** to be changed.

```
LUV Trip 2
   60 %    21
```

Parameter No.	21
Display Units	%
Parameter Type	Read/Write
Factory Default	60% AC_{BASE} ❶
Min/Max Value	50/70% AC_{BASE} ❶
Drive Units	100 = 4096

AC Line Undervoltage Trip Level 2 (Enabled)

This parameter sets a second software under voltage trip point that is active when the 1336 REGEN Converter is enabled. The 1336 REGEN Converter is factory set to trip if the input AC line voltage is less than 60% of the AC_{BASE} volts.

❶ For 380V AC input Line Regeneration Packages, AC_{BASE} volts = 380V.
For 460V AC input Line Regeneration Packages, AC_{BASE} volts = 460V.

Important: The 1336 REGEN Converter cannot be enabled for the **[LUV Trip 2]** to be changed.

```
PLLReg Err Trip
  0.10      22
```

Parameter No.	22
Display Units	Number
Parameter Type	Read/Write
Factory Default	0.1
Min/Max Value	0.0/0.3
Drive Units	1.0 = 4096

Phase Locked Loop Error Trip Point

The phase locked loop of the 1336 REGEN Line Regeneration Package synchronizes 1336 REGEN operation with the incoming power from the utility. This parameter allows the software trip point of **[PLLReg Err Trip]** to be adjusted to help avoid nuisance trips due to utility distortion.

Important: The 1336 REGEN Converter cannot be enabled for a **[PLLReg Err Trip]** to be changed.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

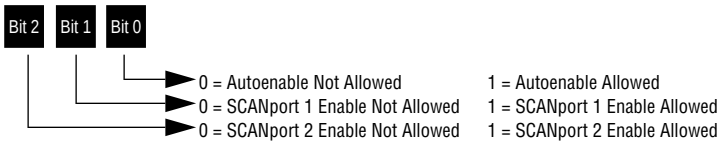
Programming

```
Port Enable Mask
XXXXX111      23
```

Parameter No.	23
Display Units	Bits
Parameter Type	Read/Write
Factory Default	111
Min/Max Value	0/7
Drive Units	N/A

Port Enabled Mask

This parameter sets the ability of a SCANport device to issue enable commands. The commands are defined by the first (3) bits of a 16 bit word. The **[Port Enable Mask]** may be set while the 1336 REGEN Converter is enabled.



Bit 0 = 1 When Bit 0 = 1, the system will be set to the auto-enable mode.

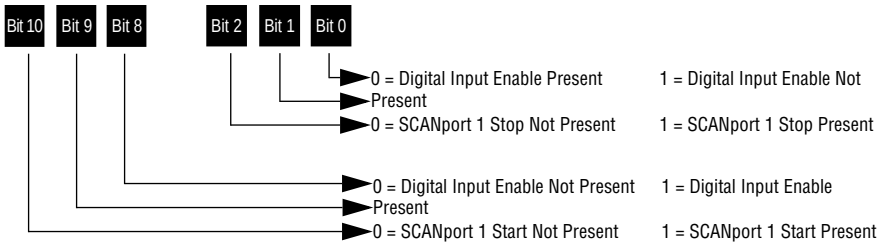
Bit 0 = 0 When Bit 0 = 0, this input requires an enable command from SCANport 1 or 2.

```
StartStop Owner
00000001      24
```

Parameter No.	24
Display Units	Bits
Parameter Type	Read Only
Factory Default	N/A
Min/Max Value	N/A
Drive Units	N/A

Start/Stop Owner

This parameter displays which adapter is currently issuing a valid enable command. Only the first (3) bits of each byte are valid.

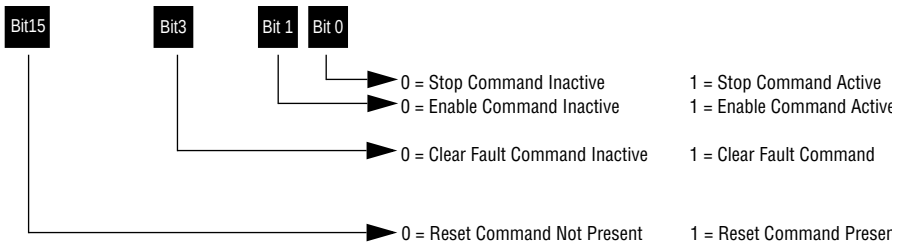



```
Command Status
00000001      25
```

Parameter No.	25
Display Units	Bits
Parameter Type	Read Only
Factory Default	N/A
Min/Max Value	N/A
Drive Units	N/A

Current Command Being Issued

This parameter displays the logic command currently being issued.

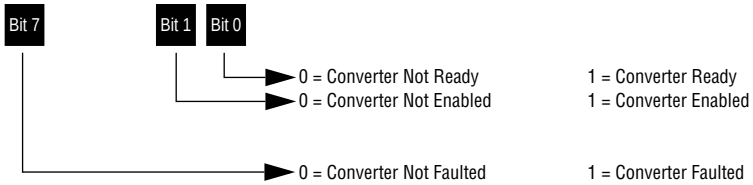



```
Logic Status
00000000      26
```

Parameter No.	26
Display Units	Bits
Parameter Type	Read Only
Factory Default	N/A
Min/Max Value	N/A
Drive Units	N/A

Logic Status

This parameter displays the current logic status of the 1336 REGEN Converter.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

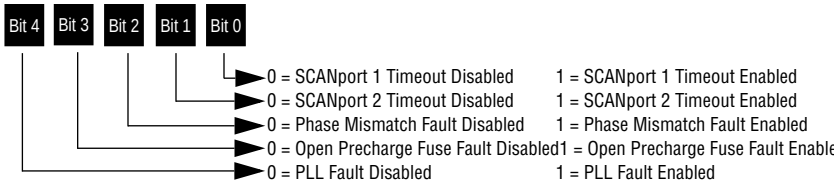
Programming

```
Fault Select1
XXX11100        27
```

Parameter No.	27
Display Units	Bits
Parameter Type	Read/Write
Factory Default	11100
Min/Max Value	N/A
Drive Units	N/A

Fault Select 1

This parameter enables or disables faults as defined by the first (5) bits of a (16) bit word. The **[Fault Select1]** parameter may be set while the 1336 REGEN Converter is enabled.




```
HIM Display Prm
        5       28
```

Parameter No.	28
Display Units	Number
Parameter Type	Read/Write
Factory Default	5
Min/Max Value	1/32
Drive Units	N/A

HIM Default Display Parameter

This parameter sets which of the previous parameters will be displayed after 1336 REGEN Converter power-up. The **[HIM Display Param]** parameter may be set while the 1336 REGEN Converter is enabled.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

End of Chapter

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative Brake Operation

Overview

The 1336 REGEN Line Regeneration Package represents an amp rated package that can remove energy from the DC bus of a 1336 PLUS, PLUSII, FORCE or IMPACT AC drive and send it back to the utility. When properly sized with one or more standard 1336 PLUS, PLUSII, FORCE or IMPACT AC drives, Regenerative Brake Operation provides an energy efficient alternative solution to dynamic braking.

General Precautions

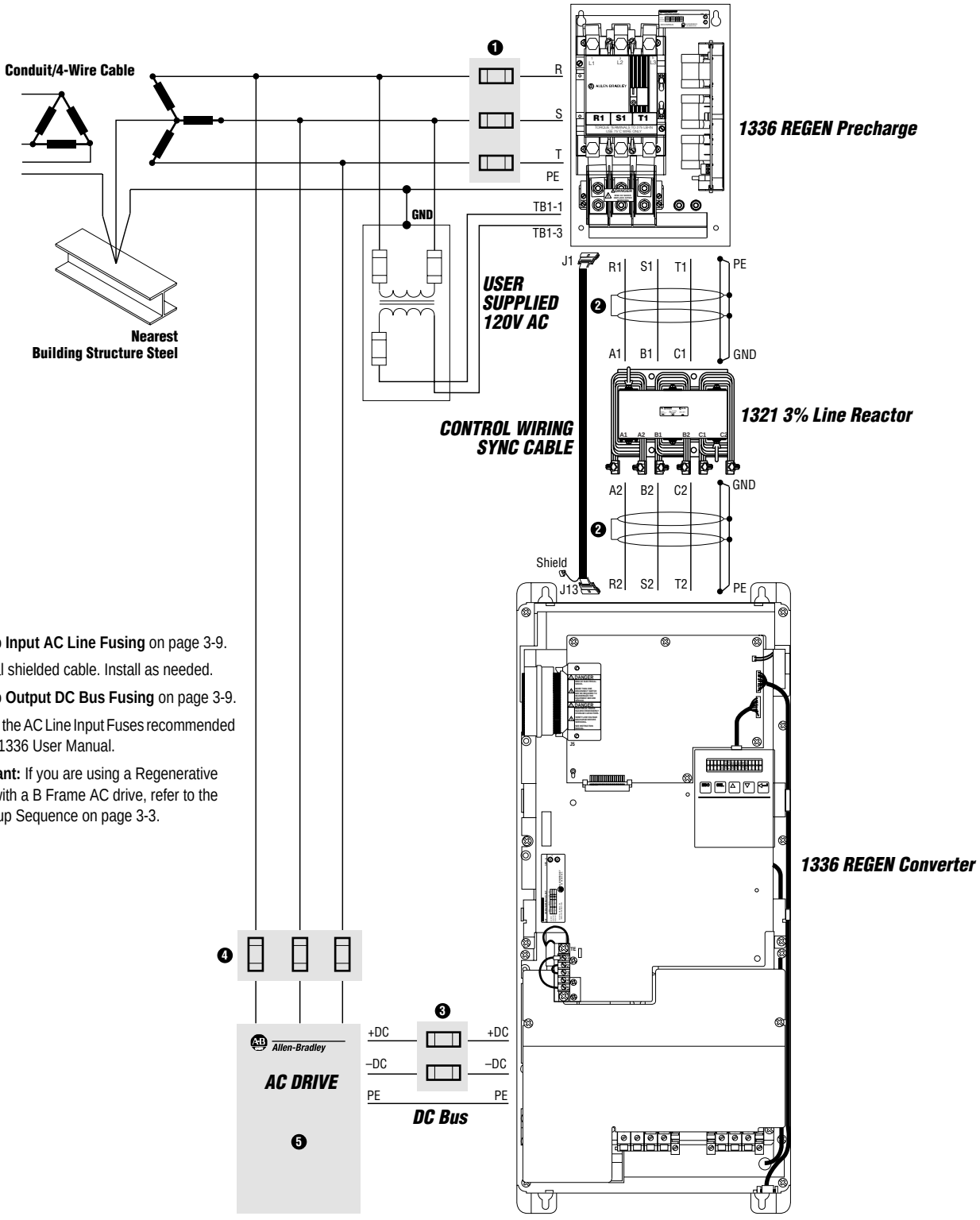
ATTENTION: Only personnel familiar with the 1336 REGEN Line Regeneration Package and associated equipment should plan or implement the installation, start-up and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION: This product and its associated equipment 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 publication 8000-4.5.2 "*Guarding Against Electrostatic Damage*" or any other applicable ESD protection handbook.

ATTENTION: The 1336 REGEN Line Regeneration Package is shipped from the factory with Parameter 1 set to the Regenerative Brake Mode of operation. Ensure that Parameter 1 **[Operational Mode]** is set to its factory setting of Regenerative Brake Mode as described in the Programming section of this chapter. Incorrectly applied or installed equipment can result in component damage or a reduction in product life. Wiring or application errors, such as incorrect or inadequate AC supply or excessive ambient temperatures may result in malfunction of the 1336 REGEN Line Regeneration Package.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative Brake Layout



❶ Refer to **Input AC Line Fusing** on page 3-9.

❷ Optional shielded cable. Install as needed.

❸ Refer to **Output DC Bus Fusing** on page 3-9.

❹ Refer to the AC Line Input Fuses recommended in your 1336 User Manual.

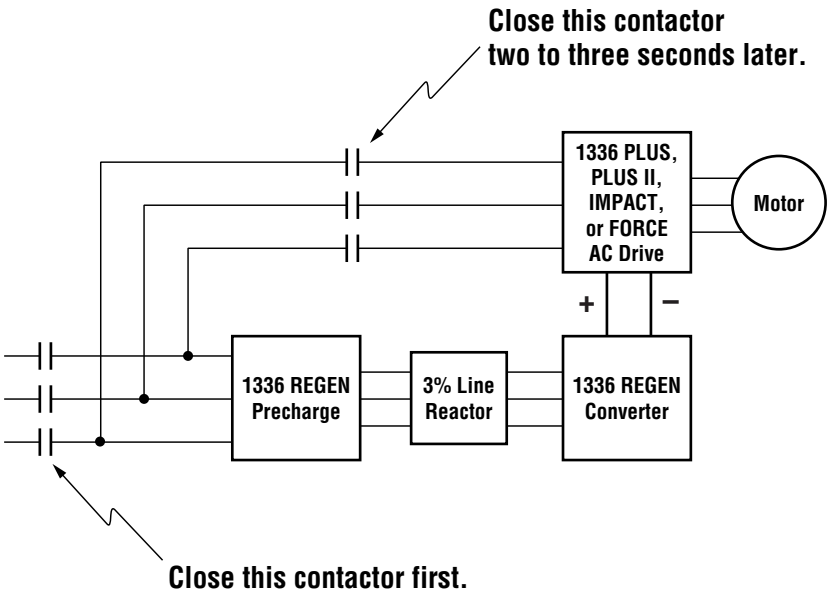
❺ **Important:** If you are using a Regenerative Brake with a B Frame AC drive, refer to the Power-up Sequence on page 3-3.

Figure 3.1 — Regenerative Brake Layout

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Power-up Sequence for Regenerative Brakes and B Frame AC Drives

When using a 1336 REGEN Line Regeneration Package with a B Frame 1336 PLUS, PLUSII, IMPACT, or FORCE, a special power-up sequence is needed to avoid clearing the AC line fuses on the input of the AC drive or the DC bus fuses between the drive and the Regenerative Brake. These fuses will clear if both the 1336 REGEN Package and the connected B Frame AC drive are powered up from the AC supply simultaneously. To avoid the problem, the Regenerative Brake should be powered up before the AC Drive is connected to the AC line. The 1336 REGEN Precharge circuit will charge the capacitor bank in both the 1336 REGEN Converter and in the connected AC drive. The AC line can then safely be connected to the AC drive. On C Frame or larger AC drives, the 1336 REGEN Package and the AC drive may be powered up simultaneously.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative Brake Sizing

The following steps should be taken to size a 1336 REGEN Line Regeneration Package for Regenerative Brake Operation.

1. The 1336 REGEN Converter and 1336 REGEN Precharge unit must be sized as a package, with both components having the same nameplate amp rating.

2. In the Regenerative Brake configuration, the 1336 REGEN Line Regeneration Package removes energy from the DC bus of a standard drive and returns it back to the utility system. To calculate the rating of the Line Regeneration Package needed for a Regenerative Brake application the following information must be known:

Nameplate Motor HP
Motor Inertia
Load Inertia
Gear Reduction Ratio
Maximum Motor Speed
Minimum Motor Speed
Minimum Deceleration Time

3. Determine the rated motor torque (TQ_M).

$$TQ_M = \frac{5250 \times HP_R}{N}$$

Where HP_R = The Rated Motor HP
N = The Base Motor Speed in RPM

4. Determine the total inertia (wk^2t).

$$wk^2t = wk^2_M + [wk^2_L \times (GR)^2]$$

Where wk^2_M = The Motor Inertia in LB-FT^2
wk^2_L = The Load Inertia in LB-FT^2
GR = The Total Gear Reduction Ratio $\frac{\text{Output RPM}}{\text{Input RPM}}$

5. Determine the required braking torque (TQ_B).

$$TQ_B = \frac{wk^2t \times [N_1 - N_2]}{308 \times t_2}$$

Where wk^2t = The Total Inertia
N_1 = The Maximum Motor Speed
N_2 = The Minimum Motor Speed
t_2 = The Motor's Decel Time from N_1 to N_2

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative Brake Sizing

6. Determine the required percent of braking torque (**TQ**%).

$$\mathbf{TQ}\% = \frac{\mathbf{TQ}_B \times 100}{\mathbf{TQ}_M}$$

Where $\mathbf{TQ}_B$ = The Required Braking Torque
$\mathbf{TQ}_M$ = The Rated Motor Torque

7. Determine the peak braking horsepower ($\mathbf{HP}_2$).

$$\mathbf{HP}_2 = \frac{\mathbf{TQ}_B \times \mathbf{N}_1}{5250}$$

Where $\mathbf{TQ}_B$ = The Required Braking Torque
$\mathbf{N}_1$ = The Maximum Motor Speed

8. Calculate the peak AC line current ($\mathbf{I}_1$).

The AC line current of the 1336 REGEN Package will be at its maximum value at the beginning of the deceleration period.

$$\mathbf{I}_1 = \frac{\mathbf{HP}_1 \times 746}{\mathbf{V}_{L\text{-}L} \times \sqrt{3}}$$

Where $\mathbf{HP}_1$ = The Peak Braking HP
$\mathbf{V}_{L\text{-}L}$ = The Line-to-Line Utility Voltage

If your application requires continuous regeneration, ($\mathbf{I}_1$) must be less than the rated current of the 1336 REGEN Package. Pick a 1336 REGEN Package that has an AC line current rating greater than or equal to ($\mathbf{I}_1$) at the appropriate AC line voltage.

If your application does not require continuous regeneration, continue on to Step 9.

See page 3-8 for information on paralleling regenerative brakes.

9. The 1336 REGEN Package has a peak overload current rating ($\mathbf{I}_{OL}$) of 150% of its data nameplate rating.

$$\mathbf{I}_{OL} = \mathbf{I}_{RATED} \times 1.5$$

Where $\mathbf{I}_{RATED}$ = The nameplate current of the 1336 REGEN Package

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative Brake Sizing

This is the peak current the 1336 REGEN Package can return to the AC utility. For any regenerative application, the peak AC current calculated in Step 8 (I_1), must be less than the peak current calculated in Step 9 (I_{OL}). Because I_1 is greater than the rated current of the 1336 REGEN Package, the 1336 REGEN Package will be operating at its overload region for some portion of the application cycle.

The 1336 REGEN Package can operate for 1 minute at an overload of 150% of rated current. At 140% of rated current, overload time is approximately 77 seconds. Shown below are the allowable operating times over a range of rated currents.

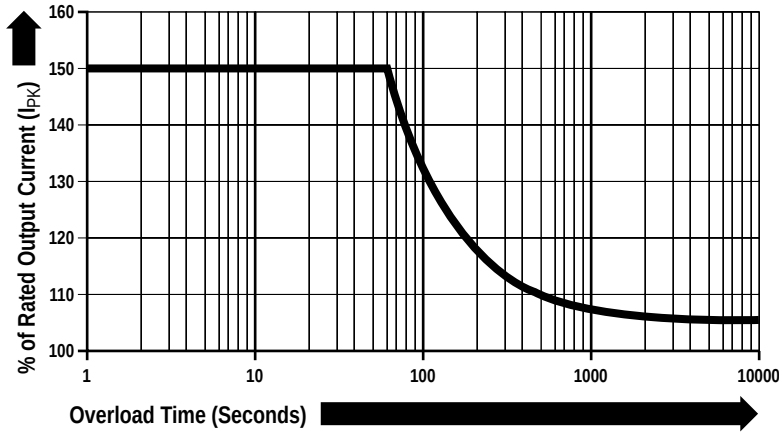


Figure 3.2 — 1336 REGEN Overload Rating

10. Calculate the overload current for your application (I_{PK}).

To calculate the overload current for your application (I_{PK}), divide the peak AC current calculated in Step 8 (I_1) by the rated current of the 1336 REGEN Package you plan to use.

$$I_{PK} = \frac{I_1}{I_{RATED}}$$

Where I_{RATED} = The nameplate current of the 1336 REGEN Package

Remember I_{PK} *must be less than 150% of the 1336 REGEN Package you plan to use.*

See page 3-8 for information on paralleling regenerative brakes.

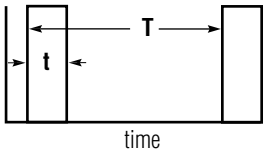
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative Brake Sizing

Additional Requirements

In addition to satisfying the peak current requirements, the application must satisfy the duty cycle limitations of the 1336 REGEN Package. After operating in the overload region, the 1336 REGEN Package must operate at or below rated current for some period of time before it can be overloaded again. The overload region is useful for applications requiring intermittent regeneration, or those that alternate between regeneration and motoring.

One regeneration profile that is cyclic in nature is shown below.



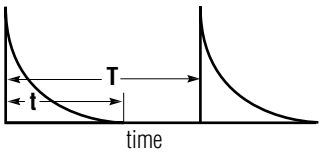
In this case, the motor holds back on an overhauling load (or regenerates) for **t** seconds. After **t** seconds, the motor provides positive torque for **T–t** seconds. The total cycle time is represented by **T**, and the duty cycle (**DC**) is

$$DC = \frac{t}{T} \%$$

The table below summarizes the maximum regeneration time and duty cycle that the 1336 REGEN Package can handle with various peak currents for a given overhauling load. As long as I_{PK} is less than 150% and the conditions in the table are satisfied, the 1336 REGEN Package will not trip on overload.

Peak Regenerative Current (I_{PK})	Maximum on Time (t)	Maximum Duty Cycle (DC)
150%	1 Minute	70%
140%	1 Minute, 17 Seconds	75%
130%	1 Minute, 48 Seconds	81%
120%	3 Minutes	88%
110%	9 Minutes	96%

Other applications require deceleration of the load in a cyclic pattern as shown below.



In this case, the required braking torque drops with speed. The deceleration time is represented by **t**, and the total cycle time is represented by **T**.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative Brake Sizing

The table below summarizes the maximum deceleration times that the 1336 REGEN Package can provide with various peak currents when decelerating a load. As long as the peak overload current is less than 150% and maximum deceleration time is less than that listed in the table, the 1336 REGEN Package will not trip on overload. In general, if the load is decelerating to zero speed, there is no limit on the available duty cycle.

Peak Regenerative Current (I_{PK})	Maximum Decel Time (t)
150%	7 Minutes
140%	10 Minutes
130%	21 Minutes

If your application requires a longer deceleration time than that listed in the table above, the 1336 REGEN Package must be sized for continuous regeneration as described in Step 8.

For applications requiring more complex regeneration profiles, contact Allen-Bradley Application Engineering.

Parallel Regenerative Brakes

Multiple 1336 REGEN Line Regeneration Packages **of the same rating** can be paralleled with no de-rating when operating in the Regenerative Brake configuration. Each package requires its own 3% line reactor and operates independently of any other Regenerative Brakes in parallel with it. Each Regenerative Brake should also be separately fused with both AC line fuses and DC bus fuses to protect the other Regenerative Brakes and the connected AC drive in case of failure.

Input Power Conditioning



ATTENTION: The National Codes and standards (NEC, CENELEC, etc.) and local codes outline the 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.

In general, 1336 REGEN Line Regeneration Package equipment is suitable for direct connection to a correct voltage AC line.

If the AC input power system does not have a neutral or one phase referenced to ground as detailed under **Ungrounded Distribution Systems**, an isolation transformer with the neutral of the secondary grounded is highly recommended. If the line-to-ground voltages on any phase exceed 125% of the nominal line-to-line voltage, an isolation transformer with the neutral of the secondary grounded is highly recommended.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Input Fusing

ATTENTION: 1336 REGEN equipment does not provide input power short circuit fusing. Branch circuit breakers or disconnect switches cannot provide this level of protection for converter and precharge unit components. Specifications for the recommended fuse size and type to provide input power protection against short circuits at the Converter or Precharge Unit is listed below.

Customer Supplied Fusing

Based on the maximum 1336 REGEN Package voltage rating, the following customer supplied fuses are recommended.

ATTENTION: To guard against personal injury and/or equipment damage caused by improper fusing, use only the recommended line fuses specified.

		380-480V AC Rating	
Gould Shamut A70QS must be used for all 1336 REGEN Line Regeneration Packages.	**Catalog Number**	**Input AC Line Fusing**	**Output DC Bus Fusing**
	1336R-VB048	**70A**	**100A**
	1336R-VB078	**125A**	**150A**
	1336R-VB180	**250A**	**350A**

1336 REGEN Precharge Fusing

The 1336 REGEN Precharge Circuit Board is internally fused to protect precharge components. When replacing 1336 REGEN Precharge Unit fuses F1, F2 & F3 (shown in Figure 3.12), use only the type and size specified below.

Catalog Number	380-480V AC Rating
1336R-VB048PRE	FNQ-R4, 600V
1336R-VB078PRE	FNQ-R4, 600V
1336R-VB180PRE	FNQ-R8, 600V

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

380-480V AC Power Wiring

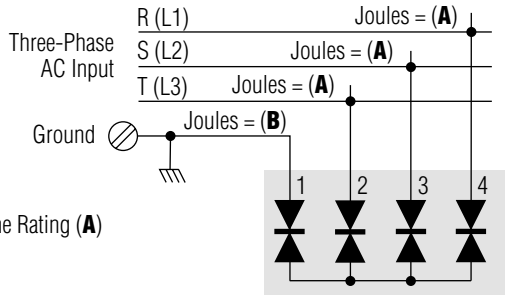
Unbalanced Distribution Systems

The 1336 REGEN Line Regeneration Package is designed to operate on 3Ø systems supply systems whose line voltages are symmetrical. Surge suppression devices are included to protect the drive from lightning induced overvoltages between line and ground. Where the potential exists for abnormally high phase-to-ground voltages (in excess of 125% of nominal), or where the supply ground is tied to another system or equipment that could cause the ground potential to vary with operation, suitable isolation is required for the equipment. Where this potential exists, an isolation transformer with the neutral of the secondary grounded, is strongly recommended.

