Model M3345D

Diode Sharing Module

Customer Reference Manual

Web: www.bonitron.com • Tel: 615-244-2825 • Email: info@bonitron.com

Bonitron, Inc.
Nashville, TN

An industry leader in providing solutions for AC drives.

ABOUT BONITRON

Bonitron designs and manufactures quality industrial electronics that improve the reliability of processes and variable frequency drives worldwide. With products in numerous industries, and an educated and experienced team of engineers, Bonitron has seen thousands of products engineered since 1962 and welcomes custom applications.

With engineering, production, and testing all in the same facility, Bonitron is able to ensure its products are of the utmost quality and ready to be applied to your application.

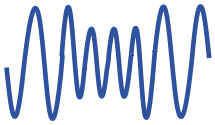
The Bonitron engineering team has the background and expertise necessary to design, develop, and manufacture the quality industrial electronic systems demanded in today's market. A strong academic background supported by continuing education is complemented by many years of hands-on field experience. A clear advantage Bonitron has over many competitors is combined on-site engineering labs and manufacturing facilities, which allows the engineering team to have immediate access to testing and manufacturing. This not only saves time during prototype development, but also is essential to providing only the highest quality products.

The sales and marketing teams work closely with engineering to provide up-to-date information and provide remarkable customer support to make sure you receive the best solution for your application. Thanks to this combination of quality products and superior customer support, Bonitron has products installed in critical applications worldwide.

AC Drive Options

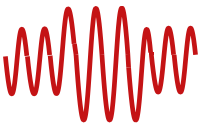
In 1975, Bonitron began working with AC inverter drive specialists at synthetic fiber plants to develop speed control systems that could be interfaced with their plant process computers. Ever since, Bonitron has developed AC drive options that solve application issues associated with modern AC variable frequency drives and aid in reducing drive faults. Below is a sampling of Bonitron's current product offering.

World Class Products



Undervoltage Solutions

Uninterruptible Power for Drives
(DC Bus Ride-Thru)
Voltage Regulators
Chargers and Dischargers
Energy Storage



Overvoltage Solutions

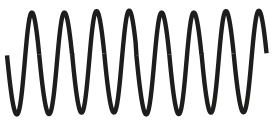
Braking Transistors
Braking Resistors
Transistor/Resistor Combo
Line Regeneration
Dynamic Braking for Servo Drives

Common Bus Solutions

Single Phase Power Supplies
3-Phase Power Supplies
Common Bus Diodes

Portable Maintenance Solutions

Capacitor Formers
Capacitor Testers



Power Quality Solutions

12 and 18 Pulse Kits

Green Solutions

Line Regeneration

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1. INTRODUCTION

1.1. WHO SHOULD USE

This manual is intended for use by anyone who is responsible for integrating, installing, maintaining, troubleshooting, or using this equipment.

Please keep this manual for future reference.

1.2. PURPOSE AND SCOPE

This manual is a user's guide for the Model M3345D Diode Sharing Module. It will provide the user with the necessary information to successfully install, integrate, and use the M3345D module in a variable frequency AC drive system.

In the event of any conflict between this document and any publication and/or documentation related to the AC drive system, the latter shall have precedence.

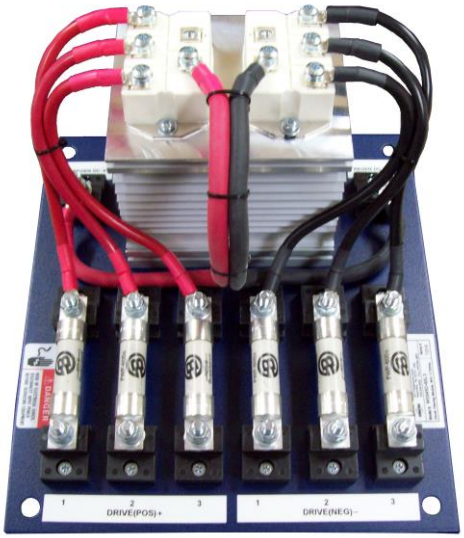
1.3. MANUAL VERSION AND CHANGE RECORD

Revisions 02c and 02d have minor format changes. Product data is unchanged.

Update to the manual template in Rev 02e.

Figure 3-1 and Table 6-1 were updated and Section 7.3 was added in Rev 02g.

Figure 1-1: Typical M3345D-90N2



1.4. SYMBOL CONVENTIONS USED IN THIS MANUAL AND ON EQUIPMENT

	Earth Ground or Protective Earth
	AC Voltage
	DC Voltage
 DANGER!	DANGER: Electrical hazard - Identifies a statement that indicates a shock or electrocution hazard that must be avoided.
 DANGER!	DANGER: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.
 CAUTION!	CAUTION: Identifies information about practices or circumstances that can lead to property damage, or economic loss. Attentions help you identify a potential hazard, avoid a hazard, and recognize the consequences.
 CAUTION!	CAUTION: Heat or burn hazard - Identifies a statement regarding heat production or a burn hazard that should be avoided.

2. PRODUCT DESCRIPTION / FEATURES

Bonitron's M3345D Diode Sharing Modules are designed to offer a low cost solution for sharing regeneration or dynamic braking for multiple drives. Traditionally, a common DC bus for the drives and regen modules has required that the drives be connected to a common bus power supply. If the drives are directly connected to the AC line, the parallel input bridges can cause circulating currents. This causes overheating and shortened drive life. The M3345D modules provide blocking diodes that isolate the drives from each other while establishing a shared, common regen bus. This eliminates circulating currents with parallel input bridges.

Please see the Application Notes in Section 7 for additional information.

2.1. RELATED DOCS / PRODUCTS

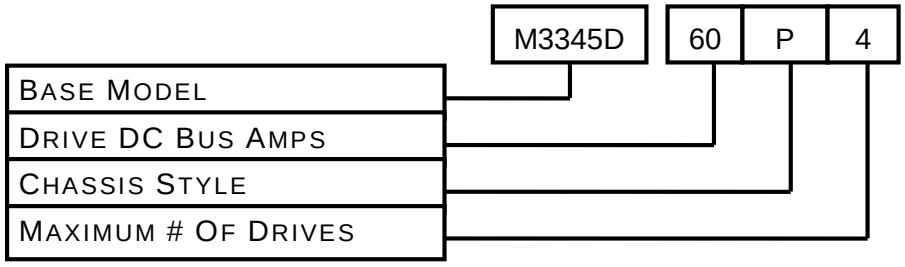
M3345 Line Regen Module

M3345CBM (Common Bus Modules)

M3460D Diode Sharing Modules (Used with Bonitron M3534 and M3460 Ride-Thru Modules)

2.2. PART NUMBER BREAKDOWN

Figure 2-1: Example of M3345D Part Number Breakdown



BASE MODEL NUMBER

The Base Model Number for these Diode Modules is M3345D.

