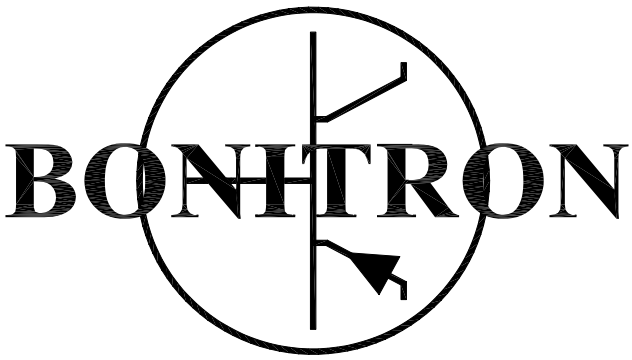


Model M3539

Bi-Directional
DC Motor Field Protector

Customer Reference Manual

TEL. (615) 244-2825 • FAX (615) 244-2833 • www.bonitron.com

Bonitron, Inc.

An Industry Leader in AC Drive Systems and Industrial Electronics

OUR COMPANY

Bonitron Inc. is an industrial electronics and electrical systems design, engineering, and manufacturing company founded in 1962 and located in Nashville, Tennessee. Bonitron designs and manufactures custom and standard product modules and systems for industry 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.

Sales of equipment, generated mainly by reputation and referrals, are worldwide. The customer base includes ABB, Allen-Bradley, Control Techniques, GE, Magnetek, Reliance, Siemens, and other fine companies. Equipment is installed in most of the fifty states, Canada, Mexico, Brazil, Argentina, Northern Ireland, Holland, Spain, India, Hungary, Turkey, Indonesia, and China.

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 adjustable speed drives. Bonitron's Ride-Thru module provides protection from AC line voltage sags while the Line Regen and Resistive Braking modules provide protection from over-voltage faults due to regenerated voltage. Today, many drive system integrators use Bonitron AC drive option modules with their adjustable speed drives.

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

Table of Contents

1. PREFACE

1.1. WHO SHOULD USE THIS MANUAL

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

Please keep this manual for future reference.

1.2. PURPOSE AND SCOPE OF THIS MANUAL

This manual is a user's guide for the Model M3539 DC Motor Field Protector. It will provide the user with the necessary information to successfully install, integrate, and use this module.

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

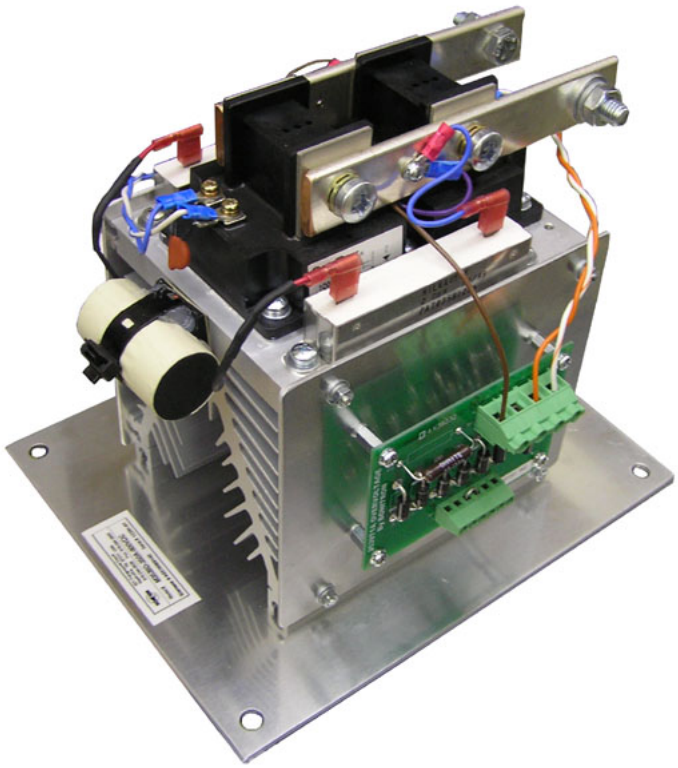


Figure 1-1: M3539-D-500A-600VDC Motor Field Protector

2. SAFETY PRECAUTIONS

WARNING!

