

**Model M3345D**  
**Diode Sharing Module**

**Customer Reference Manual**

**Bonitron, Inc.**



**An Industry Leader in AC Drive Systems and Industrial Electronics**

**OUR COMPANY**

Bonitron is an international supplier of power controls designed to improve the performance and reliability of electronic systems and variable frequency drives. Located in Nashville, Tennessee, and founded in 1962, Bonitron has gained a reputation for designing and manufacturing products with the highest possible degree of quality and reliability.

Bonitron has all the necessary resources in-house for complete electronic product development and manufacturing. Engineering facilities include a CAD lab for circuit board design and engineering labs for prototype testing and evaluation. Production facilities include production areas for circuit board assembly, a machine tool and sheet metal shop for chassis fabrication, and a systems assembly and checkout area. With these assets, Bonitron is positioned to be a leader into the future while maintaining first class support for their current customer base.

Worldwide sales of equipment are generated mainly by reputation and referrals. Our customer base includes all of the major drive manufacturers, their distributors, OEMs, end users, and many other satisfied companies. Equipment is installed throughout the United States as well as in Canada, Mexico, Costa Rica, Argentina, Brazil, Chile, Venezuela, Northern Ireland, the Netherlands, Spain, Hungary, Israel, Turkey, China, India, Indonesia, Singapore, Taiwan, and the Philippines.

## **TALENTED PEOPLE MAKING GREAT PRODUCTS**

The engineering team at Bonitron has the background and expertise needed to design, develop, and manufacture the quality industrial systems demanded by today's client. A strong academic background supported by continuing education is complemented by many years of hands-on field experience. Expertise encompasses a broad range of applications and engineering solutions such as modern power conversion design techniques and microprocessor-based controls. This insures a solution tailored to the specific needs of the client.

A clear advantage that Bonitron has over many competitors is combined on-site engineering labs and manufacturing facilities. This allows the engineering team to have immediate access to and response from testing and manufacturing. This not only saves time during prototype development, but also is essential to providing only the best quality products.

## **AC DRIVE OPTIONS**

In 1975, Bonitron began working with the AC inverter drive specialists at synthetic fiber plants to develop speed control systems that could be interfaced to their plant process computers. Since that time, Bonitron has developed AC drive option modules that help overcome many of the problems encountered in applications of modern AC variable frequency drives.

Bonitron's Ride-Thru module provides protection from AC line voltage sags while the Line Regen and Resistive Braking modules provide DC Bus regulation for over-voltage due to regenerated voltage.

Bonitron AC drive modules are available to provide Undervoltage, Overvoltage, Line Side, Load Side, Maintenance, Power Quality, and Green / Sustainability solutions. These products are compatible with the drives of all major manufacturers and have become the standard in many industries including semiconductor, oil, and fiber.

## **WORLD CLASS PRODUCTS**

Bonitron has developed over 3000 different modules and systems. Bonitron is willing and able to meet the unique specifications the client may request.

Some Bonitron products include:

- Power Sag Ride-Thru Modules
- Power Outage Ride-Thru Modules
- Line Regen Modules
- Resistive Braking Modules
- Modular High Speed Precision AC Inverter Systems
- Inverter Upgrade Modules
- Multi-motor, Multi-phase Current Sensors
- Battery Production Charging Systems
- Data Acquisition Systems
- Process Controllers
- Temperature Control Systems
- RMS True Reading Digital Voltmeters, Ammeters, and Frequency Meters

