



Model M3528UC

Ultracapacitor Module

Customer Reference Manual

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.

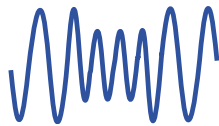
The Bonitron engineering team has the background and expertise necessary to design, develop, and manufacture the quality industrial electronic systems demanded in today's market. A strong academic background supported by continuing education is complemented by many years of hands-on field experience. 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

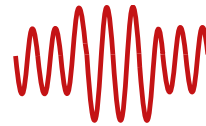
In 1975, Bonitron began working with AC inverter drive specialists at synthetic fiber plants to develop speed control systems that could be interfaced with their plant process computers. Ever since, Bonitron has developed AC drive options that solve application issues associated with modern AC variable 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



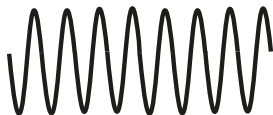
Common Bus Solutions

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

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 M3528UC. It will provide the user with the necessary information to successfully install, integrate, and use the M3528UC.

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 00 is the initial printing of the manual for the M3528UC.

Manual template was updated in Rev 00a.

Figure 1-1: M3528UC



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

Bonitron's M3460R and M3534R Ride-Thru Voltage Regulators provide sag protection from power quality events for Variable Frequency Drives (VFDs) that use a fixed rectifier and DC Bus for up to 2 seconds at 50% line sag on all 3 phases. The M3528UC Ultracapacitor modules can be used in conjunction with the M3460R or M3534R to provide full outage protection up to 2 seconds.

2.1. RELATED PRODUCTS

M3460 SERIES RIDE-THRU MODULES

Voltage regulators used for sag or outage protection of higher power systems.

M3534 SERIES RIDE-THRU MODULES

Voltage regulators used for sag or outage protection of lower power systems.

M3528 BATTERY AND ULTRACAPACITOR CHARGERS

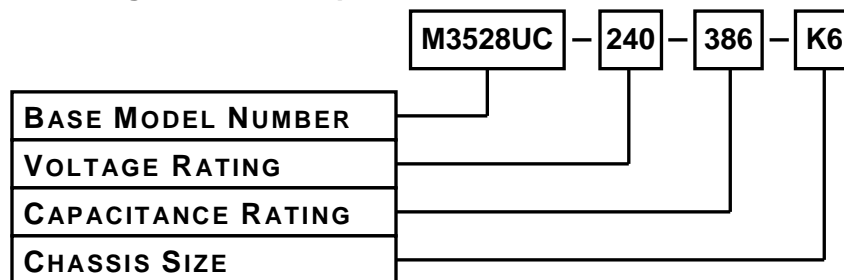
Chargers for high voltage storage strings.

M3628 ULTRACAPACITOR SAFETY DISCHARGERS

Automatic discharge for large capacitor storage banks for safety and quick maintenance entry.

2.2. PART NUMBER BREAKDOWN

Figure 2-1: Example of Part Number Breakdown



BASE MODEL NUMBER

The Base Model Number for all ultracapacitor modules in this series is **M3528UC**.

VOLTAGE RATING

The Voltage Rating indicates the maximum voltage of the ultracapacitor module. For example, **240** represents 240VDC.

CAPACITANCE RATING

The Capacitance Rating indicates the total capacitance of the ultracapacitor module. For example, **386** represents 3.86 Farads.

CHASSIS SIZE

The chassis size used for the M3528UC is **K6**.

2.3. GENERAL SPECIFICATIONS

Table 2-1: General Specifications

PARAMETER	SPECIFICATION
DC Voltage	208-240 VDC
Maximum Continuous Current	19A ($\Delta T = 40^{\circ}\text{C}$)
Capacitance	3.86 – 4.46 Farads
Storage Temperature	-40°C to +70°C
Operating Temperature	-40°C to +65°C
Humidity	Below 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C
Atmosphere	For indoor use only and free of corrosive gas and dust
Pollution Degree	2
Installation/Overvoltage Category	II
Altitude	2000 m

2.4. GENERAL PRECAUTIONS AND SAFETY WARNINGS



DANGER!