Ungrounded Distribution Systems

All precharge units are equipped with MOVs (Metal Oxide Varistors) that provide voltage surge protection plus phase-to-phase and phase-to-ground protection 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 MOV connection could become a continuous current path to ground (energy ratings are listed below). Exceeding the published line-to-line and line-to-ground voltage ratings listed in the **Specifications** may cause physical damage to the MOV.



Line-to-Line MOV Rating
Energy Rating = 2 x Line-to-Line Rating (**A**)
= 2 x 140
= 280 Joules

Line-to-Ground MOV Rating
Energy Rating = Line-to-Line (**A**) + Line-Ground (**B**)
= 140 + 220
= 360 Joules

Figure 3.3 — Ungrounded Distribution System

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

380-480V AC Power Wiring

Grounding

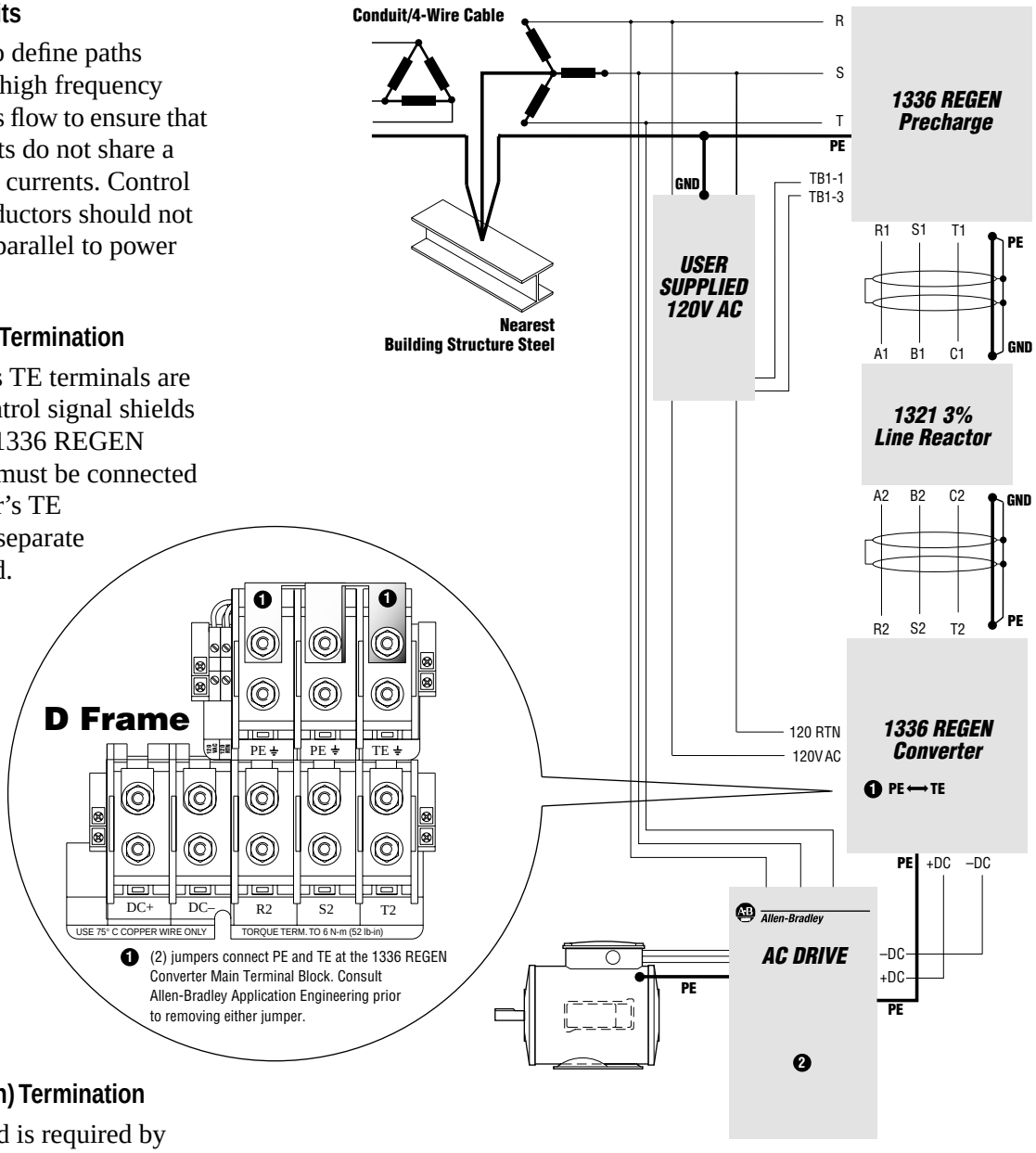
All 1336 REGEN components must be connected to system ground at the PE power ground terminal provided. Ground impedance must conform to the requirements of national and local industrial safety regulations (NEC, CENELEC, etc.), and should be inspected and tested at appropriate intervals. In any cabinet, 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 paths through which high frequency ground currents flow to ensure that sensitive circuits do not share a path with these currents. Control and signal conductors should not be run near or parallel to power conductors.

TE (True Earth) Termination

The converter's TE terminals are used for all control signal shields internal to the 1336 REGEN Converter and must be connected to the converter's TE terminals by a separate continuous lead.



❷ **Important:** If you are using a Regenerative Brake with a B Frame AC drive, refer to the Power-up Sequence on page 3-3.

PE (Power Earth) Termination

A safety ground is required by code. This point must be connected to adjacent building steel or a floor ground rod provided grounding points comply with NEC and local regulations.

Fig. re 3.4 — Regenerative Brake Gro. nding

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

380-480V AC Power Wiring

380-480V AC Power Connections

380-480V AC input and output power connections are made as shown in Figure 3.5 through Figure 3.8.

ATTENTION: 1336 REGEN equipment will not be properly synchronized unless correct Precharge-to-Line Reactor-to-Converter AC power connections are maintained. Failure to maintain correct phase-related connections will result in equipment malfunction and/or failure.

PRECHARGE UNIT		LINE REACTOR		CONVERTER
Input Term.	Output Term.	Input Term.	Output Term.	Input Term.
R	R1	A1	A2	R2
S	S1	B1	B2	S2
T	T1	C1	C2	T2

1321 3% Line Reactor

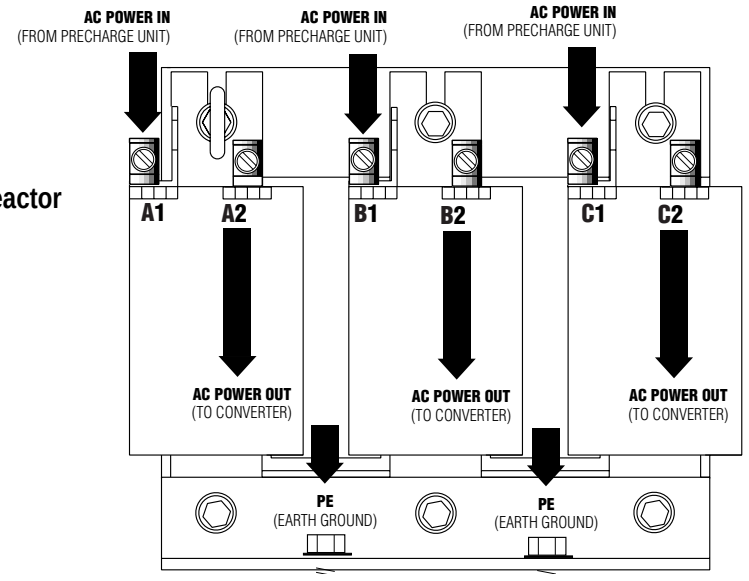


Figure 3.5 — 380-480V AC 1321 3% Line Reactor Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

380-480V AC Power Wiring

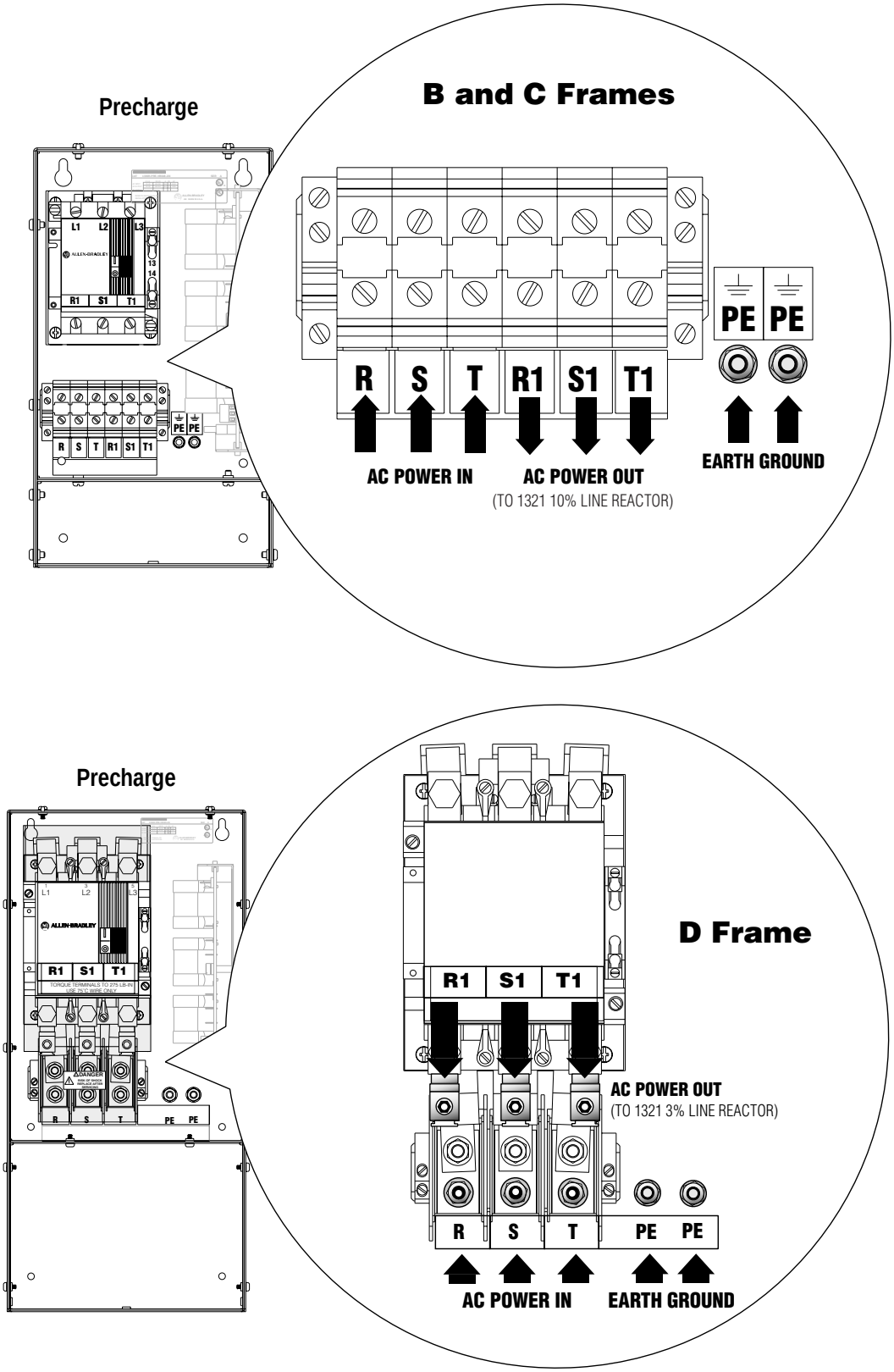


Figure 3.6 — 380-480V AC Precharge Unit Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

380-480V AC Power Wiring

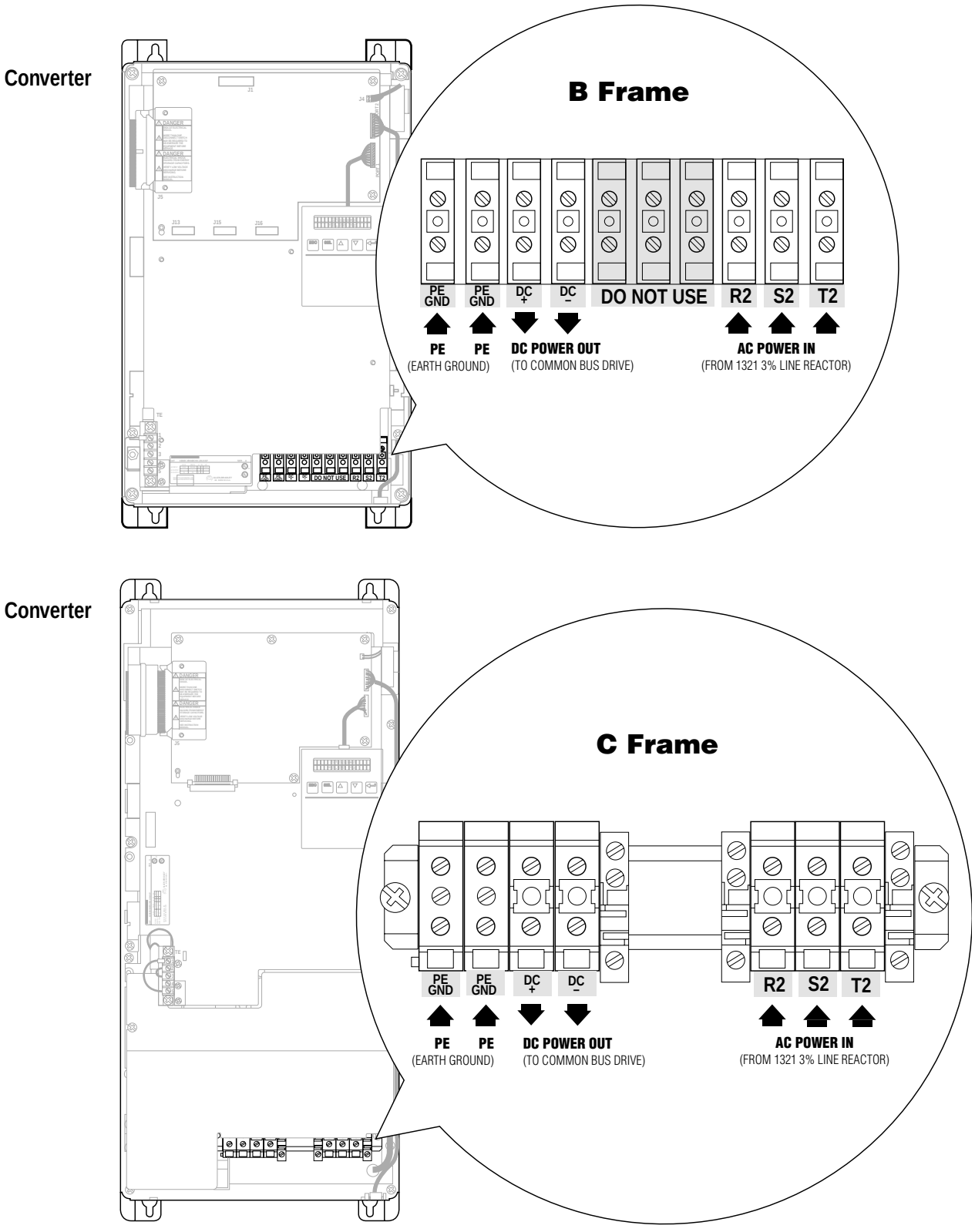
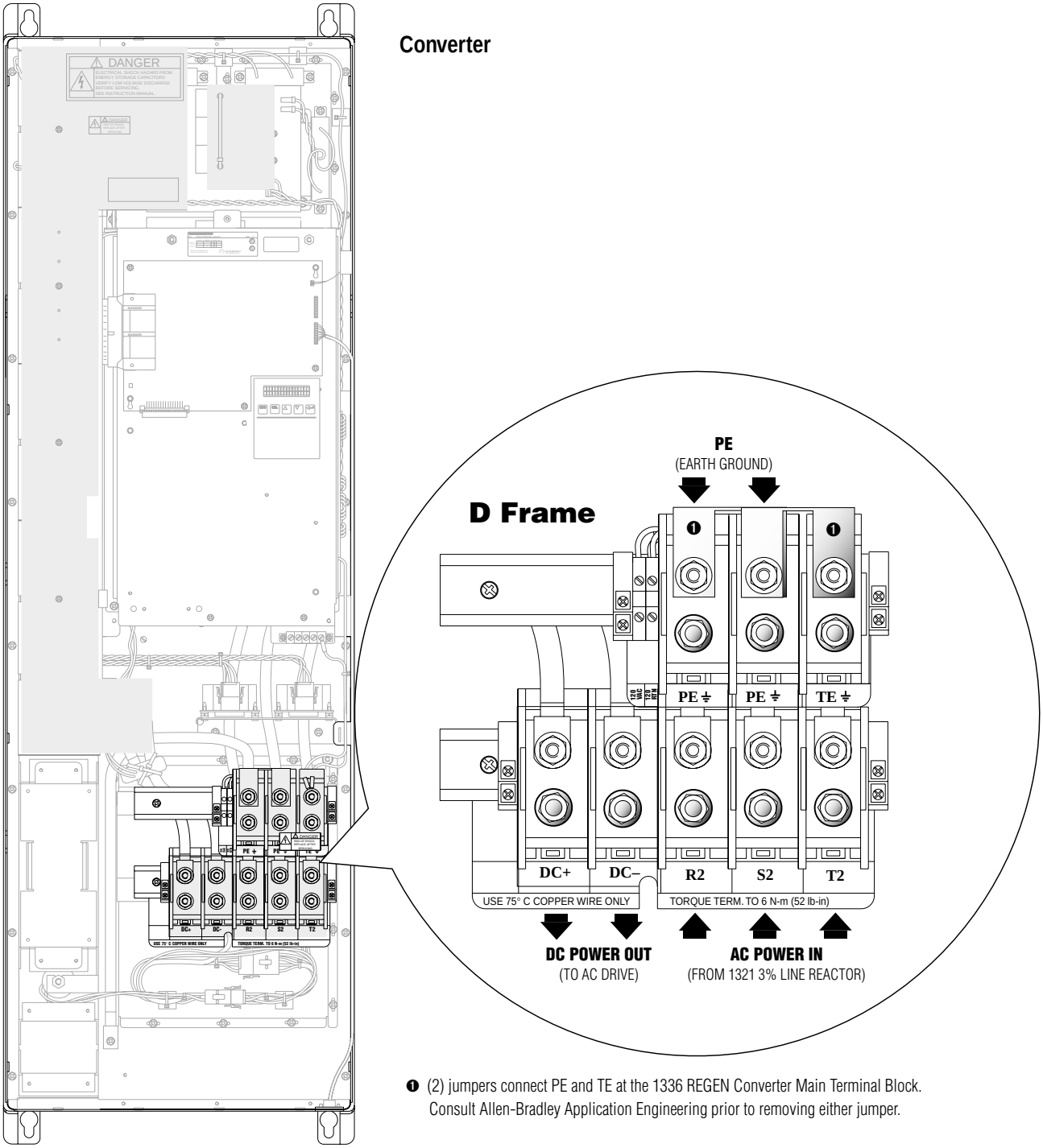


Figure 3.7 — B and C Frame 380-480V AC Converter Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

380-480V AC Power Wiring



❶ (2) jumpers connect PE and TE at the 1336 REGEN Converter Main Terminal Block. Consult Allen-Bradley Application Engineering prior to removing either jumper.

Figure 3.8 — D Frame 380-480V AC Converter Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

380-480V AC Power Wiring

380-480V AC Power Connection Specifications

1. Use 75ºC Copper Wire Only.

2. Listed wires sizes are maximum/minimum wire sizes that the terminals will accept — Not recommendations.

1336 REGEN PRECHARGE UNIT RATING	MAX/MIN WIRE SIZE mm^2 (AWG)	MAX TORQUE N-m (lb-in)
B Frame	13.3/0.5 (6/20) — Single Conductor	1.70 (15)
C Frame	26.7/0.8 (3/18) — Single Conductor	5.65 (50)
D Frame	127.0/2.1 (250MCM/14) — Single Conductor 67.4/2.1 (00/14) — Double Conductor	6.00 (52)

1321 3% LINE REACTOR CAT. NO.	MAX/MIN WIRE SIZE mm^2 (AWG)	MAX TORQUE N-m (lb-in)
-3R55-B and -3RA55-B	13.3/0.5 (6/20) — Single Conductor	1.70 (15)
-3R100-B and -3RA100-B	26.7/0.8 (3/18) — Single Conductor	5.65 (50)
-3R200-B and -3RA200-B	127.0/2.1 (250MCM/14) — Single Conductor 67.4/2.1 (00/14) — Double Conductor	6.00 (52)

1336 REGEN CONVERTER RATING	MAX/MIN WIRE SIZE mm^2 (AWG)	MAX TORQUE N-m (lb-in)
B Frame	13.3/0.5 (6/20) — Single Conductor	1.70 (15)
C Frame	26.7/0.8 (3/18) — Single Conductor	5.65 (50)
D Frame	127.0/2.1 (250MCM/14) — Single Conductor 67.4/2.1 (00/14) — Double Conductor	6.00 (52)

3. Input power connections to D frame Precharge Units and input/output power connections to D frame Converters are stud type terminations or bus bar bolts that require the use of lug type connectors to terminate field installed conductors. Lugs used with these connections are listed below.

Catalog Number	PRECHARGE INPUT R, S, T & PE CONVERTER INPUT R2, S2, T2 & PE CONVERTER OUTPUT DC+ & DC–	T & B Part Number ❶
	Cable (per phase) Qty. mm^2 (AWG)	Qty. P/N
1336R-VB180	(1) 107.2 (4/0)	(10) 54168 ❷

❶T & 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.

❷5/16" stud. All other termination studs are 3/8".

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

120V AC Precharge and Converter Wiring

ATTENTION: 1336 REGEN equipment does not provide 120V AC short circuit fusing. Branch circuit breakers or disconnect switches cannot provide this level of protection for converter and precharge unit components. Short circuit fusing should be sized and typed in accordance with National Codes and standards (NEC, CENELEC, etc.) and any additional local codes.

120V AC Current Requirements

1336 REGEN LINE REGENERATION PACKAGE CAT. NO.	PRECHARGE CONTACTOR		CONVERTER FAN	
	Inrush Amps	S.S. Amps	Inrush Amps	S.S. Amps
1336R-VB048 **1336R-VB078**	3A	0.3A	—	—
1336R-VB180	7A	0.7A	5A	0.8A

120V AC is required by the 1336 REGEN Precharge Contactor and 1336 REGEN D Frame Converter fan. 120V AC must be derived from the same AC power supply source used for all 1336 REGEN equipment and taken at the AC Power Input, or, before the Power Line Filter if used.