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<b>1. INTRODUCTION</b>	<b>1</b>
1.1. Who Should Use	1
1.2. Purpose and Scope	1
1.3. Manual Version and Change Record	1
Figure 1-1: Typical M3345D-60L3	1
<b>2. PRODUCT DESCRIPTION / FEATURES</b>	<b>3</b>
2.1. Related Docs / Products	3
2.2. Part Number Breakdown	3
Figure 2-1: Example of M3345D Part Number Breakdown	3
Table 2-1: DC Bus Amps Codes	3
Table 2-2: Chassis Codes	4
2.3. General Specifications	4
Table 2-3: General Specifications Chart	4
2.4. General Precautions and Safety Warnings	5
<b>3. INSTALLATION INSTRUCTIONS</b>	<b>7</b>
3.1. Environment	7
3.2. Unpacking	7
3.3. Mounting	7
3.4. Wiring and Customer Connections	7
3.4.1. Power Wiring	7
Table 3-1: Power Wiring Specifications	7
3.5. Typical Configurations	9
Figure 3-1: Typical Field Wiring	9
<b>4. OPERATION</b>	<b>11</b>
4.1. Functional Description	11
4.2. Startup	11
4.2.1. Pre-Power Checks	11
4.2.2. Startup Procedure And Checks	11
4.3. Operational Adjustments	11
<b>5. MAINTENANCE AND TROUBLESHOOTING</b>	<b>13</b>
5.1. Troubleshooting	13
5.2. Technical Help – before you call	13
<b>6. ENGINEERING DATA</b>	<b>15</b>
Table 6-1: M3345D Diode Modules	15
6.1. Block Diagram	15
Figure 6-1: M3345D Block Diagram	15
6.2. Dimensions and Mechanical Drawings	15
Figure 6-2: Typical “F” Chassis	16
Figure 6-3: Typical “H” Chassis	17
Figure 6-4: Typical “J” Chassis	18
Figure 6-5: Typical “L” Chassis	19
Figure 6-6: Typical “N” Chassis	20
Figure 6-7: Typical “P” Chassis	21
Figure 6-8: Typical “P2” Chassis	22
<b>7. APPENDICES</b>	<b>23</b>
7.1. Application Notes	23
7.2. Sizing	23

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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

Rev 02c has minor format changes. Product data is unchanged.

**Figure 1-1: Typical M3345D-60L3**



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## 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

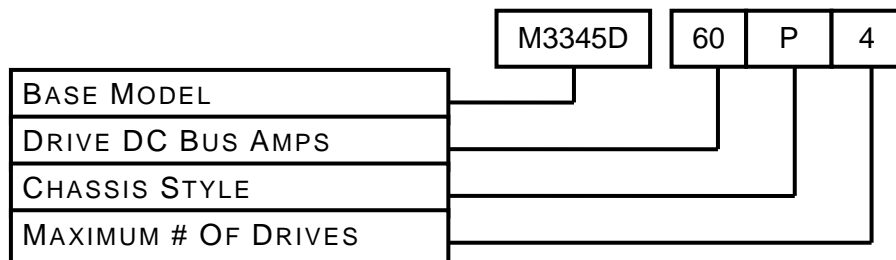
M3345 Regeneration Module

M3345CBM (Common Bus Modules)

M3534D 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	460VAC is standard Up to 575VAC available upon request <i>(Please consult with Bonitron regarding special requirements)</i>
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



*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.