- **HIGH VOLTAGES MAY BE PRESENT!**
- **NEVER ATTEMPT TO OPERATE THIS PRODUCT WITH THE ENCLOSURE COVER REMOVED!**
- **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!

- **NO USER-SERVICEABLE PARTS ARE CONTAINED WITHIN THIS PRODUCT. INOPERABLE UNITS SHOULD BE REPLACED OR RETURNED FOR EVALUATION AND/OR REPAIR BY QUALIFIED TECHNICIANS.**

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

3. INSTALLATION INSTRUCTIONS



Installation and/or removal of this product should only be performed by a qualified electrician in accordance with National Electrical Code or local codes and regulations.

Proper installation of the M3528UC should be accomplished following the steps outlined below. Be sure to refer to the AC Drive instruction manual as these steps are performed.

3.1. ENVIRONMENT

The module should be installed in an area protected from moisture and falling debris. Buildup of dust or debris may cause poor performance and possibly a failure. Operating in a wet environment can pose a shock hazard. The recommended temperature range for operating or storing this module is 0 to +40°C.

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.

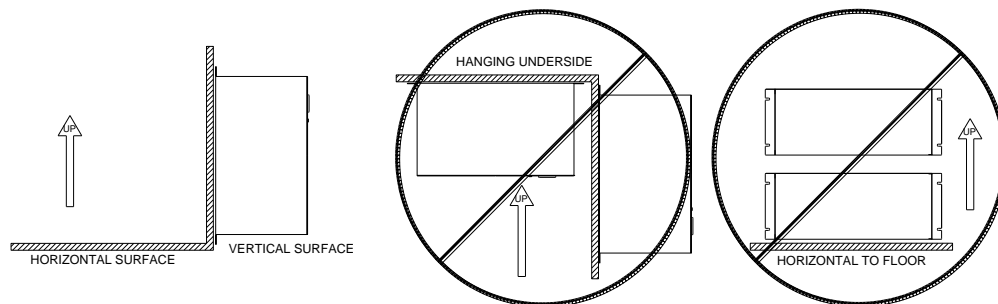
3.3. MOUNTING

Mounting dimensions can be found in Section 6.

The installation site for the module should be chosen with several considerations in mind:

- The unit requires a minimum clearance of two (2) inches in all directions around it when mounted near a non-heat source.
- Unit should not be exposed to falling debris or condensation.
- Once the installation site has been selected as outlined above, the unit should be mounted in place. The unit should be mounted vertically as shown in Example A of Figure 3-1.
- **DO NOT** mount the unit upside-down or on the underside of a mounting surface as shown in Example B of Figure 3-1.
- **DO NOT** mount unit in a horizontal position with its side parallel to the mounting surface or floor as shown in Example C of Figure 3-1.


Figure 3-1: M3528UC Mounting Orientation



3.4. WIRING AND USER CONNECTIONS

3.4.1. WIRING

Table 3-1: Wiring Connections

TERMINAL DESIGNATION	FUNCTION	WIRING SPECIFICATION	CONNECTION	TORQUE
+ - CAP	DC Connection	600VAC	6 - 12 AWG Box Connection	15 lb-in
	Ground		#10 Lug Ring or Spade	

3.4.1.1. CAP (+ -)

The DC connection from the attached equipment is made at the CAP terminals. Make sure the polarity is correct for the connection; failure to do so can cause severe damage to the system.

3.4.1.2. GROUNDING REQUIREMENTS

The M3528UC module comes equipped with a 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.

4. OPERATION

4.1. FUNCTIONAL DESCRIPTION

Bonitron's M3528UC Ultracapacitor modules can be used with an M3460R or M3534R Ride-Thru Voltage Regulator to provide full outage protection against power quality events for up to 2 seconds. When the M3528UC ultracapacitor storage bank is used, the Ride-Thru will power the DC bus from the AC line until it drops below the storage bank voltage. At this point, power will be drawn from the storage bank until the Ride-Thru reaches its input current limit. In order to use an ultracapacitor storage bank for outage support, the capacitor bank must be charged with a separate charger such as the Bonitron M3528, as the Ride-Thru does not have charging capabilities.

4.2. FEATURES

4.2.1. VOLTAGE PRESENT INDICATOR

The Voltage Present light on the front panel will illuminate blue when high voltage is present at the M3528UC module's CAP terminals.