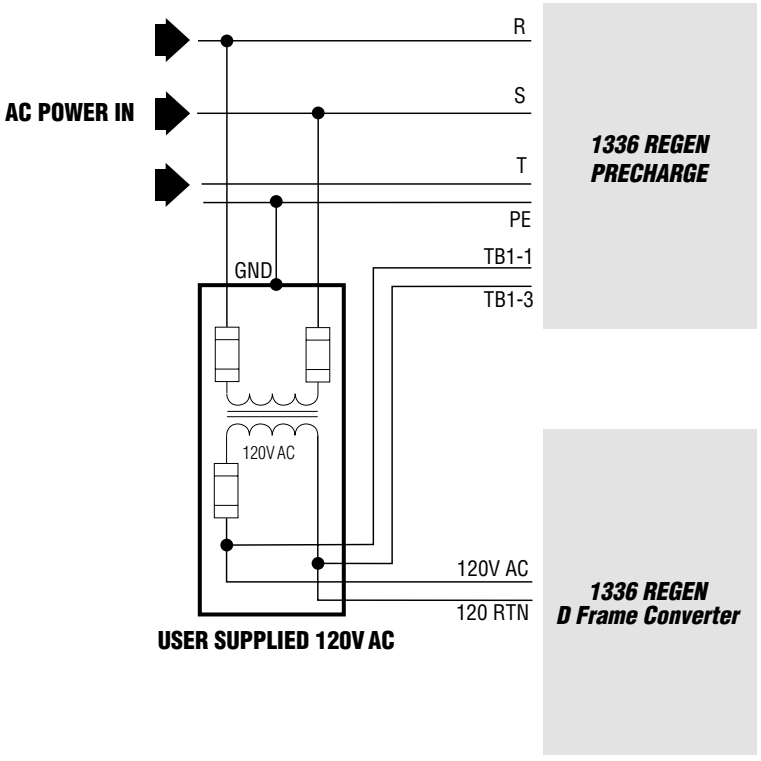


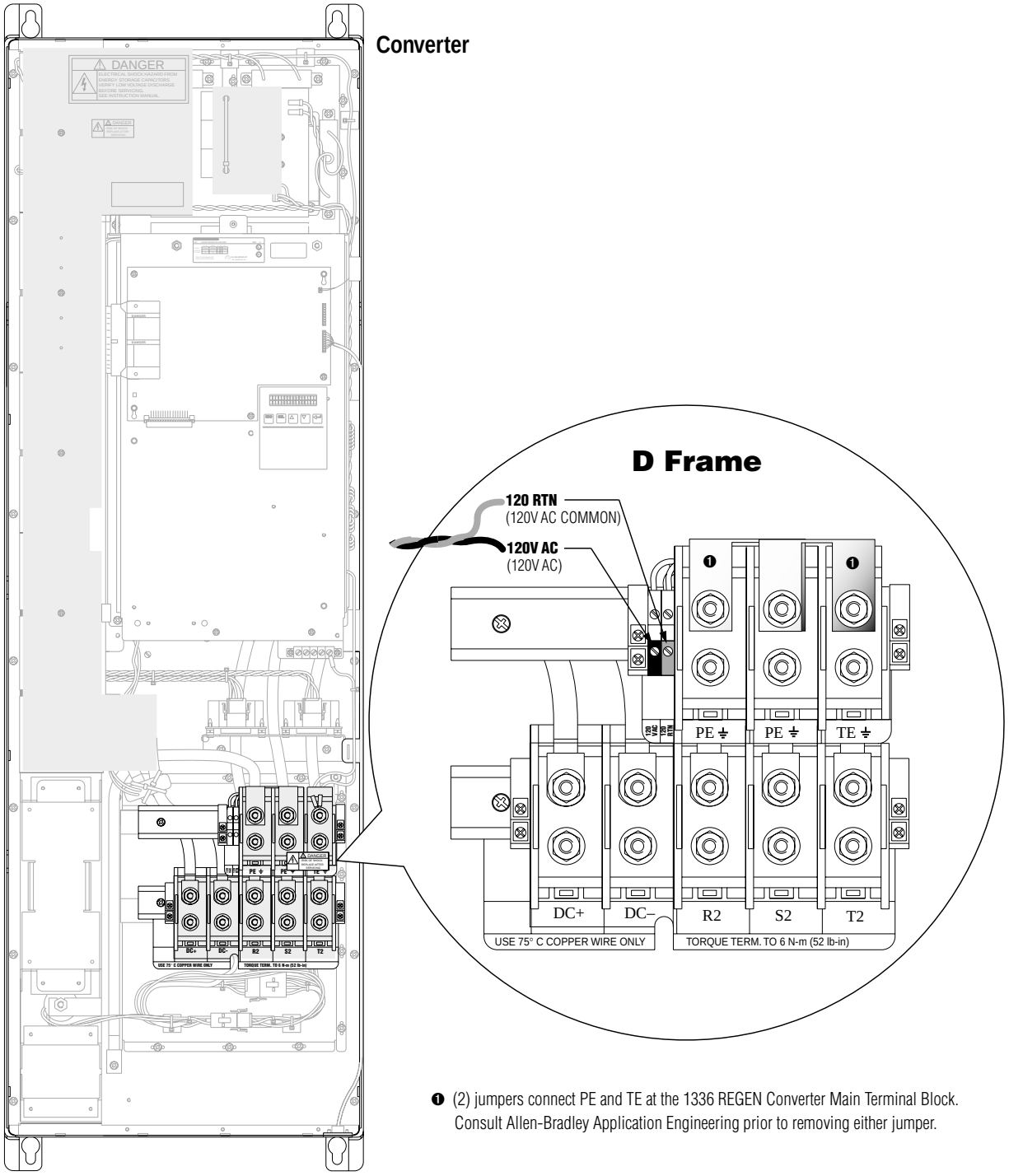
Figure 3.9 — 120V AC Precharge and Converter Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

120V AC Precharge and Converter Wiring

120V AC Converter Connections

120V AC input and output power connections are made as shown below.



❶ (2) jumpers connect PE and TE at the 1336 REGEN Converter Main Terminal Block. Consult Allen-Bradley Application Engineering prior to removing either jumper.

Figure 3.10 — 120V AC D Frame Converter Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

120V AC Precharge and Converter Wiring

120V AC Precharge Connections

120V AC input and output connections are made to B-D Frame Precharge Units as shown below.

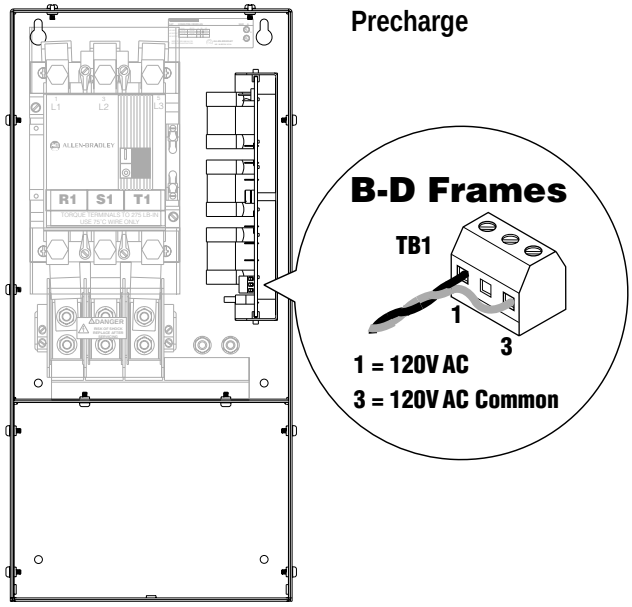


Figure 3.11 — 120V AC Precharge Unit Connections

120V AC Connection Specifications

1. Use 75ºC Copper Wire Only.

2. Listed wires sizes are maximum/minimum wire sizes that the terminals will accept — Not recommendations.

1336 REGEN PRECHARGE UNIT RATING	MAX/MIN WIRE SIZE mm^2 (AWG)	MAX TORQUE N-m (lb-in)
B-D Frames	2.1/0.30 (14/22)	0.90-1.13 (8-10)

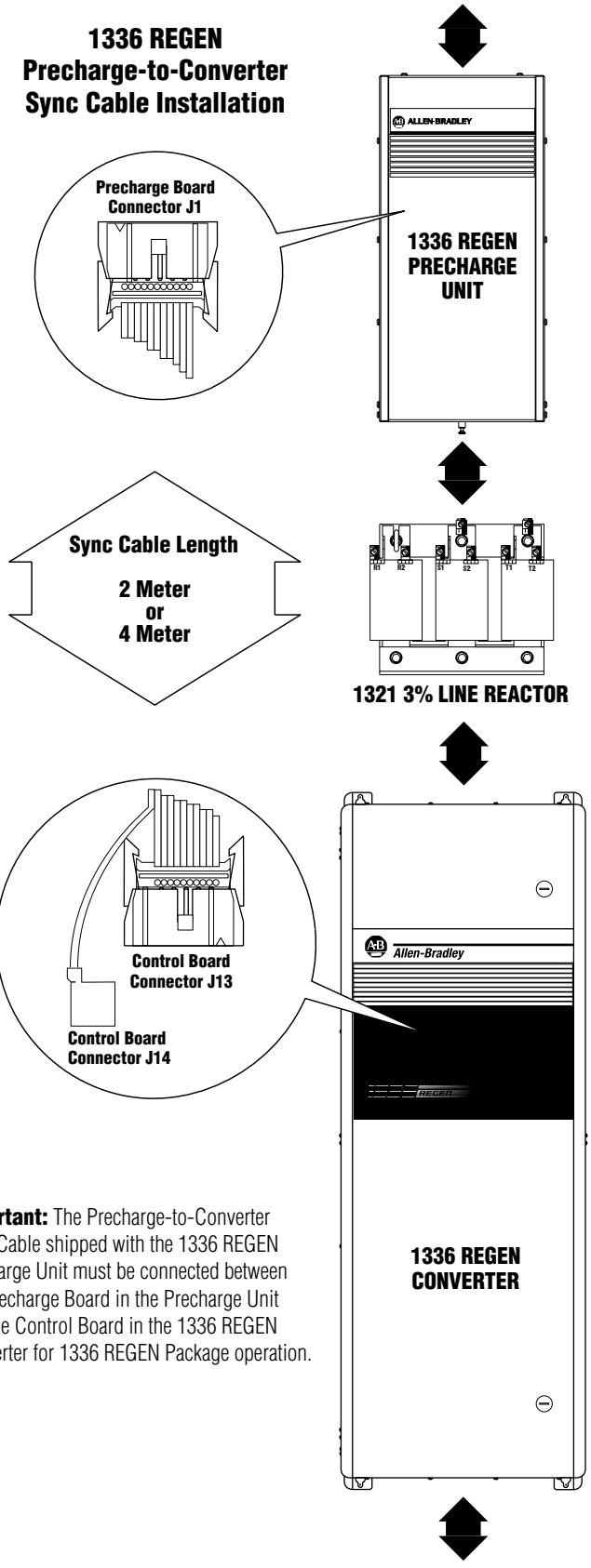
1336 REGEN CONVERTER RATING	MAX/MIN WIRE SIZE mm^2 (AWG)	MAX TORQUE N-m (lb-in)
D Frame	2.1/0.30 (14/22)	0.90-1.13 (8-10)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Control and Signal Wiring

Sync Cable

The sync cable that is shipped with the 1336 REGEN Precharge unit connects the required startup, diagnostic and control signals between the 1336 REGEN Converter Control Board and the 1336 REGEN Precharge Board. The ribbon cable shield provided at the converter end must be connected to the Control Board Shield Connector J14 as shown in Figure 3.13 to maintain signal integrity.



Important: The Precharge-to-Converter Sync Cable shipped with the 1336 REGEN Precharge Unit must be connected between the Precharge Board in the Precharge Unit and the Control Board in the 1336 REGEN Converter for 1336 REGEN Package operation.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Control and Signal Wiring

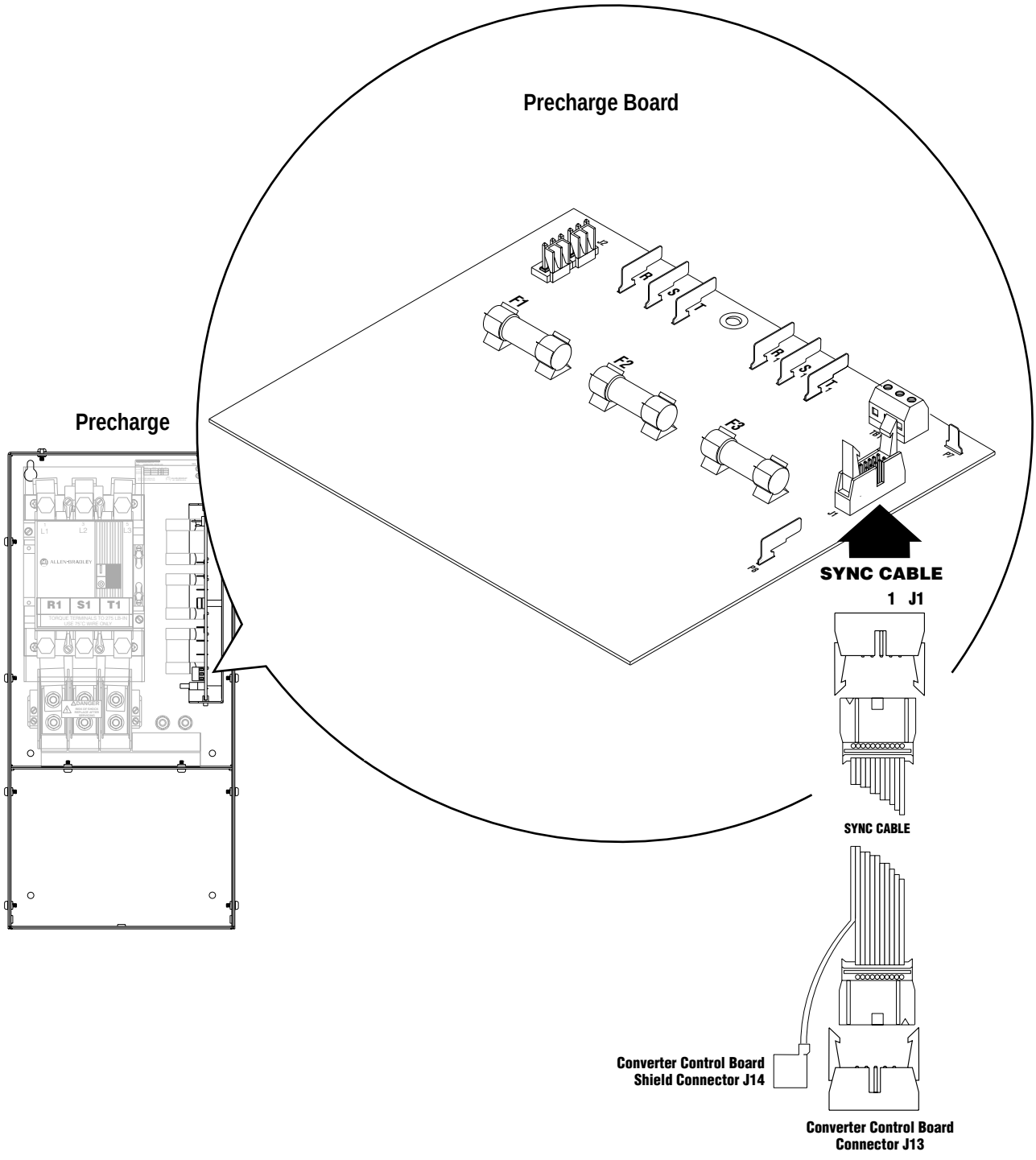


Figure 3.12 — Precharge Unit Precharge Board Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Control and Signal Wiring

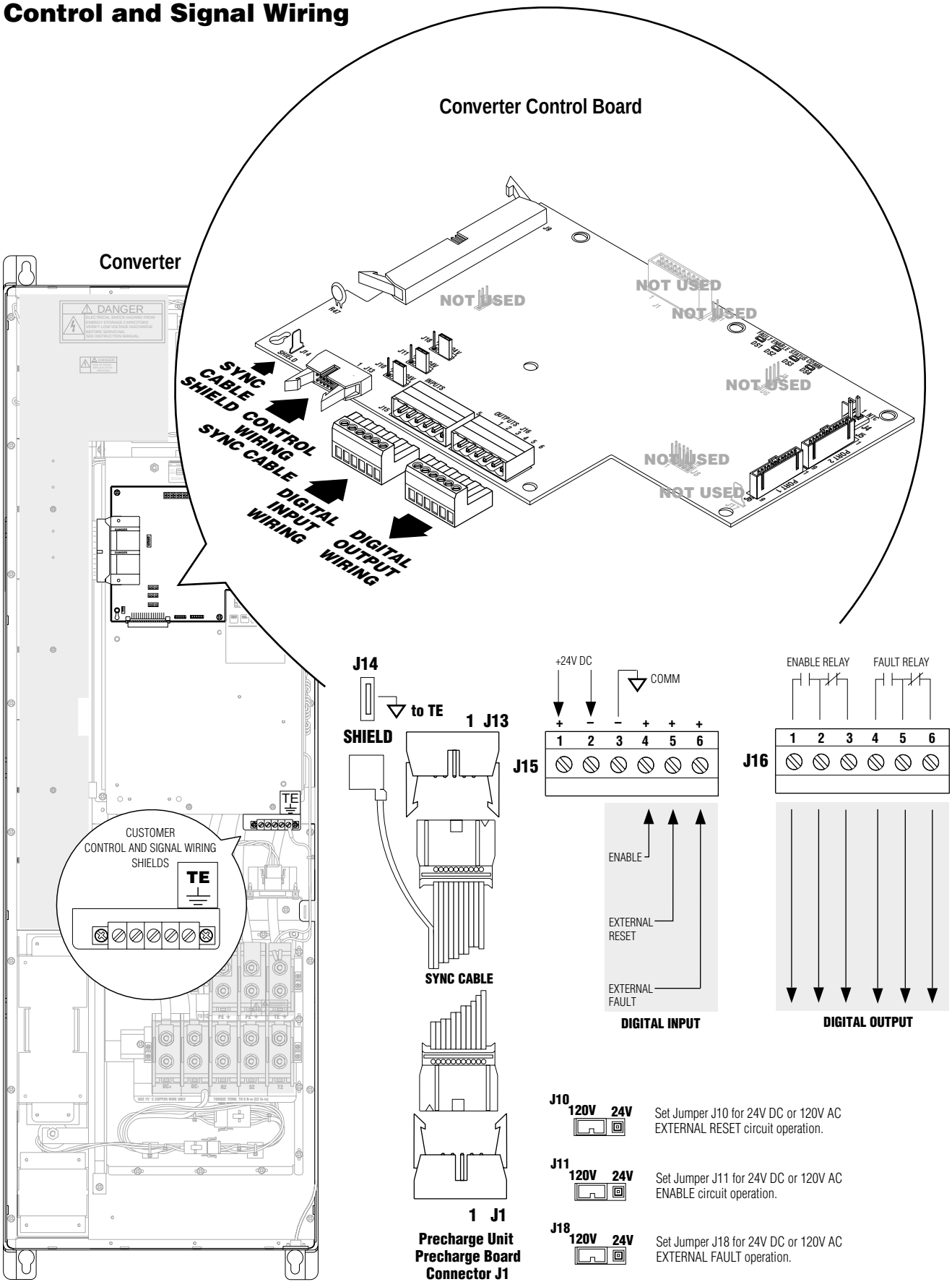


Figure 3.13 — Converter Control Board Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Control and Signal Wiring

Control Board Connections

All customer control and signal wiring is made to quick-connect terminal blocks J15 and J16.

The maximum/minimum wire sizes accepted by J15 & J16 is 3.3/0.6 mm^2 (12/30 AWG). Maximum torque is 0.79 N-m (7 lb.-in.). Recommended control/signal wire is:

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

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

Important: Signal common (DGND) puts the common or negative side of the signal at earth ground potential. Control schemes must be examined for possible conflicts.

All customer control and signal wiring shields are terminated at the TE terminal block shown on the previous page.

Cable Routing

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

Important: If user installed control and signal wiring with an insulation rating of less than 600V is used, route the wiring inside the converter enclosure such that is it separate from any other wiring or uninsulated live parts.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Control and Signal Wiring

Digital Input Signals

ATTENTION: Ensure that all jumpers on the 1336 REGEN Converter Control Board are set correctly prior to applying AC power to the board. Applying 120V AC to the digital inputs when jumpers J10, J11 or J18 are set to 24V DC will permanently damage the Converter Control Board.

Important: Customer **EXTERNAL FAULT** and **ENABLE** circuits must be connected to J15 and at logic high for the 1336 REGEN Converter to operate.

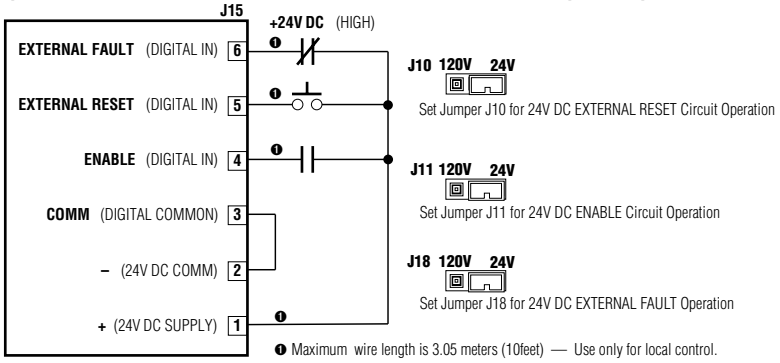
1336 REGEN Converter digital inputs are designed for operation at either 24V DC or 120V AC. Digital input signal circuits must be capable of operating with high = true logic. For 24V DC operation, +24V DC is available from the 1336 REGEN Converter Control Board. For 120V AC operation, a separate 120V AC user supply is required.

24V DC and 120VAC Circuits

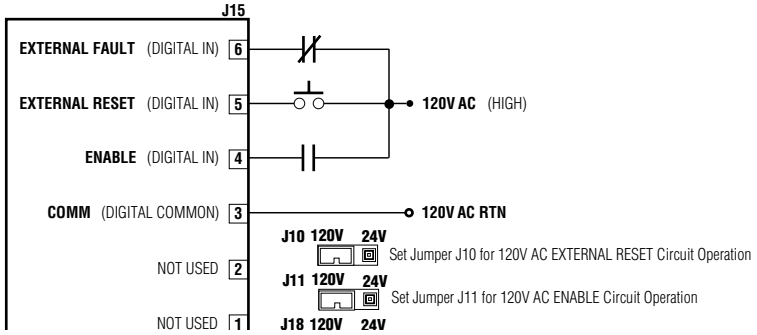
IN THE LOW STATE . . .	MUST GENERATE A VOLTAGE OF NO MORE THAN . . .	AND LEAKAGE CURRENT MUST BE LESS THAN . . .
24V DC Circuits	8V DC	1.5mA Into a 2.5kΩ Load
120V AC Circuits	30V AC	10mA Into a 6.5kΩ Load

IN THE HIGH STATE . . .	MUST GENERATE A VOLTAGE OF . . .	AND SOURCE CURRENT MUST BE AT LEAST . . .
24V DC Circuits	20-26V DC	10mA
120V AC Circuits	81-132V AC	20mA

24V DC Operation
Contacts are Shown in the Unpowered State
(or in the Powered State with no Enable or External Fault present)



120V AC Operation
Contacts are Shown in the Unpowered State
(or in the Powered State with no Enable or External Fault present)



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Control and Signal Wiring

Important: Fuse R47 is self-resetting and will open should a low impedance or short circuit occur at J15 during 24V DC operation. Should a fault occur, allow (1) minute after removal of power from the Converter Control Board for R47 to cool before reapplying power.

Important: For Regenerative Brake applications, the 1336 REGEN Package will always be used with a single 1336 AC drive. It is recommend that the fault relay on the 1336 REGEN Converter Control board be interconnect into the 1336 AC drive control logic. This will allow coordination the Regenerative Brake faults with the 1336 AC drive.

External Fault

Allows a customer supplied external signal to be wired into the 1336 REGEN Converter. Opening this contact issues an external fault command, disabling the converter.

External Reset

Resets the 1336 REGEN Converter when closed. If the converter has faulted, closing this contact clears the fault and resets the converter.

Enable

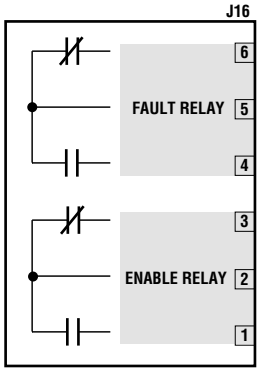
For the 1336 REGEN Converter to modulate, an enable signal must be present at J15 on the 1336 REGEN Converter Control Board. Opening this contact disables the converter. When this contact is closed, the Enable LED on the Control Board will be lit.

Digital Output Signals

(2) form C, N.O./N.C. output relays are available at J16 on the 1336 REGEN Control Board to provide external warning or fault change-of-state signals.

Resistive Rating = 120V AC/30V DC, 5.0A
Inductive Rating = 120V AC/30V DC, 2.0A

Contacts are Shown in the Unpowered State



Fault Output - The fault output is used to indicate that the 1336 REGEN Converter is faulted with either an internal or external fault.
Note: The unpowered state of the fault relay is the opposite of the faulted state—or the unpowered state of the fault relay indicates an unfaulted condition.

Enable Output - The enable output indicates that the 1336 REGEN Converter is modulating. An enable signal must be present on J15 and the 1336 REGEN Converter must not be faulted for the enable output to be active.

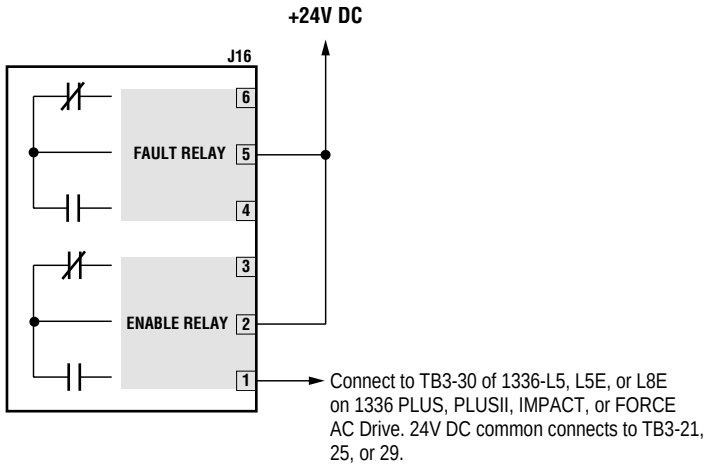
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Control and Signal Wiring

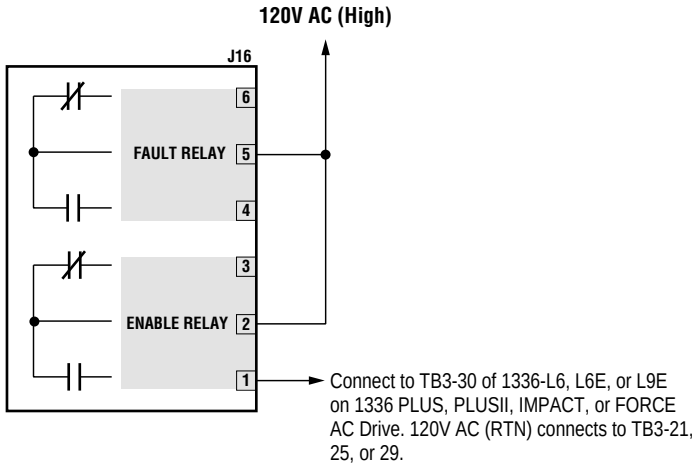
Interlocking 1336 REGEN Enable with AC Drive Enable

It may be desirable to interlock the 1336 REGEN Enable Output with the Enable Input on the connected 1336 PLUS, 1336 PLUSII, 1336 IMPACT or 1336 FORCE AC drive. This will keep the AC drive from starting if the 1336 REGEN Converter is not enabled, and will also remove the Enable signal from the AC drive if the 1336 REGEN Converter is faulted. If the Enable signals are not interlocked, the AC drive may fault on bus overvoltage when attempting to regenerate.