- HIGH VOLTAGES MAY BE PRESENT!
- NEVER ATTEMPT TO SERVICE THIS PRODUCT WITHOUT FIRST DISCONNECTING INCOMING AC POWER.
- ALWAYS ALLOW ADEQUATE TIME FOR RESIDUAL VOLTAGES TO DRAIN BEFORE OPENING THE ENCLOSURE DOOR.
- FAILURE TO HEED THESE WARNINGS MAY RESULT IN SERIOUS BODILY INJURY OR DEATH!

WARNING!

- CERTAIN COMPONENTS WITHIN THIS PRODUCT MAY GENERATE HIGH AMBIENT TEMPERATURES DURING OPERATION.
- ALWAYS ALLOW AMPLE TIME FOR THE UNIT TO COOL BEFORE ATTEMPTING SERVICE ON THIS PRODUCT.

ATTENTION!

- BEFORE BEGINNING INSTALLATION OR REMOVAL OF THIS PRODUCT, BE SURE TO REVIEW ALL DC DRIVE DOCUMENTATION FOR PERTINENT SAFETY PRECAUTIONS.

ATTENTION!

- INSTALLATION AND/OR REMOVAL OF THIS PRODUCT SHOULD ONLY BE UNDERTAKEN 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.

3. OVERVIEW

3.1. GENERAL DESCRIPTION

DC motor field coils and controlled rectifier bridges can experience dangerously high voltages in cases of uncontrolled shutdown of the SCR bridge. Uncontrolled shutdown can happen due to momentary sag or loss of incoming power or a control logic failure. The energy stored in the inductive coil can cause damage to connected components if it is released without control. M3539D is a bi-polar DC motor field protection device designed to save these coils from over voltage destruction. M3539 limits this voltage by firing an SCR when the voltage reaches a predetermined point, thus shunting the potentially damaging energy.

3.2. FUNCTIONAL DESCRIPTION

The M3539D Field coil protector is connected in parallel with the DC motor field coil. It is bi-directional and self powered from the voltage spike energy. When the voltage goes above a certain threshold, the proper SCR will fire, limiting the voltage from going higher. The coil energy is circulated through the field resistance until dissipated. Typically 6 time constants will reduce field current to .25%. The M3539 is designed with heatsinks to handle time constants up to 12 seconds without the fan. Once the current drops below the SCR latching threshold, the circuit turns off and awaits another high voltage spike. For systems where the motor field voltage is not reversed, M3539S Uni-directional model is also available.

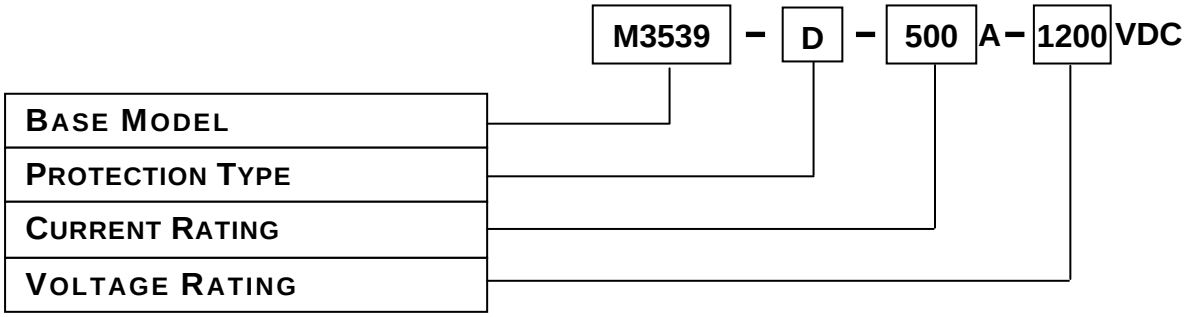
3.3. NORMAL OPERATION

Under normal operation M3539 is OFF as it sees only low voltage levels. It uses no standby power. When an incoming power disturbance occurs and the SCR rectifier does not commutate properly, the result may be a high spike on the field coil. This spike will automatically enable the M3539, and the voltage spike will be shunted before damage can occur to the coil or the associated components.