DC BUS AMPS

The DC Bus Amps Rating indicates the current rating of each individual drive.

The DC Bus Amps Rating is entered directly into the part number and will be either 2 or 3 digits.

Table 2-1: DC Bus Amps Codes

RATING CODE	DC BUS AMPS
04	4
10	10
30	30
60	60
90	90
200	200

CHASSIS STYLE

The Chassis Style is determined by the configuration of the module. This is not a selection, but an indicator of the chassis size.

Table 2-2: Chassis Codes

CHX CODE	TYPE AND SIZE (H X W X D)
F	8.0 x 12.5 x 5.5”
H	8.5 x 8.5 x 5.5”
J	8.5 x 15.0 x 5.5”
L	13.0 x 12.0 x 8.0”
N	14.0 x 15.0 x 8.0”
P	15.0 x 24.0 x 8.0”

MAXIMUM # OF DRIVES

The Maximum Number of Drives that can be connected in this configuration.

2.3. GENERAL SPECIFICATIONS

Table 2-3: General Specifications Chart

PARAMETER	SPECIFICATION
Voltage	230VAC, 460VAC, 575VAC *(Please consult with Bonitron regarding special requirements)*
Current	0 – 200ADC
Connections	Drive DC bus DC bus to Regen from Diode Module
Fusing	Individual bus connections DC bus to Regen
Operating Temperature	0°C to +40°C
Storage Temp	-2°C to + 65°C
Humidity	Below 90% non-condensing
Atmosphere	Free of corrosive gas and dust

2.4. General Precautions and Safety Warnings

DANGER!

- **HIGH VOLTAGES MAY BE PRESENT!**
- **NEVER ATTEMPT TO SERVICE THIS PRODUCT WITHOUT FIRST DISCONNECTING POWER TO AND FROM THE UNIT.**
- **ALWAYS ALLOW ADEQUATE TIME FOR RESIDUAL VOLTAGES TO DRAIN BEFORE REMOVING THE ENCLOSURE COVER.**
- **FAILURE TO HEED THESE WARNINGS MAY RESULT IN SERIOUS BODILY INJURY OR DEATH!**

CAUTION!

- **COMPONENTS WITHIN THIS PRODUCT GET HOT DURING OPERATION.**
- **ALWAYS ALLOW AMPLE TIME FOR THE UNIT TO COOL BEFORE ATTEMPTING SERVICE ON THIS PRODUCT.**
- **BEFORE ATTEMPTING INSTALLATION OR REMOVAL OF THIS PRODUCT, BE SURE TO REVIEW ALL DRIVE AND/OR RESISTIVE LOAD DOCUMENTATION FOR PERTINENT SAFETY PRECAUTIONS.**
- **INSTALLATION AND/OR REMOVAL OF THIS PRODUCT SHOULD ONLY BE ACCOMPLISHED BY A QUALIFIED ELECTRICIAN IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE OR EQUIVALENT REGULATIONS.**

ANY QUESTIONS AS TO APPLICATION, INSTALLATION, OR SERVICE SAFETY SHOULD BE DIRECTED TO THE EQUIPMENT SUPPLIER.

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3. INSTALLATION INSTRUCTIONS

3.1. ENVIRONMENT

- All units require adequate protection from the elements. Open frame modules must be mounted within enclosures of suitable rating for the environment.
- Adequate clearance should be allowed for easy access to terminals and adjustments. This will facilitate inspection and maintenance.
- Sufficient circulation of clean, dry air should be provided. Ambient temperatures should not exceed +40°C (+104°F) nor be less than 0°C (+32°F) and non-condensing. Ambient air should not be contaminated with harmful chemical vapors or excessive dust, dirt, or moisture.

3.2. UNPACKING

Upon receipt of this product, please verify that the product received matches the product that was ordered and that there is no obvious physical damage to the unit. If the wrong product was received or the product is damaged in any way, please contact the supplier from which the product was purchased.

3.3. MOUNTING

The modules are intended to be mounted in a protective enclosure. The unit will require a minimum clearance of three (3) inches around it to allow for proper airflow for cooling.

Refer to Section 6 of this manual to determine the correct mounting dimensions and provisions for the unit.

3.4. WIRING AND CUSTOMER CONNECTIONS

3.4.1. POWER WIRING

WARNING!

Only qualified electricians should perform and maintain the interconnection wiring of this product. All wiring should be done in accordance with local codes.

Wire size should be selected in accordance with local codes, according to the current rating of the braking load. In general, the wire type should be selected by the nominal system AC voltage and the current rating of the module.

Table 3-1: Power Wiring Specifications

CHASSIS	TERMINAL	TORQUE
F, H, J	Regen terminal +/-	182 lb-in
	Drive terminal +/-	20 lb-in
L, N, P	Regen terminal +/-	182 lb-in
	Drive terminal +/-	182 lb-in

3.4.1.1. REGEN CONNECTION

The DC bus input should be connected to the DC input of the Regen module.
Make sure that the DC bus connection polarity is correct. Improper polarity connections risk damaging drive equipment if energized.