24V DC Operation



120V AC Operation



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Adapter Definitions

Serial communication devices such as the HIM that are connected to the 1336 REGEN Converter are identified by SCANport serial communications as adapters. Depending on the communications options ordered, a number of different adapters are available.

When the Converter mounted Programming Only HIM is supplied, it is connected as adapter 1 as detailed in Figure 3.14. Figure 3.14 also shows the maximum distance allowed between devices.

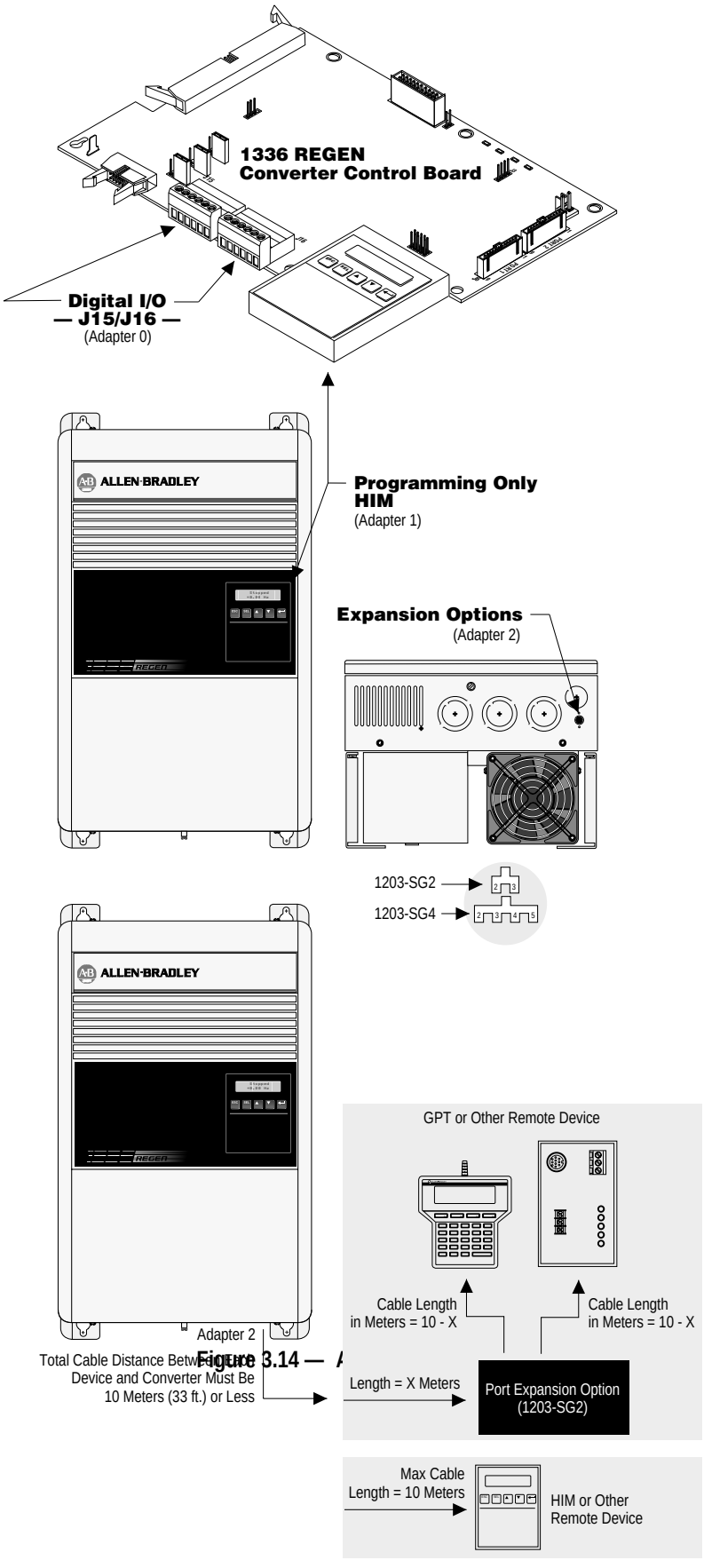


Figure 3.14 — A

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Human Interface Module

HIM Description

When the converter mounted HIM is supplied, it will be connected as Adapter 1 and visible from the front of the converter.

The display panel provides a means of programming the 1336 REGEN Converter and viewing the various operating parameters.

Important: If a Control Panel HIM is connected to the 1336 REGEN Converter, only the Start key and Stop key on the control panel will be functional — The Start key will send an Enable command to the Converter, the Stop key will send a Not Enable command to the Converter.

ATTENTION: When a HIM is not supplied on enclosed NEMA Type 1 (IP 20) 1336 REGEN Controllers, the blank cover plate (option HAB) must be installed to close the opening in the front cover of the enclosure. Failure to install the blank cover plate allows access to electrically live parts which may result in personnel injury and/or equipment damage.

When a HIM is supplied with enclosed NEMA Type 1 (IP 20) 1336 REGEN Converters but has been removed from its mounting cradle for remote operation, the blank cover plate must be installed in its place.

HIM Removal

For handheld operation, the module can be removed and located up to 10 meters (33 feet) from the 1336 REGEN Converter.

ATTENTION: Some voltages present behind the 1336 REGEN Converter front cover are at incoming line potential. To avoid an electric shock hazard, use extreme caution when removing/replacing the HIM.

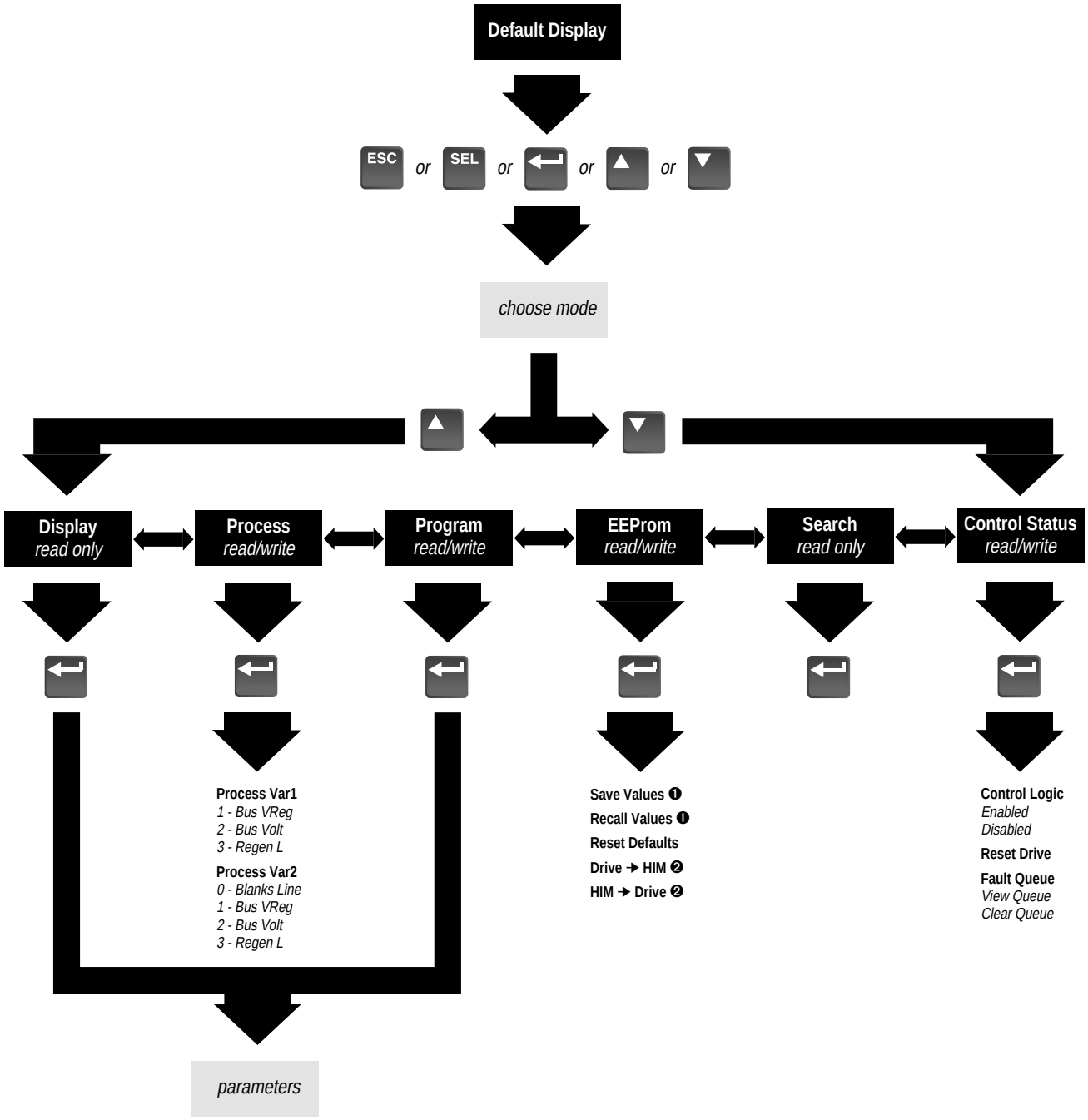
HIM Operation



ESC	**ESCape** When pressed, the escape key will cause the programming system to go back one level in the menu tree.
SEL	**SELect** Pressing the select key alternately causes the top or bottom line of the display to become active. The flashing first character indicates which line is active.
▲ ▼	**Increment/Decrement** These keys are used to increment and decrement a value or scroll though different parameters.
↵	**Enter** When pressed, a 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 to be chosen.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Programming Flow Chart



❶ Reserved for future use.
❷ HIM will indicate Drive, but download will be to or from 1336 REGEN Converter.

Figure 3.15 — HIM Startup Programming

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative Brake Startup

Overview

The following procedure describes how to startup the 1336 REGEN Line Regeneration Package and connected 1336 AC drive when used for Regenerative Brake applications. Included are typical checks to assure proper operation. The selection information contained in Chapter 1 must be read and understood before proceeding.

Important: For the majority of applications there should be no need to adjust parameters. Should utility or load conditions deviate from the “normal” conditions listed in the Specifications in Appendix B, the following parameters have been provided to allow adjustments to factory settings.

The following startup procedure is written for users who have a Human Interface Module (HIM) installed. For users without a HIM, respective external commands and signals must be substituted to simulate their operation.



ATTENTION: Power must be applied to the 1336 REGEN Line Regeneration Package to perform the following startup procedure. Some of the voltages present are at incoming line potential. To avoid electric shock hazard or damage to equipment, only qualified service personnel should perform the following procedure. Thoroughly read and understand the procedure before beginning. If an event does not occur while performing this procedure, Do Not Proceed. Remove power by opening the branch circuit disconnect device and correct the malfunction before proceeding.

Important: Power must be applied to the 1336 REGEN Line Regeneration Package when viewing or changing parameters. Previous programming of the 1336 REGEN Converter will effect operation when power is applied.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative Brake Startup

Initial Operation

Important: For Regenerative Brake applications, the 1336 REGEN Package will always be used with a single 1336 AC drive. It is recommend that the fault relay on the 1336 REGEN Converter Control board be interconnected into the 1336 AC drive control logic. This will allow coordination the Regenerative Brake faults with the 1336 AC drive.

1. Verify that AC line power at the disconnect device is within the rated value of the 1336 REGEN Package.

2. Verify that the digital inputs are configured as described in the Control and Signal Wiring section. Ensure that jumpers J10, J11 & J18 on the 1336 REGEN Converter Control Board are set correctly.

3. Set the converter logic to Not Enabled by presenting a logic “low” at terminal 4 of J15.

4. Confirm that all other control inputs and outputs are connected to the correct terminals and are secure and de-energized. In addition, confirm that the external fault circuit is closed.

5. Replace all 1336 REGEN Package covers and guards.

6. Apply AC power and control voltages to the Regenerative Brake System. The 1336 REGEN Converter HIM display should light and display a status of

```
Not Enabled
   650.0 VOLT
```

   If the system detects a fault, a brief statement will be shown on the display. Record this information, remove all power and correct the source of the fault before proceeding. Refer to Chapter 4 for fault descriptions and troubleshooting.

   The remaining steps in this procedure are based on factory default settings. If the 1336 REGEN Package has been previously operated, parameter settings may have been changed and may not be compatible with this startup procedure or application.

Important: To obtain proper results, the 1336 REGEN Package must be set to Not Enabled and its parameters reset to factory defaults.

   Setting parameters to factory defaults with the 1336 REGEN Package set to Enabled will result in an EEProm error. Setting the converter logic to Not Enabled by presenting a logic “low” at terminal 4 of J15 will clear the error and restore the

```
Not Enabled
   650.0 VOLT
```

screen.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Regenerative Brake Startup

7. From the status display, press Enter or any other key.

   `Choose Mode` / `Display` will be displayed.

8. Press the ▲ or ▼ until `Choose Mode` / `EEProm` is displayed.

9. Press Enter

10. Press the ▲ or ▼ until `EEProm` / `Reset Defaults` is displayed.

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

12. Press ESC once to exit back to the status display.

After the parameters have been restored to their factory settings, the status display will show `Not Enabled` / `650.0 VOLT`

To Enable the converter, present a logic “high” to terminal 4 of J15.

At the factory default settings, the 1336 REGEN Package is programmed for 460V AC line power and set to the Regenerative Brake mode of operation.

- For 380V AC operation, set Bit 2 of P-1 **[Operational Mode]** to 1. No other parameter changes are required.

To view a parameter other than P-5 **[Bus Volts Act.]** on the HIM display, P-28 **[HIM Display Prm]** may be changed. Setting parameter 28 to a different parameter number will display that parameter’s value on line 2 of the status display.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Programming

Overview

The 1336 REGEN Package is designed so that factory default parameter settings allow it to operate satisfactorily under a wide variety of load and utility conditions.

For the majority of applications there should be no need to adjust parameters. Should utility or load conditions deviate from the “normal” conditions listed in the Specifications, the following parameters have been provided to allow adjustments to factory settings.

Important: The 1336 REGEN Package has been shipped from the factory with Parameter 1 set to the Regenerative Brake Mode of operation.

Conventions

- Only parameters that are used in the Regenerative Brake mode of operation are listed in this chapter.
- Some parameters can be modified when the 1336 REGEN Converter is enabled. Other parameters can be modified only when the 1336 REGEN is not enabled.
- `Parameter Names` appear in the display in the left column. If mentioned in text, they will be shown in **[brackets]**.
- The **Parameter No.** is a unique number assigned to each of the 1336 REGEN Package parameters.
- The **Display Units** are units shown on the HIM — Bits, Amps, Volts, Percentages or Numbers.
- The **Parameter Type** heading indicates whether or not the parameter is read/write or read only. If read/write, whether or not it can be changed while the converter is enabled.
- The **Factory Default** value is the value set at the factory. In most circumstances this value should be sufficient for the application.
- The **Min/Max Value** is the lowest/highest setting for the parameter.
- **Drive Units** are internal units used to scale values properly when reading or writing to the converter.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

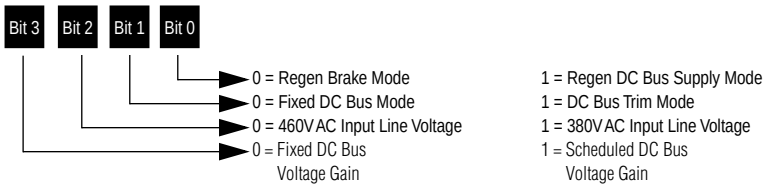
Programming

```
Operational Mode
XXXX0000          1
```

Parameter No.	1
Display Units	bits
Parameter Type	Read/Write
Factory Default Regen Brake Mode	XXXXX000
Min/Max Value	N/A
Drive Units	000 = 0_{bin}

Operational Mode

Sets the 1336 REGEN Line Regeneration Package mode of operation. The modes are defined by the last (3) bits of a 16 bit word. To set the mode, first stop the 1336 REGEN Converter, set the mode, then re-enable the converter.



Important: If the **[Operational Mode]** is reset while the 1336 REGEN Converter is enabled, a System Mode Change Fault will occur. Issuing a reset command will clear the fault and reset the converter.

```
Rated Current
   00.0 AMPS      2
```

Parameter No.	2
Display Units	Amps
Parameter Type	Read Only
Drive Units	1 = 0.1A

Rated AC Line Current

Displays the rated AC line current of the 1336 REGEN Converter.

```
Line Current
     +100 %       3
```

Parameter No.	3
Display Units	%
Min/Max Value	-200/200
Parameter Type	Read Only
Drive Units	100 = 4096

AC Line Current

Displays the actual I_q AC line current in percent of rated AC line current. Positive values indicate motoring — Negative values indicate regeneration.

```
Peak Load
     +100 %       4
```

Parameter No.	4
Display Units	%
Min/Max Value	-200/200
Parameter Type	Read Only
Drive Units	100 = 4096

Peak Load

Displays the peak motoring or regenerating current in percent of rated AC current. The peak value is held for five seconds. Positive values indicate motoring — Negative values indicate regenerating.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Programming

```
Bus Volts Act.
  735.0 VOLT   5
```

Actual Bus Voltage

Displays the actual voltage on the DC bus in DC volts.

Parameter No.	5
Display Units	Volts
Parameter Type	Read Only
Drive Units	1 = 0.1V

```
Cond Angle Const
   0.50      9
```

Conduction Angle Constant

Altering this parameter allows the conduction angle of the Regenerative Brake — The duration of IGBT device conduction per period — to be tuned while the 1336 REGEN Converter is enabled.

Parameter No.	9
Display Units	Number
Parameter Type	Read/Write
Factory Default	0.50
Min/Max Value	0.50/0.55
Drive Units	1.00 = 4096

Example: For a setting of 0.5, the conduction angle has a maximum value of 120˚.
For a setting of 0.55, the conduction angle is at it's minimum value, 113˚.

Reducing the **[Cond Angle Const]** increases the conduction angle. A larger conduction angle yields higher Regenerative Brake efficiency, since regeneration for the utility cycle lasts longer. A larger conduction angle however, also causes higher no-load quiescent currents.

Increasing the **[Cond Angle Const]** decreases the conduction angle, while slightly increasing DC bus voltage and reducing no-load quiescent currents.

```
Shift Angl Const
   0.03     10
```

Shift Angle Constant

Altering this parameter allows the conduction angle of the Regen Brake to be adjusted relative to the reference point of 30˚, after zero crossing of the phase voltage.

Parameter No.	10
Display Units	Number
Parameter Type	Read/Write
Factory Default	0.03
Min/Max Value	0.00/0.06
Drive Units	1.00 = 4096

The default factory setting of 0.03 should be adequate for the majority of line and load conditions.

For a setting of 0, IGBT quiescent current will be minimal. During regeneration, Input line current will initially rise slowly, then increase quickly at the conduction period. The resultant current waveform for a fully loaded unit during regeneration will be more triangular.

Increasing the setting to 0.06 will result in increasing the quiescent current and reducing the DC bus voltage. At the beginning of conduction period, input line current will initially rise quickly, then increase slowly. The resultant current waveform for a fully loaded unit during regeneration will now be more rectangular.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Programming

```
Cur Trip Filter
   5.0        11
```

Parameter No.	11
Display Units	Number
Parameter Type	Read/Write
Factory Default	5
Min/Max Value	1/10
Drive Units	1 = 4096

Instantaneous Overcurrent Trip Filter Constant

This parameter adjusts a software filter to prevent nuisance tripping due to severe, repeated and prolonged line notches and voltage sags on the utility system. The default factory setting of 5 should be adequate for the majority of line and load conditions.

Example: For a setting of 5:

- The converter will fault if line current reaches the HW Overcurrent Trip Point after approximately (5) consecutive sampling intervals.
- If (3) consecutive hardware trip conditions occur, the converter will not fault.
- If fault conditions disappear after (3) counts, the filter will discharge towards zero at a rate (10) times less that the one it was initially charged up at.
- If fault conditions reappear before the filter discharges to zero, it will start counting up again from the internal value it reached during discharge towards zero and quickly reach the HW Overcurrent Trip point.

```
Regen Curr Limit
  -150 %       13
```

Parameter No.	13
Display Units	%
Parameter Type	Read/Write
Factory Default	-150%
Min/Max Value	-150/0
Drive Units	100 = 4096

Regen Current Limit

Sets the actual negative or regenerating AC line current limit in percent of P-2 **[Rated AC Line Current]**.

Important: The 1336 REGEN Converter cannot be enabled for the **[Regen Curr Limit]** to be changed.

```
IOC SW Trip
  192 %        14
```

Parameter No.	14
Display Units	%
Parameter Type	Read/Write
Factory Default	192% I_{RATE} ❶
Min/Max Value	100/200% I_{RATE} ❶
Drive Units	100 = 4096

Instantaneous Overcurrent Trip Level

This parameter sets the software trip point for the **Instantaneous SW Overcurrent Fault** in percent of P-2 **[Rated AC Line Current]**.

❶ I_{RATE} Amps = the rated nameplate current of the 1336 REGEN Converter **[Rated AC Line Current]**.

Important: The 1336 REGEN Converter cannot be enabled for the **[IOC SW Trip]** to be changed.

```
Volt Trp Fltr BW
   9.8        15
```

Parameter No.	15
Display Units	Hz
Parameter Type	Read/Write
Factory Default	9.8
Min/Max Value	0.5/100
Drive Units	1.0 = 4096

Voltage Feedback Filter Bandwidth

This parameter sets the bandwidth of a first order filter used for AC line voltage feedback. Increasing the bandwidth can help avoid nuisance trips due to short term AC line overvoltage or undervoltage conditions.

Important: The 1336 REGEN Converter cannot be enabled for the **[Volt Trp Fltr BW]** to be changed.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Programming

```
BOV SW Trip
   130 %    16
```

Parameter No.	16
Display Units	%
Parameter Type	Read/Write
Factory Default	130% DC_{BASE} ❶
Min/Max Value	120/135% DC_{BASE} ❶
Drive Units	100 = 4096

DC Bus Overvoltage Trip Level

This parameter sets the software over voltage trip point of the DC bus. The 1336 REGEN Converter is factory set to prevent it from operating when DC bus voltage is 30% above DC_{BASE} volts.

❶ For 380V AC input Line Regeneration Packages, DC_{BASE} volts = 537V.
For 460V AC input Line Regeneration Packages, DC_{BASE} volts = 650V.

```
BUV SW Trip
    60 %    17
```

Parameter No.	17
Display Units	%
Parameter Type	Read/Write
Factory Default	60% DC_{BASE} ❶
Min/Max Value	50/100% DC_{BASE} ❶
Drive Units	100 = 4096

DC Bus Undervoltage Trip Level

This parameter sets the software under voltage trip point of the DC bus. The 1336 REGEN Converter is factory set to prevent it from operating when DC bus voltage is less than 60% of DC_{BASE} volts.

❶ For 380V AC input Line Regeneration Packages, DC_{BASE} volts = 537V.
For 460V AC input Line Regeneration Packages, DC_{BASE} volts = 650V.

```
LOV Trip 1
   115 %    18
```

Parameter No.	18
Display Units	%
Parameter Type	Read/Write
Factory Default	115% AC_{BASE} ❶
Min/Max Value	110/130% AC_{BASE} ❶
Drive Units	100 = 4096

AC Line Overvoltage Trip Level 1 (Not Enabled)

This parameter sets a software over voltage trip point that is active when the 1336 REGEN Converter is not enabled. The 1336 REGEN Converter is factory set to prevent it from being enabled when the input AC line voltage is 15% above the AC_{BASE} volts.

❶ For 380V AC input Line Regeneration Packages, AC_{BASE} volts = 380V.
For 460V AC input Line Regeneration Packages, AC_{BASE} volts = 460V.

Important: The 1336 REGEN Converter cannot be enabled for the **[LOV Trip 1]** to be changed.

```
LOV Trip 2
   130 %    19
```

Parameter No.	19
Display Units	%
Parameter Type	Read/Write
Factory Default	130% AC_{BASE} ❶
Min/Max Value	120/135% AC_{BASE} ❶
Drive Units	100 = 4096

AC Line Overvoltage Trip Level 2 (Enabled)

This parameter sets a second software over voltage trip point that is active when the 1336 REGEN Converter is enabled. The 1336 REGEN Converter is factory set to trip if the input AC line voltage is 30% above the AC_{BASE} volts.

❶ For 380V AC input Line Regeneration Packages, AC_{BASE} volts = 380V.
For 460V AC input Line Regeneration Packages, AC_{BASE} volts = 460V.