3.4. FIELD ADJUSTMENT

The M3539 typically does not need field adjustments as it is factory set for the proper voltage clamp. Some adjustment via jumper selection can be accomplished before installation so it may be used to protect different coil voltage levels. A series of three jumpers are used to set a voltage clamp range between 400-700v (other voltage ranges are possible by request). Rise time of spike will determine actual clamp level as there is 1-2us of delay in the sensing circuit. See chart S-5 for clamp voltages vs. jumper positions and rise time.

4. PART NUMBER BREAKDOWN



4.1. BASE MODEL NUMBER

The model number for all DC Motor Field Protectors is **M3539**

4.2. PROTECTION TYPE

Indicated by one letter representing the selected Protection Type.

S – Single SCR – Uni-directional protection
D – Dual SCRs – Bi-directional protection

4.3. CURRENT RATING

Current Rating is indicated by a 3 digit number.

070A or
250A or
500A

4.4. VOLTAGE RATING

Voltage Rating is shown as a 4 digit number. The factory set Voltage Ratings are:

0600VDC or
1200VDC

5. APPLICATION INFORMATION

For applications other than outlined above, contact the Bonitron Engineering staff for assistance.

6. SECTION S: SUPPLEMENTAL DRAWINGS

Figure S-1: Typical M3539 Wiring

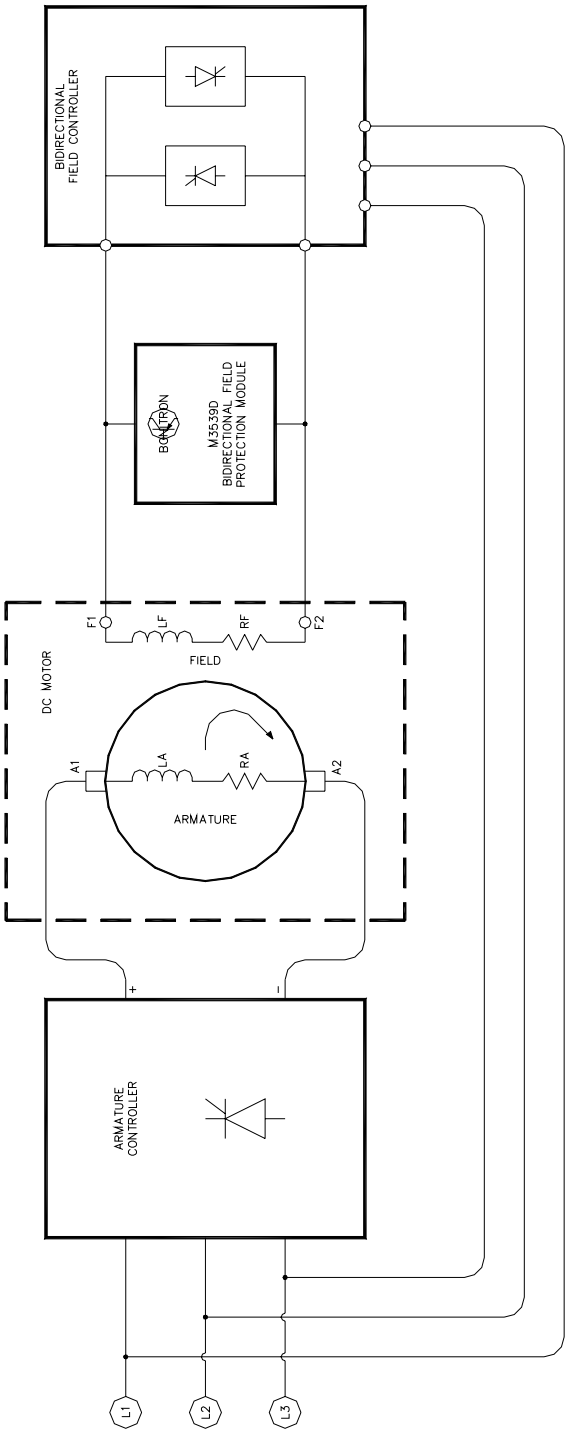
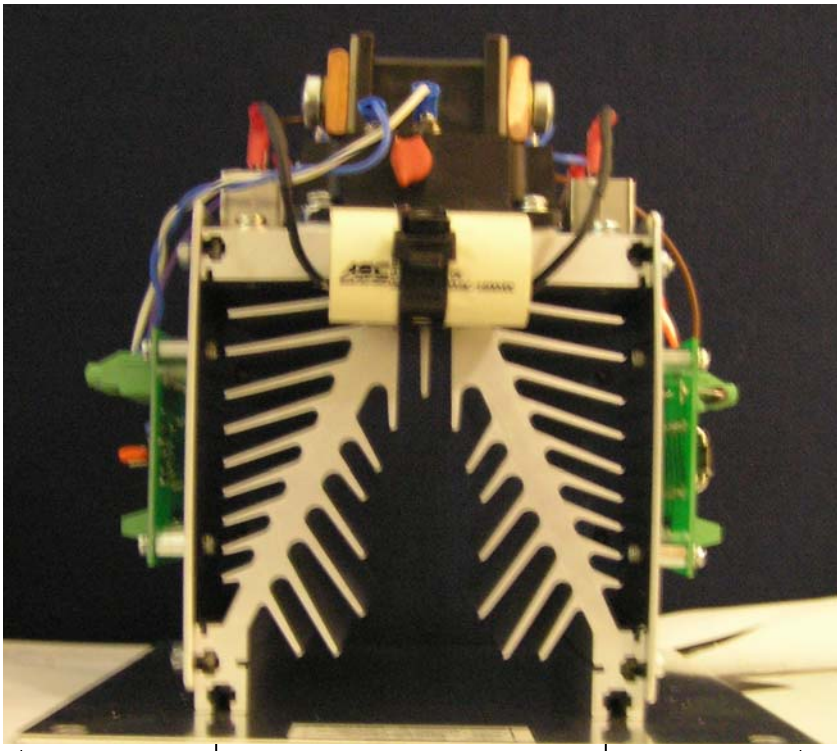


Figure S-2: M3539 Overall Dimensions



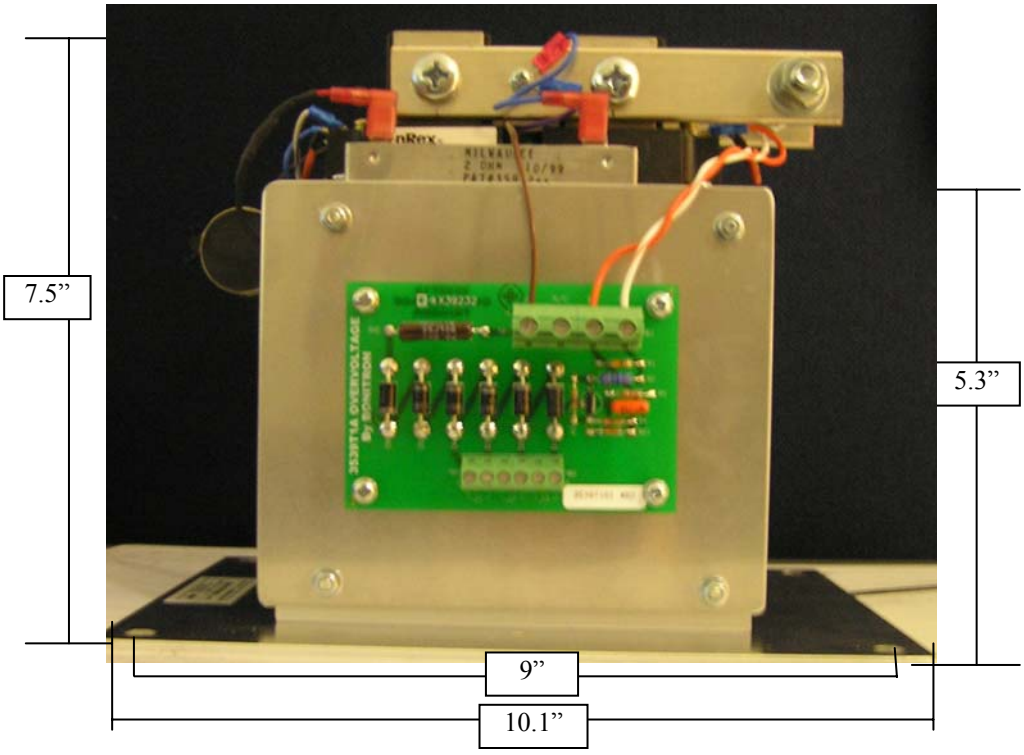


Figure S-3: M3539-D-500A-600VDC