3.4.1.2. DRIVE CONNECTION

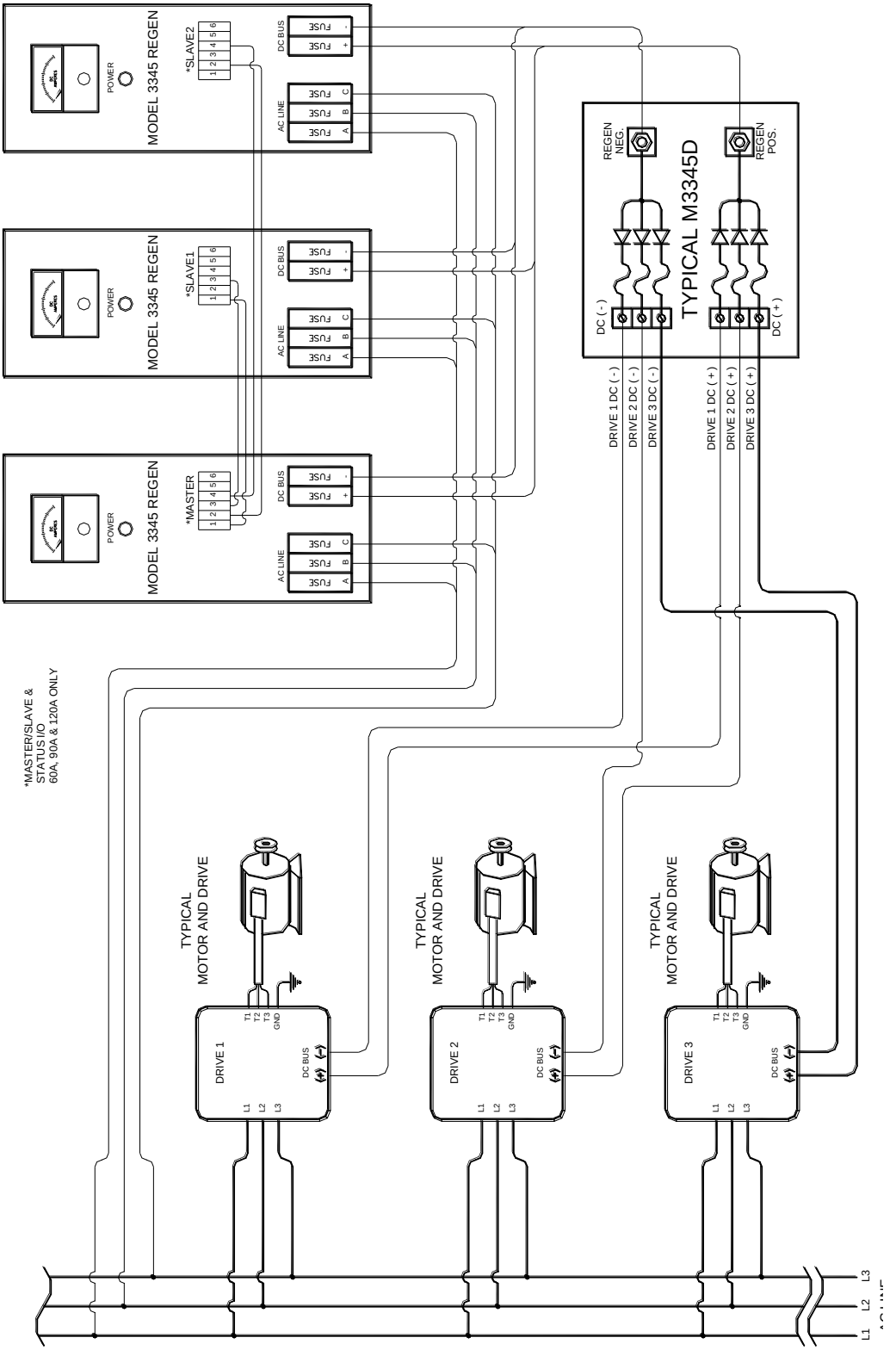
Some drives have a connection to an internal braking transistor. Do **NOT** use this connection. Connect **only** to the DC bus terminals.
Make sure that the DC bus connection polarity is correct. Improper polarity connections risk damaging drive equipment if energized.

3.4.1.3. GROUNDING REQUIREMENTS

All units come equipped with either a ground terminal or ground stud that is connected to the module chassis. Ground the chassis in accordance with local codes. Typically, the wire gauge will be the same as is used to ground the attached drive.

3.5. TYPICAL CONFIGURATIONS

Figure 3-1: Typical Field Wiring



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4. OPERATION

4.1. FUNCTIONAL DESCRIPTION

The Diode Sharing Module isolates the DC bus connections of multiple drives to isolate the AC bridges of the drives. This insures that the input bridges of each drive do not supply power to other drives in the network, or allow circulating currents between drives. These currents can cause bridge overheating and damage to the drives.

4.2. STARTUP

4.2.1. PRE-POWER CHECKS

Insure that all connections are tight, DC bus polarity is correct, and that the drives are connected to the proper terminals. Check for exposed conductors that may lead to inadvertent contact or shorting. Insure that the current rating of the module is suitable for the application.

4.2.2. STARTUP PROCEDURE AND CHECKS

- Check each drive + and – connection, and make sure they are correct.
- Cross connection of the drive buses can cause catastrophic damage to the drives or the Ride-Thru Module.
- Make sure the incoming line voltage is within tolerance of the drive system and the M3345 Diode Sharing Module.
- Apply power to the drive system.

4.3. OPERATIONAL ADJUSTMENTS

There are no adjustments necessary to these modules.

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5. MAINTENANCE AND TROUBLESHOOTING

Repairs or modifications to this equipment are to be performed by Bonitron approved personnel only. Any repair or modification to this equipment by personnel not approved by Bonitron will void any warranty remaining on this unit.

5.1. TROUBLESHOOTING

5.1.1. DRIVE WILL NOT PRECHARGE

Verify that the DC bus connections on the drive and on the M3345D DC bus terminals.

5.1.2. CIRCULATING CURRENTS BETWEEN DRIVES

Make sure the connections are correct between the drives and the Common Bus Module.

5.1.3. HEATSINK GETS EXCESSIVELY HOT

Make sure that the connections are correct. Heat can be caused by circulating currents between the drives.

5.1.4. DRIVE VOLTAGE TOO HIGH OR DRIVE TRIPS ON OVER-VOLTAGE

- Make sure that the fuses are not blown. Check voltage across the M3345D fuses and replace fuses if voltage is >1V.
- Check blocking diodes for failure.
- Verify that voltage is 0.5 - 2V across the M3345 diode which should be regenerating energy.

5.1.5. DRIVE OVERVOLTAGE ON ONE DRIVE BUT NOT ON ANOTHER DRIVE

Check the fuses on the M3345D. A blown fuse will not let the drive

5.1.6. OVERHEATING

Check that if the unit has a fan that it is working properly. If there is any debris or object blocking the fan clear this immediately.
Check the heatsink, diodes, and fuses for being covered if they are covered in dust or dirt. If the unit is dirty wipe it down thoroughly.