Important: The 1336 REGEN Converter cannot be enabled for the **[LOV Trip 2]** to be changed.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Programming

```
LUV Trip 1
   85 %    20
```

Parameter No.	20
Display Units	%
Parameter Type	Read/Write
Factory Default	85% AC_{BASE} ❶
Min/Max Value	75/90% AC_{BASE} ❶
Drive Units	100 = 4096

AC Line Undervoltage Trip Level 1 (Not Enabled)

This parameter sets a software under voltage trip point that is active when the 1336 REGEN Converter is not enabled. The 1336 REGEN Converter is factory set to prevent it from being enabled when the input AC line voltage is less than 85% of the AC_{BASE} volts.

❶ For 380V AC input Line Regeneration Packages, AC_{BASE} volts = 380V.
For 460V AC input Line Regeneration Packages, AC_{BASE} volts = 460V.

Important: The 1336 REGEN Converter cannot be enabled for the **[LUV Trip 1]** to be changed.

```
LUV Trip 2
   60 %    21
```

Parameter No.	21
Display Units	%
Parameter Type	Read/Write
Factory Default	60% AC_{BASE} ❶
Min/Max Value	50/70% AC_{BASE} ❶
Drive Units	100 = 4096

AC Line Undervoltage Trip Level 2 (Enabled)

This parameter sets a second software under voltage trip point that is active when the 1336 REGEN Converter is enabled. The 1336 REGEN Converter is factory set to trip if the input AC line voltage is less than 60% of the AC_{BASE} volts.

❶ For 380V AC input Line Regeneration Packages, AC_{BASE} volts = 380V.
For 460V AC input Line Regeneration Packages, AC_{BASE} volts = 460V.

Important: The 1336 REGEN Converter cannot be enabled for the **[LUV Trip 2]** to be changed.

```
PLLReg Err Trip
  0.10      22
```

Parameter No.	22
Display Units	Number
Parameter Type	Read/Write
Factory Default	0.1
Min/Max Value	0.0/0.3
Drive Units	1.0 = 4096

Phase Locked Loop Error Trip Point

The phase locked loop of the 1336 REGEN Line Regeneration Package synchronizes 1336 REGEN operation with the incoming power from the utility. This parameter allows the software trip point of **[PLLReg Err Trip]** to be adjusted to help avoid nuisance trips due to utility distortion.

Important: The 1336 REGEN Converter cannot be enabled for a **[PLLReg Err Trip]** to be changed

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

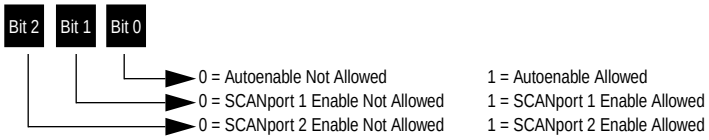
Programming

```
Port Enable Mask
XXXXX111      23
```

Parameter No.	23
Display Units	Bits
Parameter Type	Read/Write
Factory Default	111
Min/Max Value	0/7
Drive Units	N/A

Port Enabled Mask

This parameter sets the ability of a SCANport device to issue enable commands. The commands are defined by the first (3) bits of a 16 bit word. The **[Port Enable Mask]** may be set while the 1336 REGEN Converter is enabled.



Bit 0 = 1 When Bit 0 =1, the system will be set to the auto-enable mode.

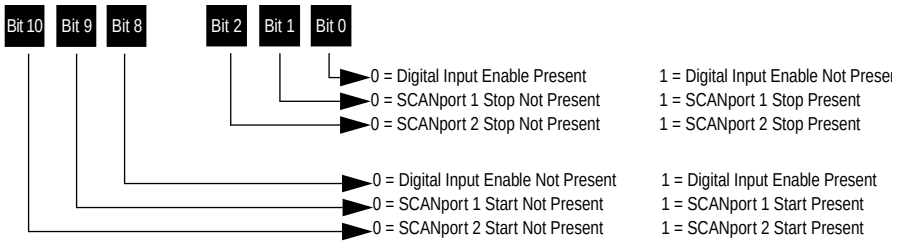
Bit 0 = 0 When Bit 0 = 0, this input requires an enable command from SCANport 1 or 2.

```
StartStop Owner
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1      24
```

Parameter No.	24
Display Units	Bits
Parameter Type	Read Only
Factory Default	N/A
Min/Max Value	N/A
Drive Units	N/A

Start/Stop Owner

This parameter displays which adapter is currently issuing a valid enable command. Only the first (3) bits of each byte are valid.

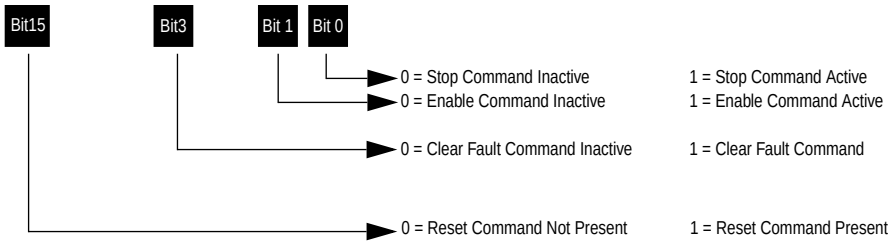



```
Command Status
00000001      25
```

Parameter No.	25
Display Units	Bits
Parameter Type	Read Only
Factory Default	N/A
Min/Max Value	N/A
Drive Units	N/A

Current Command Being Issued

This parameter displays the logic command currently being issued.

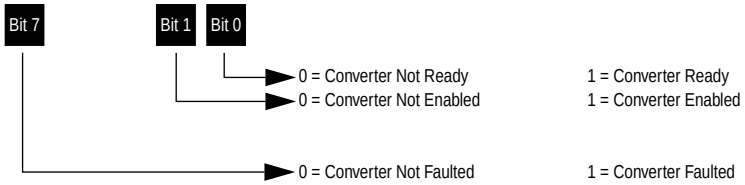



```
Logic Status
00000000      26
```

Parameter No.	26
Display Units	Bits
Parameter Type	Read Only
Factory Default	N/A
Min/Max Value	N/A
Drive Units	N/A

Logic Status

This parameter displays the current logic status of the 1336 REGEN Converter.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

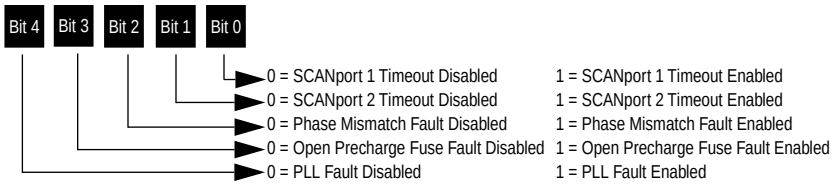
Programming

```
Fault Select1
XXX11100          27
```

Parameter No.	27
Display Units	Bits
Parameter Type	Read/Write
Factory Default	XXX11100
Min/Max Value	N/A
Drive Units	N/A

Fault Select 1

This parameter enables or disables faults as defined by the first (5) bits of a (16) bit word. The **[Fault Select1]** parameter may be set while the 1336 REGEN Converter is enabled.




```
HIM Display Prm
      5           28
```

Parameter No.	28
Display Units	Number
Parameter Type	Read/Write
Factory Default	5
Min/Max Value	1/32
Drive Units	N/A

HIM Default Display Parameter

This parameter sets which of the previous parameters will be displayed after 1336 REGEN Converter power-up. The **[HIM Display Param]** parameter may be set while the 1336 REGEN Converter is enabled.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Troubleshooting

Overview

Chapter 4 provides information to guide the user in troubleshooting the 1336 REGEN Line Regeneration Package. Included is a listing and description of the various faults that can occur and their code numbers as they would appear on the HIM. An additional section is included to document troubleshooting from the 1336 REGEN Converter Control Board. (3) LEDs on the Control Board provide status and fault information for the 1336 REGEN Line Regeneration Package.

Clearing a Fault

When a fault occurs, the Enable & Fault Output Relays will change state and the 1336 REGEN Converter will shut down. Issuing a reset command will clear the fault and reset the converter. When a fault occurs however, the cause should be investigated and action taken prior to resetting the fault.

Troubleshooting

1336 REGEN Converter Control Board LED Indication

LED	Status	Indicates
FAULT DS1	Off	No Faults Exist
	On	A Fault Has Occurred — Refer to the Fault Codes Below
ENABLE DS2	Off	No Power Has Been Applied to the Converter
	On	The Converter Is Being Powered Up
	On Flashing	The Converter Has Tripped — Refer to the Fault Codes Below
STATUS DS3	Off	The Converter Is Not Enabled
	On	The Converter Is Enabled
	On Flashing	The Converter Has Tripped — Refer to the Fault Codes Below
COM DS4	Off	The Converter Is Not Enabled
	On 2 Flashes	A host checksum has occurred.
	On Continuous Flashing	The Converter Has Tripped — Refer to the Fault Codes Below

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Troubleshooting

1336 REGEN Fault and Code Number

Fault & Code No.	Status				Indicates	Action
	FAULT DS1	ENABLE DS2	STATUS DS3	COM DS4		
Bus Over Volt HW F 1	On	1 Flash	1 Flash	Flashing	Bus voltage has exceeded 130% of the rated DC bus voltage — — 537VDC for a 380VAC input. — 650VDC for a 460VAC input.	1. Reduce the braking current limit of the connected AC drive. 2. Reduce regeneration demand on the connected AC drive by reducing braking time. 3. Reset and re-enable the Converter.
IOC HW F 2	On	1 Flash	2 Flashes	Flashing	Current has exceeded 198% of the rated converter current.	1. Reduce the current limit of the connected AC drive. 2. Check AC line fuses. 3. Reset and re-enable the Converter. 4. If problem persists, replace the Converter Control Board. If problem reoccurs, check Converter IGBT devices.
Bus Over Volt SW F 4	On	2 Flashes	1 Flash	Flashing	Bus voltage has exceeded that set by P16 - **[BOV SW Trip]**.	1. Check the DC bus overvoltage trip level set in P16. 2. Reduce regeneration demand on the drive by reducing braking time. 3. Ensure that the 1336 REGEN Package is correctly sized for the application.
IOC SW F 5	On	2 Flashes	2 Flashes	Flashing	1336 REGEN Converter input current has exceeded that set by P14 - **[IOC SW Trip]**.	1. Check the instantaneous overcurrent trip level set by P14. 2. Reduce the Converter's current limits. 3. Ensure that the 1336 REGEN Package is correctly sized for the application.
PLL Fault F 6	On	2 Flashes	3 Flashes	Flashing	A phase locked loop error has exceeded the software trip point set by P22 - **[PLLReg Err Trip]**. This can occur for several reasons. 1. The utility voltage is corrupted or unbalanced. 2. One of the line voltage feedback inputs is missing.	1. Ensure that P22 - **[PLLReg Err Trip]** is set correctly. 2. Verify that the utility's voltage is within the specifications listed in Appendix B. 3. Check voltage feedback inputs at the 1336 REGEN Precharge Unit's input contactor.
IT Fault F 7	On	2 Flashes	4 Flashes	Flashing	Current has exceeded 150% of rated line current for (1) minute or the equivalent IT value (current × time).	Reduce Converter loading.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Troubleshooting

Fault & Code No.	Status				Indicates	Action
	FAULT DS1	ENABLE DS2	STATUS DS3	COM DS4		
Over Temperature F 8	On	2 Flashes	5 Flashes	Flashing	The 1336 REGEN Converter heat sink temperature has exceeded 100°C.	1. Check fan operation. 2. Check for blocked or dirty cooling fins. 3. Confirm that the Converter's ambient temperature is within the specifications listed in Appendix B.
Bus Under Volts F 9	On	2 Flashes	6 Flashes	Flashing	Bus voltage has fallen below that set by P17 - **[BUV SW Trip]**.	Reset and re-enable the Converter. Verify that the AC input line is within the specifications listed in Appendix B.
Contactor Out F 10	On	3 Flashes	1 Flash	Flashing	The 1336 REGEN Precharge Unit's input contactor has opened.	Check the 115V AC contactor coil supply.
External Fault F 11	On	3 Flashes	2 Flashes	Flashing	An external fault has been detected at terminal 6 of J15 on the 1336 REGEN Converter Control Board.	Check that logic high is present at terminal 6 of J15 on the 1336 REGEN Converter Control Board.
Line Over Volts1 F 12	On	4 Flashes	1 Flash	Flashing	The line-to-line voltage has exceeded that set by P18 - **[LOV Trip 1]**.	1. Verify that the AC input line is within the specifications listed in Appendix B. 2. Reset and re-enable the Converter.
Line Under Volt1 F 13	On	4 Flashes	2 Flashes	Flashing	The line-to-line voltage has fallen below that set by P20 - **[LUV Trip 1]**.	1. Verify that the AC input line is within the specifications listed in Appendix B. 2. Reset and re-enable the Converter.
Line Over Volt2 F 14	On	4 Flashes	3 Flashes	Flashing	The line-to-line voltage has exceeded that set by P19 - **[LOV Trip 2]**.	1. Verify that the AC input line is within the specifications listed in Appendix B. 2. Reset and re-enable the Converter.
Line Under Volt2 F 15	On	4 Flashes	4 Flashes	Flashing	The line-to-line voltage has fallen below that set by P21 - **[LUV Trip 2]**.	1. Verify that the AC input line is within the specifications listed in Appendix B. 2. Reset and re-enable the Converter.
Open Fuse F 16	On	5 Flashes	1 Flash	Flashing	1. 1336 REGEN Precharge Board fuse F1, F2 or F3 has opened. This fault will be detected only on power up. 2. 1336 REGEN Converter line fuse F1, F2 and F3 has opened. This fault will be detected after the converter is enabled.	1. Check fuse F1, F2 and F3 on the Precharge Board if fault occurs at power up. 2. Check bus fuse F1, F2 and F3 if fault occurs after power up.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Troubleshooting

Fault & Code No.	Status				Indicates	Action
	FAULT DS1	ENABLE DS2	STATUS DS3	COM DS4		
Phase Mismatch F 17	On	5 Flashes	2 Flashes	Flashing	A phase mismatch has been detected between incoming power lines, at the 1336 REGEN Precharge Unit, or at the 1321 Line Reactor.	Check the phase sequence wiring between incoming power lines, in and out of the Precharge Unit and at the line reactor.
C Verify Time Out F 18	On	5 Flashes	3 Flashes	Flashing	Since requesting the 1336 REGEN Precharge contactor to close, more than (1) second has passed without the Converter Control Board receiving a confirmation signal.	1. Check all wiring to the Precharge Contactor. 2. Verify that the 120VAC input to the contactor is within the specifications listed in Appendix B.
Excess Cur Offst F 19	On	5 Flashes	4 Flashes	Flashing	DC offset in current feedback in excess of 5% of rated current has been detected. This could be due to a malfunctioning sensor or faulty wiring.	Check the current sensor wiring.
Illegal Drv. Type F 20	On	5 Flashes	5 Flashes	Flashing	The power structure is not supported.	1. Check that the Converter Control Board and Gate Driver Board are matched and correspond to the Converter frame size. 2. Reset and re-enable by: a. Exiting to the EEProm Mode. b. Resetting defaults. c. Verifying that P1 is set to the correct operating mode. d. Resetting the Converter. If the fault occurs again, replace the Converter Control Board.
NTC In Discon. F 21	On	5 Flashes	6 Flashes	Flashing	The NTC was not detected by the Converter Control Board.	Check all NTC wiring from the Converter's Base Driver Board to the Converter Control Board.
DSP Checksum F 22	On	5 Flashes	7 Flashes	Flashing	DSP Checksum mismatch.	Reset Converter. If the fault occurs again, replace the Converter Control Board.
Diff SW Version F 32	On	N/A	N/A	Flashing	Software has detected a major revision change.	1. Reset defaults. 2. Reset and re-enable the Converter.
Diff Drv Type F 33	On	N/A	N/A	Flashing	Board has been moved to a new power structure different than the last known power structure.	1. Reset defaults. 2. Reset and re-enable the Converter.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Troubleshooting

Fault & Code No.	Status				Indicates	Action
	FAULT DS1	ENABLE DS2	STATUS DS3	COM DS4		
Illegal Drv. Type F 34	On	N/A	N/A	Flashing	The power structure is not supported.	1. Check that the Converter Control Board and Gate Driver Board are matched and correspond to the Converter frame size. 2. Reset and re-enable by: a. Exiting to the EEProm Mode. b. Resetting defaults. c. Verifying that P1 is set to the correct operating mode. d. Resetting the Converter. If the fault occurs again, replace the Converter Control Board.
SW Malfunction F 35	On	N/A	N/A	Flashing	Software error.	Reset and re-enable the Converter. If the fault occurs again, replace the Converter Control Board.
Host/DSP Com Err F 37	On	N/A	N/A	Flashing	Host processor unable to communicate with the Converter SCANport.	Reset and re-enable the Converter. If the fault occurs again, replace the Converter Control Board.
PwrUp DspCom Err F 38	On	N/A	N/A	Flashing	Host processor unable to communicate with the Converter SCANport.	Reset and re-enable the Converter. If the fault occurs again, replace the Converter Control Board.
EE Checksum F 39	On	N/A	N/A	Flashing	1336 REGEN Converter parameter database is corrupt.	Reinitialize Converter parameters or: 1. Recall values. 2. Save values. 3. Reset and re-enable the Converter. If the fault occurs again, replace the Converter Control Board.
Pwr Up Marker F 40	On	N/A	N/A	Flashing	Fault queue text.	N/A
Unknown Error F 41	On	N/A	N/A	Flashing	Fault queue text.	Reset and re-enable the Converter. If the fault occurs again, replace the Converter Control Board.
No Entry F 42	On	N/A	N/A	Flashing	Fault queue text.	N/A
Clear Faults F 43	On	N/A	N/A	Flashing	Fault queue text.	N/A

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Troubleshooting

Fault & Code No.	Status				Indicates	Action
	FAULT DS1	ENABLE DS2	STATUS DS3	COM DS4		
Host/DSP Handshake	On	3 Flashes	3 Flashes	Don't Care	Host processor and DSP handshake error.	Reset and re-enable the Converter. If the fault occurs again, replace the Converter Control Board.
SP1 Timeout F 48	On	N/A	N/A	Flashing	The SCANport device connected to SCANport 1 has been disconnected and the mask bit for SCANport 1 is set.	If the SCANport device was not intentionally disconnected, do the following: 1. Check the wiring between SCANport1 and the SCANport device. Replace wiring if required. 2. Clear bit 0 of P27 - **[Fault Select1]** to disable this fault from occurring.
SP2 Timeout F 49	On	N/A	N/A	Flashing	The SCANport device connected to SCANport 2 has been disconnected and the mask bit for SCANport 2 is set.	If the SCANport device was not intentionally disconnected, do the following: 1. Check the wiring between SCANport1 and the SCANport device. Replace wiring if required. 2. Clear bit 1 of P27 - **[Fault Select1]** to disable this fault from occurring.
Sys. Mode Change F 50	On	N/A	N/A	Flashing	P1 - **[Operational Mode]** was changed.	Reset and re-enable the Converter.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Dimensions and Weights

Appendix A provides detailed dimension information for the 1336 REGEN Line Regeneration Package. Included are:

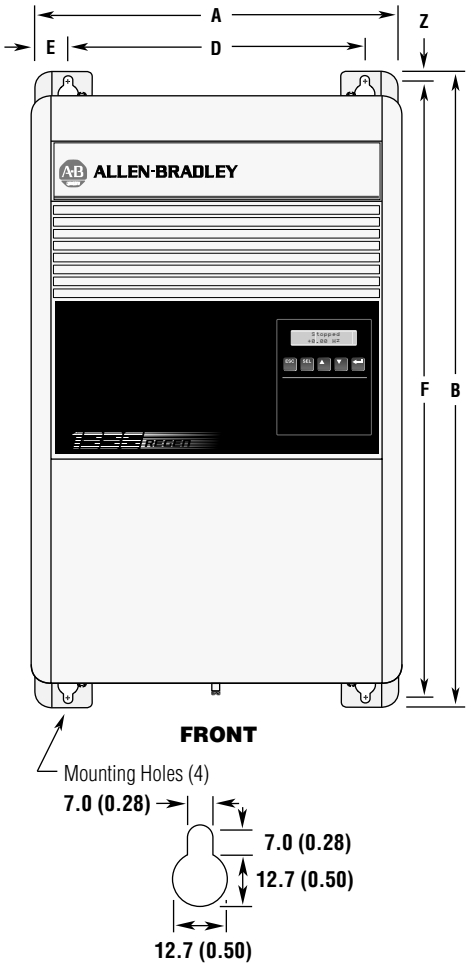
- 1336 REGEN Converter Dimensions and Weights.
- 1336 REGEN Precharge Unit Dimensions and Weights.
- 1321 3% Line Reactor Dimensions and Weights for Regenerative Brake Operation.
- 1321 10% Line Reactor Dimensions and Weights for Regenerative DC Bus Supply Operation.
- 1336 REGEN Converter Heat Sink-Through-the-Back Cutout Dimensions

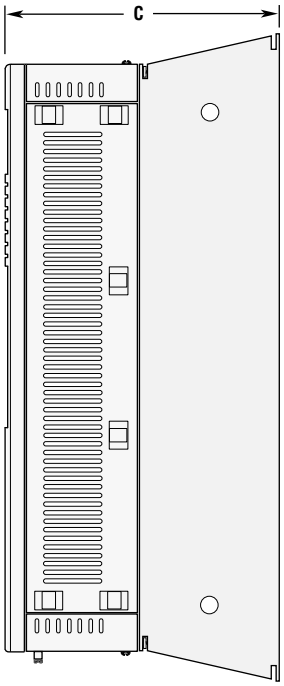
Important: The dimensions and weights given in the following drawings are for estimating purposes only. Contact your Allen-Bradley Sales Office if certified drawings are required.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1336 REGEN B and C Frame Converter

Important: Allow 152.4 mm (6.0 In.) on all sides for proper heat dissipation.



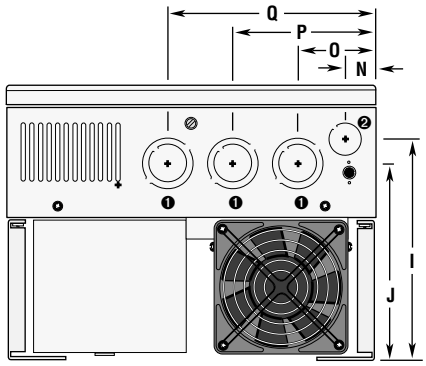


Knockout Diameters

❶ Dual Knockout — 3 Places 28.6/34.9 (1.13/1.38)
❷ Single Knockout — 1 Place 22.2 (0.88)

Shipping Weight

B Frame — 22.7 kg (50 lbs.)
C Frame — 38.6 kg (85 lbs.)



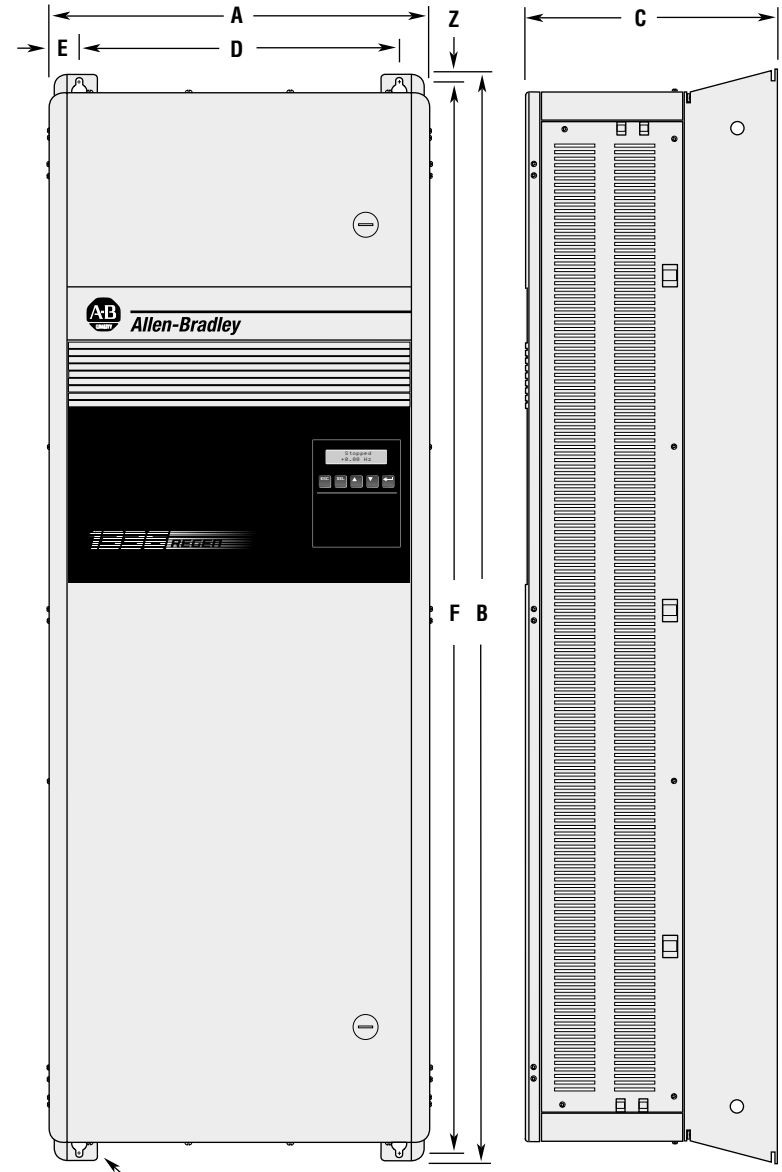
All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

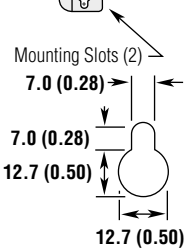
Frame Reference	A	B	C	D	E	I	J	N	O	P	Q	Z
B	276.4 (10.88)	476.3 (18.75)	225.0 (8.86)	212.6 (8.37)	461.0 (18.15)	181.6 (7.15)	167.1 (6.58)	26.5 (1.04)	163.6 (6.44)	112.8 (4.44)	62.0 (2.44)	7.6 (0.30)
C	301.8 (11.88)	701.0 (27.60)	225.0 (8.86)	238.0 (9.37)	685.8 (27.00)	181.6 (7.15)	167.1 (6.58)	26.5 (1.04)	182.7 (7.19)	119.2 (4.69)	68.4 (2.69)	7.6 (0.30)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1336 REGEN D Frame Converter

Important: Allow 152.4 mm (6.0 In.) on all sides for proper heat dissipation.