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5. MAINTENANCE AND TROUBLESHOOTING

The M3528UC is designed to require no maintenance. While a typical inverter may require capacitor replacement after a certain time due to the heavy ripple currents, the Ride-Thru typically is in a standby mode waiting for a power quality event. The capacitors inside the M3528UC are rated for 10 years at full voltage and 25°C.

5.1. TROUBLESHOOTING

Table 5-1: Troubleshooting Guide

SYMPTOM	ACTION
Voltage Present LED stays OFF	Check DC voltage at M3528UC terminals.
M3528UC produces significant heat	Ensure the DC voltage at the M3528UC terminals is not too high



CAUTION!

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.

5.2. TECHNICAL HELP – BEFORE YOU CALL

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

- Exact model number of affected units
- Serial number of unit
- Name and model number of attached drives
- Name of original equipment supplier
- Brief description of the application
- The AC line to line voltage on all 3 phases
- The battery bank voltage
- The DC Bus voltage
- KVA rating of power source
- Source configuration Wye/Delta and grounding

This information will help us support you much more quickly. Please contact us at (615) 244-2825 or through www.Bonitron.com

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6. ENGINEERING DATA

6.1. RATINGS CHART

Table 6-1: M3528UC Ratings

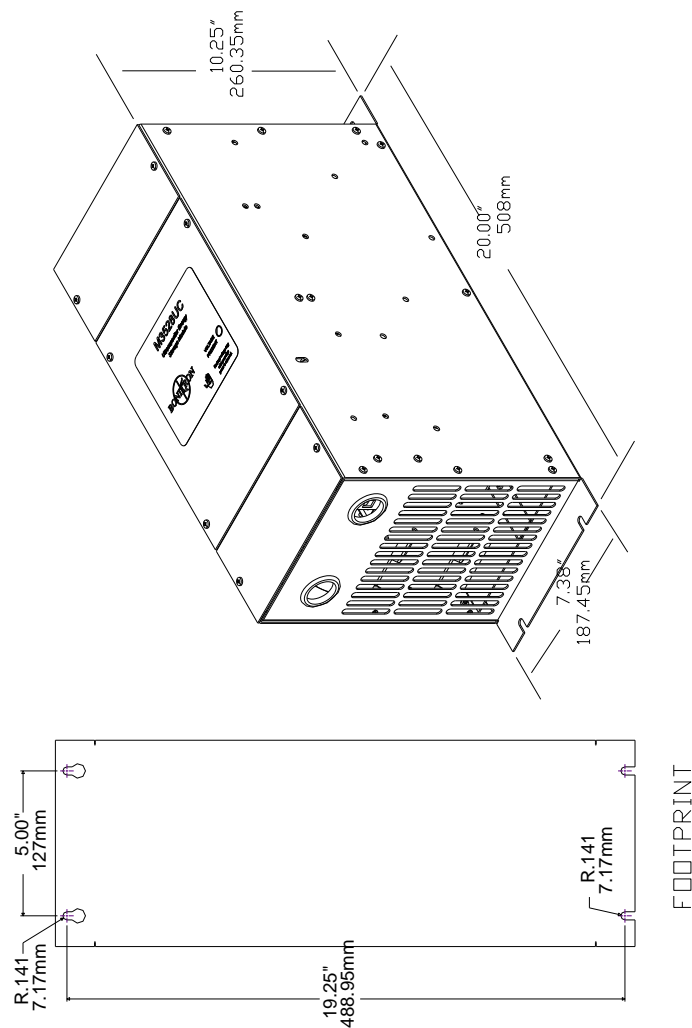
MODEL	VOLTAGE	CAPACITANCE
M3528UC-240-386-K6	240VDC	3.86 F
M3528UC-224-414-K6	224VDC	4.14 F
M3528UC-208-446-K6	208VDC	4.46 F

6.2. EFFICIENCY / POWER CONSUMPTION

Power consumption in standby mode is less than 10W.

6.3. DIMENSIONS AND MECHANICAL DRAWING

Figure 6-1: M3528UC K6 Chassis Dimensional Outline



NOTES

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