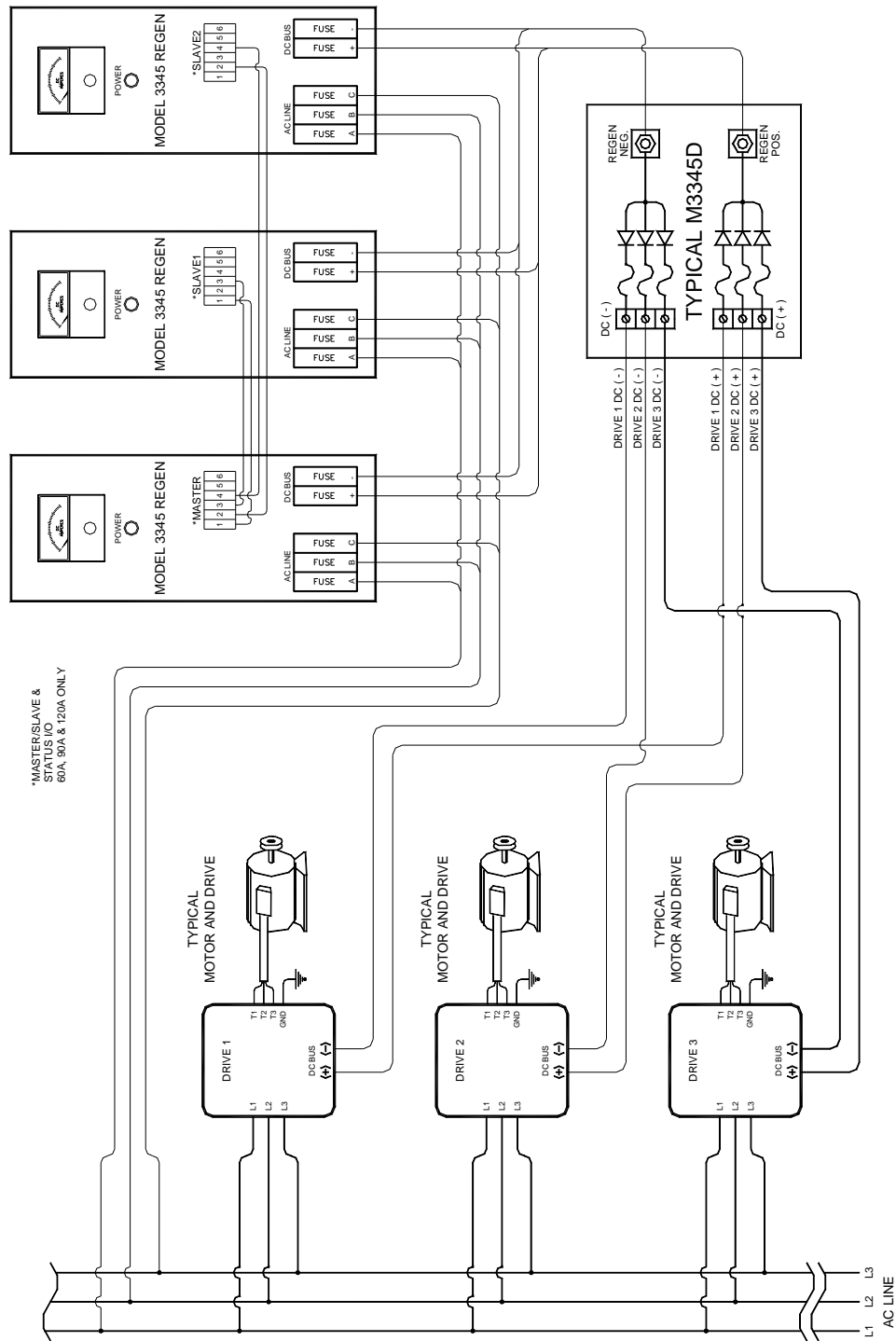
Make sure that the DC bus connection polarity is correct. Improper polarity connections risk damaging drive equipment if energized.

## 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. CIRCULATING CURRENTS BETWEEN DRIVES

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

#### 5.1.2. HEATSINK GETS EXCESSIVELY HOT OR DRIVES DO NOT BEHAVE PROPERLY DURING NORMAL OPERATING CONDITIONS

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

#### 5.1.3. 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

### 5.2. 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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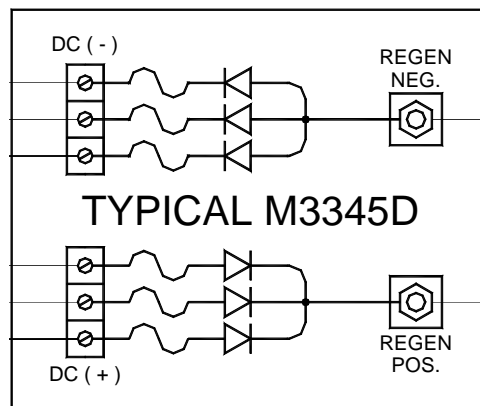
## 6. ENGINEERING DATA

**Table 6-1: M3345D Diode Modules**

PART NUMBER	NOMINAL HP		NUMBER OF DRIVES	DRIVE BUS AMPS	CONTINUOUS OUTPUT AMPS	PEAK AMPS	BUS FUSE	WATT LOSS
	230V	460V						
M3345D - 04F6	1.5	3	6	04	20	24	ATM-4	56W
M3345D - 10H3	3	5	3	10	30	30	ATM-10	84W
M3345D - 10J6	3	5	6	10	30	60	ATM-10	84W
M3345D - 30H3	10	20	3	30	30	90	ATM-30	84W
M3345D - 30J6	10	20	6	30	30	180	ATM-30	84W
M3345D - 60L2	20	40	2	60	50	120	ATM-60	140W
M3345D - 60L3	20	40	3	60	50	180	ATM-60	140W
M3345D - 60P4	20	40	4	60	100	240	ATM-60	280W
M3345D - 60P6	20	40	6	60	100	360	ATM-60	280W
M3345D - 90N2	30	60	2	90	100	180	ATM-100	280W
M3345D - 90N3	30	60	3	90	100	270	ATM-100	280W
M3345D - 200P2	100	200	2	200	200	400	ATM-200	560W