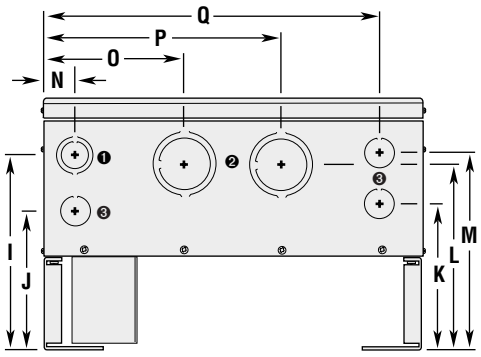


Knockout Diameters

❶ Dual Knockout — 1 Place 34.9/50.0 (1.38/1.97)
❷ Dual Knockout — 2 Places 62.7/76.2 (2.47/3.00)
❸ Single Knockout — 3 Places 34.9 (1.38)

Shipping Weight

D Frame — 108.9 kg (240 lbs.)



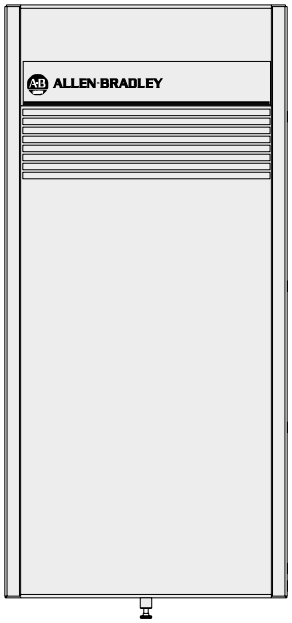
All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

Frame Reference	A	B	C	D	E	F	I	J	K	L	M	N	O	P	Q	Z
D	381.5 (15.02)	1240.0 (48.82)	270.8 (10.66)	325.9 (12.83)	27.94 (1.10)	1216.2 (47.88)	198.1 (7.8)	131.6 (5.18)	153.7 (6.05)	169.4 (6.67)	204.5 (8.05)	52.1 (2.05)	144.0 (5.67)	261.4 (10.29)	343.9 (13.54)	11.94 (0.47)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

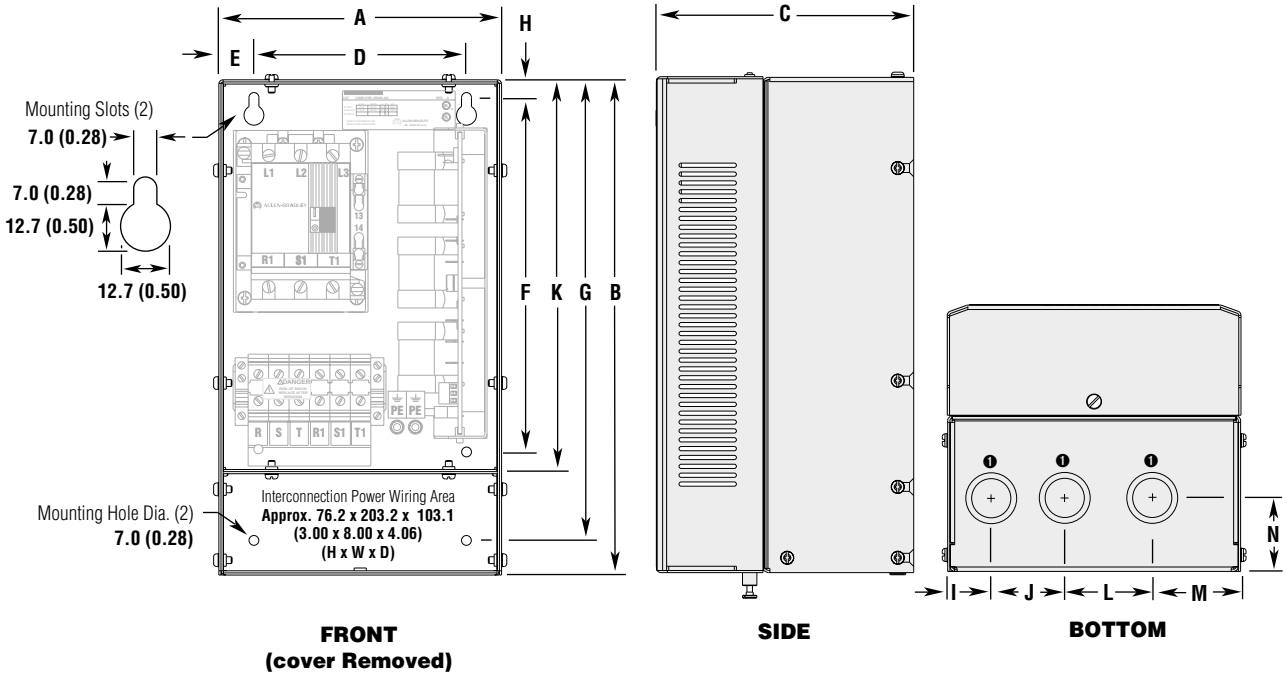
1336 REGEN B and C Frame Precharge Unit

Important: Allow 152.4 mm (6.0 In.) on all sides for proper heat dissipation.



Knockout Diameters
❶ Dual Knockout — 3 Places 28.6/34.9 (1.125/1.375)

Shipping Weight
B and C Frame — 9.1 kg (20 lbs.)



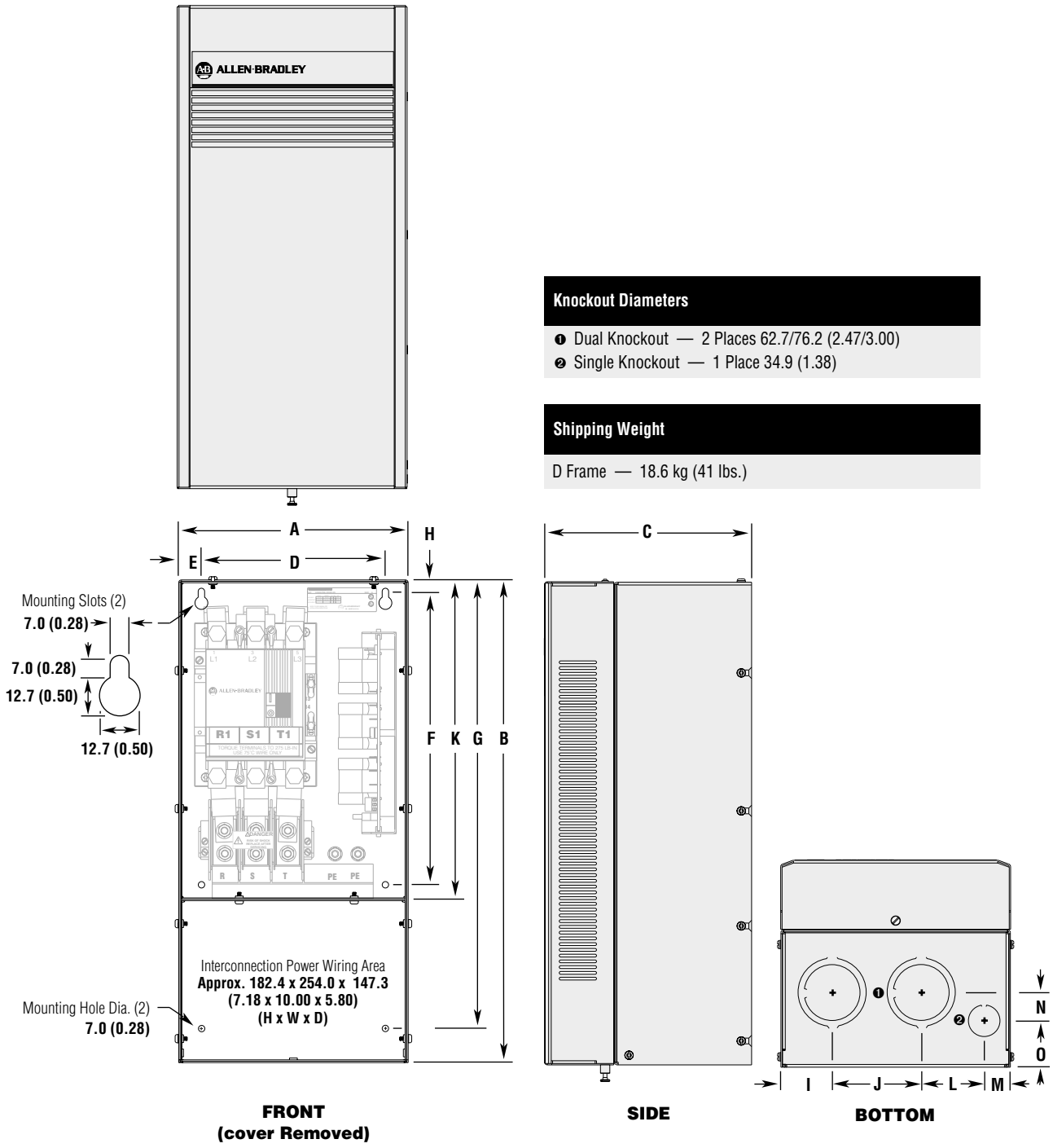
All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

Frame Reference	A	B	C	D	E	F	G	H	I	J	K	L	M	N
B and C	203.2 (8.00)	355.6 (14.00)	184.2 (7.25)	152.4 (6.00)	25.4 (1.00)	254.0 (10.00)	317.5 (12.50)	12.7 (0.50)	28.45 (1.12)	50.8 (2.00)	279.4 (11.0)	60.45 (2.38)	33.02 (1.30)	59.44 (2.34)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1336 REGEN D Frame Precharge Unit

Important: Allow 152.4 mm (6.0 In.) on all sides for proper heat dissipation.



Knockout Diameters

❶ Dual Knockout — 2 Places 62.7/76.2 (2.47/3.00)
❷ Single Knockout — 1 Place 34.9 (1.38)

Shipping Weight

D Frame — 18.6 kg (41 lbs.)

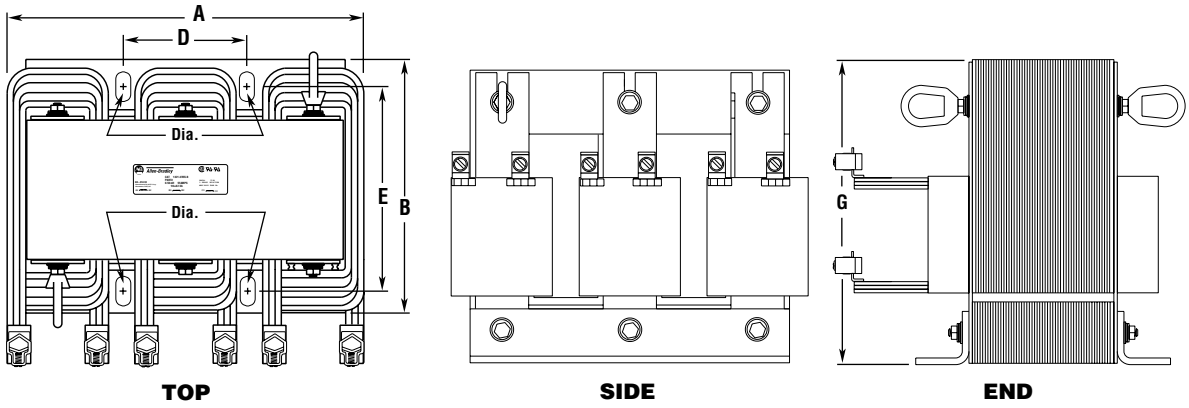
All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

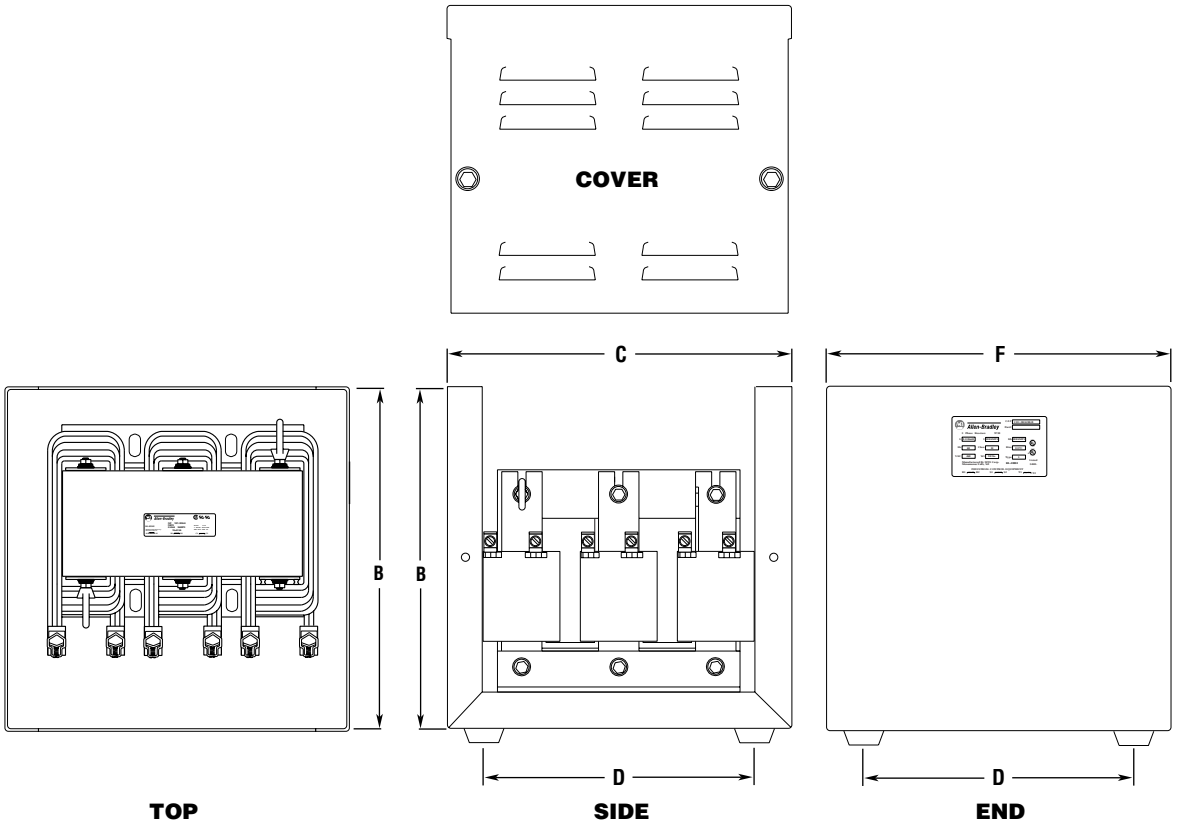
Frame Reference	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
D	254.0 (10.00)	533.4 (21.00)	228.6 (9.00)	203.2 (8.00)	25.4 (1.00)	323.9 (12.75)	482.6 (19.00)	12.7 (0.50)	53.9 (2.12)	98.6 (3.88)	350.0 (13.82)	69.9 (2.75)	31.8 (1.25)	31.8 (1.25)	50.8 (2.00)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1321 48 and 78A 3% Line Reactor

Important: Allow 152.4 mm (6.0 In.) on all sides for proper heat dissipation.





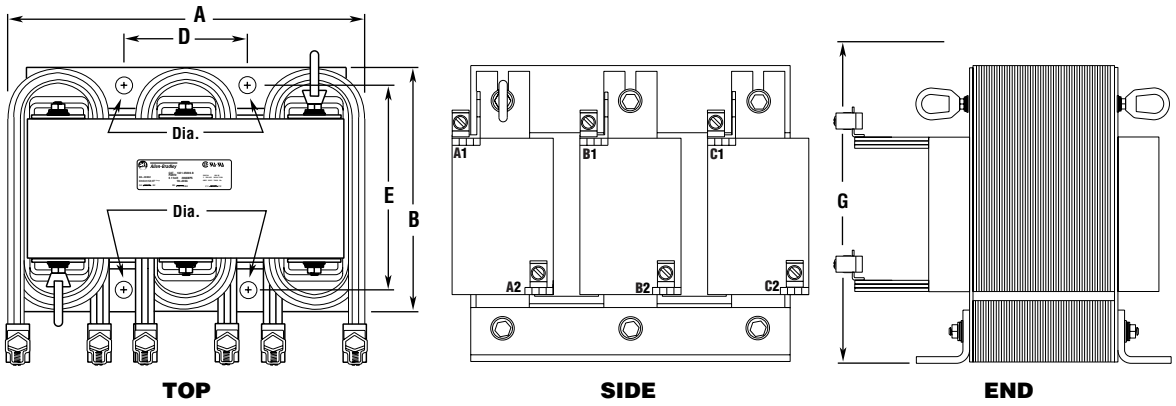
All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

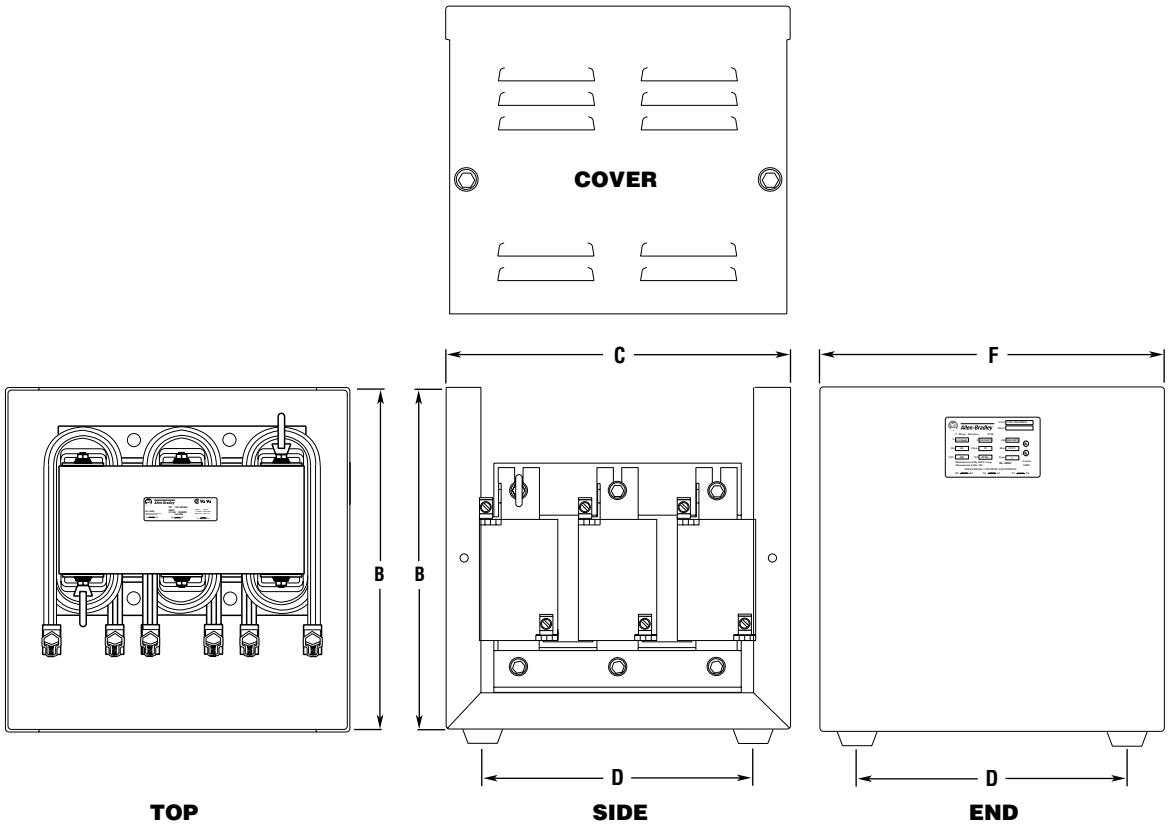
1321 Rating	A	B	C	D	E	F	G	Mounting Hole Dia. (4) Places	Shipping Weight
48A Open (IP00)	229 (9.0)	118 (4.7)	—	76 (3.0)	80 (3.2)	—	187 (7.4)	9.5 (0.375)	12 (27)
78A Open (IP00)	274 (10.8)	144 (5.7)	—	92 (3.6)	93 (3.7)	—	210 (8.3)	12.7 (0.5)	23 (51)
48/78A NEMA Type 1 (IP20)	—	330 (13.0)	330 (13.0)	279 (11.0)	—	336 (13.2)	—	—	14.5/25.4 (32/56)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1321 180A 3% Line Reactor

Important: Allow 152.4 mm (6.0 In.) on all sides for proper heat dissipation.





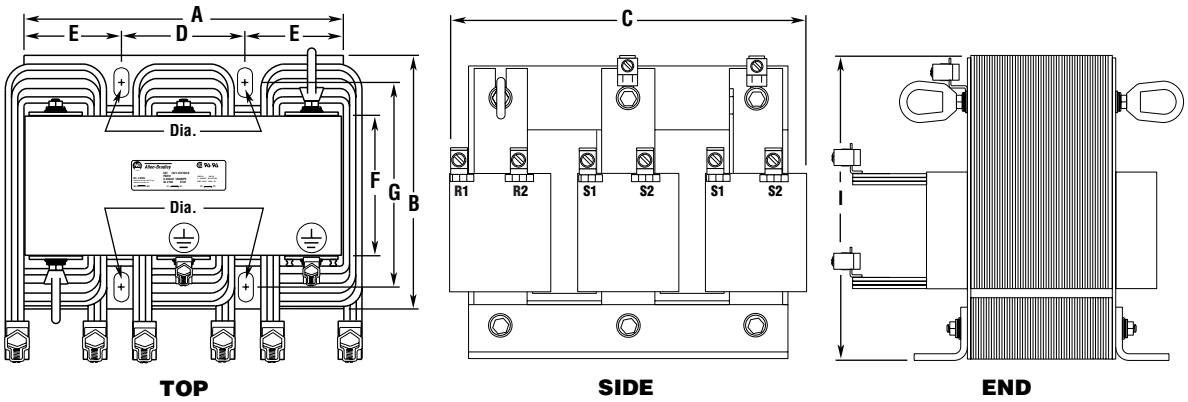
All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

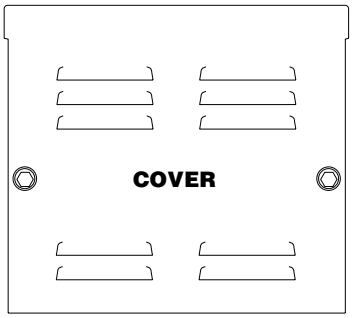
1321 Rating	A	B	C	D	E	F	G	Mounting Hole Dia. (4) Places	Shipping Weight
180A Open (IP00)	274 (10.8)	210 (8.3)	—	92 (3.6)	112 (4.4)	—	211 (8.3)	14.22 (0.56)	31 (67)
180A NEMA Type 1 (IP20)	—	330 (13.0)	330 (13.0)	279 (11.0)	—	336 (13.2)	—	—	32.7 (72)

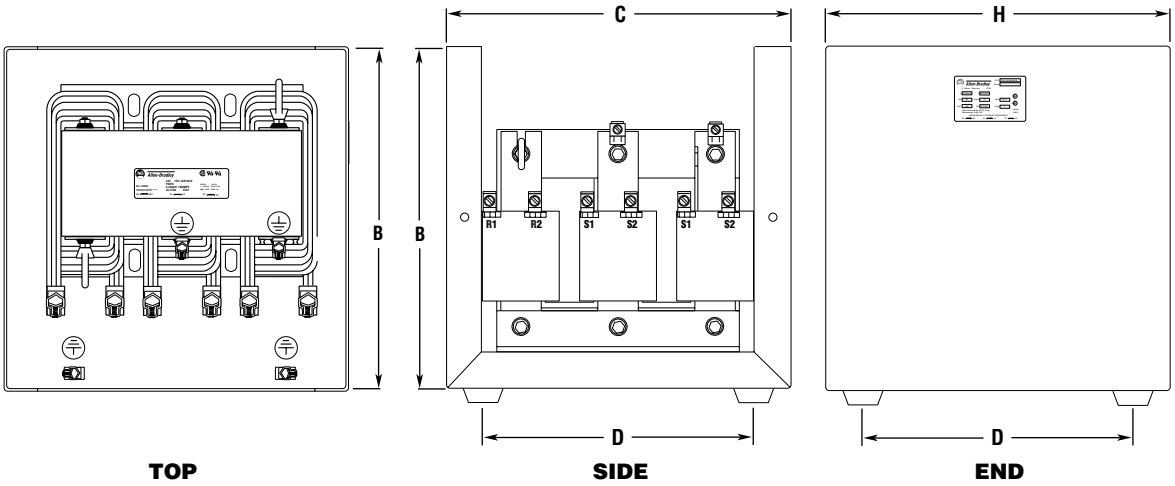
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1321 48 and 78A 10% Line Reactor

Important: Allow 152.4 mm (6.0 In.) on all sides for proper heat dissipation.