Motor Field Protector Schematic

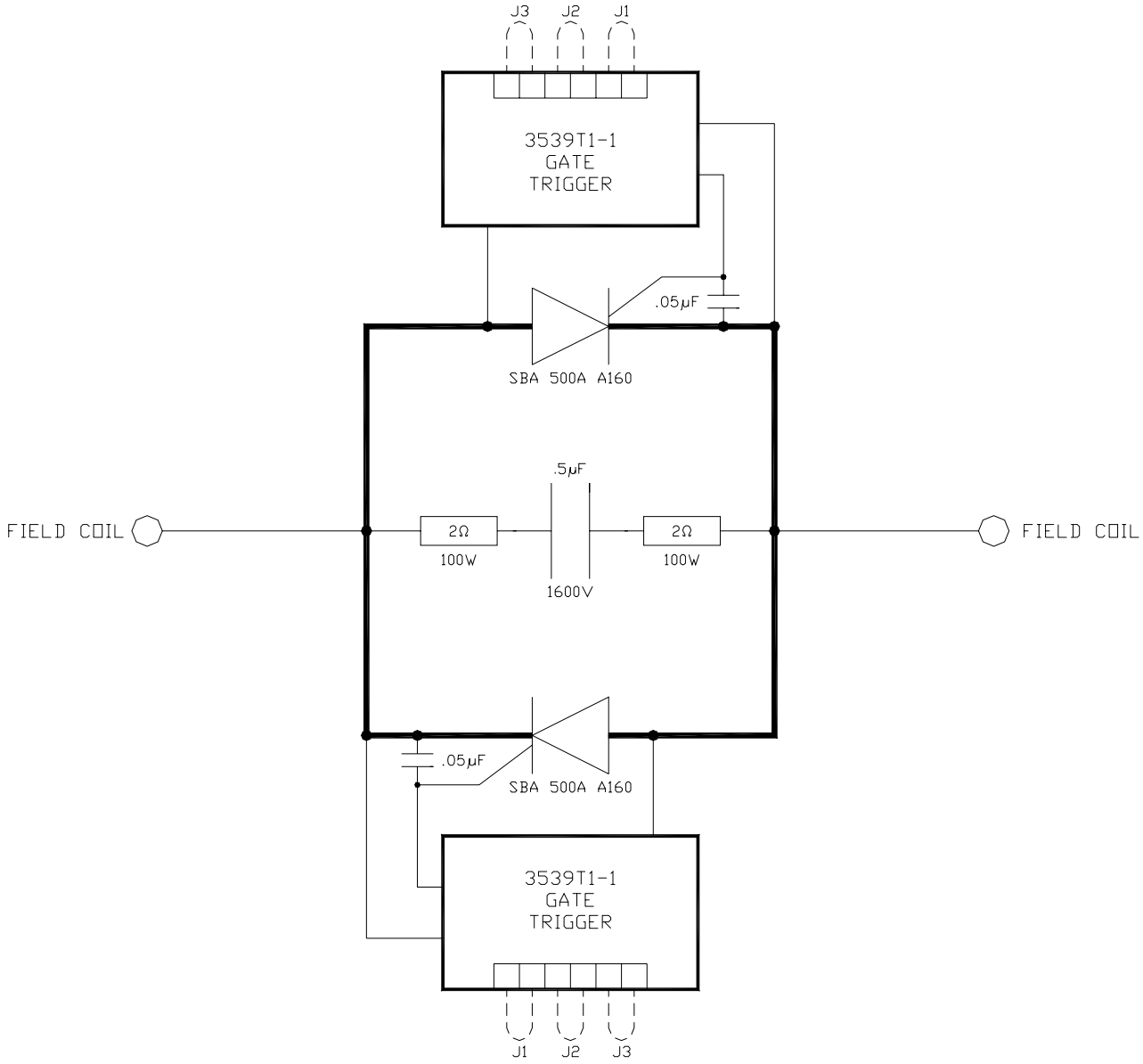


Figure S-4: Trip Level vs. Rise Time