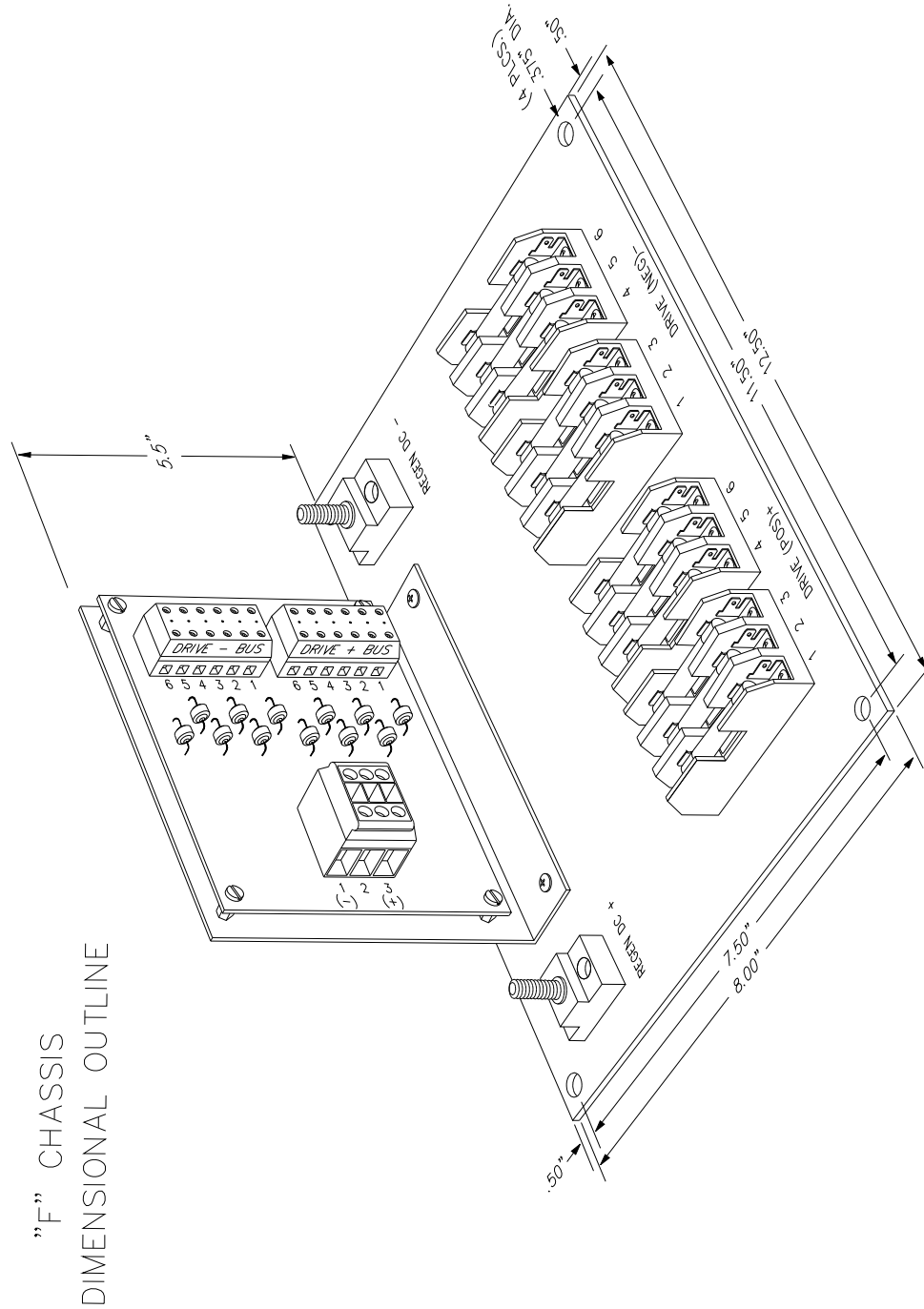
### 6.1. BLOCK DIAGRAM

**Figure 6-1: M3345D Block Diagram**



6.2. DIMENSIONS AND MECHANICAL DRAWINGS

Figure 6-2: Typical "F" Chassis



"F" CHASSIS  
DIMENSIONAL OUTLINE



**Figure 6-4: Typical "J" Chassis**

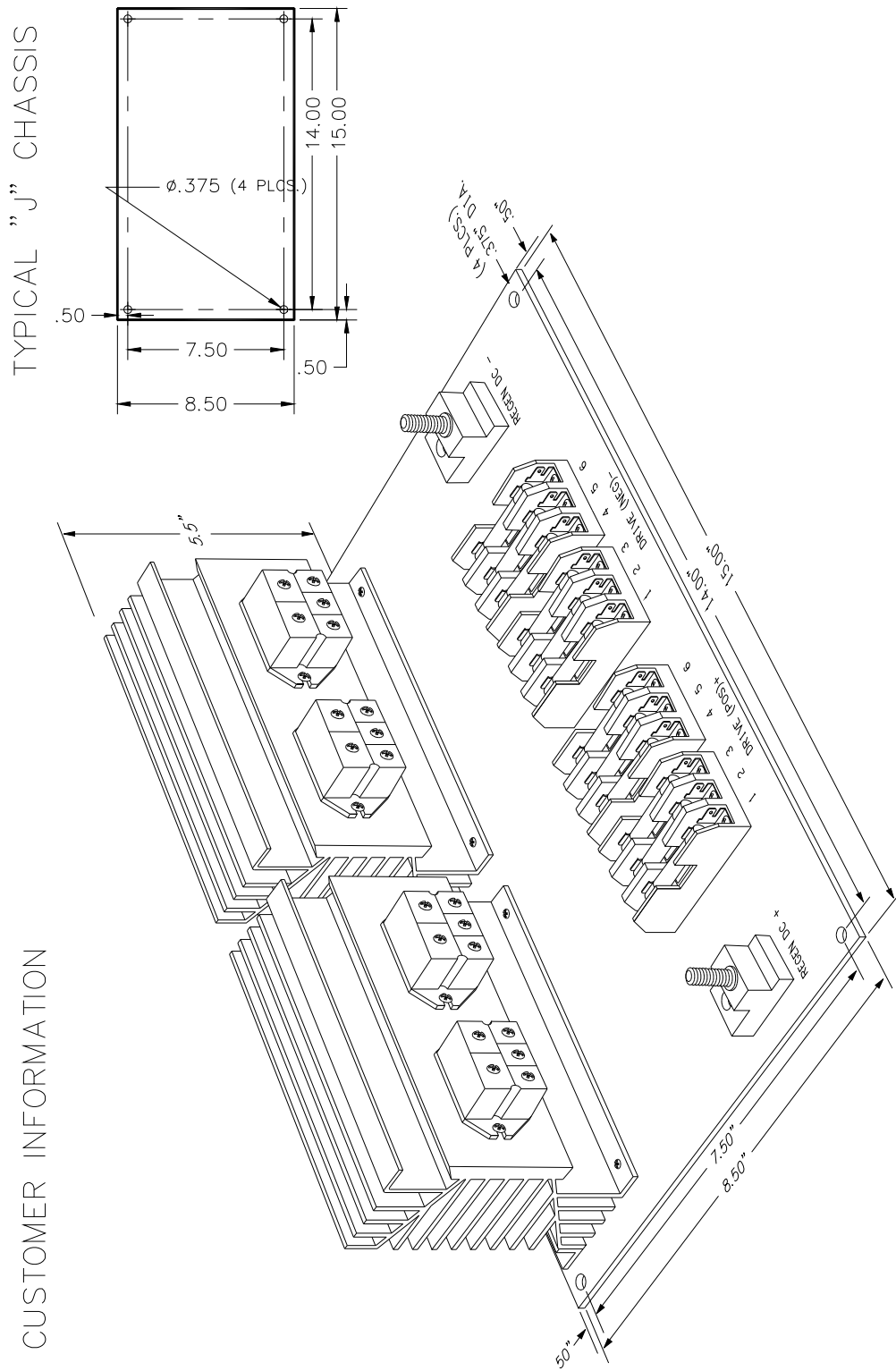
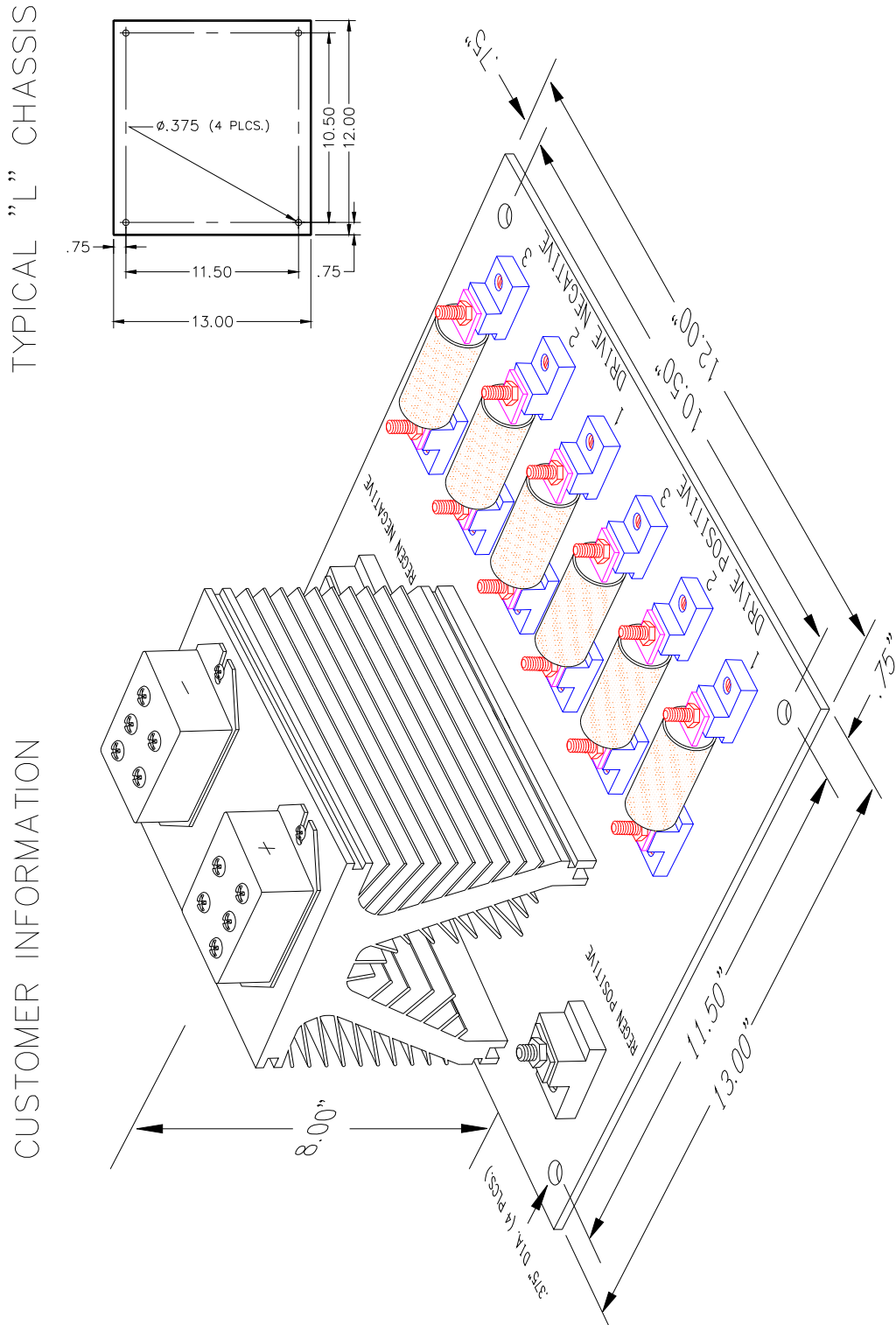


Figure 6-5: Typical "L" Chassis









## 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 occurring 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.



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