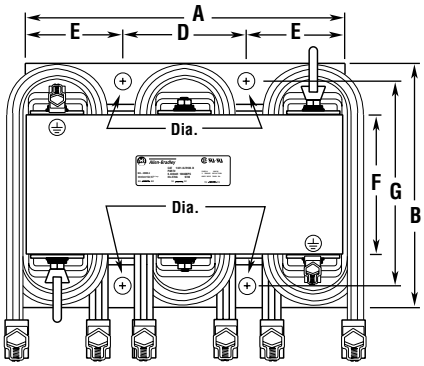
All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

1321 Rating	A	B	C	D	E	F	G	H	I	Mounting Hole Dia. (4) Places	Shipping Weight
48A Open (IP00)	304.8 (9.00)	207.3 (8.16)	279.4 (11.00)	92.2 (3.63)	68.33 (2.69)	114.3 (4.50)	156.5 (6.16)	—	215.9 (8.50)	0.38 x 0.75 (9.7 x 19 Slot)	36.3 (80)
78A Open (IP00)	304.8 (9.00)	232.7 (9.16)	279.4 (11.00)	92.2 (3.63)	68.33 (2.69)	139.7 (5.50)	181.9 (7.16)	—	215.9 (8.50)	0.38 x 0.75 (9.7 x 19 Slot)	59 (130)
48 NEMA Type 1 (IP20)	—	330.2 (13.00)	330 (13.0)	279 (11.0)	—	—	—	335.8 (13.22)	—	—	38.6 (85)

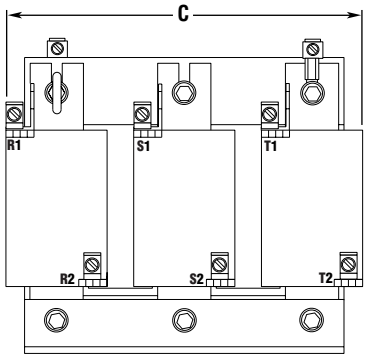
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1321 180A 10% Line Reactor

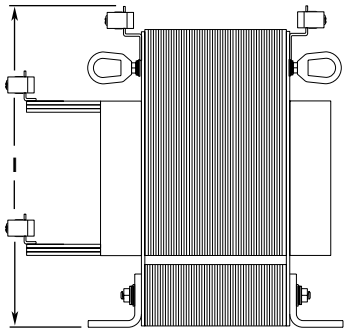
Important: Allow 152.4 mm (6.0 In.) on all sides for proper heat dissipation.



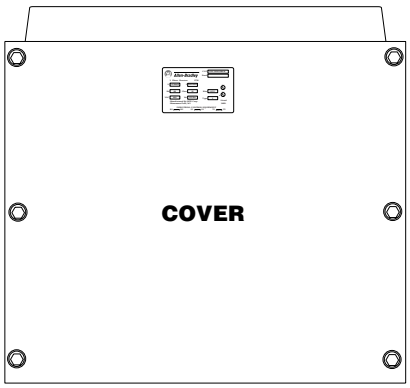
TOP

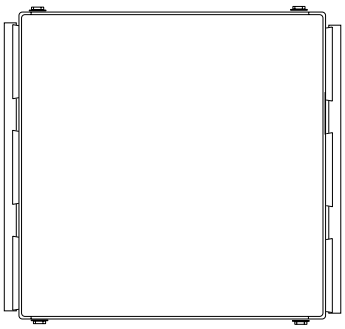


SIDE

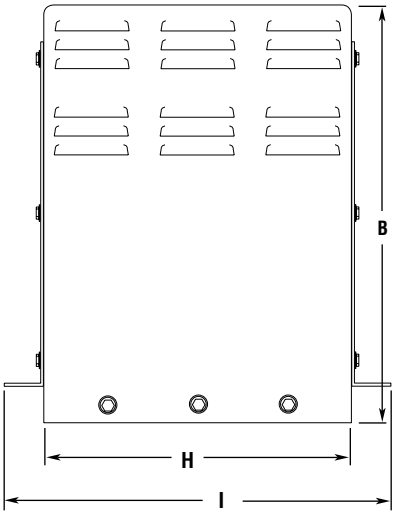


END

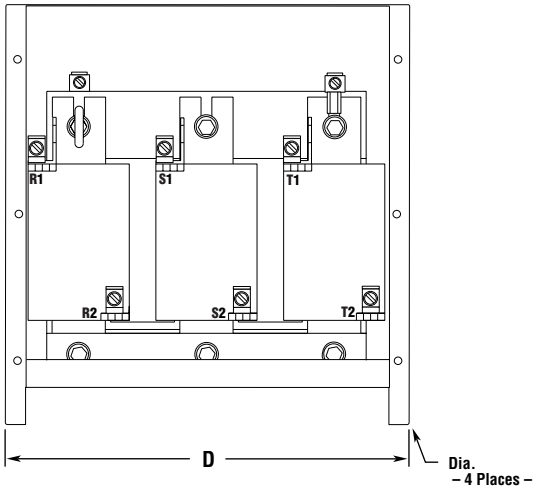




TOP



END



SIDE

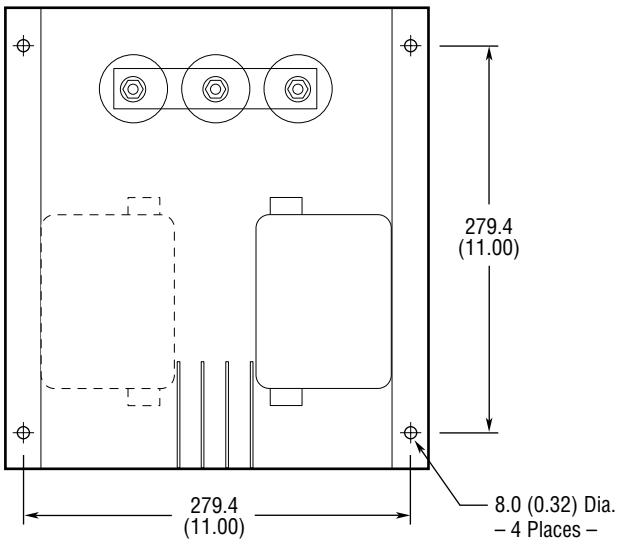
All Dimensions in Millimeters and (Inches) — All Weights in Kilograms and (Pounds)

1321 Rating	A	B	C	D	E	F	G	H	I	Mounting Hole Dia. (4) Places	Shipping Weight
180A Open (IP00)	304.8 (12.00)	292.4 (11.51)	368.3 (14.50)	116.8 (4.60)	94.0 (3.70)	184.2 (7.25)	254.3 (10.01)	—	317.5 (12.50)	14.22 (0.56)	136 (300)
78A/180A NEMA Type 1 (IP20)	—	609.6 (24.00)	—	434.9 (17.12)	—	—	—	432 (17.0)	467 (18.38)	11.18 x 17.53 (0.44 x 0.69 Slot)	61.2/160 (135/353)

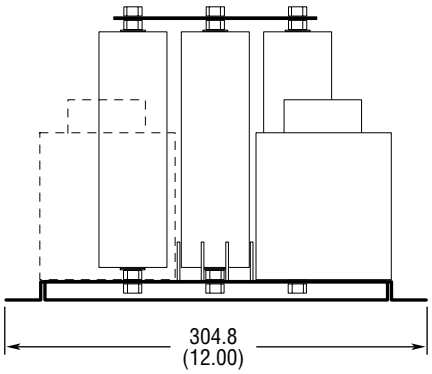
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1321 Power Line Filter

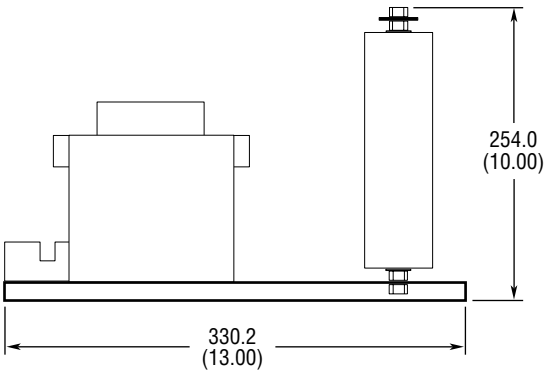
All ratings are Open (IP00).



TOP



END

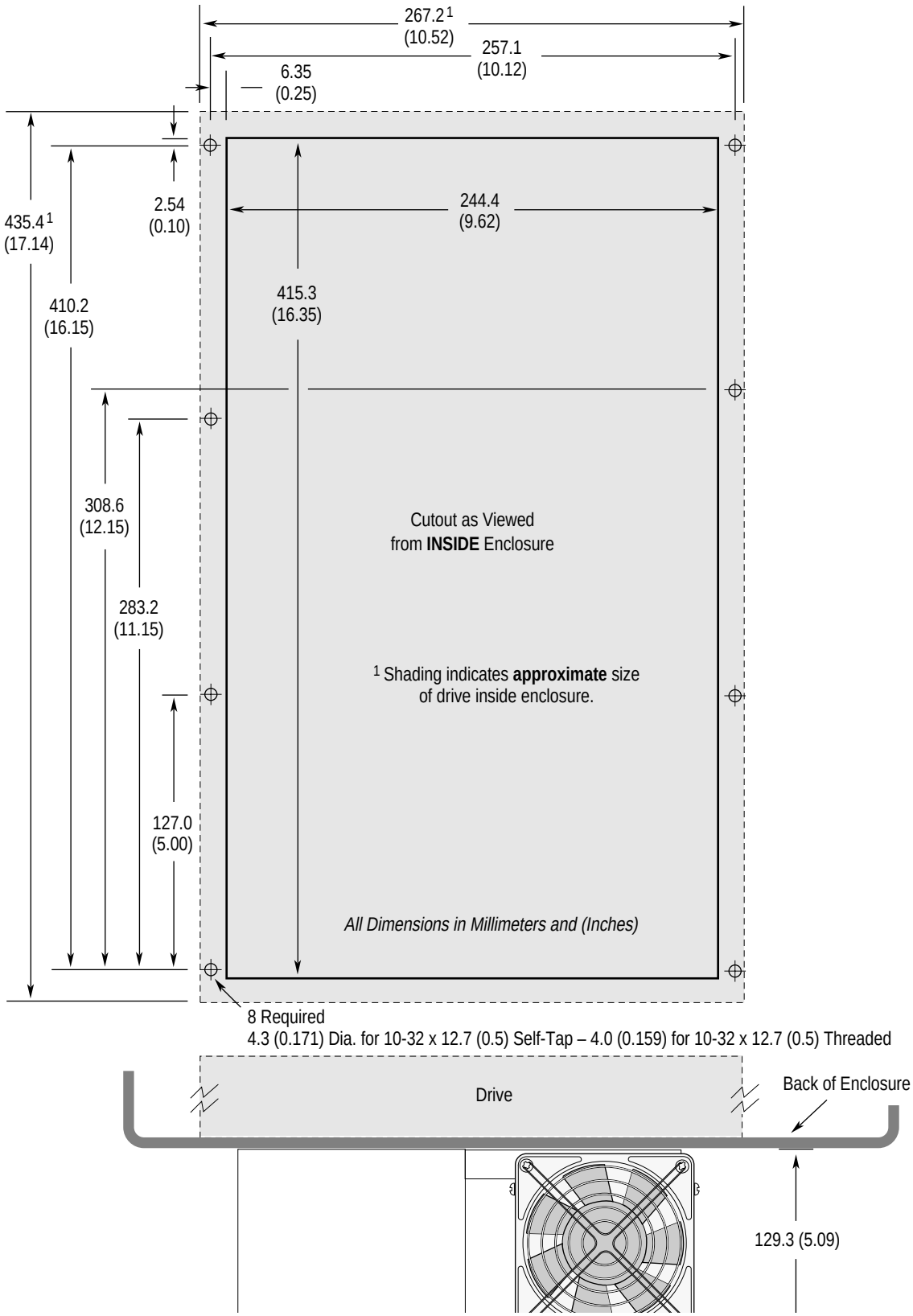


SIDE

All Dimensions in Millimeters and (Inches)

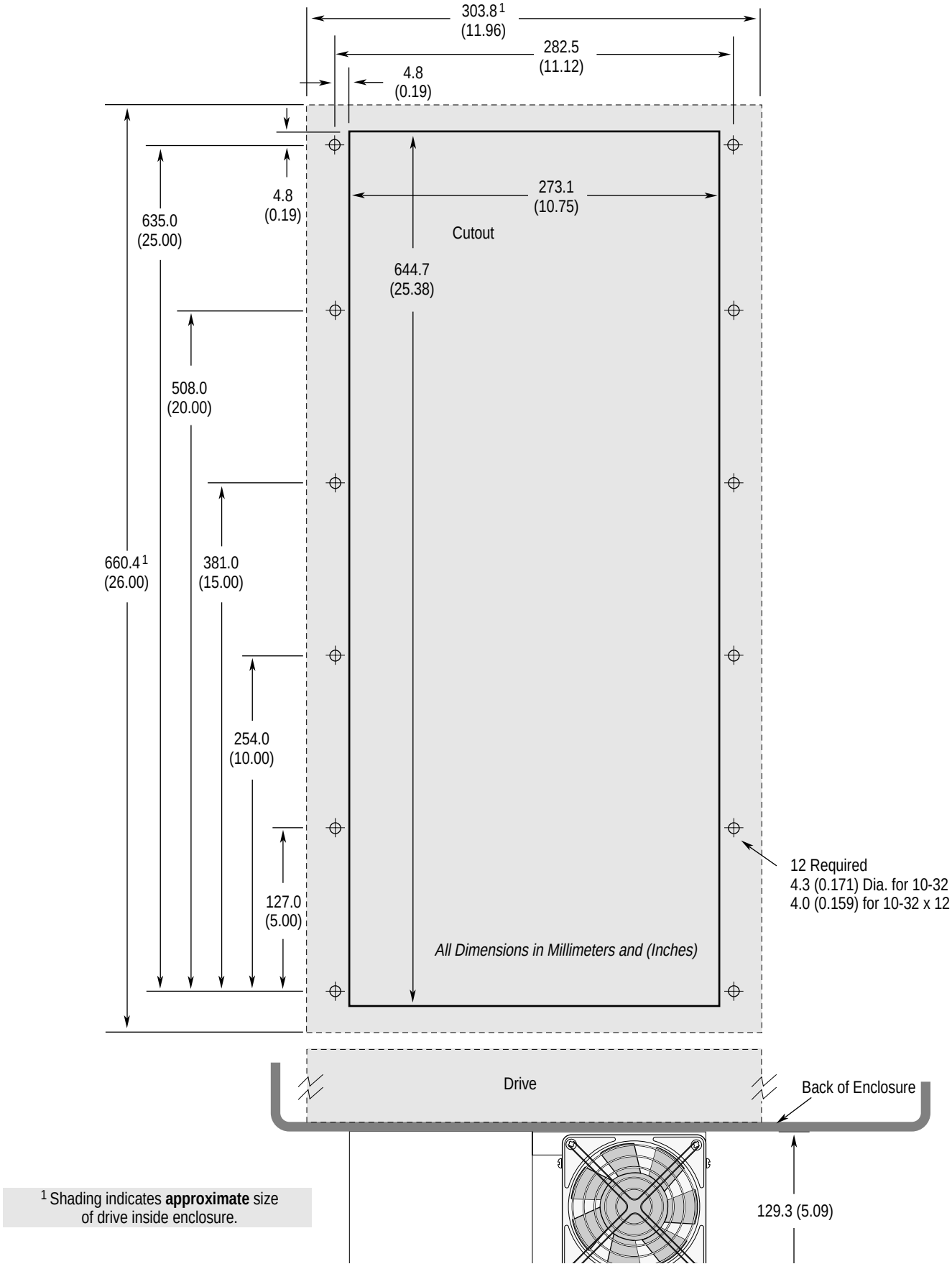
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1336 REGEN B Frame Through-the-Back Heat Sink Mounting



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

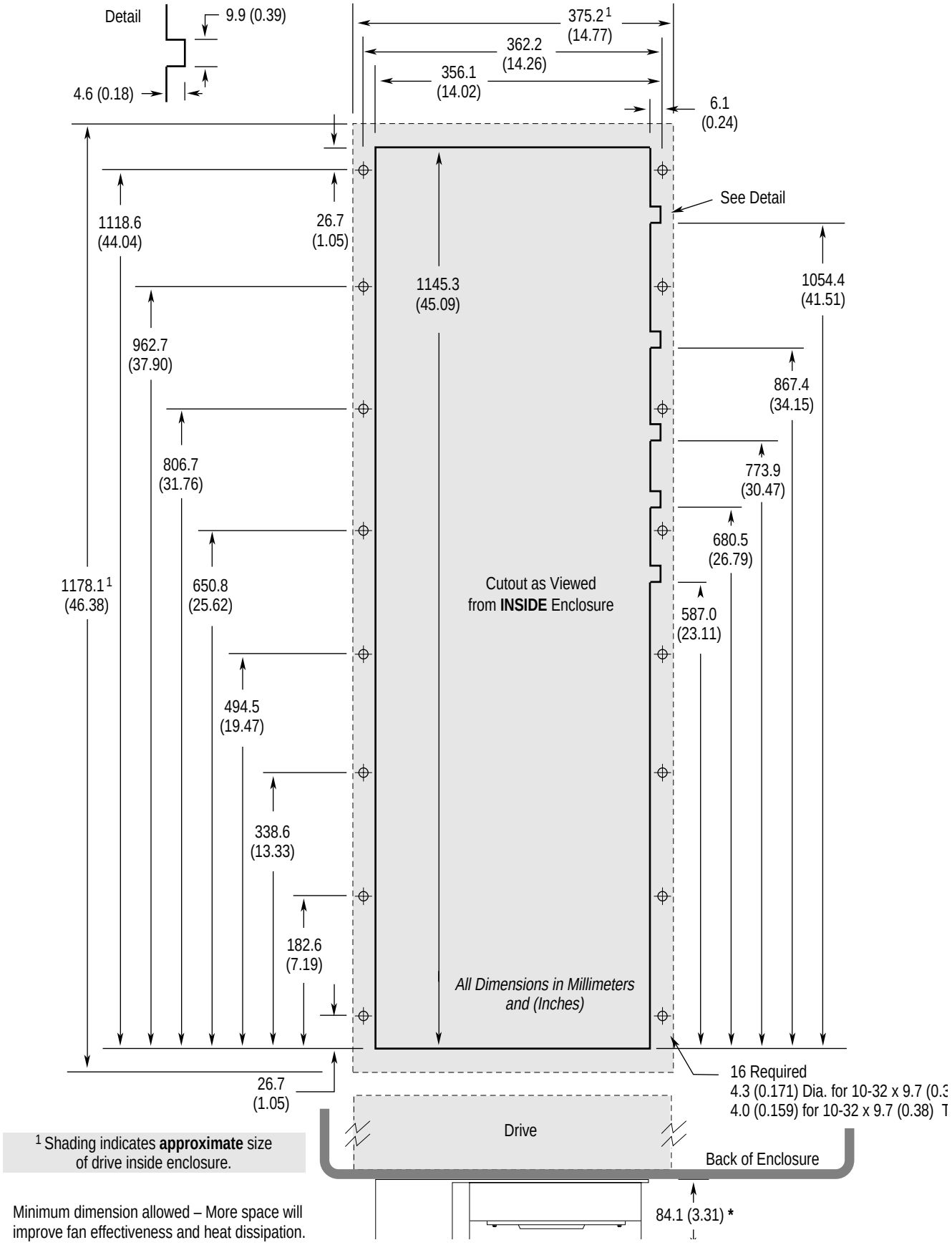
1336 REGEN C Frame Through-the-Back Heat Sink Mounting



[1] Shading indicates **approximate** size of drive inside enclosure.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1336 REGEN D Frame Through-the-Back Heat Sink Mounting



[1] Shading indicates **approximate** size of drive inside enclosure.

Minimum dimension allowed – More space will improve fan effectiveness and heat dissipation.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

End of Appendix

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Specifications

Appendix B provides specification and supplemental information for the 1336 REGEN Line Regeneration Package. Specifciations apply to both the Regenerative DC Bus Supply and the Regenerative Brake modes of operation unless noted.

Electrical

AC Main Supply and Auxiliary Voltage

380-480V AC, 3Ø, +10%/–15% Nominal
48-62 Hz

90-115V AC, 1Ø, ±10% Nominal
48-62 Hz

Environmental

Temperature

Ambient Operating Temperature	IP00 (Open) 0-50˚C
	IP20 (NEMA Type 1) 0-40˚C
Storage Temperature	All Ratings -40 to +85˚C

Relative Humidity 5-95% Non-Condensing

Shock and Vibration

Shock	15g Peak for 11mSec. Duration (±1.0mSec.)
Vibration	0.152mm (0.0006 In.) Displacement, 1g Peak

ESD Susceptibility

IP20 (NEMA Type 1) Only	15kV

Agency Certification

U.L. Listed
CSA Certified

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Protection

Regenerative DC Bus Supply Mode Only	380V AC Input	480V AC Input
Bus Overvoltage Trip	670V DC	850V DC
Bus Undervoltage Trip	430V DC	520V DC
Nominal Bus Voltage	610V DC	735V DC

AC Input Overvoltage Trip
Factory Set to +15% of Nominal Line Voltage

Heatsink Over Temperature Trip
100˚C

1336R Converter Overcurrent Trip

Software Overcurrent Limit — Factory Set to 192% of AC Input Current
Hardware Overcurrent Limit — Factory Set to 245% of AC Input Current

Line Transients

Up to 6000 Volts Peak per ANSI C62.41-1991

Control Logic Noise Immunity

Showering Arc Transients Up to 1500 Volts Peak

Power Ride-Thru

6 mSec. at Full Load

Control Logic Ride-Thru

0.5 Sec. Minimum, 2 Sec. Typical

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Heat Dissipation

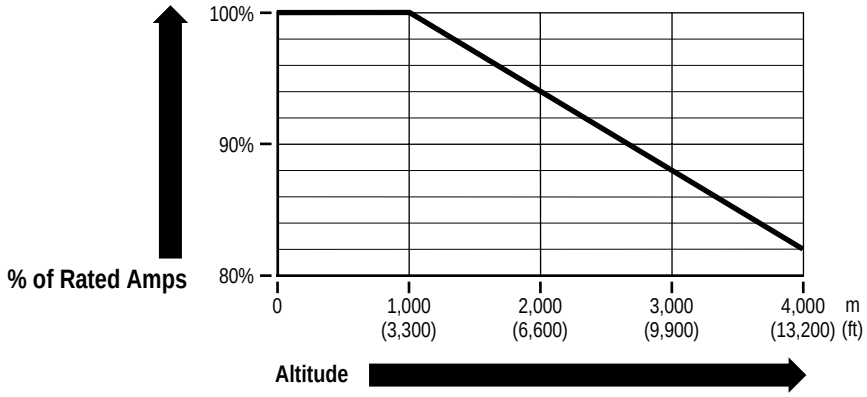
Regenerative DC Bus Supply Operation Only — 380-480V AC Input

1336 REGEN Package Amp Rating	Converter	Converter Heatsink	Precharge Unit	10% Line Reactor	Power Line Filter	Package Total
48A	141W	820W	15W	186W	173W	1335W
78A	193W	1110W	29W	258W	236W	1826W
180A	522W	2664W	58W	474W	317W	4035W

Regenerative Brake Operation Only — 380-480V AC Input

1336 REGEN Package Amp Rating	Converter	Converter Heatsink	Precharge Unit	3% Line Reactor	Package Total
48A	141W	656W	15W	65W	877W
78A	193W	888W	29W	84W	1194W
180A	522W	2131W	58W	168W	2879W

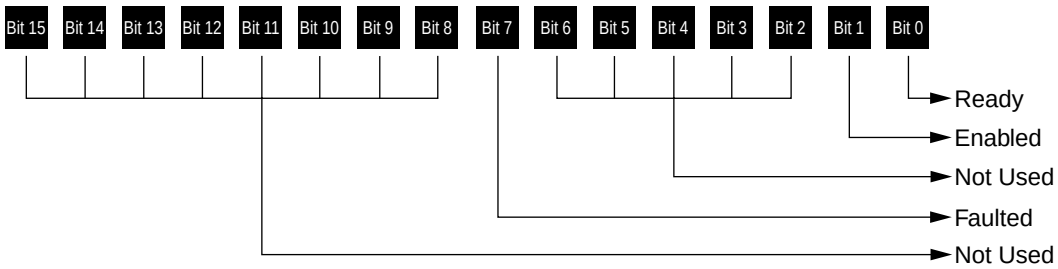
Altitude Derating



Communications Format and Configuration

Logic Status Structure

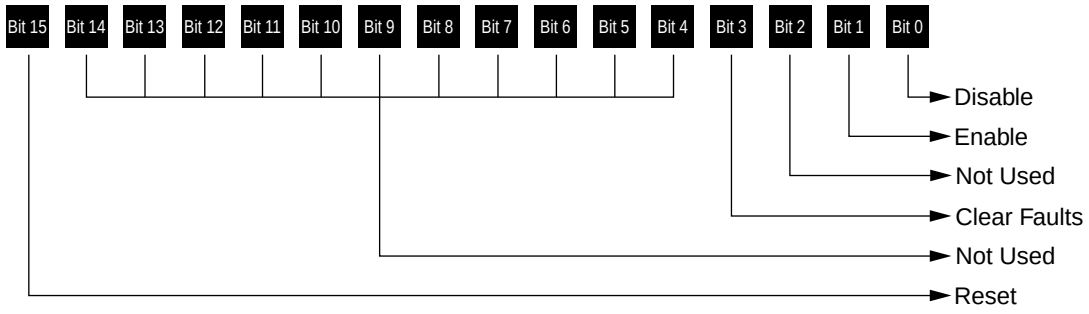
This provides the drive status information that will be sent to the logic controllers input image table when the communication module is set to control converter.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Logic Command Structure

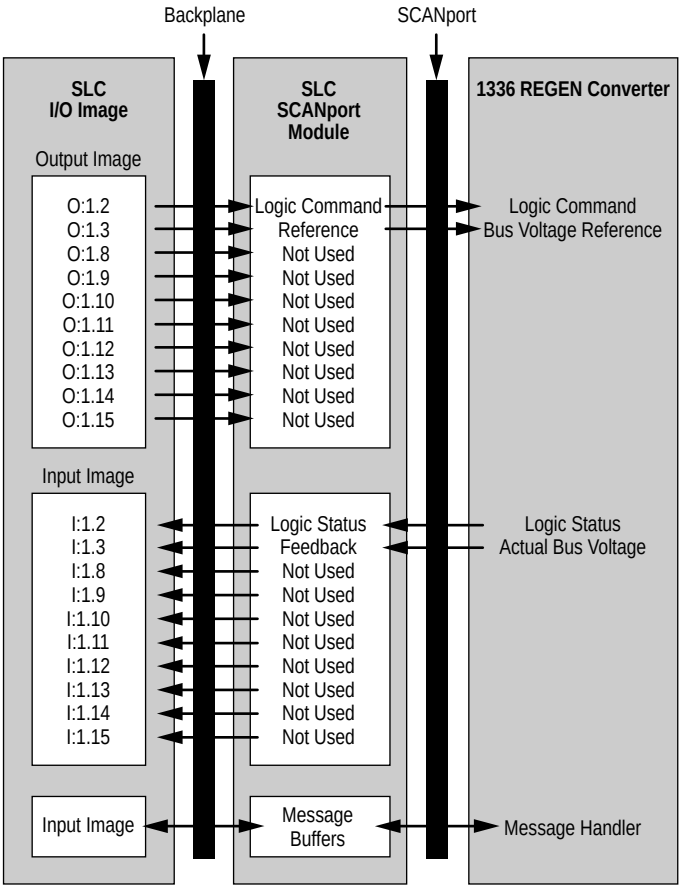
This information provides the control logic information that is sent to the converter through the logic controllers output image table when the Communication Module is set to control the converter.