5.2. TECHNICAL HELP – BEFORE YOU CALL

If possible, please have the following information when calling for technical help:

- Serial number of unit
- Name of original equipment supplier
- Brief description of the application
- Drive and motor hp or kW
- The line to line voltage on all 3 phases
- The DC bus voltage
- kVA rating of power source
- Source configuration Wye/Delta and grounding

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6. ENGINEERING DATA

6.1. RATINGS CHARTS

Table 6-1: M3345D Diode Module Load Ratings

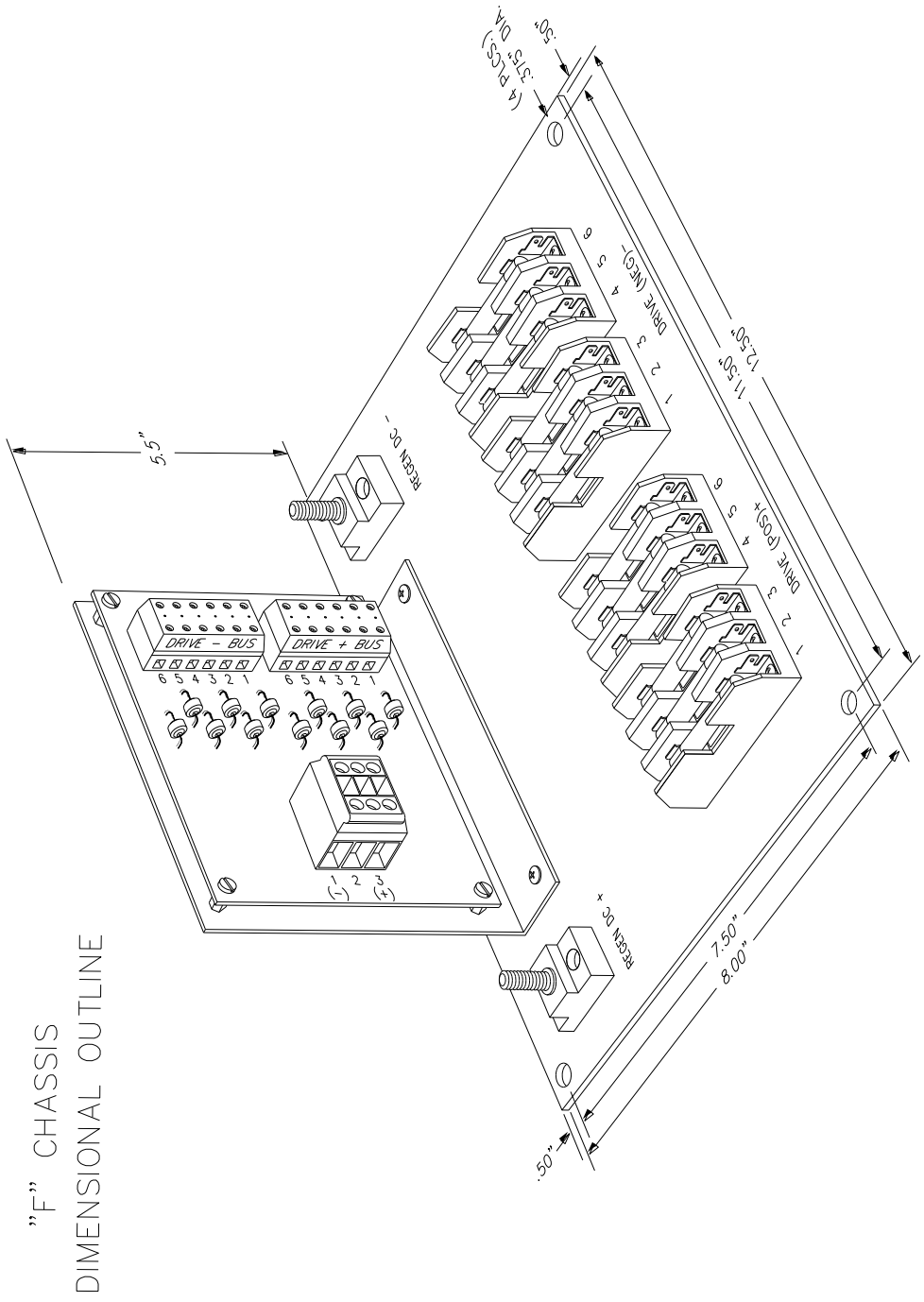
PART NUMBER	NUMBER OF DRIVES	NOMINAL HP			TOTAL DRIVE BUS CURRENT	M3345D CONT. OUTPUT CURRENT	M3345D PEAK OUTPUT CURRENT
		230V	460V	575V			
M3345D-04F6	6	1.5 hp	3 hp	4 hp	4 A	20 A	24 A
M3345D-10H3	3	3 hp	5 hp	6 hp	10 A	30 A	30 A
M3345D-10J6	6	3 hp	5h p	6 hp	10 A	30 A	60 A
M3345D-30H3	3	10 hp	20 hp	25 hp	30 A	30 A	90 A
M3345D-30J6	6	10 hp	20 hp	25 hp	30 A	30 A	180 A
M3345D-60L2	2	20 hp	40 hp	50 hp	60 A	50 A	120 A
M3345D-60L3	3	20 hp	40 hp	50 hp	60 A	50 A	180 A
M3345D-60P4	4	20 hp	40 hp	50 hp	60 A	100 A	240 A
M3345D-60P6	6	20 hp	40 hp	50 hp	60 A	100 A	360 A
M3345D-90N2	2	30 hp	60 hp	75 hp	90 A	100 A	180 A
M3345D-90N3	3	30 hp	60 hp	75 hp	90 A	100 A	270 A
M3345D-200P2	2	100 hp	200 hp	250 hp	200 A	200 A	400 A

Table 6-2: M3345D Diode Module Fuses and Watt Loss

PART NUMBER	BUS FUSE	WATT LOSS
M3345D-04F6	ATM-4	56W
M3345D-10H3	ATM-10	84W
M3345D-10J6	ATM-10	84W
M3345D-30H3	A60Q30	84W
M3345D-30J6	ATM-30	84W
M3345D-60L2	FWP-60	140W
M3345D-60L3	FWP-60	140W
M3345D-60P4	FWP-60	280W
M3345D-60P6	FWP-60	280W
M3345D-90N2	FWP-100	280W
M3345D-90N3	FWP-100	280W
M3345D-200P2	FWP-200	560W

6.2. DIMENSIONS AND MECHANICAL DRAWINGS

Figure 6-1: Typical "F" Chassis



"F" CHASSIS
DIMENSIONAL OUTLINE

Figure 6-2: Typical "H" Chassis

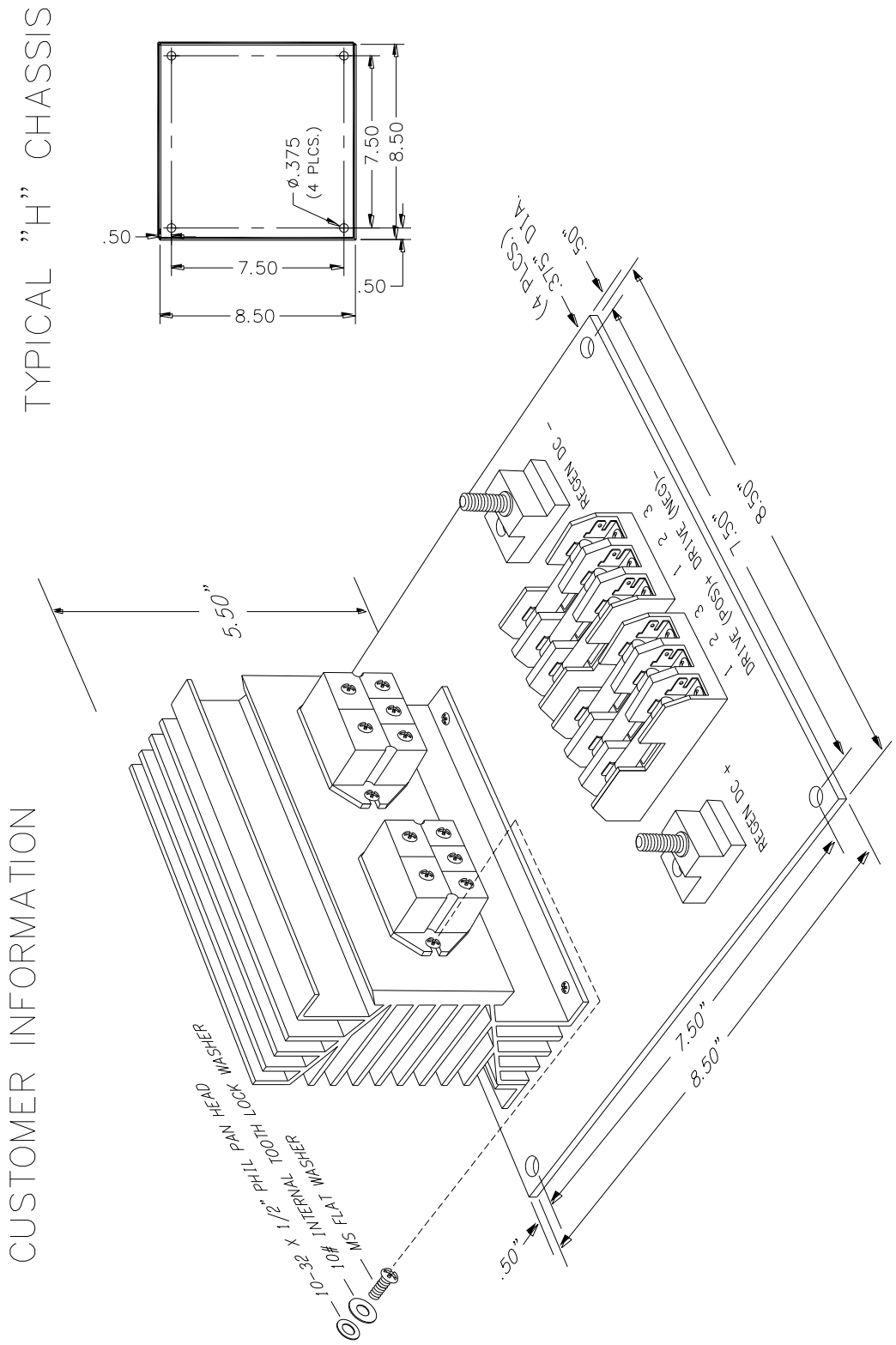


Figure 6-3: Typical "J" Chassis

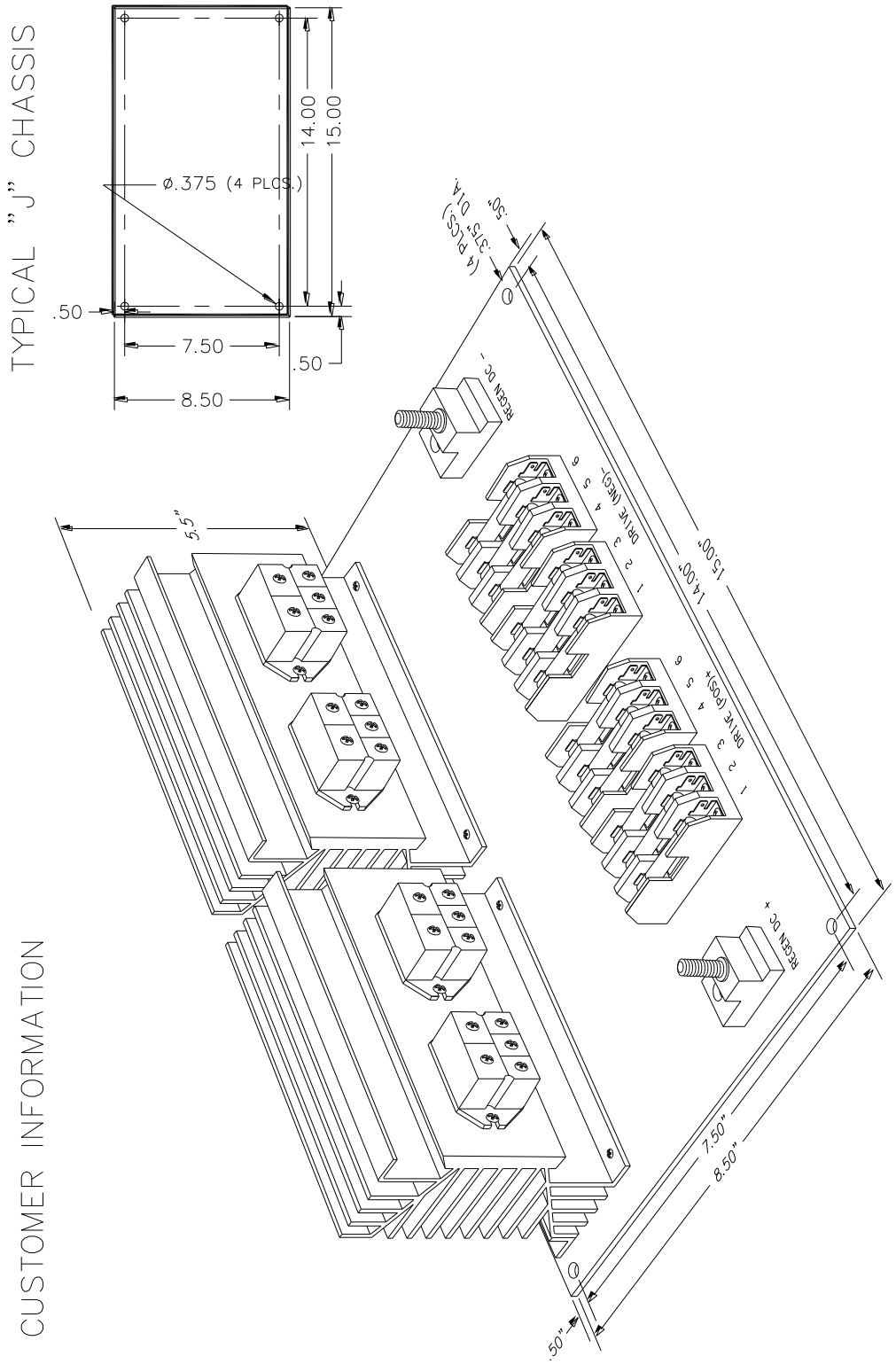


Figure 6-4: Typical "L" Chassis

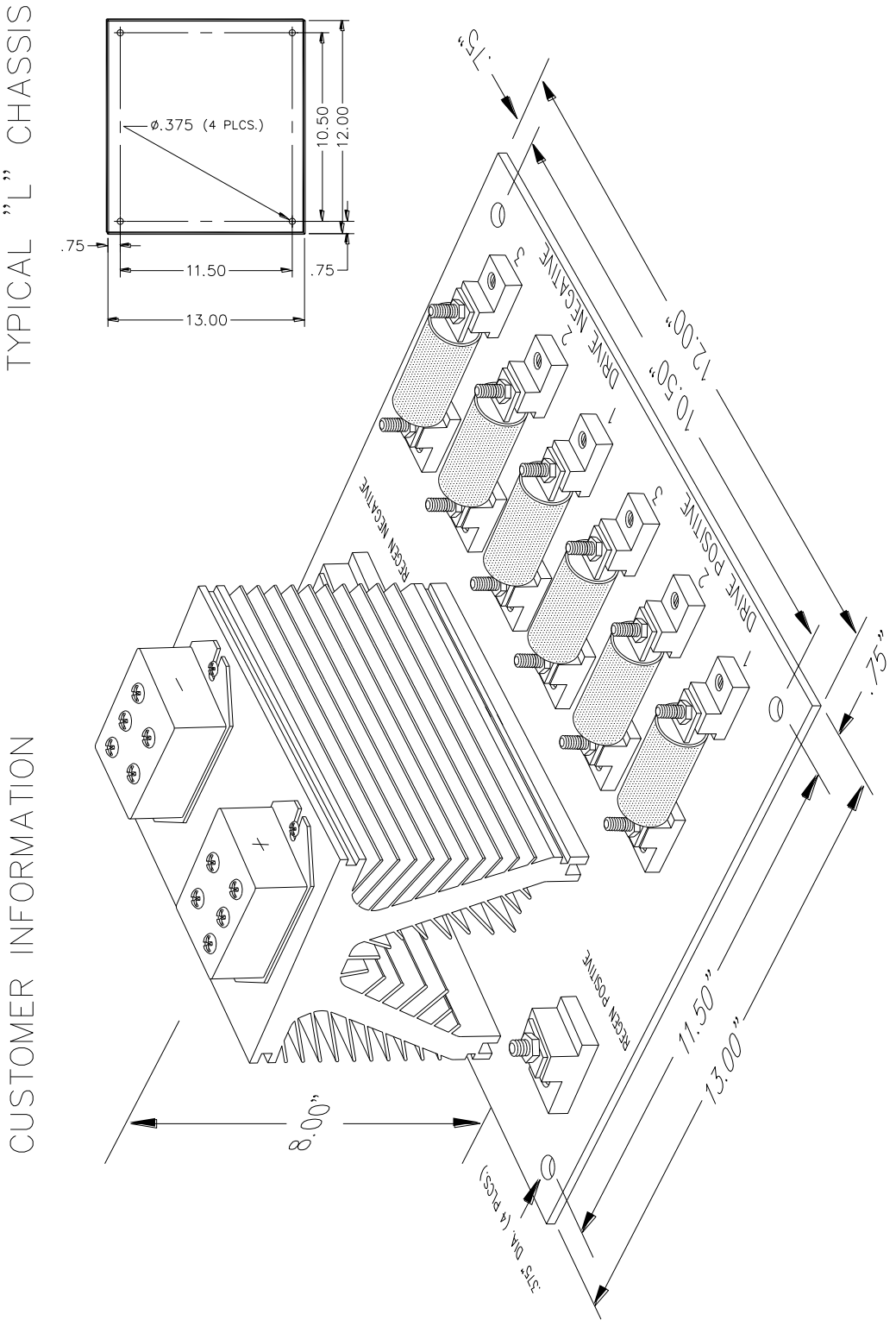


Figure 6-5: Typical "N" Chassis

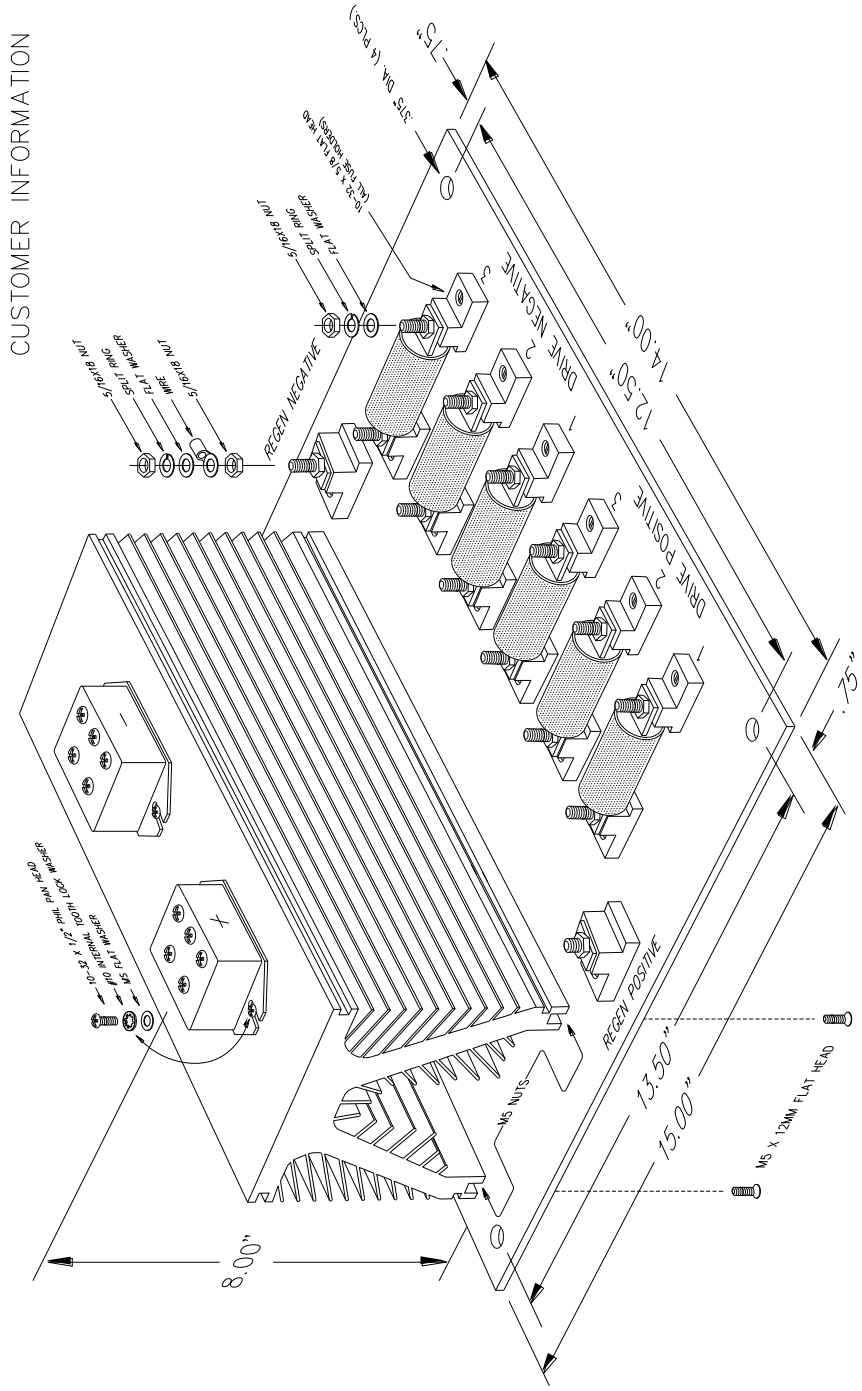


Figure 6-6: Typical "P" Chassis

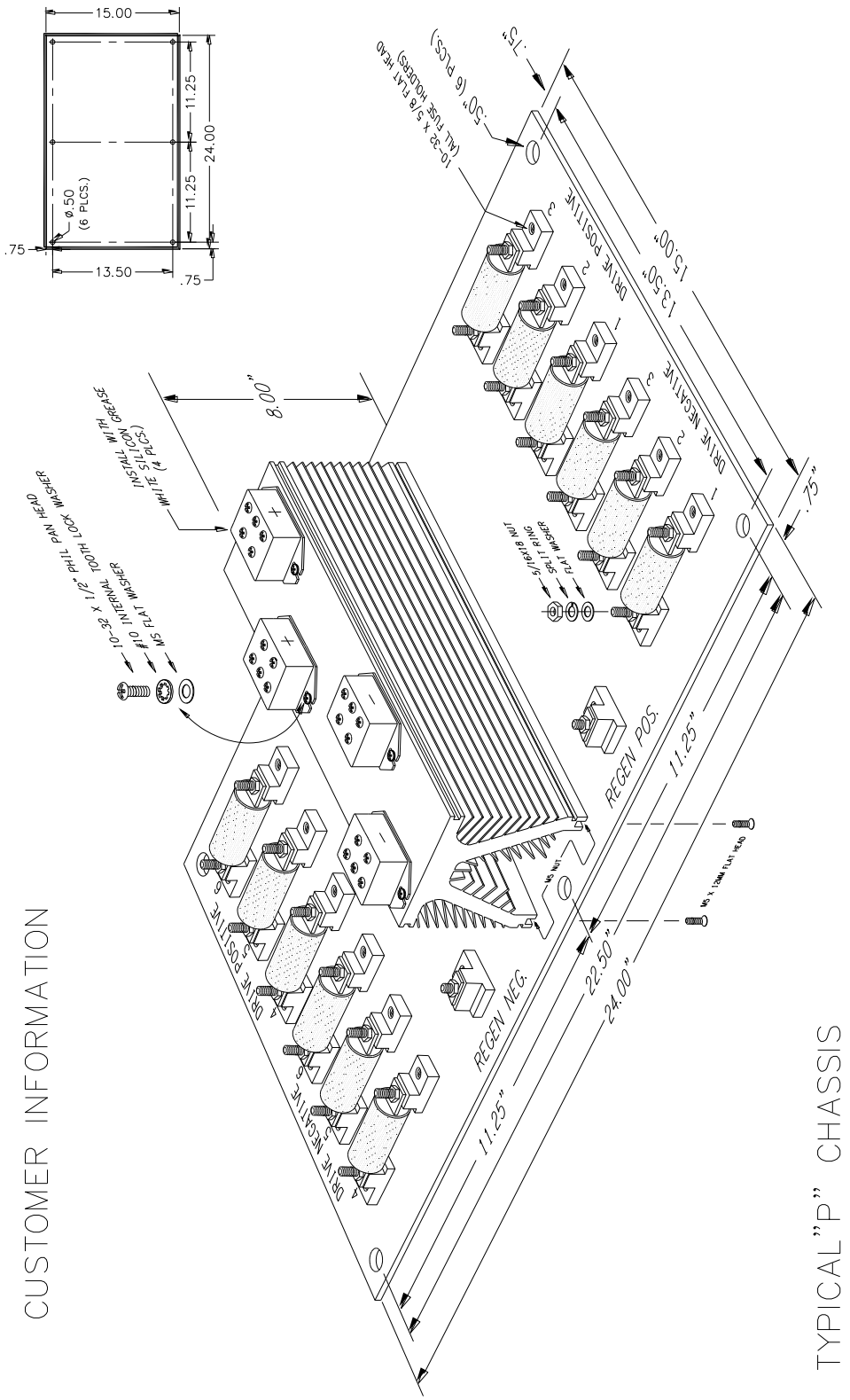
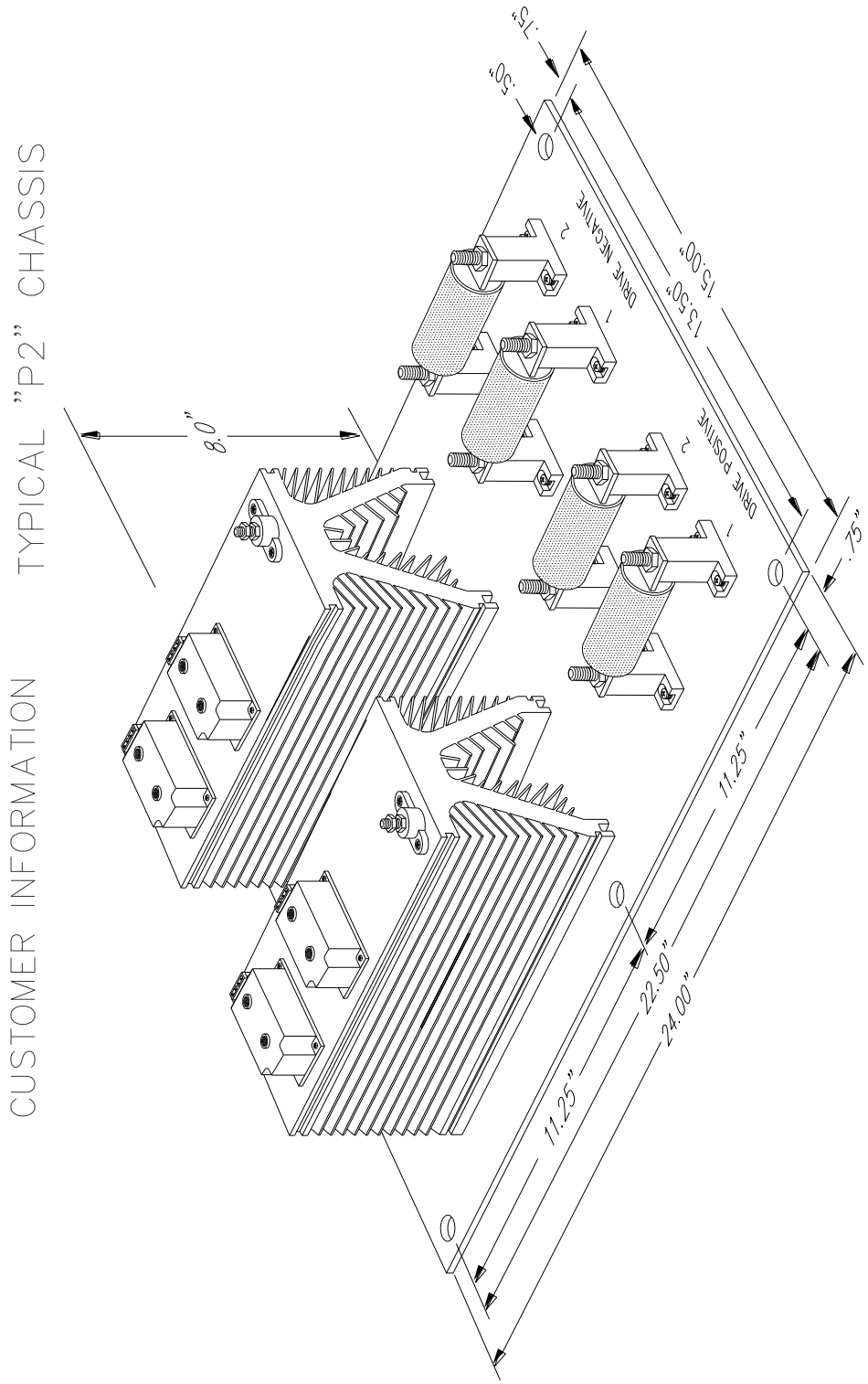


Figure 6-7: Typical "P2" Chassis



7. APPENDICES

7.1. APPLICATION NOTES

The diode modules include fusing, heatsinks, and diodes mounted on a backplate. High speed semiconductor fuses are included for the protection of the drives and diode modules.

Two applications are ideal for regen sharing:

1. Several drives, each producing a small amount of regenerated energy and sharing a line regen module large enough to handle the sum total amount of regenerated energy.
2. Multiple drive applications which have regeneration occuring on only one drive at a time (an example is an overhead crane system which is lifting or only moving in one axis at a time).

7.2. SIZING

The M3345D is selected based on the maximum DC regen current per drive. This will generally be based on the size of the largest drive in the application. Bonitron does not recommend sharing more than 200 amps of regen current. Applications involving more than 200 amps of regen should be reviewed with Bonitron Engineering. Custom configurations may be designed for specialized applications or high volumes.

Example: System has two (2) 50hp drives and one (1) 25hp drive.

- The largest drive is 50hp.
- From Table 6-1 select the 90 amp module for 3 drives, the M3345D-90N3.

7.3. USE WITH LINE REGENS

The M3345 is the only line regen that should be used with the M3345D diode sharing module.

The M3345D should not be used with the M3545 or the M3645 series of line regens. Several drives on the same DC bus that do not share the same ground will result in common mode noise which will cause Overvoltage and IGBT Desat faults in the M3545 or the M3645. For the M3545 and M6545 line regens use of the M3345CBM common bus diode sharing module is recommended.

NOTES

521 Fairground Court ● Nashville, TN 37211 ● USA
Tel: (615) 244-2825 ● Fax: (615) 244-2833 ● Web: www.bonitron.com ● Email: info@bonitron.com