Typical PLC Communications Configurations

SLC to SCANport Module

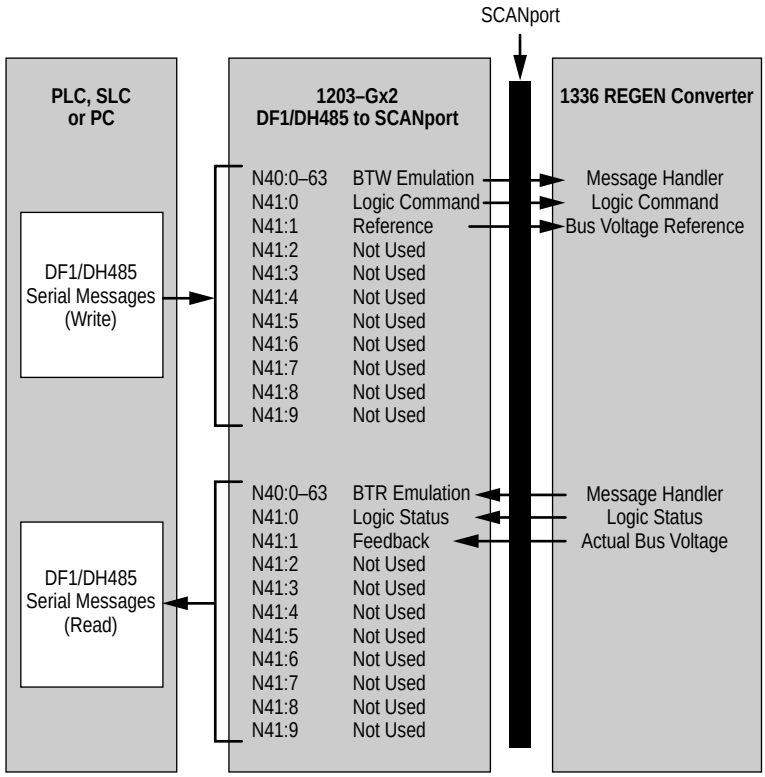
The following fugure shows how the I/O image table for the SLC programmable controller relates to the 1336 REGEN Converter. In this example, the converter is connected to channel 1 of the SLC module in basic mode.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Serial Communications Module

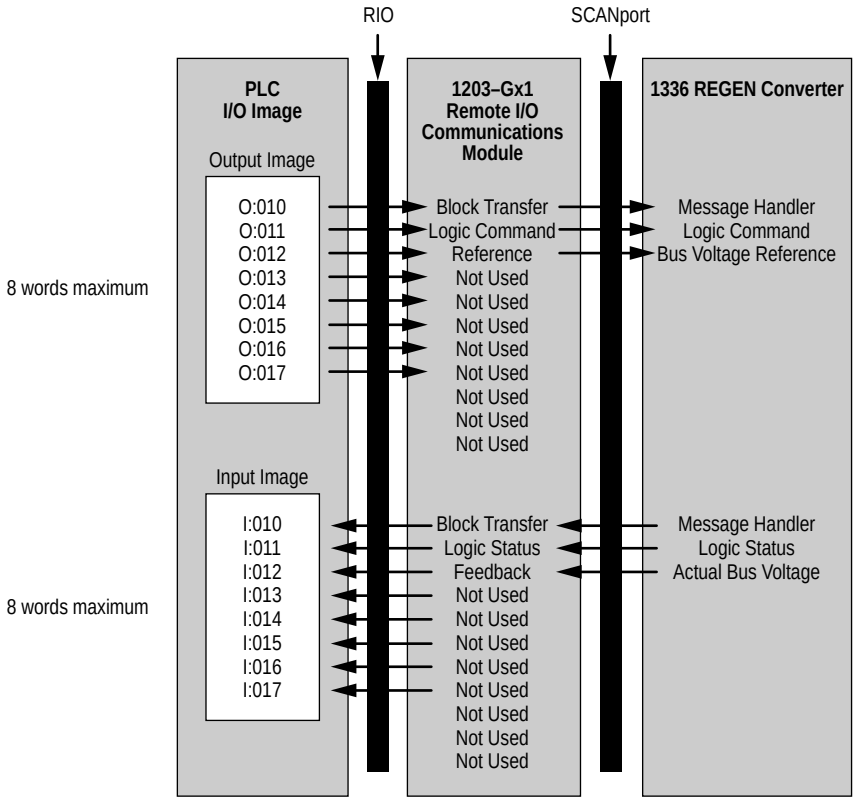
The following fugure shows how the I/O image table for the programmable controller relates to the 1336 REGEN Converter when a Serial Communications Module is used.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

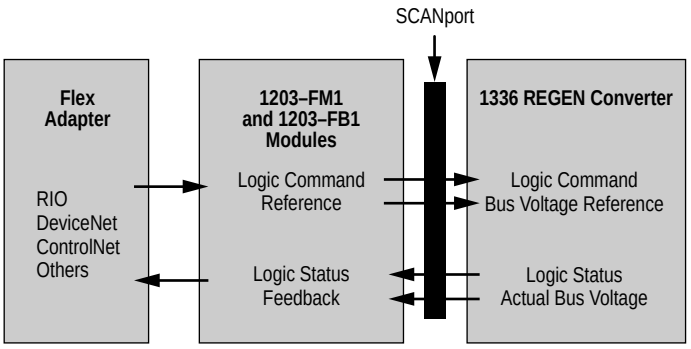
Remote I/O Communications Module

The following fugure shows how the I/O image table for the programmable controller relates to the 1336 REGEN Converter when a Remote I/O Communications Module is used.



Flex I/O Module

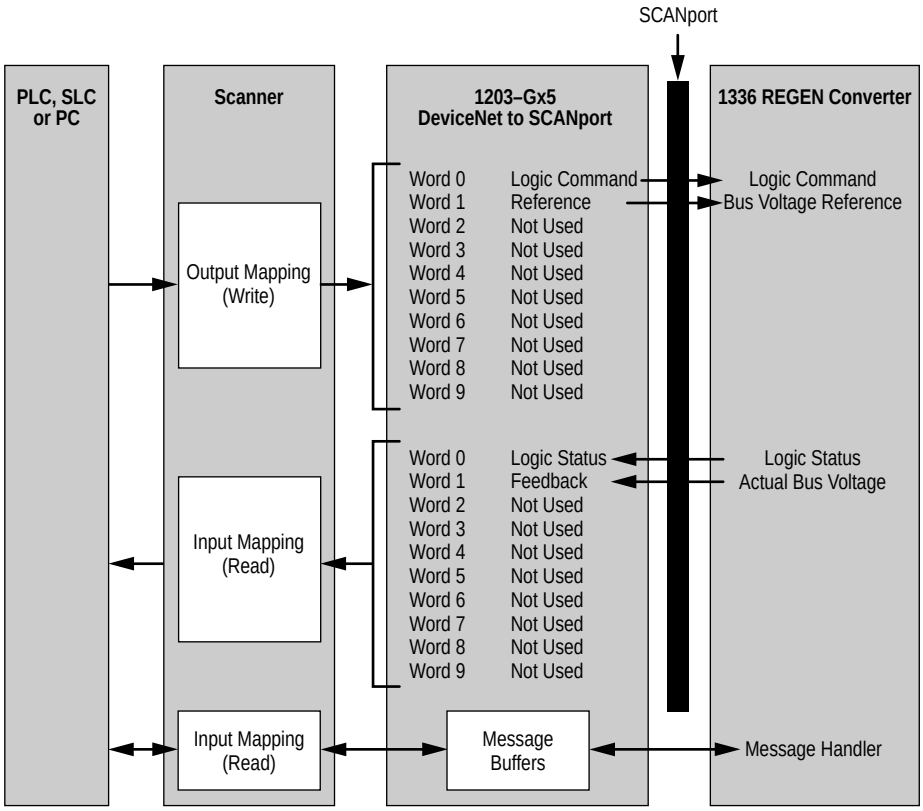
The following fugure shows how the I/O image table for the programmable controller relates to the 1336 REGEN Converter when a Flex I/O Module is used.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

DeviceNet Communications Module

The following fugure shows how the I/O image table for the programmable controller relates to the 1336 REGEN Converter when a Flex I/O Module is used.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

End of Appendix

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Spare Parts Information

1336 REGEN Line Regeneration Package Spare Parts Information

Current 1336 REGEN Line Regeneration Package spare parts information including recommended parts, catalog numbers and pricing can be obtrained from the following sources:

- Allen-Bradley home page on the World Wide Web at:
  http://www.ab.com

  then select . . .
  "Drives" *followed by . . .*
  "Product Information" *and . . .*
  "Service Information . . ."
  Select document **1060.pdf**

- Standard Drives "AutoFax" service — An automated system that you can call to request a "faxed" copy of the spare parts information (or other technical document).

  Simply call **440-646-6701** and follow the phone prompts to request document **1060**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

End of Appendix

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Numbers

120V AC Connection Specifications, **2-14**, **3-19**

120V AC Current Requirements, **2-12**, **3-17**

120V AC D Frame Converter Connections, **2-13**, **3-18**

120V AC Precharge and Converter Wiring, **2-12**, **3-17**

120V AC Precharge Connections, **2-14**, **3-19**

1321 Line Reactor, **1-1**, **1-4**

1336 REGEN Frame Designations, **1-4**

1336 REGEN Line Regeneration Package, **1-1**

1336 REGEN Line Regeneration Package Components, **1-1**

1336 REGEN Operating Mode Application, **1-3**

1336 REGEN Precharge Fusing, **2-4**, **2-5**, **3-9**, **3-10**

1336 REGEN Precharge Unit fuse sizing (Regen DC Bus Supply Mode), **2-4**

1336 REGEN Spare Parts Information

- AutoFax Service, **C-1**
- World Wide Web Home Page, **C-1**

1336 REGEN Specifications

- Altitude Derating, **B-3**
- Electrical, **B-1**
- Environmental, **B-1**
- Heat Dissipation, **B-3**
- Protection, **B-2**

24V DC and 120V AC Circuits, **2-19**, **3-24**

380-480V AC 1321 10% Line Reactor Connections - Regen DC Bus Supply Mode, **2-7**

380-480V AC 1321 3% Line Reactor Connections - Regenerative Brake Operation, **3-12**

380-480V AC B and C Frame Converter Connections, **2-9**, **3-14**

380-480V AC D Frame Converter Connections, **2-10**, **3-15**

380-480V AC Power Connection Specifications, **2-11**, **3-16**

380-480V AC Power Connections, **2-7**, **3-12**

380-480V AC power line filter connections - Regen DC Bus Supply Mode, **2-7**

380-480V AC Precharge Unit Connections, **2-8**, **3-13**

A

abnormally high phase-to-ground voltage, **2-5**, **3-10**

Adapter Definitions, **2-22**

Additional Requirements in Regenerative Brake Sizing, **3-7**

B

basic modes, **1-1**

braking capability, **1-3**

C

Cable Routing, **2-18**, **3-23**

calculating overload current (Regenerative Brake Operation), **3-6**

calculation the peak AC line current (Regenerative Brake Operation), **3-5**

Catalog Number Explanation, **1-4**

certified drawings, **A-1**

Clearing a Fault, **4-1**

combined AC drive/Line Regeneration Package, **1-2**

common bus drive, **1-2**

common DC bus precharge, **1-3**

Control and Signal Wiring, **2-15**, **3-20**

Control and Signal Wiring Converter Control Board Connections, **2-17**, **3-22**

Control and Signal Wiring Precharge Board Connections, **2-16**, **3-21**

Converter, **1-1**

Customer Supplied Fusing, **2-4**, **3-9**

D

determining the peak braking HP (Regenerative Brake Operation), **3-5**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

determining the rated motor torque (Regenerative Brake Operation), **3-4**

determining the required % of braking torque (Regenerative Brake Operation), **3-5**

determining the required braking torque (Regenerative Brake Operation), **3-4**

determining the total inertia (Regenerative Brake Operation), **3-4**

Digital Input Signals, **2-19**, **3-23**

Digital Output Signals, **2-20**, **3-25**

Dimensions & Weights

- 1321 180A 10% Line Reactor, **A-9**
- 1321 180A 3% Line Reactor, **A-7**
- 1321 48 and 78A 10% Line Reactor, **A-8**
- 1321 48 and 78A 3% Line Reactor, **A-6**
- 1336 REGEN B and C Frame Converter, **A-2**
- 1336 REGEN B and C Frame Precharge Unit, **A-4**
- 1336 REGEN D Frame Converter, **A-3**
- 1336 REGEN D Frame Precharge Unit, **A-5**

Display Units Definition, **2-28**, **3-33**

Drive Units Definition, **2-28**, **3-33**

E

Enable, **2-20**, **3-25**, **3-27**, **3-28**

External Fault, **2-20**, **3-25**

External Reset, **2-20**, **3-25**

F

Factory Default Definition, **2-28**, **3-33**

Faults

- Bus Over Volt HW - Fault Code No. 1, **4-2**
- Bus Over Volt SW - Code No. 4, **4-2**
- Bus Under Volts - Fault Code No. 9, **4-3**
- C Verify Time Out - Fault Code No. 18, **4-4**
- Clear Faults - Fault Code No. 43, **4-5**
- Contactor Out - Fault Code No. 10, **4-3**
- Diff Drv Type - Fault Code No. 33, **4-4**
- Diff SW Version - Fault Code No. 32, **4-4**
- EE Checksum - Fault Code No. 39, **4-5**
- Excess Cur Offst - Fault Code No. 19, **4-4**
- External Fault - Fault Code No. 11, **4-3**
- Host/DSP Com Err - Fault Code No. 37, **4-5**
- Illegal Drv Type - Fault Code No. 34, **4-5**
- Illegal Drv. Type - Fault Code No. 20, **4-4**
- IOC HW - Fault Code No. 2, **4-2**
- IOC SW - Fault Code No. 5, **4-2**
- IT Fault - Fault Code No. 7, **4-2**
- Line Over Volts1 - Fault Code No. 12, **4-3**
- Line Over Volts1 - Fault Code No. 14, **4-3**
- Line Under Volts1 - Fault Code No. 13, **4-3**
- Line Under Volts2 - Fault Code No. 15, **4-3**
- No Entry - Fault Code No. 42, **4-5**
- NTC In Discon. - Fault Code No. 21, **4-4**
- Open Fuse - Fault Code No. 16, **4-3**
- Over Temperature - Fault Code No. 8, **4-3**
- Phase Mismatch - Fault Code No. 17, **4-4**
- PLL Fault - Fault Code No. 6, **4-2**
- Pwr Up Marker - Fault Code No. 40, **4-5**
- PwrUp DspCom Err - Fault Code No. 38, **4-5**
- SP1 Timeout - Fault Code No. 48, **4-6**
- SP2 Timeout - Fault Code No. 49, **4-6**
- SW Malfunction - Fault Code No. 35, **4-5**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Sys. Mode Change - Fault Code No. 50, **4-6**

Unknown Error - Fault Code No. 41, **4-5**

Fixed Bus Voltage Operation, **2-27**

G

Grounding, **2-6**, **3-11**

H

Heatsink Through-the-Back Mounting

1336 REGEN B Frame, **A-10**

1336 REGEN C Frame, **A-11**

1336 REGEN D Frame, **A-12**

HIM Description, **2-23**

HIM Enter Button, **2-23**, **3-28**, **3-29**

HIM ESCape Button, **2-23**, **3-28**

HIM Increment/Decrement Button, **2-23**, **3-28**

HIM Operation, **2-23**, **3-28**

HIM Removal, **2-23**, **3-28**

HIM SELect Button, **2-23**, **3-28**

HIM Startup Programming, **2-24**

Human Interface Module, **2-23**

I

input amp rating (Regen DC Bus Supply Mode), **2-3**

input power conditioning, **2-3**, **3-8**

isolation transformers, **2-5**, **3-10**

L

LED Status Indication

Com - DS4, **4-1**

Enable - DS2, **4-1**

Fault - DS1, **4-1**

Status - DS3, **4-1**

line regeneration, **1-1**

M

maximum deceleration times for regenerative brake operation, **3-8**

Min/Max Value Definition, **2-28**, **3-33**

motoring power, **1-2**

N

nameplate location (1321 10% Line Reactor), **1-9**

nameplate location (1321 3% Line Reactor), **1-8**

nameplate location (B and C Frame Converter), **1-5**

nameplate location (B, C and D Frame Precharge Units), **1-7**

nameplate location (D Frame Converter), **1-6**

O

operating mode choice, **1-2**

Operational Mode Factory Setting (Regen DC Bus Supply Mode), **2-25**

P

Parameter No. Definition, **2-28**, **3-33**

Parameter Type Definition, **2-28**, **3-33**

Parameters

AC Line Current - Par. No. 3, **2-29**, **3-34**

AC Line Overvoltage Trip Level 1 (Not Enabled) - Par. No. 18, **2-32**, **3-37**

AC Line Overvoltage Trip Level 2 (Enabled) - Par. No. 19, **2-32**, **3-37**

AC Line Undervoltage Trip Level 1 (Not Enabled) - Par. No. 20, **2-33**, **3-38**

AC Line Undervoltage Trip Level 2 (Enabled) - Par. No. 21, **2-33**, **3-38**

Actual Bus Voltage - Par. No. 5, **2-30**, **3-35**

Bus Overvoltage Trip Level - Par. No. 16, **2-32**, **3-37**

Conduction Angle Constant - Par. No. 9 - Regen Brake Operation Only, **3-35**

Current Command Being Issued - Par. No. 25, **2-34**, **3-39**

DC Bus Undervoltage Trip Level - Par. No. 17, **2-32**, **3-37**

Fault Select 1 - Par. No. 27, **2-35**, **3-40**

HIM Default Display Parameter - Par. No. 28, **2-35**, **3-40**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Instantaneous Overcurrent Trip Filter Constant - Par. No. 11 - Regen Brake Operation Only, **3-36**

Instantaneous Overcurrent Trip Level - Par. No. 14, **2-31**, **3-36**

Integral Gain - Par. No. 8 - Regen DC Bus Supply Operation Only, **2-30**

Logic Status - Par. No. 26, **2-34**, **3-39**

Motoring Current Limit - Par. No. 12 - Regen DC Bus Supply Operation Only, **2-31**

Operational Mode - Par. No. 1, **2-29**, **3-34**

Peak Load - Par. No. 4, **2-29**, **3-34**

Phase Locked Loop Error Trip Point - Par. No. 22, **2-33**, **3-38**

Port Enabled Mask - Par. No. 23, **2-34**, **3-39**

Proportional Gain - Par. No. 7 - Regen DC Bus Supply Operation Only, **2-30**

Rated AC Line Current Par. No. 2, **2-29**, **3-34**

Regen Current Limit - Par. No. 13, **2-31**, **3-36**

Shift Angle Constant - Par. No. 10 - Regen Brake Operation Only, **3-35**

Start/Stop Owner - Par. No. 24, **2-34**, **3-39**

Voltage Feedback Filter Bandwidth - Par. No. 15, **2-31**, **3-36**

Voltage Reference - Par. No. 6 - Regen DC Bus Supply Operation Only, **2-30**

Parameters Operational Mode, **2-29**, **3-34**

PE (Power Earth) Termination, **2-6**, **3-11**

peak power requirements, **1-2**

phase-to-ground protection, **2-5**, **3-10**

phase-to-phase protection, **2-5**, **3-10**

power line filter, **1-1**

Precharge Unit, **1-1**

Programming Conventions, **2-28**, **3-33**

Programming Overview, **2-28**, **3-33**

R

regenerative brake configuration requirements, **3-4**

Regenerative Brake Layout, **3-2**

Regenerative Brake Mode - required information, **3-4**

Regenerative Brake Operation, **3-1**

Regenerative Brake Sizing (steps), **3-4**

Regenerative Brake Startup - Initial Operation, **3-30**

Regenerative DC Bus Supply Layout, **2-2**

Regenerative DC Bus Supply Mode, **1-2**

Regenerative DC Bus Supply Sizing (steps), **2-3**

Regenerative DC Bus Supply Startup - Initial Operation, **2-26**

regenerative power, **1-2**

Regenerative DC Bus Supply Operation, **2-1**

S

Sensitive Circuits, **2-6**, **3-11**

Sync Cable, **2-15**, **3-20**

Sync Cable (Regen DC Bus Supply), **2-15**, **3-20**

system ground, **2-6**, **3-11**

T

TE (True Earth) Termination, **2-6**, **3-11**

total drive power (Regen DC BUS Supply Mode), **2-3**

U

Ungrounded Distribution Systems, **2-3**, **2-5**, **3-8**, **3-10**

V

Variable Bus Voltage Operation, **2-27**

viewing parameters, **2-27**, **3-32**

voltage surge protection, **2-5**, **3-10**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Reach us now at www.rockwellautomation.com

Wherever you need us, Rockwell Automation brings together leading brands in industrial automation including Allen-Bradley controls, Reliance Electric power transmission products, Dodge mechanical power transmission components, and Rockwell Software. Rockwell Automation's unique, flexible approach to helping customers achieve a competitive advantage is supported by thousands of authorized partners, distributors and system integrators around the world.



Americas Headquarters, 1201 South Second Street, Milwaukee, WI 53204, USA, Tel: (1) 414 382-2000, Fax: (1) 414 382-4444
European Headquarters SA/NV, avenue Herrmann Debroux, 46, 1160 Brussels, Belgium, Tel: (32) 2 663 06 00, Fax: (32) 2 663 06 40
Asia Pacific Headquarters, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Allen-Bradley
RELIANCE ELECTRIC
DODGE
ROCKWELL SOFTWARE
Rockwell Automation

Publication 1336 REGEN-5.0 — August, 1999
Supersedes June, 1998
P/N 164968 (04)
Copyright 1999 Rockwell International Corporation. Printed in USA

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP