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GE
Grid Solutions

MM300

Motor Management System



Quick Start Guide

MM300 Revision: 1.7x
Manual P/N: 1601-9022-AD
Manual Order Code: GEK-113336M

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WORLDWIDE 10 YEAR WARRANTY

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The MM300 Motor Management System QuickStart Guide for revision 1.7x.

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Part number: 1601-9022-AD (May 2016)

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Storage

Store the unit indoors in a cool, dry place. If possible, store in the original packaging. Follow the storage temperature range outlined in the Specifications.

NOTICE

To avoid deterioration of electrolytic capacitors, power up units that are stored in a de-energized state once per year, for one hour continuously.

Warranty

For products shipped as of 1 October 2013, GE warrants most of its GE manufactured products for 10 years. For warranty details including any limitations and disclaimers, see our Terms and Conditions at https://www.gegridsolutions.com/multilin/warranty.htm

For products shipped before 1 October 2013, the standard 24-month warranty applies.

Repairs

The firmware and software can be upgraded without return of the device to the factory.

For issues not solved by troubleshooting, the process to return the device to the factory for repair is as follows:

- Contact a GE Grid Solutions Technical Support Center. Contact information is found in the first chapter.
- Obtain a Return Materials Authorization (RMA) number from the Technical Support Center.
- Verify that the RMA and Commercial Invoice received have the correct information.
- Tightly pack the unit in a box with bubble wrap, foam material, or styrofoam inserts or packaging peanuts to cushion the item(s). You may also use double boxing whereby you place the box in a larger box that contains at least 5 cm of cushioning material.
- Ship the unit by courier or freight forwarder, along with the Commercial Invoice and RMA, to the factory.

  Customers are responsible for shipping costs to the factory, regardless of whether the unit is under warranty.
- Fax a copy of the shipping information to the GE Grid Solutions service department.

Use the detailed return procedure outlined at

https://www.gegridsolutions.com/multilin/support/ret_proc.htm

The current warranty and return information are outlined at

https://www.gegridsolutions.com/multilin/warranty.htm

This product cannot be disposed of as unsorted municipal waste in the European Union. For proper recycling return this product to your supplier or a designated collection point. For more information go to www.recyclethis.info.

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MM300 Motor Management System

Chapter 1: Overview

The MM300 is a modular motor protection and control system designed specifically for low-voltage motor applications. The MM300 provides the following key benefits.

- Flexible protection, control, and communication options to suit any low-voltage motor application.
- Small footprint designed specifically for IEC and NEMA MCC applications.
- Modular design reduces the number of spare components for maintenance and testing.
- Integrated pushbuttons and LED indicators reduce external components and wiring.
- DIN rail and Panel Mounting.
- Multiple, simultaneous communication protocols allows simple integration into monitoring and control systems.
- Optional basic control panel or graphical control panel interface provides local control and access to system information.
- Automation FlexLogic™ for applications requiring more complex starter control, or multi-starter scenarios with interlocking or programmable logic control.

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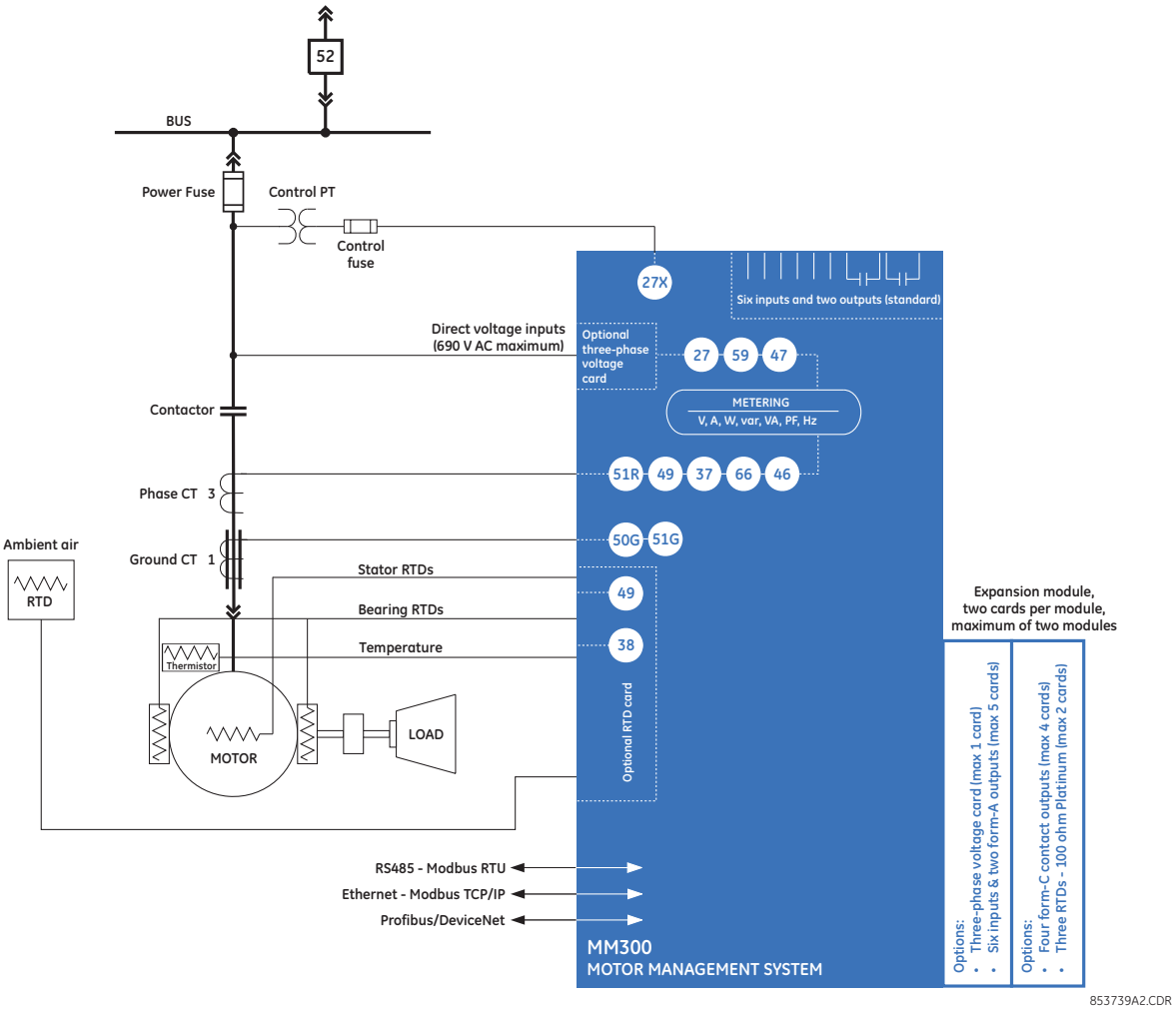


Table 1-1: MM300 protection functions

ANSI device	Description
27X	Undervoltage, auxiliary input
27	Undervoltage, three-phase
37	Undercurrent and underpower
38	Bearing temperature RTD
46	Current unbalance
47	Voltage phase reversal
49	Thermal overload
50G	Ground instantaneous overcurrent
51G	Ground time overcurrent
51R	Locked/stalled rotor, mechanical jam
59	Overvoltage, three-phase
66	Starts per hour and time between starts

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Cautions and Warnings

Before attempting to install or use the device, review all safety indicators in this document to help prevent injury, equipment damage, or downtime.

Safety words and definitions

The following symbols used in this document indicate the following conditions



Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



Indicates practices not related to personal injury.

General Safety Precautions - MM300



Failure to observe and follow the instructions provided in the equipment manual(s) could cause irreversible damage to the equipment and could lead to property damage, personal injury and/or death.

Before attempting to use the equipment, it is important that all danger and caution indicators are reviewed.

If the equipment is used in a manner not specified by the manufacturer or functions abnormally, proceed with caution. Otherwise, the protection provided by the equipment may be impaired and can result in Impaired operation and injury.

Caution: Hazardous voltages can cause shock, burns or death.

Installation/service personnel must be familiar with general device test practices, electrical awareness and safety precautions must be followed.

Before performing visual inspections, tests, or periodic maintenance on this device or associated circuits, isolate or disconnect all hazardous live circuits and sources of electric power.

Failure to shut equipment off prior to removing the power connections could expose you to dangerous voltages causing injury or death.

All recommended equipment that should be grounded and must have a reliable and un-compromised grounding path for safety purposes, protection against electromagnetic interference and proper device operation.

Equipment grounds should be bonded together and connected to the facility's main ground system for primary power.

Keep all ground leads as short as possible.

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At all times, equipment ground terminal must be grounded during device operation and service.

In addition to the safety precautions mentioned all electrical connections made must respect the applicable local jurisdiction electrical code.

Before working on CTs, they must be short-circuited.

For Further Assistance

For product support, contact the information and call center as follows:

GE Grid Solutions
650 Markland Street
Markham, Ontario
Canada L6C 0M1
Worldwide telephone: +1 905 927 7070
Europe/Middle East/Africa telephone: +34 94 485 88 54
North America toll-free: 1 800 547 8629
Fax: +1 905 927 5098
Worldwide e-mail: multilin.tech@ge.com
Europe e-mail: multilin.tech.euro@ge.com
Website: http://www.gegridsolutions.com/multilin

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MM300 Motor Management System

Chapter 2: Installation

Mechanical installation

This section describes the mechanical installation of the MM300 system, including dimensions for mounting and information on module withdrawal and insertion.

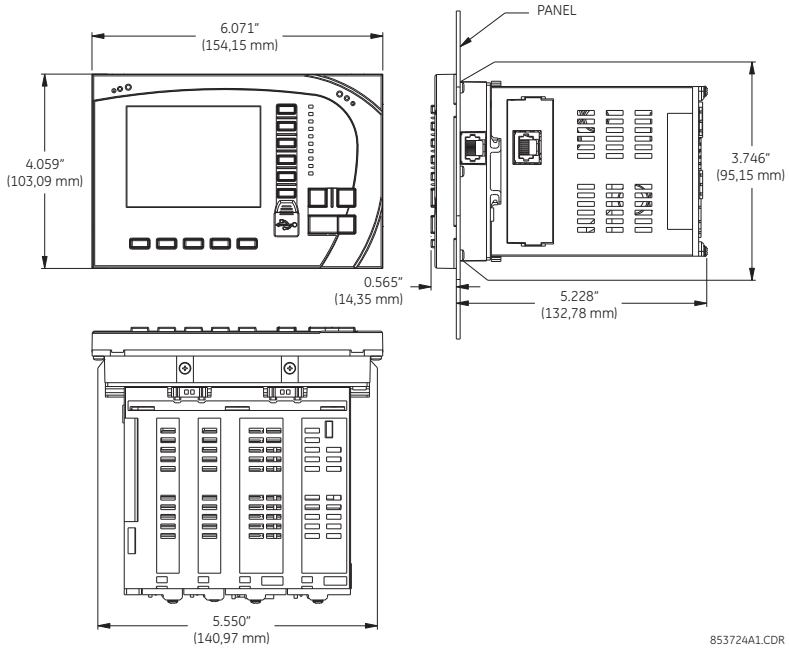
Dimensions

The MM300 is packaged in a modular arrangement.

The dimensions of the MM300 are shown below. Additional dimensions for mounting and panel cutouts are shown in the following sections.

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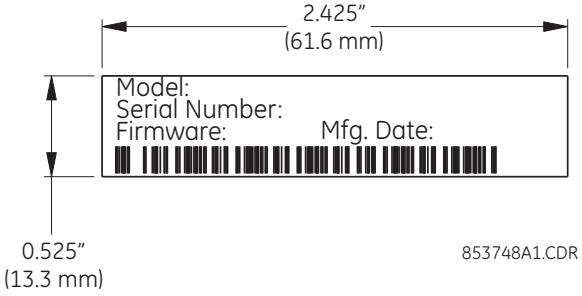
Figure 2-1: MM300 dimensions



Product identification

The product identification label is located on the side panel of the MM300. This label indicates the product model, serial number, firmware revision, and date of manufacture.

Figure 2-2: MM300 label



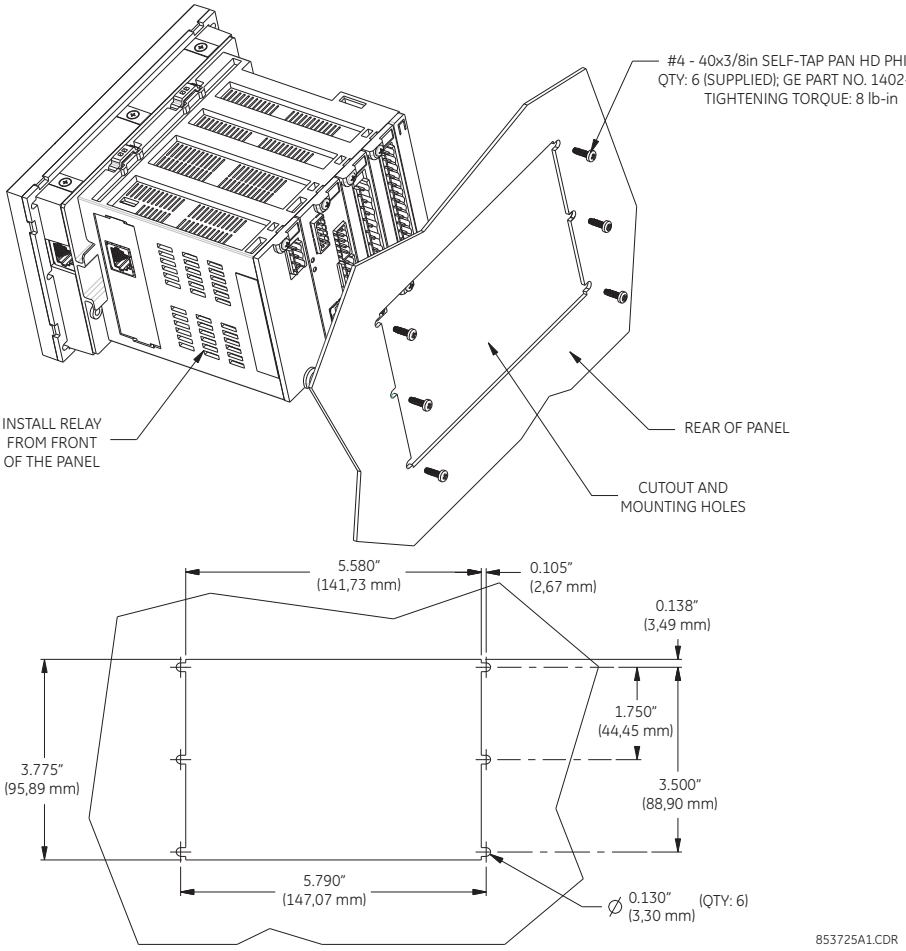
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Mounting

The MM300 can be mounted three ways: standard panel mount, DIN rail mount, and screw mount for high vibration environments.

The standard panel mount and cutout dimensions are illustrated below.

Figure 2-3: Base Unit standard panel mounting and cutout dimensions



The DIN rail mounting is illustrated below. The DIN rail conforms to EN 50022.

CAUTION

To avoid the potential for personal injury due to fire hazards, ensure the unit is mounted in a safe location and/or within an appropriate enclosure.

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Figure 2-4: Basic Control Panel mounting and cutout dimensions

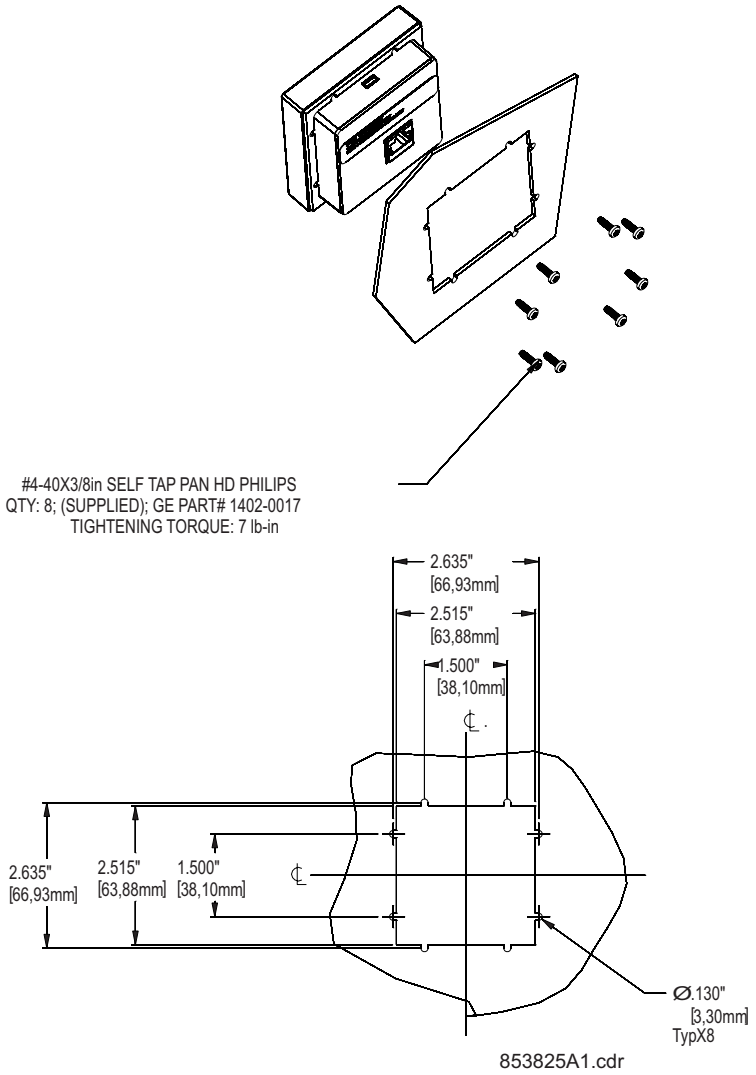
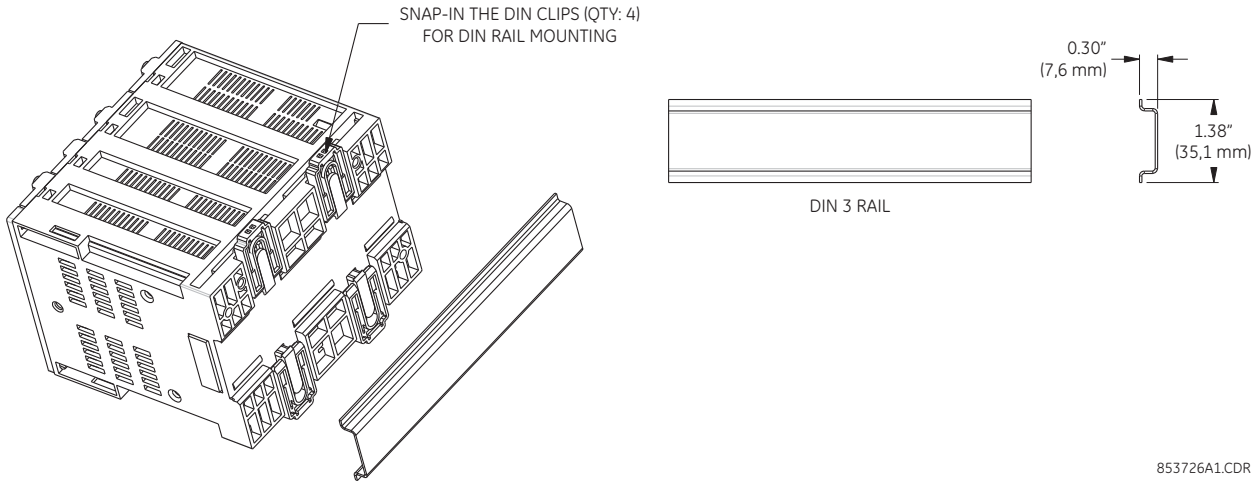


Figure 2-5: DIN rail mounting - Base and Expansion units



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Screw mounts for high vibration environments are illustrated below.

Figure 2-6: Base Unit screw mounting

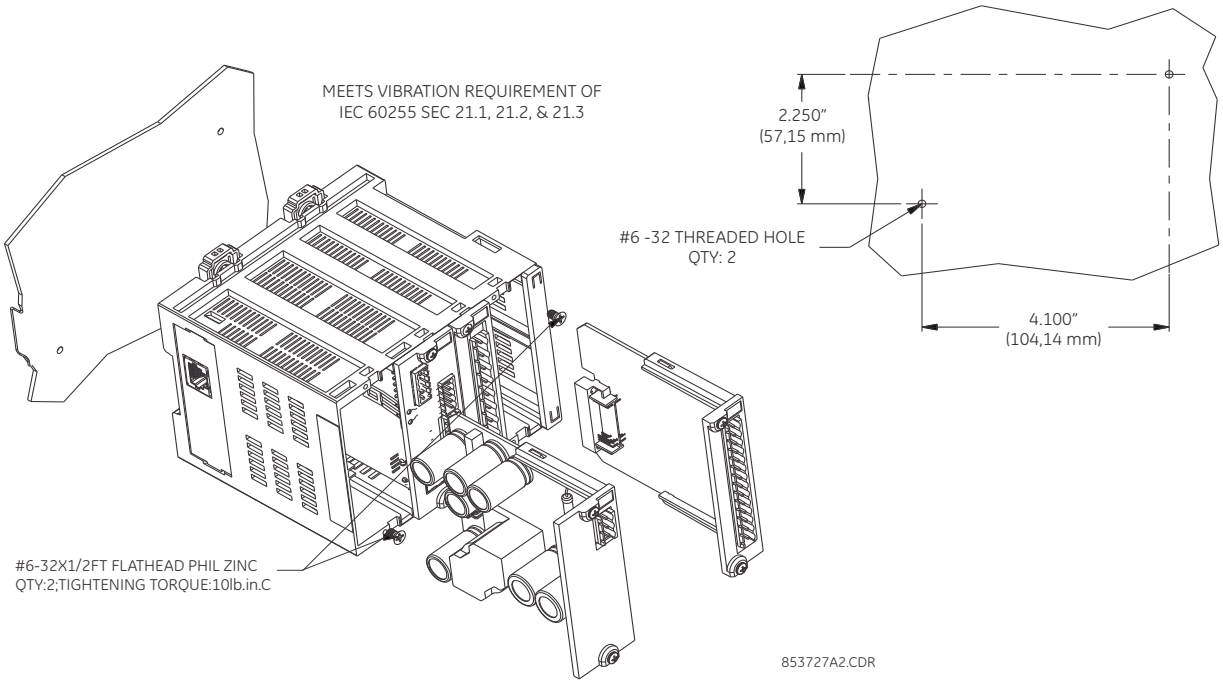
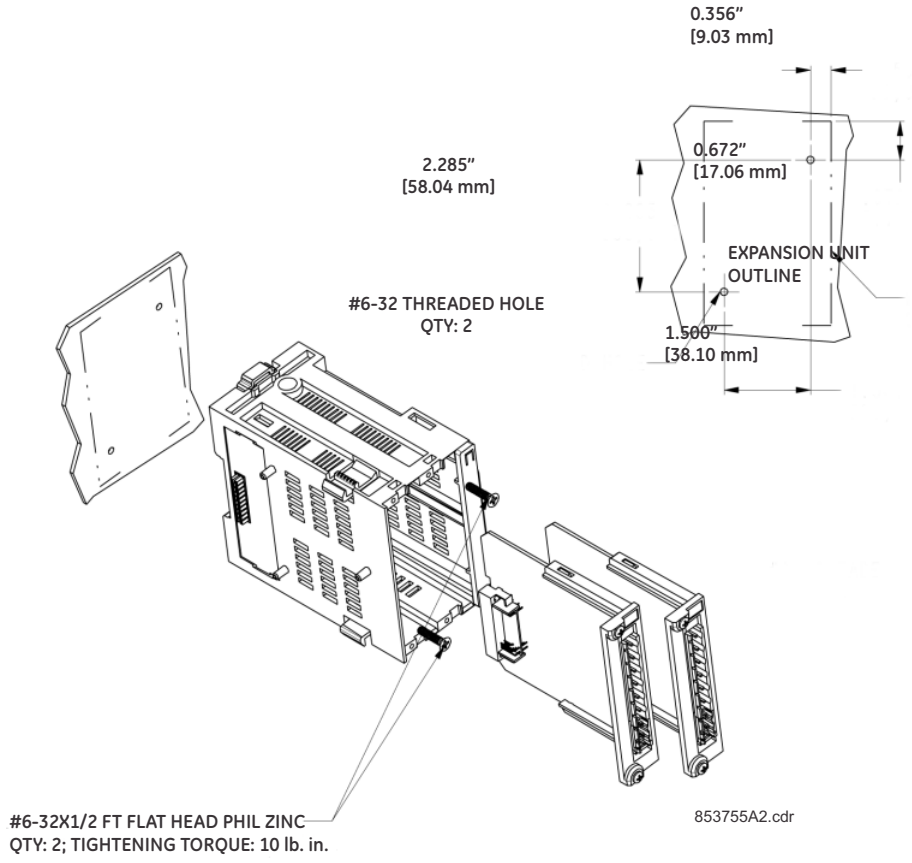


Figure 2-7: Expansion Unit screw mounting



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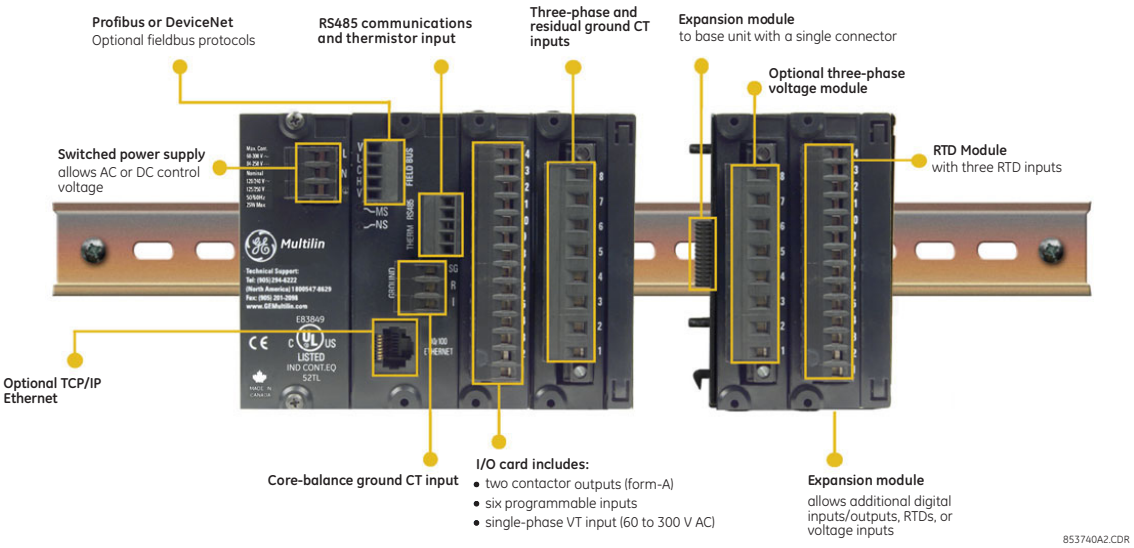
Electrical installation

This section describes the electrical installation of the MM300 system. An overview of the MM300 terminal connections is shown below.

⚠CAUTION

MM300 is not to be used in any way other than described in this manual.

Figure 2-8: MM300 terminal connection overview



The MM300 can contain up to eight modules. The first four modules (slots A through D) comprise the base unit, and the next four modules (slots E through H) comprise the optional expanded unit.

Table 2-1: Module slot position

	Slot	Module types
Base Unit	A	Power supply module (High or Low)
	B	CPU module with communications (1 of 3 Comm Types)
	C	IO_C **or** IO_E module
	D	IO_A module
Expansion Modules	E	IO_B **or** IO_C **or** IO_E **or** IO_D **or** IO_G module
	F	IO_C **or** IO_E **or** IO_D **or** IO_G module
	G	IO_C **or** IO_E **or** IO_D **or** IO_G module
	H	IO_C **or** IO_E **or** IO_D **or** IO_G module

The following figure shows a typical module arrangement for an expanded unit.

⚠CAUTION

Use gauge size appropriate for the voltage and current draw of the device.

Table 2-2: Gauge Sizes

CPU Card: Themistor, RS485 and Fieldbus	16 AWG (3.50mm pitch terminals)[1]
PSU / CBCT /IO_C / IO_E / IO_D / IO_G	12 AWG (5.00mm pitch terminals)[2]
IO_A / IO_B	12 AWG (7.62mm pitch terminals)[2]

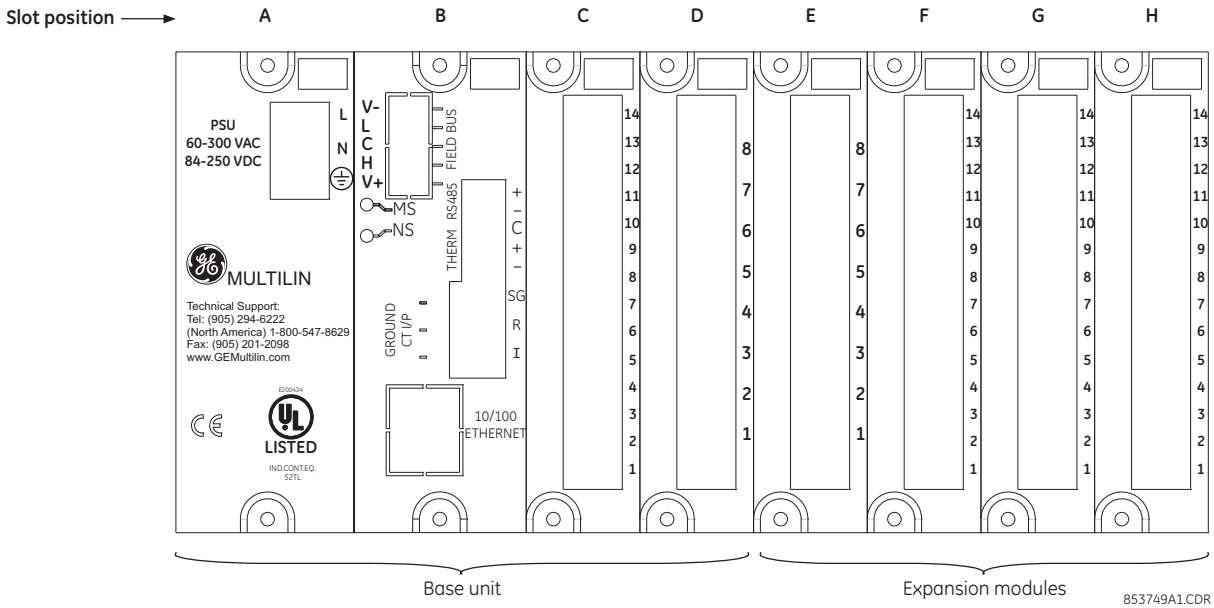
1. The uncovered communications cable shield connected to the common terminal should not exceed 1" (2.5 cm) for proper EMC shielding of the communications cable.
2. Wire gauge size remains constant; increased pitch distance reflects higher voltage rating.

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NOTE

It is recommended that you install a circuit disconnection system for control power, near the device, which should be easily accessible after installation of the unit. This is in case an emergency power shut-down of the unit is required.

Figure 2-9: Example of module arrangement



Module and terminal identification

The MM300 input/output and protection modules are labeled with the "IO_" prefix followed by a one-character identifier as follows.

Table 2-3: Input/output module nomenclature

Module	Description
IO_A	CT module
IO_B	VT module
IO_C	Two 10 A form-A relays, six 60 to 300 V AC digital inputs, and Aux VT input module.
IO_D	Four 10 A form-C relays module.
IO_E	Two 10 A form-A relays, six 20 to 60 V DC digital inputs.
IO_G	3 RTD module.

The MM300 terminals are labeled with a three-character identifier. The first character identifies the module slot position and the second character identifies the terminals within the module. For example, the first terminal in a module in slot C is identified as "C1".

NOTE

Do not confuse the slot designation with the module ordering designation. That is, terminal "C1" does not imply an IO_C module. Rather, it indicates the first terminal of whatever module is in slot C.

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Full-voltage non-reversing starter

Figure 2-10: Full-voltage non-reversing starter wiring - IO_C

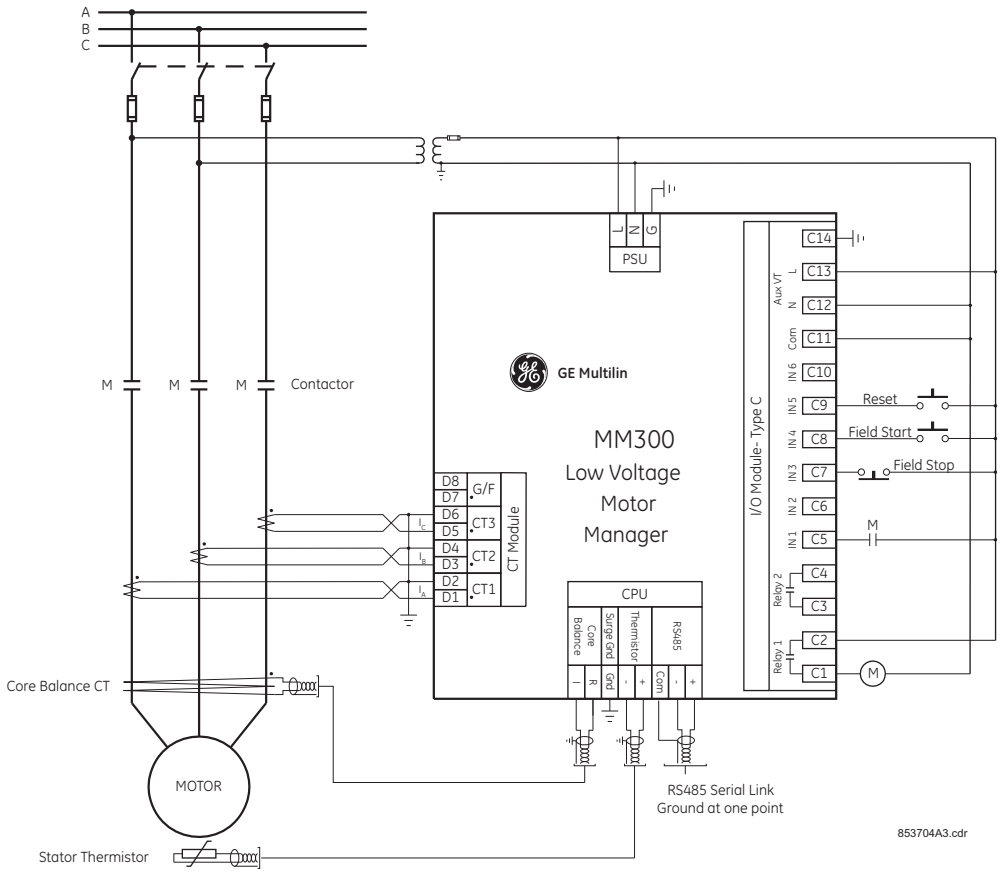
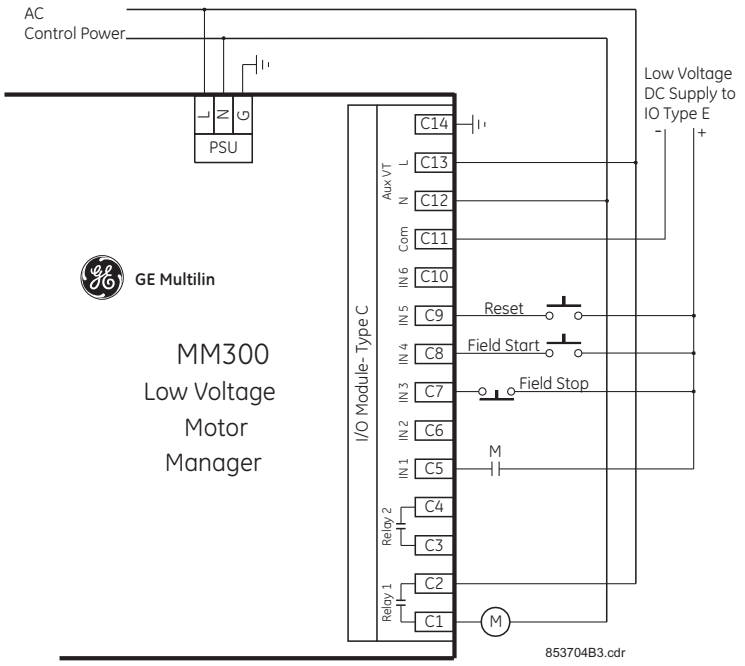


Figure 2-11: Full-voltage non-reversing starter control wiring - IO_E



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NOTE

The above drawing applies only to a high-voltage power supply. If a low-voltage (DC) power supply is used, an appropriate DC voltage source must be used for this power supply.

The full-voltage non-reversing starter type is a full voltage or across-the-line non-reversing starter.

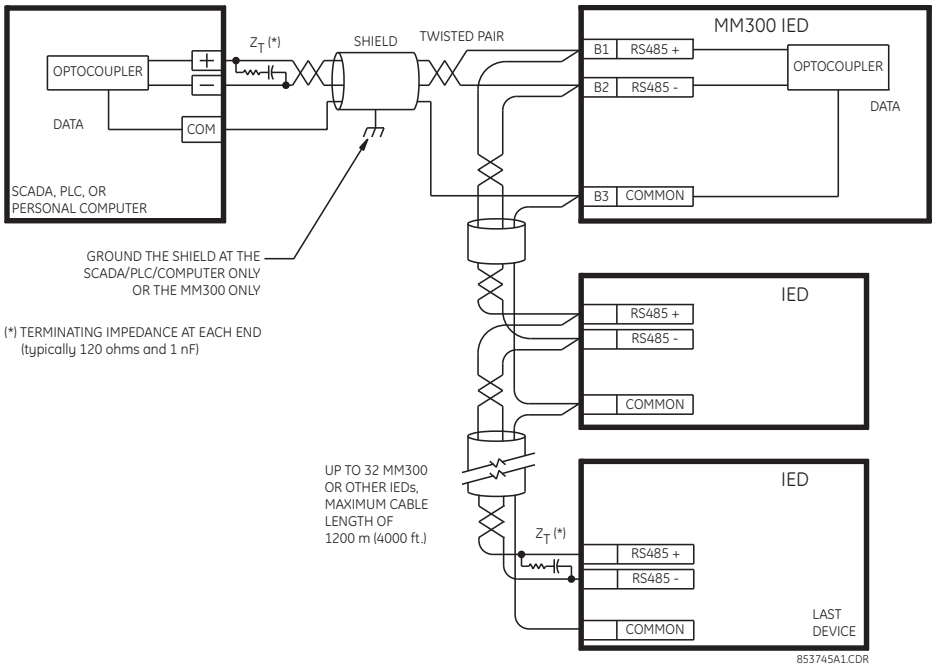
When a start control is received, the pre-contactor relay (if any) is picked up for the set pre-contactor time. When the pre-contactor timer times out, relay1 picks up and seals-in, picking up contactor M, which starts the motor. When a stop control is received, relay1 drops out, contactor M drops out, and the motor stops. The pre-contactor is omitted on forced starts (for example, UVR Immediate, External Start).

NOTE

Connect AUX VT to the Control Supply for correct operation of the UV Restart feature and correct input readings.

RS485 connections

Figure 2-12: Typical RS485 connection



One two-wire RS485 port is provided. Up to 32 MM300 IEDs can be daisy-chained together on a communication channel without exceeding the driver capability. For larger systems, additional serial channels must be added. Commercially available repeaters can also be used to add more than 32 relays on a single channel. Suitable cable should have a characteristic impedance of 120 ohms and total wire length should not exceed 1200 meters (4000 ft). Commercially available repeaters will allow for transmission distances greater than 1200 meters.

Voltage differences between remote ends of the communication link are not uncommon. For this reason, surge protection devices are internally installed across all RS485 terminals. Internally, an isolated power supply with an optocoupled data interface is used to prevent noise coupling.

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⚠CAUTION

To ensure that all devices in a daisy-chain are at the same potential, it is imperative that the common terminals of each RS485 port are tied together and grounded only once, at the master or at the MM300. Failure to do so may result in intermittent or failed communications.

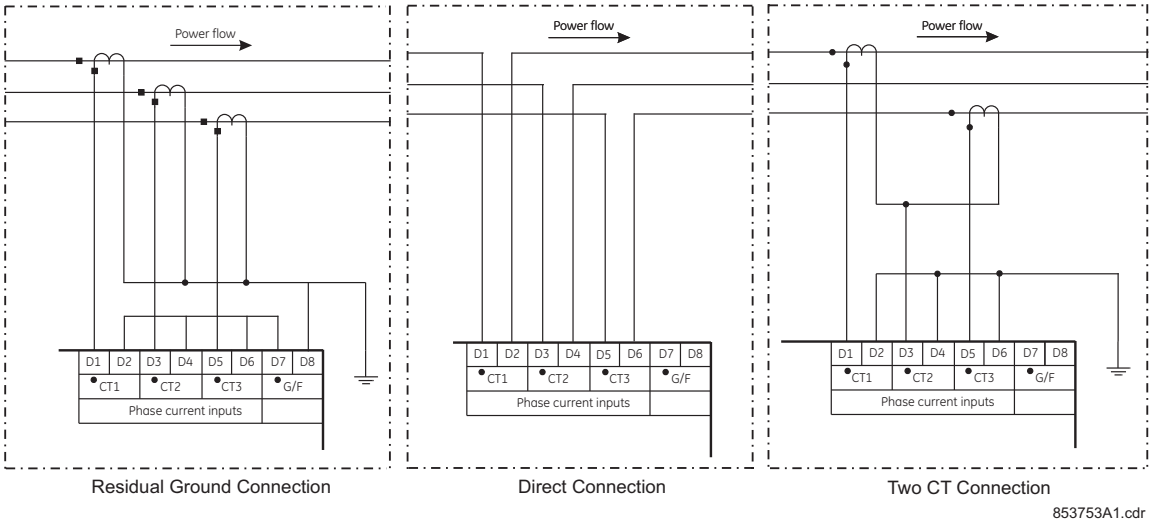
The source computer/PLC/SCADA system should have similar transient protection devices installed, either internally or externally. Ground the shield at one point only, as shown in the figure above, to avoid ground loops.

Correct polarity is also essential. The MM300 IEDs must be wired with all the positive (+) terminals connected together and all the negative (–) terminals connected together. Each relay must be daisy-chained to the next one. Avoid star or stub connected configurations. The last device at each end of the daisy-chain should be terminated with a 120 ohm ¼ watt resistor in series with a 1 nF capacitor across the positive and negative terminals. Observing these guidelines will ensure a reliable communication system immune to system transients.

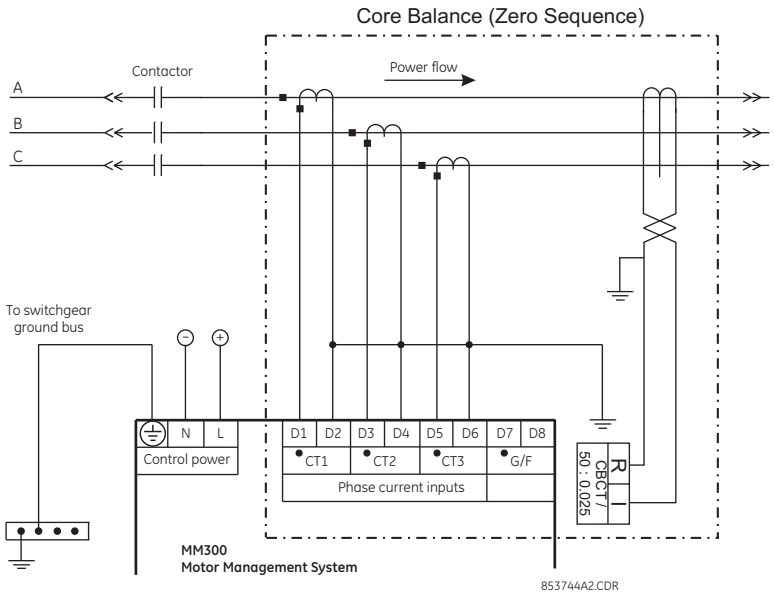
The uncovered communications cable shield connected to the common terminal should not exceed 1" (2.5 cm) for proper EMC shielding of the communications cable.

Phase current inputs (IO_A module)

Figure 2-13: Typical phase current input connections



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The MM300 has three channels for phase current inputs, each with an isolating transformer. The phase CTs should be chosen so the FLA is not less than 50% of the rated phase CT primary. Ideally, the phase CT primary should be chosen such that the FLA is 100% of the phase CT primary or slightly less, never more. This will ensure maximum accuracy for the current measurements. The maximum phase CT primary current is 1000 A.

The ground CT connection can either be a zero sequence (core balance) installation or a residual connection. Note that only 1 A and 5 A secondary CTs may be used for the residual connection. The zero sequence connection is shown in the diagram above, and this is recommended. Unequal saturation of CTs, CT mismatch, size and location of motor, resistance of the power system, motor core saturation density, etc. may cause false readings in the residually connected ground fault circuit. Refer to *section 2.2.2.1* for CBCT connection.

Note that if residual ground connection is selected, the CT primary setpoint used by the Phase CT's will also be used by the residual ground calculations.

⚠CAUTION

Polarity of the phase CTs is critical for negative-sequence unbalance calculation, power measurement, and residual ground current detection (if used).

Two CT configuration

Each of the two CTs acts as a current source. The current that comes out of the CT on phase A flows into the interposing CT on the relay marked CT1. From there, the current sums with the current that is flowing from the CT on phase C which has just passed through the interposing CT on the relay marked CT3. This summed current flows through the interposing CT marked CT2 and from there, the current splits up to return to its respective source (CT).

Polarity is very important since the value of phase B must be the negative equivalent of A + C in order for the sum of all the vectors to equate to zero.

Only one ground connection should be made as shown. If two ground connections are made, a parallel path for current has been created.

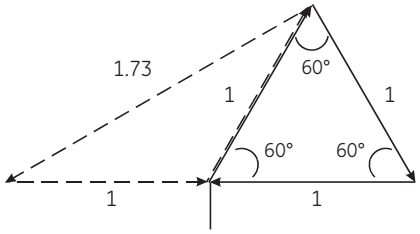
In the two CT configuration, the currents will sum vectorially at the common point of the two CTs. The diagram illustrates the two possible configurations. If one phase is reading high by a factor of 1.73 on a system that is known to be balanced, simply reverse the polarity of the leads at one of the two phase CTs (taking care that the CTs are still tied to ground at some point). Polarity is important.

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NOTE

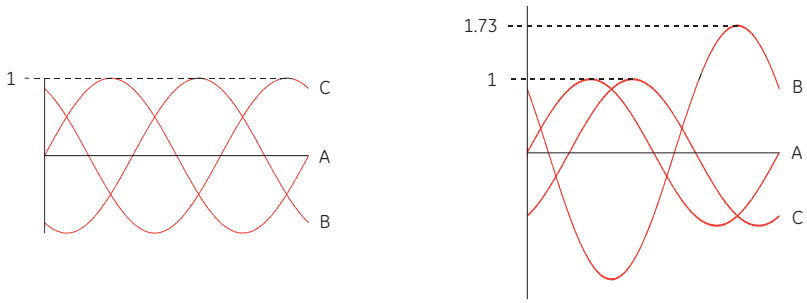
Change CT wiring only if the system is de-energized!

Figure 2-14: Two CT connection vector diagram



To illustrate the point further, the following diagram shows how the current in phases A and C sum up to create phase "B".

Figure 2-15: Two CT connection currents



Once again, if the polarity of one of the phases is out by 180°, the magnitude of the resulting vector on a balanced system will be out by a factor of 1.73.

On a three-wire supply, this configuration will always work and unbalance will be detected properly. In the event of a single phase, there will always be a large unbalance present at the interposing CTs of the relay. If for example phase A was lost, phase A would read zero while phase B and C would both read the magnitude of phase C. If on the other hand, phase B was lost, at the supply, phase A would be 180° out-of-phase with phase C and the vector addition would equal zero at phase B.

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Phase voltage inputs (IO_B module)

The MM300 has three channels for AC voltage inputs. There are no internal fuses or ground connections on the voltage inputs. Polarity is critical for correct power measurement and voltage phase reversal operation.

Figure 2-16: Wye voltage connection

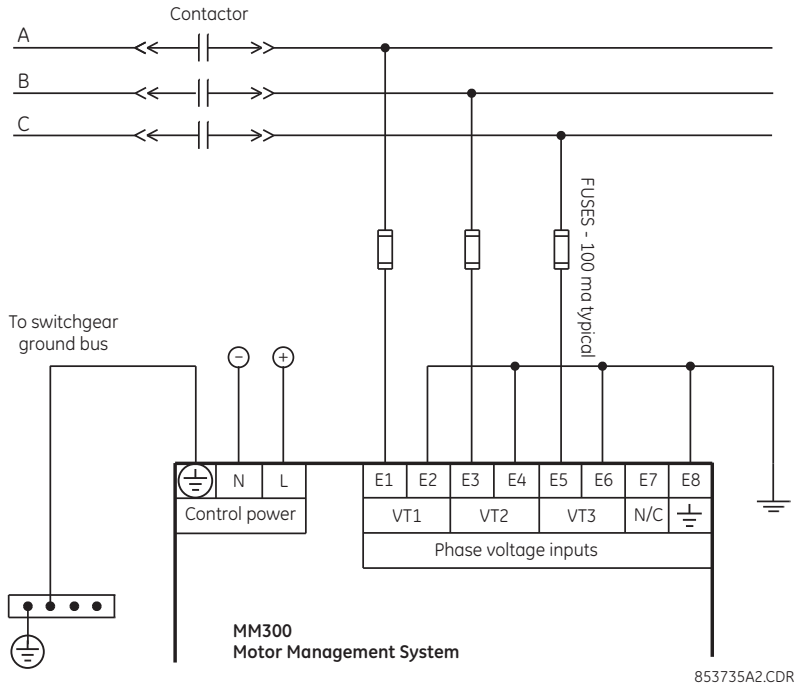
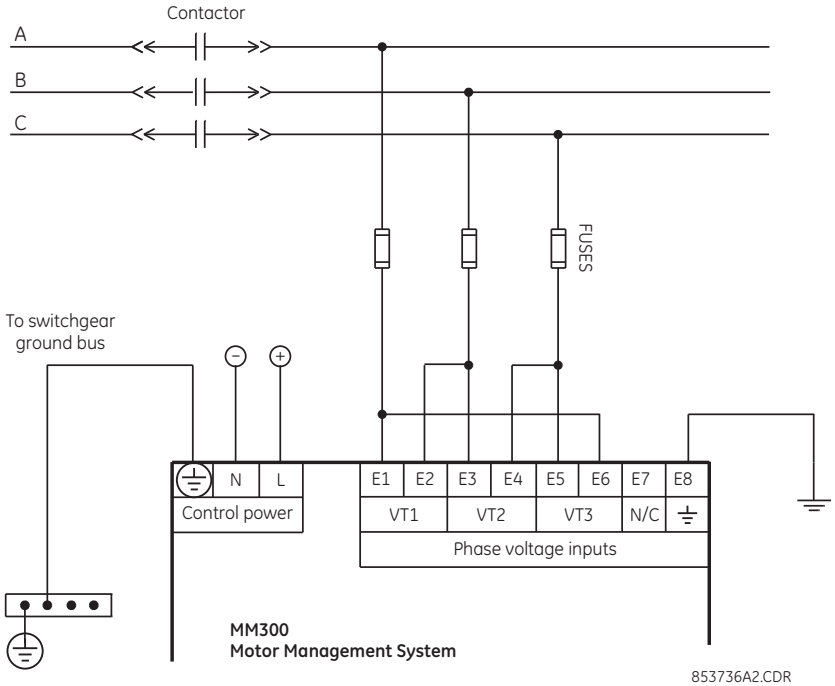


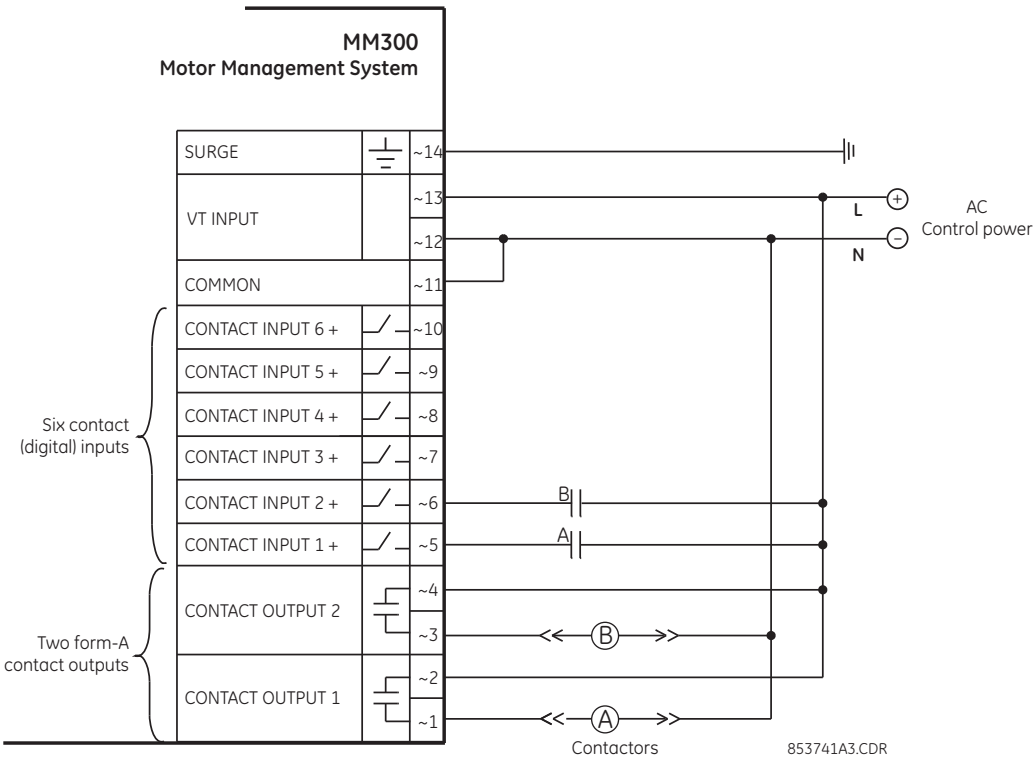
Figure 2-17: Delta voltage connection



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Type IO_C module connections

Figure 2-18: Typical wiring for type IO_C module



The IO_C module contains two form-A contact output relays, six digital inputs and control voltage input.

Contact inputs can be programmed to any of the input functions, such as field stop or process interlock. The exception is that contactor A status is fixed as the first contact input, and contactor B status (where used) is fixed as the second contact input.

An AC auxiliary supply must be connected to terminals 12 and 13. This auxiliary voltage (from slot C only) is also used for actual value indication, for auxiliary undervoltage, and for undervoltage restart. When three-phase voltages are not available, it is also used to calculate power quantities and is used as a phase angle reference.

When the IO_C module, **located in slot C**, senses an interruption to its auxiliary supply, it raises an AC Low Aux Voltage Inhibit, and forces the input state of the contact inputs to OFF, as the interruption prevents sensing the actual states.

The two contact outputs can be programmed to follow any one of the digital signals developed by the MM300, such as alarms and status signals. The exception is that the contactor A relay is fixed as the first contact output, and contactor B relay is fixed as the second contact output (where used).

NOTE

Connect AUX VT to the Control Supply for correct operation of the UV Restart feature and readings of inputs.

NOTE

All IO_C cards must have the auxiliary input VT wired for proper input sensing. If the auxiliary voltage on any IO-C module is too low, the contact inputs states for the affected module will be forced to OFF.

NOTE

Substitute the slot position of the input/output module (C, E, F, G, H) wherever the tilde symbol "~" appears in the diagrams above.

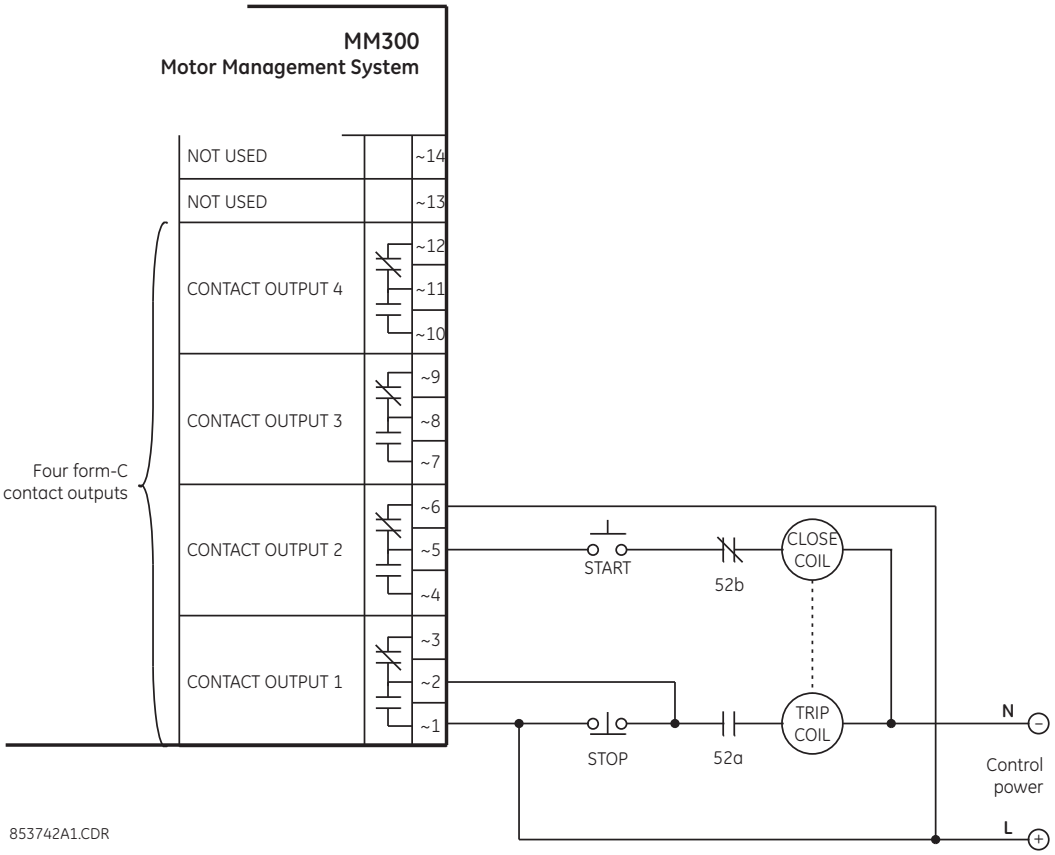
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Type IO_D module connections

The IO_D module contains four form-C contact output relays.

In general, contact outputs can be programmed to follow any one of the digital signals developed by the MM300, such as alarms and status signals.

Figure 2-19: Typical wiring for type IO_D contact output module



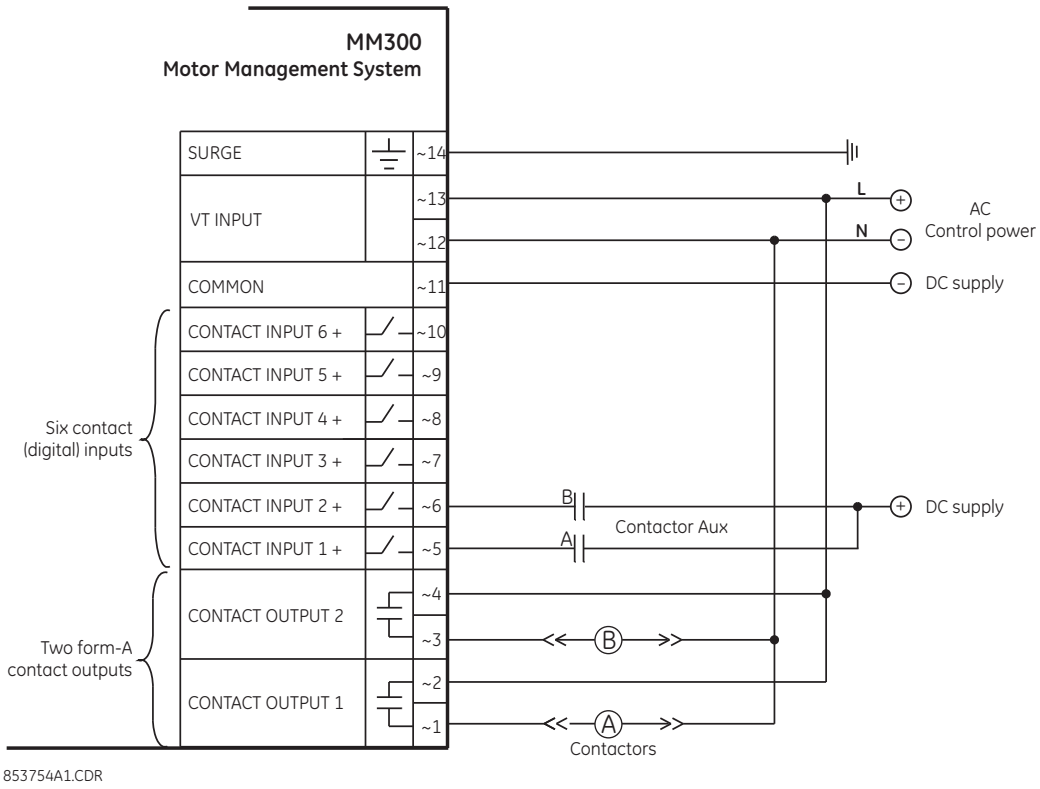
NOTE

Substitute the slot position of the input/output module (E, F, G, or H) wherever the tilde symbol "~" appears in the diagrams above.

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Type IO_E module connections

Figure 2-20: Typical wiring for type IO_E module



The IO_E module contains two form-A contact output relays, six digital inputs and a voltage input, which is a required connection. Contact inputs can be programmed to any of the input functions, such as field stop or process interlock. The exception is that contactor A status is fixed as the first contact input, and contactor B status (where used) is fixed as the second contact input.

An AC auxiliary supply **must be connected** to terminals 12 and 13 of the IO_E module in slot C. This auxiliary voltage from slot C is used for actual value indication, for auxiliary undervoltage, and for undervoltage restart. When three-phase voltages are not available, it is also used to calculate power quantities and is used as a phase angle reference. When the IO_E module, located in slot C, senses a low auxiliary voltage inhibit and the Undervoltage restart function is enabled, the states of the contact inputs are forced to OFF.

NOTE

The auxiliary voltage connection is required on all IO_E modules, both in slot C and in expansion slots.

The two contact outputs can be programmed to follow any one of the digital signals developed by the MM300, such as alarms and status signals. The exception is that the contactor A relay is fixed as the first contact output, and contactor B relay is fixed as the second contact output (where used).

NOTE

Substitute the slot position of the input/output module (C, E, F, G, H) wherever the tilde symbol "~" appears in the diagrams above.

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RTD sensor connections (IO_G module)

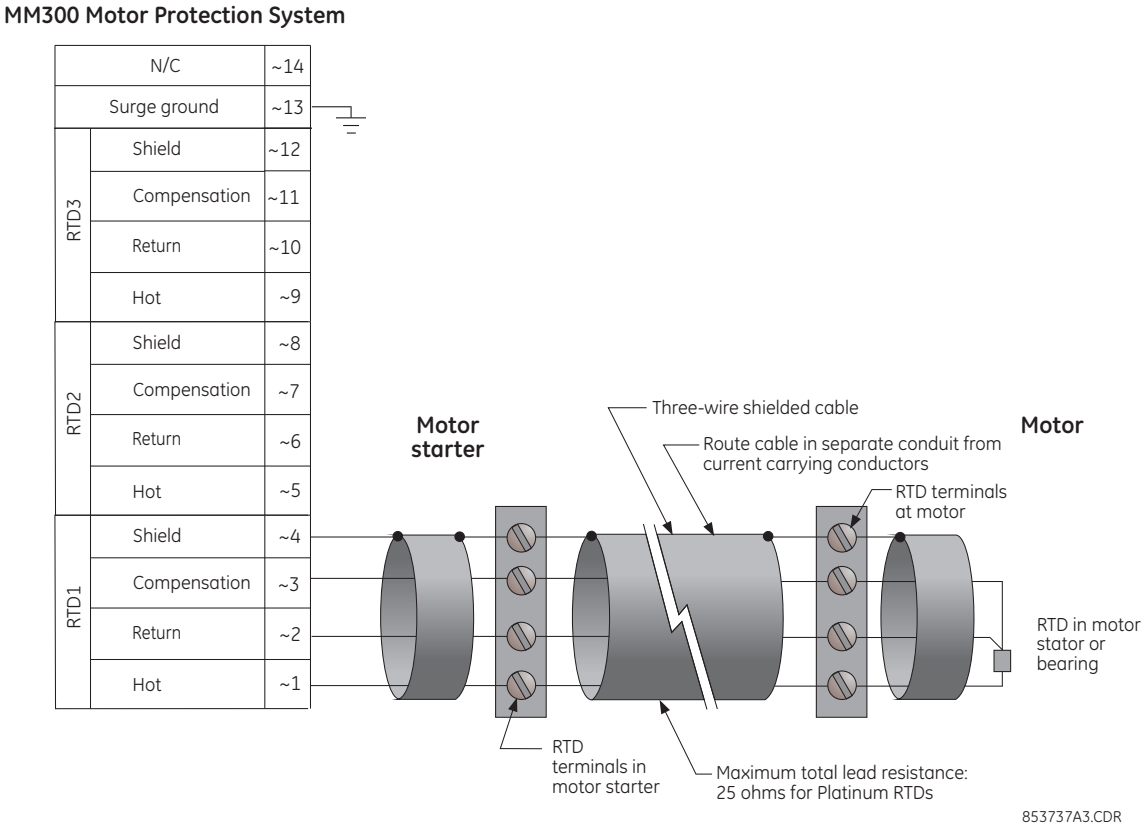
The type IO_G module contains three PT100 RTDs and associated protection functionality.

The MM300 monitors up to six RTD inputs for stator, bearing, ambient, or other temperature monitoring types. The type of each RTD is 100 ohm platinum (DIN 43760). RTDs must be three-wire type.

The RTD circuitry compensates for lead resistance, provided that each of the three leads is the same length. Lead resistance should not exceed 25 ohms per lead. Shielded cable should be used to prevent noise pickup in industrial environments. RTD cables should be kept close to grounded metal casings and away from areas of high electromagnetic or radio interference. RTD leads should not be run adjacent to or in the same conduit as high current carrying wires.

The uncovered communications cable shield connected to the common terminal should not exceed 1" (2.5 cm) for proper EMC shielding of the communications cable.

Figure 2-21: RTD wiring



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Maintenance

The MM300 requires minimal maintenance. As a microprocessor-based relay, its characteristics do not change over time. The expected service life of an MM300 is 20 years when the environment and electrical conditions are within stated specifications.

While the MM300 performs continual self-tests, it is recommended that maintenance be scheduled with other system maintenance. This maintenance can involve in-service, out-of-service, or unscheduled maintenance.

In-service maintenance

1. Visual verification of the analog values integrity, such as voltage and current (in comparison to other devices on the corresponding system).
2. Visual verification of active alarms, relay display messages, and LED indications.
3. Visual inspection for any damage, corrosion, dust, or loose wires.
4. Event recorder file download with further events analysis.

Out-of-service maintenance

1. Check wiring connections for firmness.
2. Analog values (currents, voltages, RTDs, analog inputs) injection test and metering accuracy verification. Calibrated test equipment is required.
3. Protection elements setting verification (analog values injection or visual verification of setting file entries against relay settings schedule).
4. Contact inputs and outputs verification. This test can be conducted by direct change of state forcing or as part of the system functional testing.
5. Visual inspection for any damage, corrosion, or dust.
6. Event recorder file download with further events analysis.

NOTICE

To avoid deterioration of electrolytic capacitors, power up units that are stored in a de-energized state once per year, for one hour continuously.

Unscheduled maintenance (system interruption)

- View the event recorder and oscillography for correct operation of inputs, outputs, and elements.

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Interfacing with the MM300

There are three methods of interfacing with the MM300 Motor Management System.

- Interfacing via the graphical control panel.
- Interfacing via the basic control panel.
- Interfacing via the EnerVista MM300 Setup software.

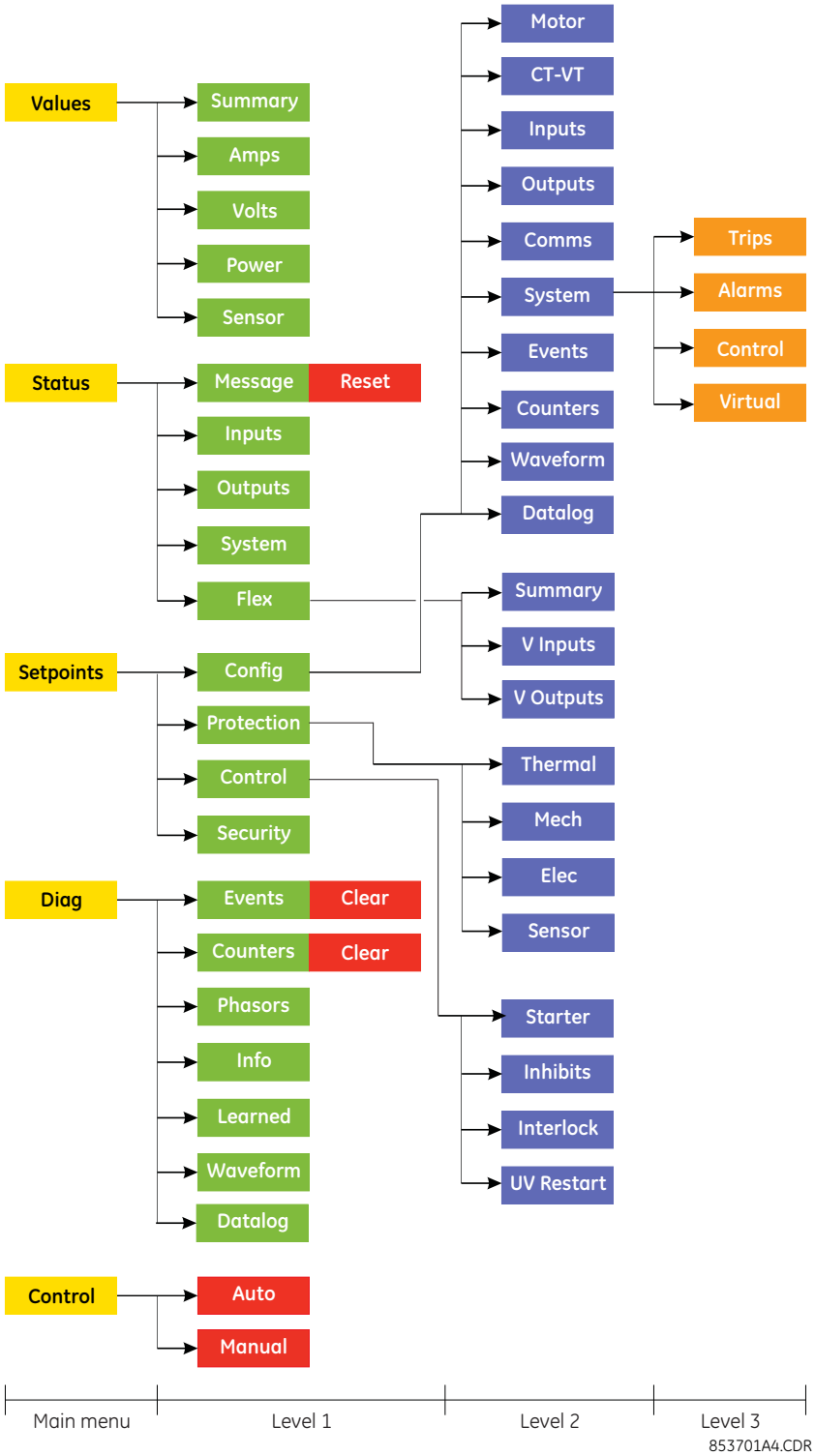
This section provides an overview of the interfacing methods available with the MM300 using the Graphical and Basic control panels. For additional details on interface parameters (for example, settings, actual values, etc.), refer to the individual chapters.

MM300 graphical display pages

A summary of the MM300 page hierarchy is shown below.

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Figure 2-22: MM300 display page hierarchy



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Introduction to the graphical control panel

The central feature of the graphical control panel is a 3.5-inch 320 by 240 pixel backlit color LCD screen. The panel also contains keys (pushbuttons) that control the display and perform commands. In addition, the interface contains START A, START B, and STOP direct acting control pushbuttons.

The display also contains several LED indicators that provide a summary of the machine status. Details are displayed on the screen when the user navigates to the appropriate page.

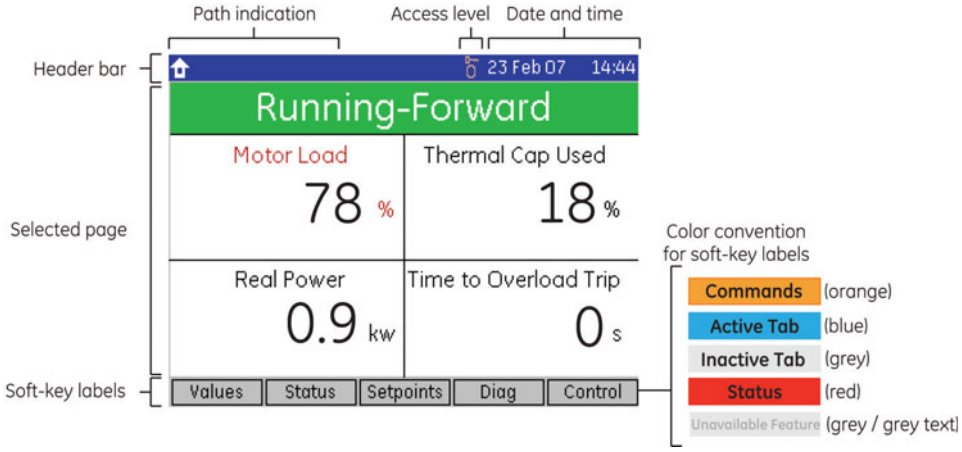
Figure 2-23: MM300 front panel with example default display



Graphical display

Each display page consists of the three components shown below.

Figure 2-24: Graphical display overview



The header bar (white text on a blue background) displays the hierarchical path name, the date and time in 24-hour format, and the current password access level. The hierarchical path is always displayed on the left top side of the graphical display. The present time is displayed on the right top side. If the test switch is on, the time is replaced with the text TEST MODE in red.

The soft-key labels are indicated on the bottom line. The soft-keys are used for navigation, performing functions, and for acknowledgement.

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- Navigation: soft-keys can be used to traverse across and down the hierarchy of pages.
- Functional: soft-keys can be used to perform page-specific functions.
- Acknowledgement: soft keys can be used to acknowledge popup windows.

Soft-keys labels change to show relevant selections for the displayed screen. The color of each soft-key label indicates its functionality. Soft-keys are highlighted for the displayed page, unauthorized keys are "greyed-out", and unused keys are not displayed.

The remainder of the screen shows the selected page. Pages are organized in a hierarchical or tree-based menu structure. To improve readability, some pages are labeled with rectangular outlines or colored backgrounds. Some pages contain too many fields to display at once. These pages display arrows bars at the right edge to indicate that the page continues below the screen. When recalled, scrolled pages are re-positioned at the top of the page.

Fields display actual value or setting information, and have behaviours that allow help display, editing, and control.

Each Actual Value analog field displayed on the home page has an associated alarm limit and changes color to orange when that limit is exceeded. Fields with an associated trip limit change their color to red when that limit has tripped. Fields that are disabled or unavailable are greyed-out.

Keypad

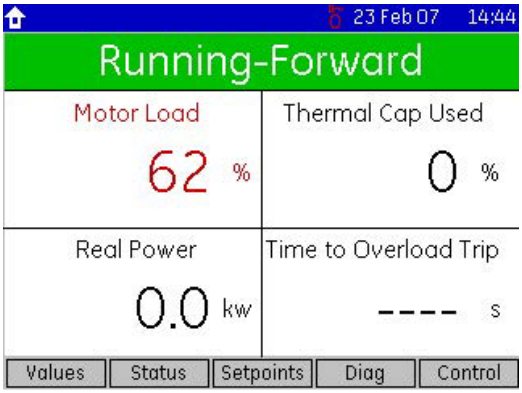
The function keys perform the labeled functionality. The summary of function key operation is shown below.

Table 2-4: Summary of function key operations

Key	Operation
HOME	Single press recalls the home page; double press recalls the default display
UP	Scroll up page, select field, tab to next field, increment value
DOWN	Scroll down page, select field, tab to previous field, decrement value
ESC	Single press closes pop-up, cancels editing, deselects field, moves to previous page; sustained press logs out (cancels security passcode entry)
ENTER	Single press freezes scrolling and selects field, edits selected field, saves edited value; double press sets the selected field/page as default; sustained press logs in (enter security passcode)
HELP	Displays context sensitive help and Modbus address

The HOME key always recalls the root or home page. The home page allows access to all sub-pages and also contains a status and process values summary. Double pressing the HOME key recalls the default display. Like a screen-saver, the default display appears after a period of inactivity and displays user-selected information. A typical default display is shown below, indicating a running motor in the forward direction.

Figure 2-25: Typical default display (actual size)



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The UP and DOWN keys function in different ways depending on their context.

- Where a scroll bar is displayed, the UP and DOWN keys scroll the page up and down.
- Where there is no scroll bar or it is greyed-out, the first press of the UP and DOWN keys selects the first field. Subsequent presses tab up and down through the fields, scrolling as required.
- When a field is open for editing, the UP and DOWN keys increment/decrement the value of that field.

The ENTER key functions in different ways depending on its context.

- If there are no selected fields, the ENTER key will freeze any scroll bars and select the first field on the display.
- If a field is selected, pressing ENTER will attempt to open it for editing.
- If a field is opened for editing, pressing enter will exit the edit sequence.
- Double pressing the ENTER key at any time selects the displayed page as the default display.
- A sustained press on ENTER prompts the security passcode and displays a dialog box that allows passcode entry.

For example, pressing and holding the ENTER key, or attempting a control where a password is required, displays the following page.

Figure 2-26: Passcode entry dialog box



The ESC key functions in different ways depending on its context.

- If a pop-up dialog box is displayed, the ESC key closes it.
- If an edit sequence is in progress, the ESC key cancels the edit.
- If a field is selected, the ESC key de-selects it.
- In all other instances, the ESC key moves back one page in the menu structure.
- A sustained press on the ESC key clears the security passcode and prompts for confirmation.

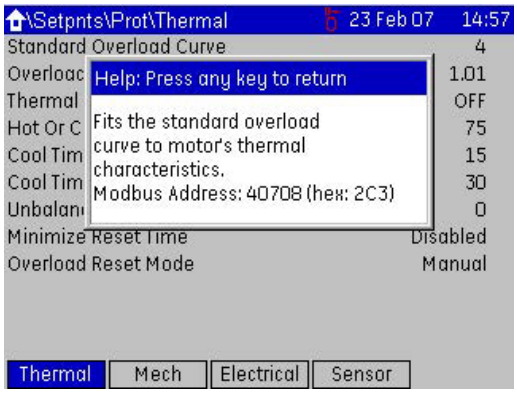
The HELP key functions in different ways depending on its context.

- If a field is selected, the HELP key displays a help window for the field.
- If a help window is displayed, the HELP key closes it.

Help windows are also closed when any other key is pressed. A typical help window is shown below.

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Figure 2-27: Typical MM300 help window



Pressing an invalid key displays a message explaining the problem and recommending a solution. Where the keypress is invalid because a security passcode is required, the dialog window will be a passcode entry window.

When a lockout occurs that clears when a count-down timer expires or when the thermal capacity recovers for a restart, the **Status > Message** page is displayed indicating timer value or thermal capacity.

Status pages

The status pages provide the user with up-to-date information on the current status of the MM300.

Status pages are divided into five sections.

- Message (displays all locked out conditions plus conditions such as alarms, internal faults, control status, etc.).
- Inputs (displays the present state of assigned contact inputs).
- Outputs (displays the present state of assigned contact outputs).
- System (displays the present state of the communications interface).
- Flex (displays the present state of the FlexLogic™ engine and number of lines used.)

A typical display is shown below:

Figure 2-28: Typical status message page



Message types are classified by color and associated icon type, as follows::

- Red Triangle = Trip
- Orange Square = Alarm
- Blue Circle = Inhibit
- Black Text = Information Message

Message can have an associated countdown timer.

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When the relay is first powered up, the status page lists why the relay is not available for service. This is not an exhaustive list of setpoints to be configured, but is a list of key items such as FLA, CT Type, starter type and control Source, that must be configured before the unit will be available for use. Protection values must still be configured for the motor to be protected correctly.

Inhibits

These include Process Interlock Stop, and Field Stop.

Trips / Alarms

These trigger depending on the protection setpoints. A typical example would be; "Overload Trip".

Information Messages

Information pages are split into two groups

- With navigation (shown above, as an **Enter** symbol on the right side of the display)
- Without navigation

When a line showing a message (with navigation) is highlighted, pressing **Enter** will take the GCP directly to the page in question, so that the situation can be quickly resolved. A typical example would be "FLA not set". Selecting this entry on the page will take you to the \setpoints\config\motor page.

MM300 programming techniques

To streamline the setting entry process, the graphical control panel omits non-functional settings from the display.

⚠CAUTION

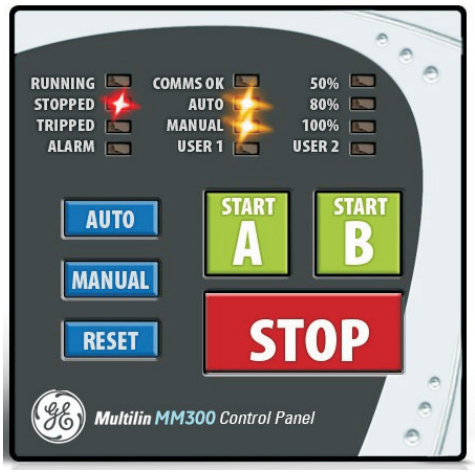
Settings may be changed while the motor is running. However, appropriate measures must be taken to limit the consequences of entering unintended or misunderstood setting values. Consequences of inappropriate settings to the specific application at hand include loss of protection, loss of control, and undesired starting or stopping.

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Basic control panel

The MM300 basic control panel provides the basic start and stop panel functionality, as well as a series of LED indications. The basic control panel is illustrated below.

Figure 2-29: Basic control panel



853750A1.CDR

The following LEDs are provided:

- Two USER LEDs (USER 1 and USER 2). the user can select parameters from a list
- 50%/80%/100% - showing motor load
- RUNNING, STOPPED, TRIPPED, and ALARM
- COMMS OK
- AUTO and MANUAL

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EnerVista MM300 Setup Software

Although settings can be entered manually using the control panel keys, a PC can be used to download values through the communications port. The EnerVista MM300 Setup software is available from GE Multilin to make this as convenient as possible. With EnerVista MM300 Setup running, it is possible to:

- Program and modify settings
- Load and save setting files to and from a disk
- Read actual values
- Monitor status
- Read pre-trip data and event records
- Get help on any topic
- Upgrade the MM300 firmware

The EnerVista MM300 Setup software allows immediate access to all MM300 features with easy to use pull down menus in the familiar Windows environment. This section provides the necessary information to install EnerVista MM300 Setup, upgrade the relay firmware, and write and edit setting files.

The EnerVista MM300 Setup software can run without a MM300 connected to the computer. In this case, settings may be saved to a file for future use. If an MM300 is connected to a PC and communications are enabled, the MM300 can be programmed from the setting screens. In addition, measured values, status and trip messages can be displayed with the actual value screens.

Software requirements

The following requirements must be met for the EnerVista MM300 Setup software.

- Windows 7, Windows 8.1, or Windows 10 is installed and running properly.

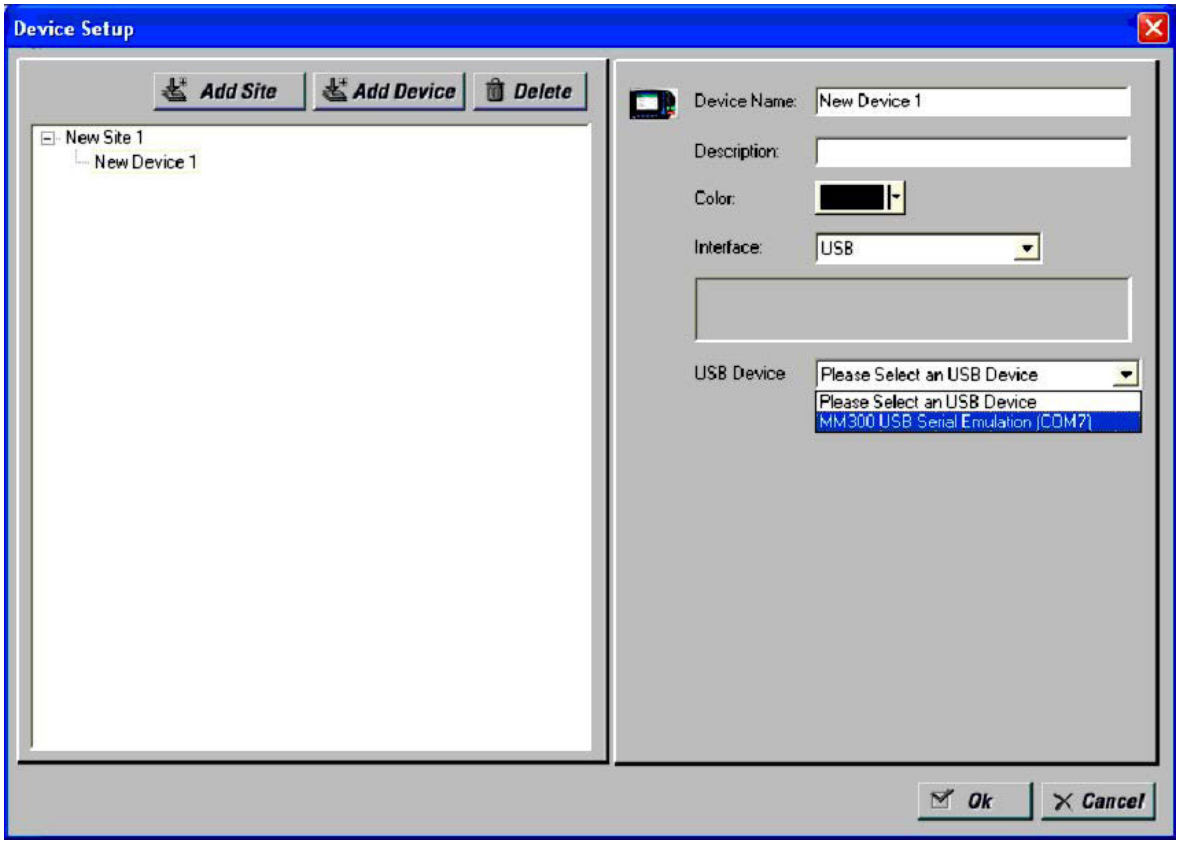
The EnerVista MM300 Setup software can be installed from either the GE EnerVista CD or the GE Multilin website at www.gegridsolutions.com/Multilin.

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Troubleshooting the USB driver

When the Setup Software is installed on the Windows 2000 or XP operating system, and the device is power recycled while the native USB port is still connected to the PC, the USB driver in the PC Program may get lost and the setup software may fail to recognize the USB device. If this happens, the 'MM300 USB Serial Emulation (COM #)' will be missing in the Setup Software's Device Setup window. To overcome the problem:

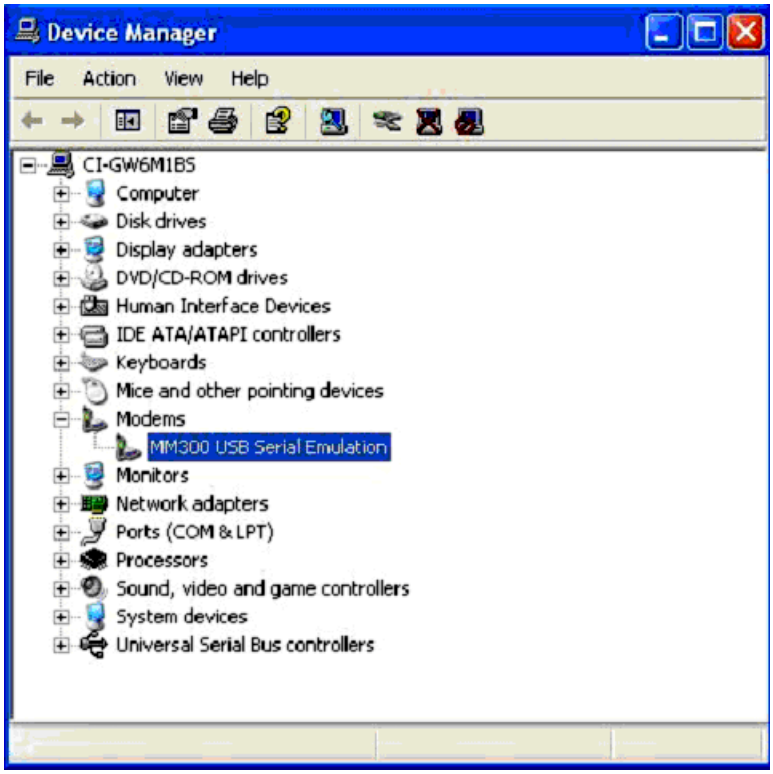
1. Remove the USB cable from the native port of the device.
2. Wait for 20 Seconds and connect the cable back to the native port of the device.
3. Check the Setup Software for the availability of the USB Device on the Device setup Window. It will automatically reappear on the 'USB Device' list as 'MM300 USB Serial Emulation (COM #)' as shown in the image below.



4. If the USB Device is not recognized automatically in the Setup Software, repeat the same procedure 2 or 3 times until the PC Program recognizes the USB device (and 'MM300 USB Serial Emulation (COM #)' reappears in dropdown of 'USB Device' list).

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5. If problem still persists, uninstall the USB driver from Computer's 'Device Manager' under tree-branch **modems** from the Installation folder. To uninstall it, right click on **MM300 USB Serial Emulation** and select **Uninstall**.

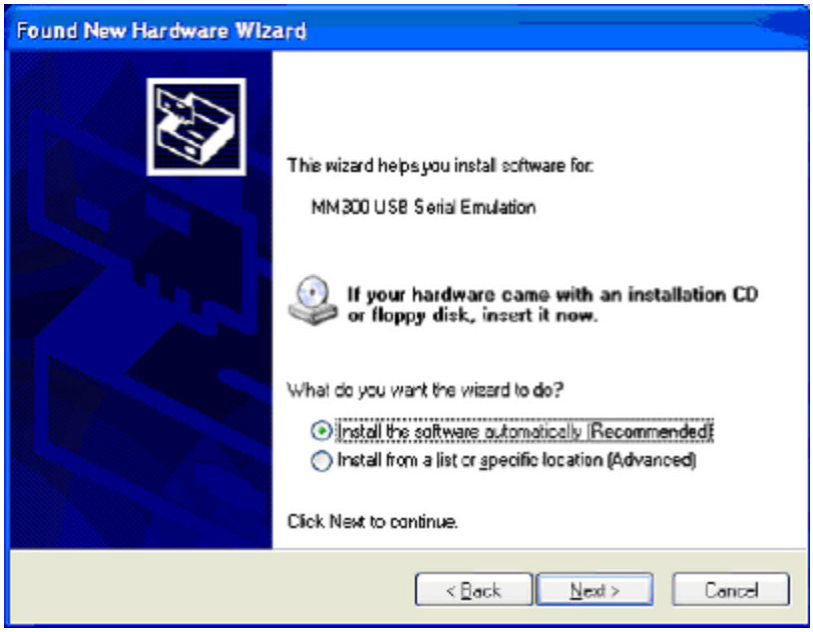


6. After the uninstall, remove the USB cable from the Device's native USB port, wait for at least 10 Seconds and reconnect it.
7. Now the 'Found New Hardware Wizard' will open, select **No, not this time** and press the **Next** button.



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8. Select **Install the software automatically (Recommended)** and press the **Next** button.



9. Press **Continue Anyway**.



10. At the end press **Finish**.
11. Check in the Setup Software for the availability of the USB Device on the Device setup Window. Now the device will reappear on the 'USB Device' list.

For the current version, the USB driver can not be installed on Windows Vista Operating System and communication to the Device via the Native USB port is not supported.

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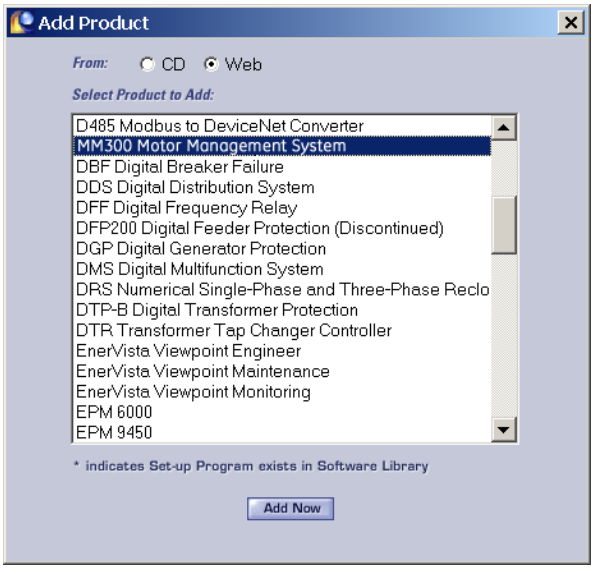
Installing the EnerVista MM300 Setup software

After ensuring the minimum requirements indicated earlier, use the following procedure to install the EnerVista MM300 Setup software from the enclosed GE EnerVista CD.

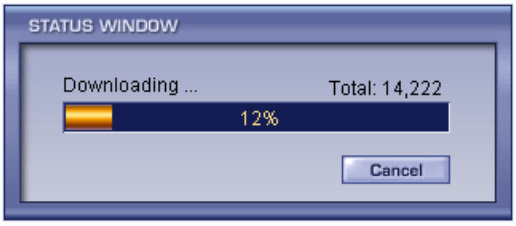
1. Insert the GE EnerVista CD into your CD-ROM drive.
2. Click the **Install Now** button and follow the installation instructions to install the no-charge EnerVista software on the local PC.
3. When installation is complete, start the EnerVista Launchpad application.
4. Click the **IED Setup** section of the Launch Pad toolbar.



5. In the EnerVista Launchpad window, click the **Add Product** button and select the MM300 Motor Management System as shown below. Select the Web option to ensure the most recent software release, or select CD if you do not have a web connection, then click the **Add Now** button to list software items for the MM300.



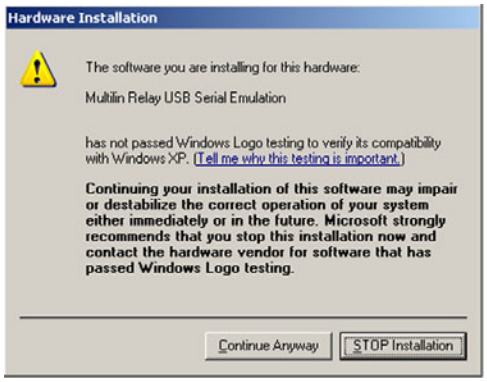
6. EnerVista Launchpad will obtain the latest installation software from the Web or CD and automatically start the installation process. A status window with a progress bar will be shown during the downloading process.



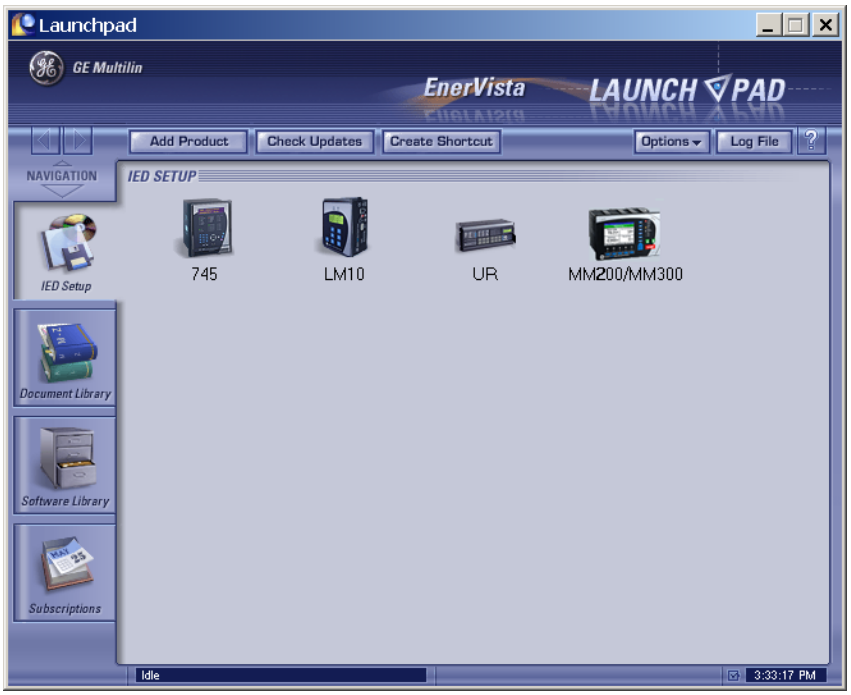
7. Select the complete path, including the new directory name, where the EnerVista MM300 Setup software will be installed.

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8. Click on **Next** to begin the installation. The files will be installed in the directory indicated, the USB driver will be loaded into the computer, and the installation program will automatically create icons and add EnerVista MM300 Setup software to the Windows start menu. The following screen will appear:



9. Press the **Continue Anyway** button, then click **Finish** to end the installation. The MM300 device will be added to the list of installed IEDs in the EnerVista Launchpad window, as shown below.



If you are going to communicate from your computer to the MM300 Relay using the USB port:

10. Plug the USB cable into the USB port on the MM300 Relay then into the USB port on your computer. The following screen will appear:

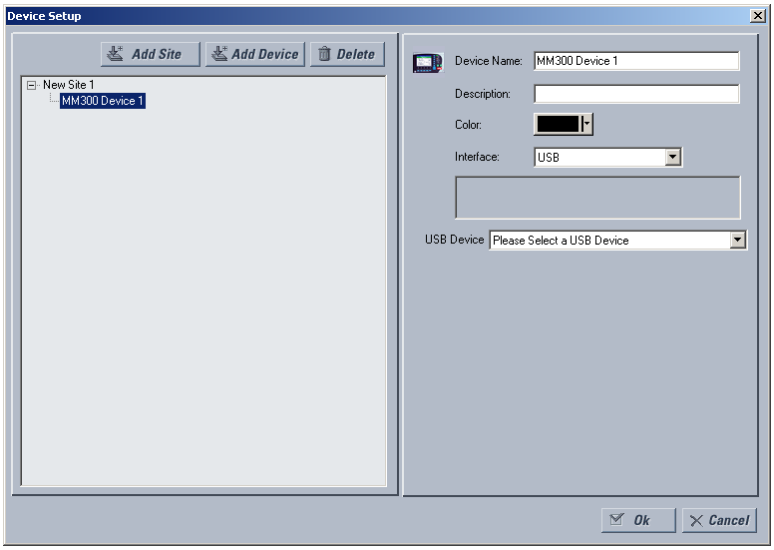
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11. Select **Install... Automatically**



12. Select **No, not this time**. The above Hardware Installation warning screen (see #8 above) will reappear. Press the **Continue Anyway** button.
13. In **EnerVista > Device Setup**:



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Select **USB** as the Interface type.

14. Select the appropriate USB device.

Upgrading the software

The latest EnerVista software and firmware can be downloaded from:

https://www.gegridsolutions.com/app/ViewFiles.aspx?prod=mm300&type=7

After upgrading, check the version number under **Help > About**. If the new version does not display, try uninstalling the software and reinstalling the new versions.

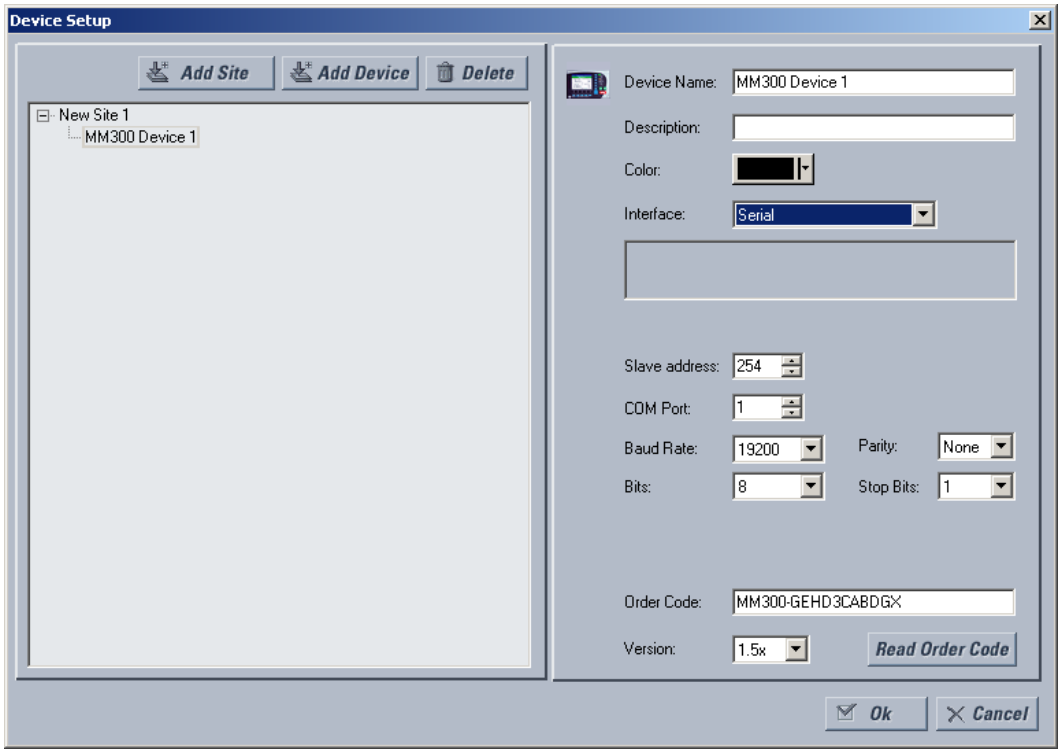
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Connecting EnerVista MM300 Setup to the relay

Configuring serial communications

Before starting, verify that the cable is properly connected to either the USB port on the front panel of the device (for USB communications) or to the Serial port on the rear of the device. This example demonstrates a Serial connection.

1. Install and start the latest version of the EnerVista MM300/MM200 Setup software (available from the GE Multilin web site). See the previous section for the installation procedure.
2. Click on the **Device Setup** button to open the Device Setup window and click the **Add Site** button to define a new site.
3. Enter the desired site name in the "Site Name" field. If desired, a short description of the site can also be entered. In this example, we will use “New Site 1” as the site name.
4. The new site will appear in the upper-left list in the EnerVista MM300/MM200 Setup window.
5. Click the **Add Device** button to define the new device.
6. Enter the desired name in the "Device Name" field and a description (optional) of the device.
7. Select “Serial Device” from the Interface drop-down list.



8. Click the **Read Order Code** button to connect to the MM300 device and upload the order code.

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9. Click **OK** when the relay order code has been received. The new device will be added to the Site List window (or Online window) located in the top left corner of the main EnerVista MM300/MM200 Setup window.

The MM300 Site Device has now been configured for Serial communications. Proceed to *Connecting to the Relay* below, to begin communications.

Using the Quick Connect feature

The **Quick Connect** button can be used to establish a fast connection through the front panel USB port of a MM300 relay. The following window will appear when the **QuickConnect** button is pressed:



As indicated by the window, the "Quick Connect" feature can quickly connect the EnerVista MM300/MM200 Setup software to a MM300 front port if the USB is selected in the interface drop-down list. Select "MM300 Relay" and press the **Connect** button.

When connected, a new Site called “Quick Connect” will appear in the Site List window.

The MM300 Site Device has now been configured via the Quick Connect feature for either USB or Serial communications. Proceed to *Connecting to the Relay* below, to begin communications.

Connecting to the relay

Now that the communications parameters have been properly configured, the user can easily communicate with the relay.

1. Expand the Site list by double clicking on the site name or clicking on the «+» box to list the available devices for the given site.
2. Desired device trees can be expanded by clicking the «+» box. The following list of headers is shown for each device:
   Device Definition
   Setpoints
   Values
   Diagnostics
   Device Summary
   Status
   Exerciser
   Maintenance.
3. Expand any list item and double click on any item contained in the expanded list to open that item, as shown below:

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4. The window related to that item will open with a corresponding status indicator tab on the lower left of the EnerVista SR3 Setup window.
5. If the status indicator is red, verify that the seria or USB cable is properly connected to the relay, and that the relay has been properly configured for communications (steps described earlier).

The "item" settings can now be edited, printed, or changed. Other windows can be displayed and edited in a similar manner. These windows can be arranged, and resized at will.

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Working with setpoints and setpoint files

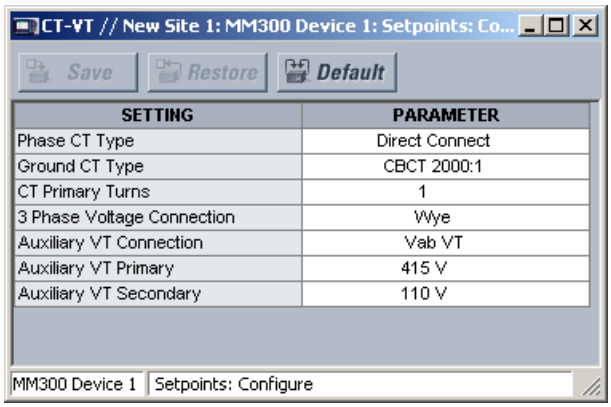
Engaging a device

The EnerVista MM300/MM200 Setup software may be used in on-line mode (relay connected) to directly communicate with a relay. Communicating relays are organized and grouped by communication interfaces and into sites. Sites may contain any number of relays selected from the product series.

Entering setpoints

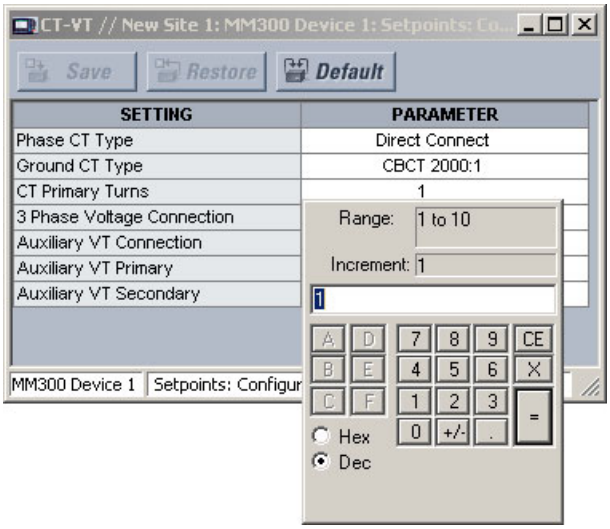
The System Setup page will be used as an example to illustrate the entering of setpoints. In this example, we will be changing the current sensing setpoints.

1. Establish communications with the relay.
2. Select the **Setpoint > Configure > CT-VT** menu item.
3. Select the CT Primary setpoint by clicking anywhere in the parameter box. This will display three arrows: two to increment/decrement the value and another to launch the numerical keypad.

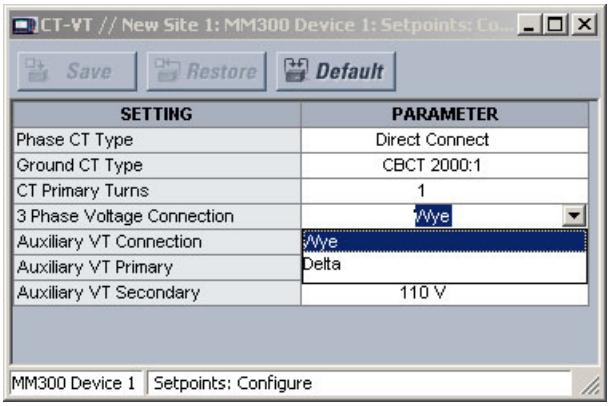


4. Clicking the arrow at the end of the box displays a numerical keypad interface that allows the user to enter a value within the setpoint range displayed near the top of the keypad: Click **=** to exit from the keypad and keep the new value. Click on **X** to exit from the keypad and retain the old value.

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5. For setpoints requiring non-numerical pre-set values (e.g. **CT Primary** below), clicking anywhere within the setpoint value box displays a drop-down selection menu arrow. Select the desired value from this list.



6. For setpoints requiring an alphanumeric text string (e.g. "relay name"), the value may be entered directly within the setpoint value box.
7. In the **Setpoint > Config > CT-VT** dialog box, click on **Save** to save the values into the MM300 . Click **YES** to accept any changes and exit the window. Click **Restore** to retain previous values. Click **Default** to restore Default values.

File support

Opening any EnerVista MM300/MM200 Setup file will automatically launch the application or provide focus to the already opened application. If the file is a Settings file (has a 'M30' extension) which had been removed from the Settings List tree menu, it will be added back to the Settings List tree.

New files will be automatically added to the tree.

Using setpoints files

The EnerVista MM300/MM200 Setup software interface supports three ways of handling changes to relay settings:

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- In off-line mode (relay disconnected) to create or edit relay settings files for later download to communicating relays.
- Directly modifying relay settings while connected to a communicating relay, then saving the settings when complete.
- Creating/editing settings files while connected to a communicating relay, then saving them to the relay when complete.

Settings files are organized on the basis of file names assigned by the user. A Settings file contains data pertaining to the following types of relay settings:

- Configure
- Protection
- Control
- Security Settings
- Modbus User Map
- FlexLogic

Factory default values are supplied and can be restored after any changes.

The EnerVista MM300/MM200 Setup displays relay setpoints with the same hierarchy as the front panel display.

Downloading and saving setpoints files

Setpoints must be saved to a file on the local PC before performing any firmware upgrades. Saving Setpoints is also highly recommended before making any Setpoint changes or creating new Setpoint files.

The Setpoint files in the EnerVista MM300/MM200 Setup window are accessed in the Files Window. Use the following procedure to download and save Setpoint files to a local PC.

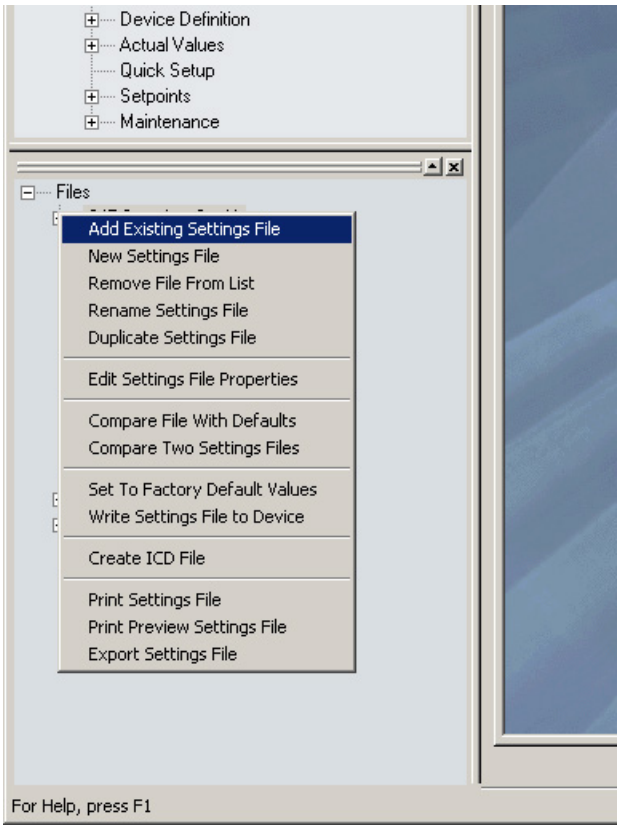
1. Ensure that the site and corresponding device(s) have been properly defined and configured as shown in *Connecting EnerVista MM300/MM200 Setup to the Relay*, above.
2. Select the desired device from the site list.
3. Select the **Online > Read Device Settings** from Device menu item (at the top of the page), or right-click on the device and select **Read Device Settings** to obtain settings information from the device.
4. After a few seconds of data retrieval, the software will request the name and destination path of the setpoint file. The corresponding file extension will be automatically assigned. Press **Receive** to complete the process. A new entry will be added to the tree, in the File pane, showing path and file name for the setpoint file.

Adding setpoints files to the environment

The EnerVista MM300/MM200 Setup software provides the capability to review and manage a large group of setpoint files. Use the following procedure to add an existing file to the list.

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1. In the files pane, right-click on **Files** and select the **Add Existing Setting File** item as shown:



2. The Open dialog box will appear, prompting the user to select a previously saved setpoint file. As for any other MS Windows® application, browse for the file to be added then click **Open**. The new file and complete path will be added to the file list.

Loading setpoints from a file

CAUTION

An error message will occur when attempting to download a setpoint file with a revision number that does not match the relay firmware. If the firmware has been upgraded since saving the setpoint file, see *Upgrading Setpoint Files to a New Revision*, above, for instructions on changing the revision number of a setpoint file.

The following procedure illustrates how to load setpoints from a file. Before loading a setpoints file, it must first be added to the EnerVista MM300/MM200 Setup environment as described in the section, *Adding Setpoints Files to the Environment*.

1. Select the previously saved setpoints file from the File pane of the software main window.
2. Select the **Offline > Edit Settings File Properties** menu item and verify that the corresponding file is fully compatible with the hardware and firmware version of the target relay. If the versions are not identical, see *Upgrading Setpoint Files to a New Revision*, above, for details on changing the setpoints file version.
3. Right-click on the selected file and select the **Write Settings File to Device** item.
4. Select the target relay from the list of devices shown and click **Send**. If there is an incompatibility, an "Incompatible Device" error message will occur:

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If there are no incompatibilities between the target device and the settings file, the data will be transferred to the relay. An indication of the percentage completed will be shown at the bottom of the main window.

Uninstalling files and clearing data

The unit can be decommissioned by turning off the power to the unit and disconnecting the wires to it. Files can be cleared after uninstalling the EnerVista software or MM300 device, for example to comply with data security regulations.On the computer, settings files can be identified by the .m30 extension.

To clear the current settings file do the following:

1. Create a default settings file.
2. Write the default settings file to the relay.
3. Delete all other files with the .m30 extension.
4. Delete any other data files , which can be in standard formats, such as COMTRADE or .csv.

You cannot directly erase the flash memory, but all records and settings in that memory can be deleted. Do this using these commands:

DIAGNOSTICS > COMMANDS

- **CLEAR LAST TRIP DATA PROMPT**
- **CLEAR TRIP COUNTERS**
- **CLEAR MAINTENANCE TIMER**
- **RESET MOTOR INFORMATION**

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Upgrading relay firmware

To upgrade the MM300 firmware, follow the procedures listed in this section. Upon successful completion of this procedure, the MM300 will have new firmware installed with the factory default setpoints.The latest firmware files are available from the GE Multilin website at http:// www.GEmultilin.com.

NOTE

EnerVista MM300/MM200 Setup software prevents incompatible firmware from being loaded into a MM300 relay.

NOTE

Before upgrading firmware, it is very important to save the current settings to a file on your PC. After the firmware has been upgraded, it will be necessary to load this file back into the MM300 relay. Refer to *Downloading and Saving Setpoints Files* for details on saving relay setpoints to a file.

NOTE

All IO_C cards **must** be connected to aux. voltage during any firmware upgrade procedure. If aux. voltage is not connected, calibration data from IO_C cards will not be restored during the upgrade procedure.

Loading new relay firmware

Loading new firmware into the MM300 flash memory is accomplished as follows:

1. Connect the RJ45 port on the relay (labelled "RS485 to Control Panel") to the RS232 port (COM1) on the local PC, using an RS232 (female)-to-RJ45 (male) custom cable (p/n 0804-0180).

   If there is no RS232 port on your PC:

   1.1. If you are using the **MM300 Graphical Control Panel (GCP) or Hand Held Device (HHD)**, connect the USB port on the front of the MM300 relay, to the USB port on the local PC, using a USB 2.0 type A to mini B cable. This configuration (1) is shown below.

   1.2. If you are using the **Basic Control Panel (BCP)**, and your PC has an RS232 port, disconnect the existing RJ45 cable from the side of the base unit (labelled "RS485 to Control Panel"), and connect an RS232-to-RJ45 cable from the PC to that same RJ45 port on the side of the base unit. This configuration (2) is shown below.

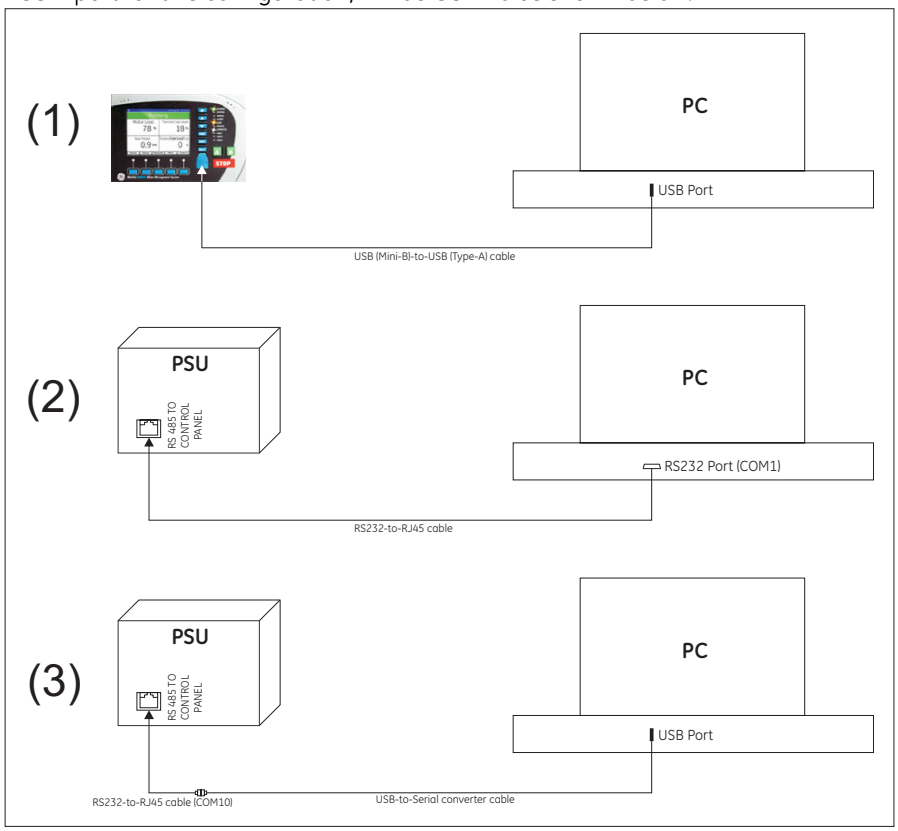
   1.3. If you are using **no control panel**, and your PC has an RS232 port, connect an RS232-to-RJ45 cable from the PC to the RJ45 port on the side of the base unit (labelled "RS485 to Control Panel"). This configuration (2) is shown below.

   Note 1: If your PC does **not** have an RS232 port, you will have to use a USB-to-serial converter cable (p/n 0100-0001), available at the GE Online Store (http:// www.gegridsolutions.com). This configuration (3) is shown below.

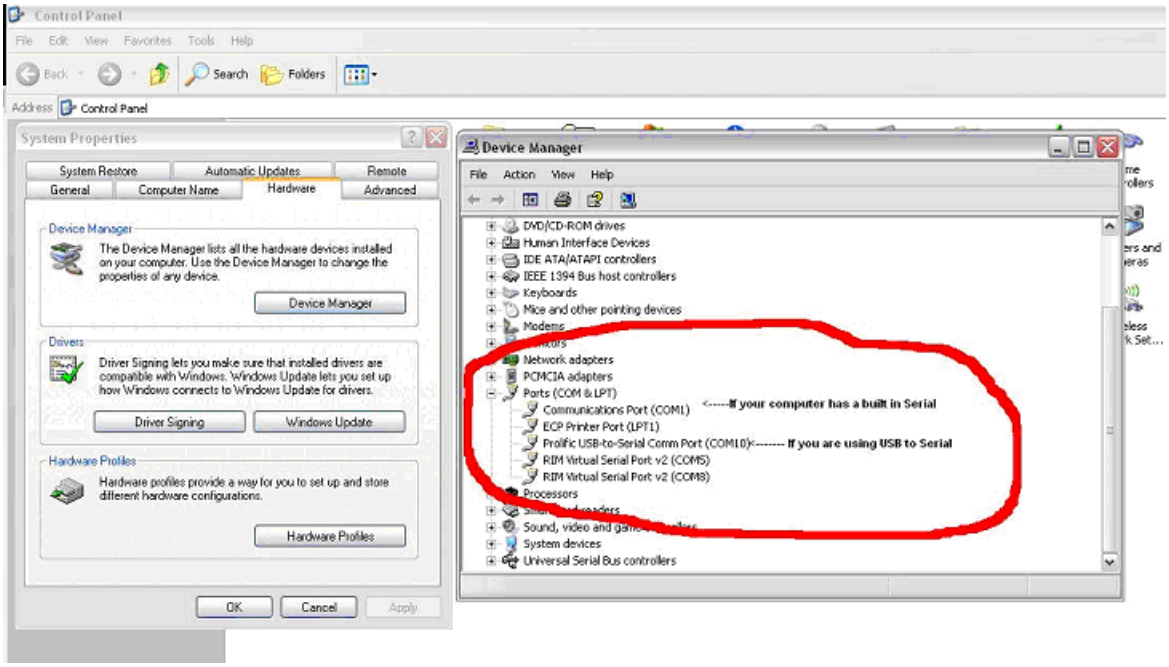
   Note 2: If the unit does not have Graphical Control Panel (GCP), you will have to use a RS232 to RJ45 custom cable (p/n 0804-0180), available at the GE Online Store (http:// www.gegridsolutions.com).

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Note 3: If you use a USB-to-serial converter cable (see Note 1 above), the effective COM port for this configuration, will be **COM10** as shown below.



2. Click **Windows Start Button > Control Panel > System > Hardware** tab. Then click Device Manager. Once your physical connections are complete and you have

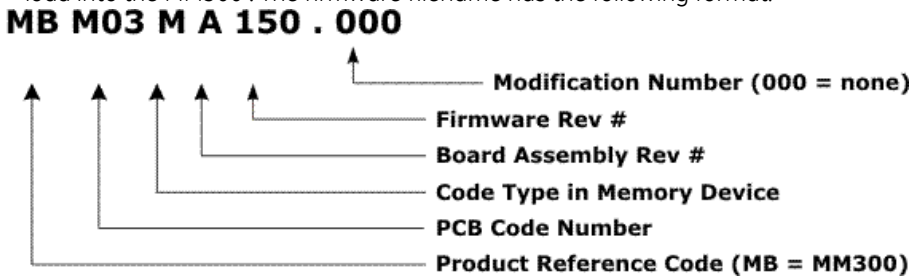


determined which COM PORT you will be using, start your MM300/MM200 EnerVista Setup Program.

3. Save the setpoints to a file as shown in *Downloading and Saving Setpoints Files*.

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4. Select the **Maintenance > Update Firmware** menu item.
5. The EnerVista MM300/MM200 Setup software will request the location of the folder containing the new firmware file. Locate the folder that contains the firmware files to load into the MM300 . The firmware filename has the following format:



6. EnerVista MM300/MM200 Setup software now prepares the MM300 to receive the new firmware file.
7. While the file is being loaded into the MM300 a status box appears showing how much of the new firmware file has been transferred and the upgrade status. The entire transfer process takes approximately 10 minutes.





8. The EnerVista MM300/MM200 Setup software will notify the user when the MM300 has finished loading the file. Carefully read any displayed messages and click **OK** to return the main screen. **Cycling power to the relay is recommended after a firmware upgrade.**

After successfully updating the MM300 firmware, the relay will not be operational and will require setpoint programming. To communicate with the relay, the communication settings may have to be manually reprogrammed.

When communications are established, the saved setpoints must be reloaded back into the relay. See *Loading Setpoints from a File* for details.

Modbus addresses assigned to firmware modules, features, settings, and corresponding data items (i.e. default values, min/max values, data type, and item size) may change slightly from version to version of the firmware. Addresses are rearranged when new features are added or existing features are enhanced or modified.

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GE
Grid Solutions

MM300 Motor Management System

Chapter 3: Actual values

Actual values overview

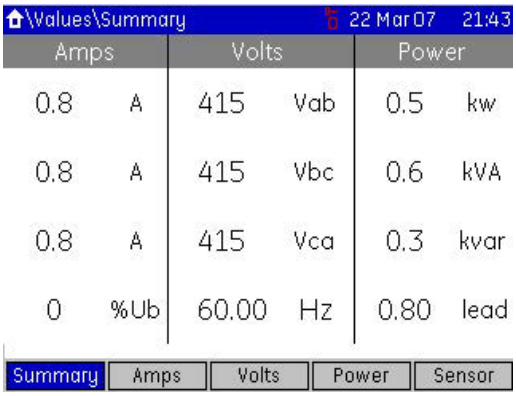
Measured values, maintenance and fault analysis information are accessed in the actual values screens. Actual values may be accessed via one of the following methods.

- Through the graphical control panel, using the keys and display.
- With the EnerVista MM300 Setup software supplied with the relay.
- Through the RS485 or Ethernet ports and a PLC/SCADA system running user-written software.

Actual value messages are organized into logical groups, or pages, for easy reference.

Pressing the **Values** soft-key displays the actual values summary window. A summary of metered current, voltage, and power values are shown for all three phases.

Figure 3-1: Actual values summary window



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MM300 Motor Management System

Chapter 4: Setpoints

Understanding setpoints

Any of the motor trip and alarm setpoints may be viewed or altered by pressing the **Setpoints** soft-key. Setpoints data is divided into four pages.

- Configuration page: Information about the motor configuration as well as system setup, inputs, outputs, communications, CTs, and VTs.
- Protection page: Information about the protection features.
- Control page: Information about the process control features.
- Security page: Information about the security and password features.

Press the **Setpoint** soft-key to scroll through the setpoints pages. When pressed for the first time, the following screen is displayed.

Figure 4-1: Setpoints home page



The soft-keys on the **Home > Setpoints** page open pages two levels down, since the pages immediately below this page are blank. For example, the Config soft-key opens the **Home > Setpoints > Config > Motor** page.

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The pages containing setpoint fields, except for the inputs and outputs pages, are in a common format. This is a simple tabular format with two columns: setpoint name and units, and setpoint value. Setpoints for features that are not enabled are omitted from the page.

CAUTION

Setpoints may be changed while the motor is running; however it is not recommended to change important protection parameters without first stopping the motor.

Setpoints will remain stored indefinitely in the internal non-volatile memory even when control power to the unit is removed. Protection parameters are based on the entered data. This data must be complete and accurate for the given system for reliable protection and operation of the motor.

Configuration setpoints

The configuration setpoints contains data on motor configuration as well as system setup, inputs, outputs, communications, CTs, and VTs. The following sub-pages are available.

- Motor (setpoints related to motor configuration).
- CT-VT (setpoints related to CT and VT configuration).
- Inputs (setpoints related to digital input configuration)
- Outputs (setpoints related to digital output configuration)
- Comms (setpoints related to communications configuration)
- System (setpoints related to MM300 system configuration, such as the faceplate LEDs)
- Events (setpoints related to the event recorder)
- Counters (setpoints related to the digital counters)

Motor setpoints

The MM300 starter function is responsible for executing the motor startup sequence, including the pre-contactor start warning. The MM300 provides eight pre-defined starters.

- Full-voltage non-reversing
- Full-voltage reversing
- Two-speed
- Wye-delta open transition
- Inverter
- Soft start
- Autotransformer open transition
- Autotransformer closed transition

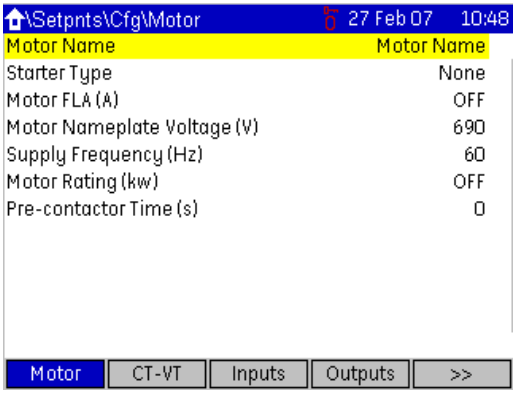
NOTE

By selecting a pre-defined starter, inputs and outputs are automatically assigned.

Select the **Home > Setpoints > Config > Motor** page to edit the motor data settings.

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Figure 4-2: Motor data settings page



Common motor setpoints

Several motor setpoints are dependent on the chosen starter type. The setpoints shown below are common to all starter types.

Motor Name

Range: up to 20 alphanumeric characters
Default: Motor Name

This setpoint specifies a name for the motor. This name will appear in the actual values, sequence of events record, and other reports.

Starter Type (Mandatory Setpoint)

Range: None, FV Non-Reversing, FV Reversing, Two Speed, Wye-Delta, Inverter, Soft Starter, Autotr Open Trans, Autotr Closed Trans, Custom Starter
Default: FV Non-Reversing

This setpoint selects the starter type. The relay is essentially disabled when the value is set to "None". The following figure illustrates typical starter timing beginning from the stopped state for all starter types.

Motor FLA (Mandatory Setpoint)

Range: 0.5 to 1000.0 amps in steps of 0.1
Default: OFF

This setpoint must be specified for motor protection. The value may be taken from the motor nameplate data sheets.

Motor Nameplate Voltage (Mandatory Setpoint)

Range: 100 to 690 volts in steps of 1
Default: 690 volts

This setpoint specifies the rated motor nameplate voltage. This value represents the base phase-to-phase voltage, and is used by the undervoltage and overvoltage protection elements.

Supply Frequency (Mandatory Setpoint)

Range: 50 Hz, 60 Hz
Default: 60 Hz

This setpoint specifies the nominal system frequency.

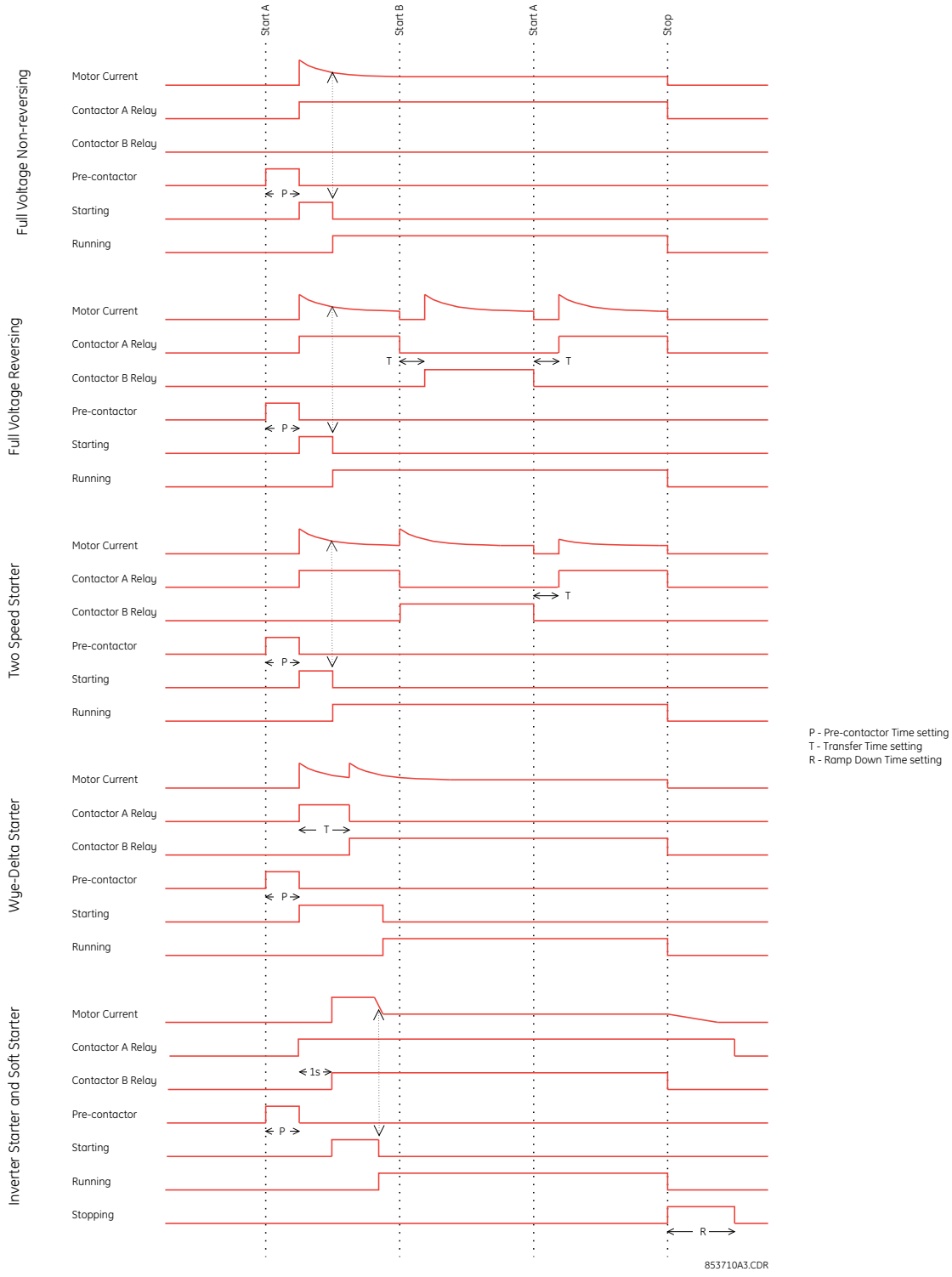
Motor Rating (Mandatory Setpoint)

Range: 0.3 to 1100.0 kW in steps of 0.1 or OFF
Default: OFF

This setpoint specifies the motor rating (or low speed motor rating for two-speed starters) in kWs.

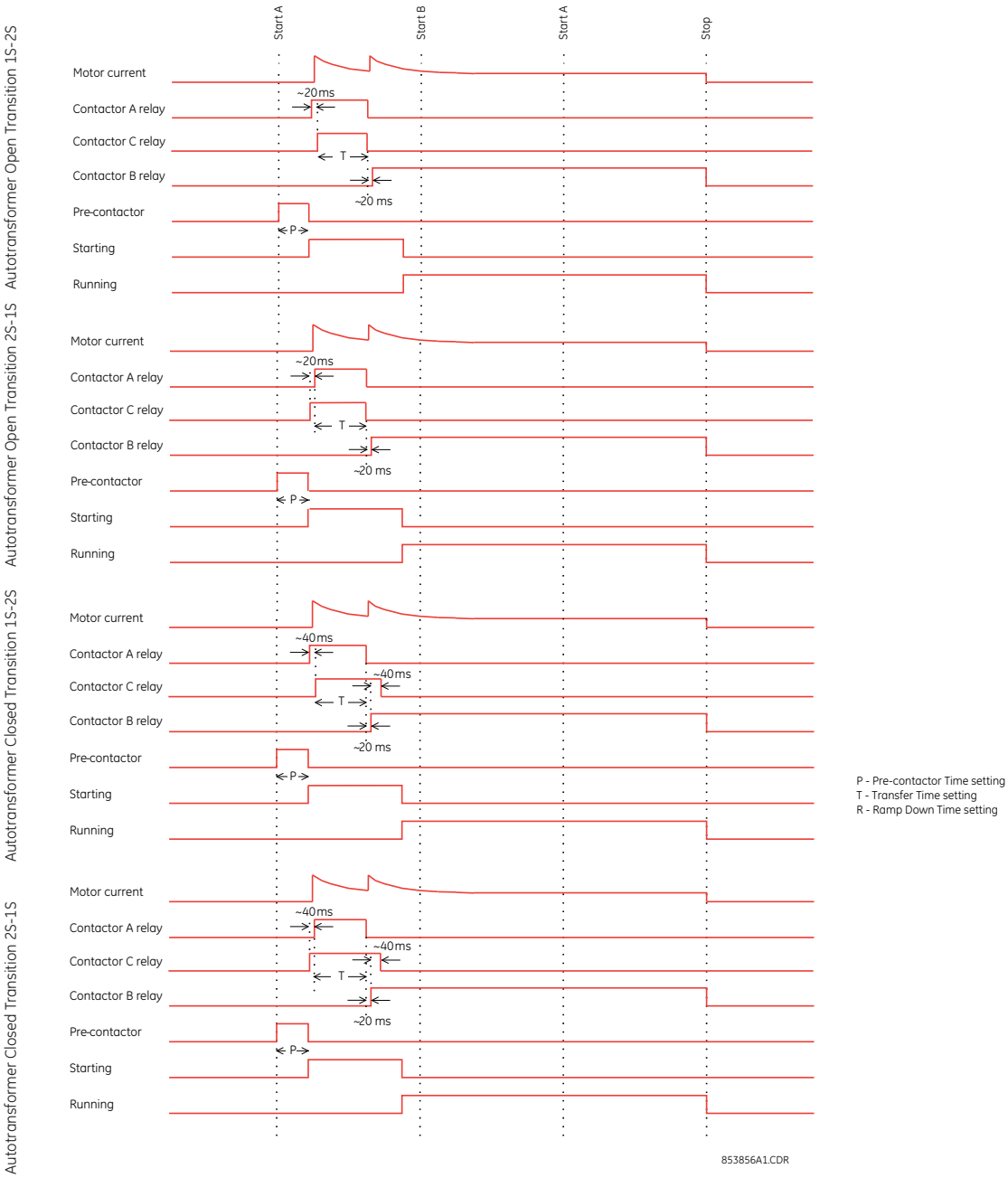
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Figure 4-3: Typical starter timing (1 of 2)



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Figure 4-4: Typical starter timing (2 of 2)



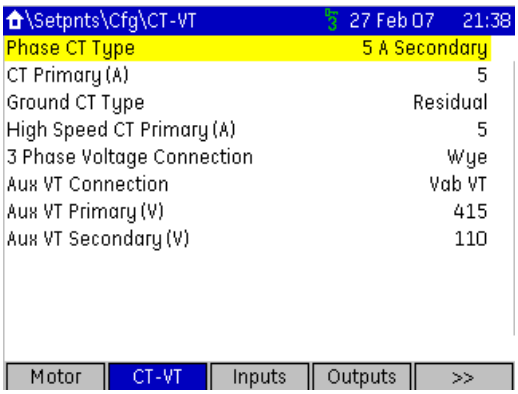
The following sections provide additional information for each starter type.

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Current and voltage transformers

Select the **Home > Setpoints > Config > CT-VT** page to edit the current and voltage transformer setpoints.

Figure 4-5: Typical current and voltage transformer setpoints window



The following setpoints are available to configure the current and voltage transformers.

Phase CT Type (Mandatory Setpoint)

Range: None, 1 A Secondary, 5 A Secondary, Direct Connect
Default: Direct Connect

This setpoint specifies the phase CT connection type. The "Direct Connect" value indicates that no phase CTs are used; instead, motor phase current passes directly through the relay. The "Direct Connect" selection should never be used where full load current is greater than 5.0 amps.

NOTE

If Direct Connect is selected and the FLA is set >5 A, a "FLA too high" message will be displayed on the Status page.

CT Primary (Mandatory Setpoint)

Range: 5 to 1000 amps in steps of 1
Default: 5 amps

This setpoint specifies the phase CT primary current. It should never be less than the full load current, and preferably no greater than twice than the full load current.

Standard cut-off default is 20% (0.2pu) of CT primary. At CT primary less then 0.2pu, primary CT turns are required and an appropriate current cut-off setpoint.

For example: using a 30:1 CT with 6A FLA gives 0.2A CT secondary @ FLA, the cut-off must be lowered to 0.1A and a minimum of 3 primary turns are required.

NOTE

This setpoint is displayed only if the phase CT type is set to 1 A secondary or 5 A secondary.

High Speed CT Primary

Range: 5 to 1000 amps in steps of 1
Default: 5 amps

This setpoint specifies the phase CT primary current when the motor is running at high speed. It should never be less than the high speed full load current, and preferably no greater than twice than the high speed full load current.

NOTE

This setpoint is displayed only if the phase CT type is set to 1 A secondary or 5 A secondary and the motor starter type is two-speed.

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Ground CT Type

Range: None, Residual, CBCT 2000:1
Default: CBCT 2000:1

This setpoint specifies the type of ground CT. Select "Residual" if the fourth CT Input on the IO_A is connected to the residual of the Phase CT. Select 2000:1 if a zero sequence CT (CBCT) is connected to the ground input on the CPU card.

CT Primary Turns

Range: 1 to 10
Default: 1

For smaller motors where the drawn current is very low, the motor leads may be wrapped through the CT Primary with several turns thereby increasing the current seen by the MM300 and as a result increasing the accuracy of the measurement. The value of this setting should equal the number of turns on the CT Primary to display the correct current value. Internally the current measurement will be divided by this setting.

Standard cut-off default is 20% (0.2pu) of CT primary. At CT primary less then 0.2pu, primary CT turns are required and an appropriate current cut-off setpoint.

For example: using a 30:1 CT with 6A FLA gives 0.2A CT secondary @ FLA, the cut-off must be lowered to 0.1A and a minimum of 3 primary turns are recommended.

Three Phase Voltage Connection

Range: Wye, Delta
Default: Wye

The method in which the IO_B voltage inputs are connected must be entered here. Note that phase reversal is disabled for single VT operation. All voltages are assumed balanced.

Auxiliary Voltage Connection (Mandatory Setpoint)

Range: VabVT, VbcVT, VcaVT, VanVT, VbnVT, VcnVT, VanDirect, VbnDirect, VcnDirect
Default: Vab VT

This setpoint specifies the control transformer connection to the motor supply voltage.

Auxiliary VT Primary

Range: 110 to 690 volts in steps of 1
Default: 415 volts

This setpoint specifies the primary voltage rating of the control transformer.

Auxiliary VT Secondary

Range: 110 to 300 volts in steps of 1
Default: 110 volts

This setpoint specifies the secondary voltage rating of the control transformer.

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MM300 Motor Management System

Chapter 5: Protection elements

Thermal protection

The primary protective function of the MM300 is the thermal model. The MM300 integrates stator and rotor heating into a single model. The rate of motor heating is gauged by measuring the terminal currents. The present value of the accumulated motor heating is maintained in the **Thermal Capacity Used** actual value register. When the motor is in overload, the motor temperature and thermal capacity used will rise. A trip occurs when the thermal capacity used reaches 100%. When the motor is stopped and is cooling to ambient, the thermal capacity used decays to zero. If the motor is running normally, the motor temperature will eventually stabilize at some steady state temperature, and the thermal capacity used increases or decreases to some corresponding intermediate value, which accounts for the reduced amount of thermal capacity left to accommodate transient overloads.

The thermal model consists of six key elements.

- Unbalance current biasing that accounts for negative-sequence heating.
- Hot/cold biasing that accounts for normal temperature rise.
- RTD biasing that accounts for ambient variation and cooling problems
- An overload curve that accounts for the rapid heating that occurs during stall, acceleration, and overload.
- Cooling rate that accounts for heat dissipation.
- Thermal protection reset that controls recovery from thermal trips and lockouts.

Each of these categories are described in the following sub-sections.

Overload curve

The overload curve accounts for the rapid motor heating that occurs during stall, acceleration, and overload. Specifically, the overload curve controls the rate of increase of **Thermal Capacity Used** whenever the equivalent motor heating current is greater than 1.01 times the full load current setpoint. The curve is defined by the following equation and

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reflects that overload heating largely swamps the cooling, and this heating is primarily due to resistive losses in the stator and the rotor windings (said losses being proportional to the square of the current).

$$\text{Trip time} = \frac{\text{Curve Multiplier} \times 2.2116623}{0.02530337 \times (\text{Pickup} - 1)^2 + 0.05054758 \times (\text{Pickup} - 1)} \quad \textbf{Eq. 1}$$

In the above equation,

- The trip time represents the time (in seconds) for the MM300 to trip, given the motor starts cold and the current is constant.
- The multiplier represents the value of the **Curve Multiplier** setpoint. This setpoint can be used to adjust the curve to match the thermal characteristics of the motor.
- I_{eq} represents the equivalent motor heating current in per-unit values on a full load current base. The value of I_{eq} is limited in this equation to 8.0 to prevent the overload from acting as an instantaneous element and responding to short circuits. Equivalent motor heating current is discussed in the *Unbalance biasing* section.

For example, a motor with a stall current (also known as locked rotor current) of 8 times its FLA, with a curve multiplier of 7, if stalled from a cold state, trips in the following amount of time.

$$\text{Trip time} = \frac{\text{Curve Multiplier} \times 2.2116623}{0.02530337 \times (\text{Pickup} - 1)^2 + 0.05054758 \times (\text{Pickup} - 1)}$$

$$= \frac{7 \times 2.2116623}{0.02530337 \times (8 - 1)^2 + 0.05054758 \times (8 - 1)}$$

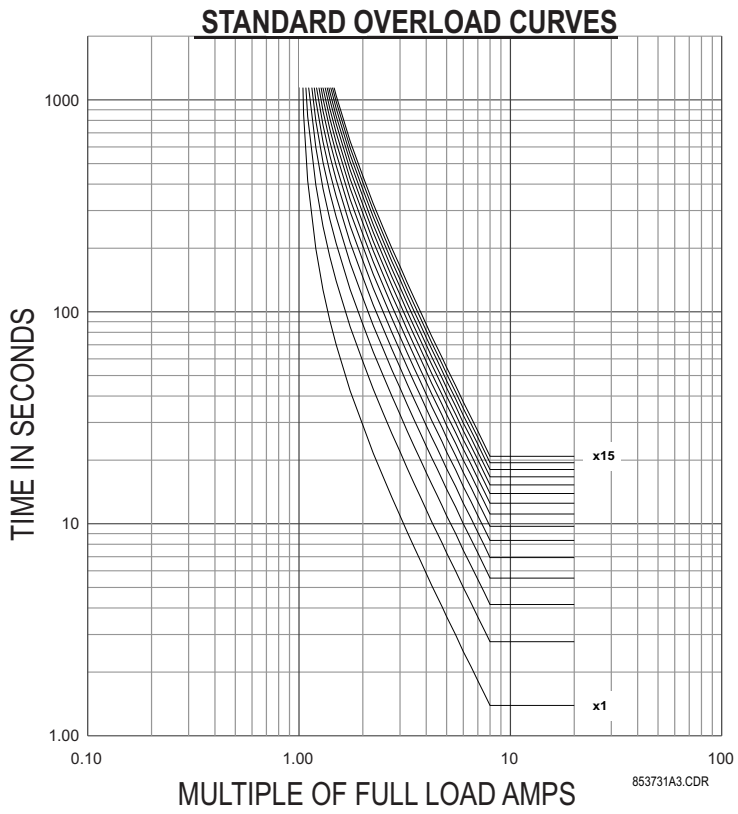
$$= 9.714 \text{ seconds} \quad \textbf{Eq. 2}$$

This would respect a safe stall cold time of 10 seconds.

The standard overload curves are displayed below.

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Figure 5-1: Standard overload curves



The trip times for the standard overload curves are tabulated below.

Table 5-1: Standard overload curve trip times (in seconds)

PICKUP (× FLA)	STANDARD CURVE MULTIPLIERS														
	× 1	× 2	× 3	× 4	× 5	× 6	× 7	× 8	× 9	× 10	× 11	× 12	× 13	× 14	× 15
1.01	4353.6	8707.2	13061	17414	21768	26122	30475	34829	39183	43536	47890	52243	56597	60951	65304
1.05	853.71	1707.4	2561.1	3414.9	4268.6	5122.3	5976.0	6829.7	7683.4	8537.1	9390.8	10245	11098	11952	12806
1.10	416.68	833.36	1250.0	1666.7	2083.4	2500.1	2916.8	3333.5	3750.1	4166.8	4583.5	5000.2	5416.9	5833.6	6250.2
1.20	198.86	397.72	596.58	795.44	994.30	1193.2	1392.0	1590.9	1789.7	1988.6	2187.5	2386.3	2585.2	2784.1	2982.9
1.30	126.80	253.61	380.41	507.22	634.02	760.82	887.63	1014.4	1141.2	1268.0	1394.8	1521.6	1648.5	1775.3	1902.1
1.40	91.14	182.27	273.41	364.55	455.68	546.82	637.96	729.09	820.23	911.37	1002.5	1093.6	1184.8	1275.9	1367.0
1.50	69.99	139.98	209.97	279.96	349.95	419.94	489.93	559.92	629.91	699.90	769.89	839.88	909.87	979.86	1049.9
1.75	42.41	84.83	127.24	169.66	212.07	254.49	296.90	339.32	381.73	424.15	466.56	508.98	551.39	593.81	636.22
2.00	29.16	58.32	87.47	116.63	145.79	174.95	204.11	233.26	262.42	291.58	320.74	349.90	379.05	408.21	437.37
2.25	21.53	43.06	64.59	86.12	107.65	129.18	150.72	172.25	193.78	215.31	236.84	258.37	279.90	301.43	322.96
2.50	16.66	33.32	49.98	66.64	83.30	99.96	116.62	133.28	149.94	166.60	183.26	199.92	216.58	233.24	249.90
2.75	13.33	26.65	39.98	53.31	66.64	79.96	93.29	106.62	119.95	133.27	146.60	159.93	173.25	186.58	199.91
3.00	10.93	21.86	32.80	43.73	54.66	65.59	76.52	87.46	98.39	109.32	120.25	131.19	142.12	153.05	163.98
3.25	9.15	18.29	27.44	36.58	45.73	54.87	64.02	73.16	82.31	91.46	100.60	109.75	118.89	128.04	137.18
3.50	7.77	15.55	23.32	31.09	38.87	46.64	54.41	62.19	69.96	77.73	85.51	93.28	101.05	108.83	116.60
3.75	6.69	13.39	20.08	26.78	33.47	40.17	46.86	53.56	60.25	66.95	73.64	80.34	87.03	93.73	100.42

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PICKUP (× FLA)	STANDARD CURVE MULTIPLIERS														
	× 1	× 2	× 3	× 4	× 5	× 6	× 7	× 8	× 9	× 10	× 11	× 12	× 13	× 14	× 15
4.00	5.83	11.66	17.49	23.32	29.15	34.98	40.81	46.64	52.47	58.30	64.13	69.96	75.79	81.62	87.45
4.25	5.12	10.25	15.37	20.50	25.62	30.75	35.87	41.00	46.12	51.25	56.37	61.50	66.62	71.75	76.87
4.50	4.54	9.08	13.63	18.17	22.71	27.25	31.80	36.34	40.88	45.42	49.97	54.51	59.05	63.59	68.14
4.75	4.06	8.11	12.17	16.22	20.28	24.33	28.39	32.44	36.50	40.55	44.61	48.66	52.72	56.77	60.83
5.00	3.64	7.29	10.93	14.57	18.22	21.86	25.50	29.15	32.79	36.43	40.08	43.72	47.36	51.01	54.65
5.50	2.99	5.98	8.97	11.96	14.95	17.94	20.93	23.91	26.90	29.89	32.88	35.87	38.86	41.85	44.84
6.00	2.50	5.00	7.49	9.99	12.49	14.99	17.49	19.99	22.48	24.98	27.48	29.98	32.48	34.97	37.47
6.50	2.12	4.24	6.36	8.48	10.60	12.72	14.84	16.96	19.08	21.20	23.32	25.44	27.55	29.67	31.79
7.00	1.82	3.64	5.46	7.29	9.11	10.93	12.75	14.57	16.39	18.21	20.04	21.86	23.68	25.50	27.32
7.50	1.58	3.16	4.75	6.33	7.91	9.49	11.08	12.66	14.24	15.82	17.41	18.99	20.57	22.15	23.74
8.00	1.39	2.78	4.16	5.55	6.94	8.33	9.71	11.10	12.49	13.88	15.27	16.65	18.04	19.43	20.82

The following tables illustrate the relation between GE Multilin MM2 and MM3 curve numbers, NEMA curves, and the MM300 curve multipliers.

Table 5-2: MM2 and MM3 curve numbers and MM300 curve multipliers

MM2 and MM3 curve number	1	2	3	4	5	6	7	8
MM300 curve multiplier	1	2	3	4	7	9	12	15

Table 5-3: NEMA curves and MM300 curve multipliers

NEMA curve	Class 10	Class 15	Class 20	Class 30
MM300 curve multiplier	4	6	8	12

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MM300 Motor Management System

Chapter 6: Communications

Communications interfaces

The MM300 has three communications interfaces. These can be used simultaneously:

- RS485
- 10/100Base-T Ethernet
- Fieldbus

NOTE

Setpoint changes related to DeviceNet, Profibus, and Ethernet, require a power cycle to be activated.

NOTE

External power must be present on the Fieldbus port at power-up, in order to correctly initialize and operate.

NOTE

For full details, please refer to the MM300 Communications Guide, to be found on the GE Multilin web site.

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Chapter 7: Specifications

NOTE

Specifications are subject to change without notice.

Protection specifications

ACCELERATION TIMER

Pickup: ..... $I_{av} > I_{pu}$
Dropout: ..... $I_{av} < I_{pu}$ or timer expired
Time delay: ..... 0.5 to 250.0 seconds in steps of 0.1
Timing accuracy: ..... ±500 ms or 1.5% of total time
Elements: ..... trip and alarm

AUXILIARY UNDERVOLTAGE

Pickup level: ..... 60 to 90% of NCV
Time delay: ..... 1 to 60 seconds in steps of 1
Timing accuracy: ..... ± 500 ms
Elements: ..... trip and alarm

CURRENT UNBALANCE

Range: ..... 4 to 40% in steps of 1
Accuracy: ..... ±2%
Time delay: ..... 1 to 60 seconds in steps of 1 s
Timing accuracy: ..... ±500 ms
Elements: ..... trip and alarm

CALCULATION METHOD
If $I_{AV} \geq I_{FLA}$: $([I_M - I_{AV}] / I_{AV}) \times 100\%$
If $I_{AV} \leq I_{FLA}$: $([I_M - I_{AV}] / I_{FLA}) \times 100\%$
Where:
I_{AV} = average phase current
I_M = current in a phase with maximum deviation from I_{AV}
I_{FLA} = MOTOR FULL LOAD CURRENT setpoint

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FUSE FAILURE (RUNNING STATE ONLY)

Timing: <500 ms
Elements: trip and alarm

GROUND FAULT (CBCT OR RESIDUAL)

Pickup level: 0.5 to 15.0 A in steps of 0.1 (CBCT); 10 to 100% of FLA in steps of 1% (residual)
Trip time delay on start: 0 to 10 s in steps of 0.1 s
Trip time delay on run: 0 to 5 s in steps of 0.1 s
Alarm time delay on start/run: 0 to 60 s in steps of 1 s
Timing accuracy: ±50 ms or ±0.5% of total time
Elements: trip and alarm

LOAD INCREASE

Pickup level: 50 to 150% of FLA in steps of 1%
Timing accuracy: ±500 ms
Elements: Alarm

MECHANICAL JAM

Pickup level: 1.01 to 4.50 × FLA in steps of 0.01
Time delay: 0.1 to 30.0 seconds in steps of 0.1
Timing accuracy: ±500 ms
Elements: trip

PHASE OVERVOLTAGE

Pickup level: 101 to 120% of rated in steps of 1%
Time delay: 1 to 60 seconds in steps of 1 s
Timing accuracy: ±500 ms
Elements: trip and alarm

PHASE UNDERVOLTAGE

Pickup level: 60 to 99% of rated in steps of 1
Time delay: 1 to 60 seconds in steps of 1 s
Timing accuracy: ±500 ms
Elements: trip and alarm

RTD PROTECTION

RTD types: three-wire (100 ohm Platinum)
Range: –50 to 250°C in steps of 1
Hysteresis: 2°C

THERMAL MODEL

Standard curve time multiplier: 1 to 15 in steps of 1
Thermal overload pickup: 1.01 to 1.25 in steps of 0.01
Motor full load current (FLA): 0.5 to 1000 A in steps of 0.1
Motor rated voltage: 100 to 690 V AC
Curve biasing: phase unbalance (±5%) hot/cold ratio stator RTD exponential running and stopped cooling rates
Update rate: 3 cycles
Hot/cold safe stall ratio: 1 to 100% in steps of 1%
Timing accuracy: ±200 ms or ±2% of total time (based on measured value)
Elements: trip and alarm

THERMISTOR

Sensor types: PTC (R_{HOT} = 100 to 30 kohms); NTC (R_{HOT} = 100 to 30 kohms)
Timing accuracy: ±500 ms
Elements: Trip and alarm

UNDERCURRENT

Pickup level: 1 to 100% of FLA in steps of 1
Time delay: 1 to 60 seconds in steps of 1
Timing accuracy: ±500 ms
Elements: trip and alarm

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UNDERPOWER

Pickup level: ..... 1 to 100% of kW rating in steps of 1
Time delay: ..... 1 to 60 seconds in steps of 1
Timing accuracy: ..... ±500 ms
Elements: ..... trip and alarm

VOLTAGE PHASE REVERSAL

Configuration: ..... ABC or Rev starter
Timing accuracy: ..... ±500 ms
Elements: ..... trip or alarm

User interface specifications

GRAPHICAL CONTROL PANEL AND HAND HELD DEVICE

Size: ..... width 153mm, height 102mm, depth 35mm
LCD: ..... 3.5-inch color, 320 by 240 pixels
LED indicators: ..... 10 LEDs
Pushbuttons: ..... Start A, Start B, Stop, plus 11 LCD screen display control keys
Ports: ..... USB 2.0 port for laptop computer connection
Cable - GCP to Base Unit: ..... Shielded RJ45; Maximum length 6' (1.83 m)

BASIC CONTROL PANEL

Size: ..... BCP: width 75mm, height 75mm, depth 31mm
LCD: ..... 3.5-inch color, 320 by 240 pixels
LED indicators: ..... 12 LEDs
Pushbuttons: ..... Start A, Start B, Stop, Reset, Auto, Manual
Cable - BCP to Base Unit: ..... Shielded RJ45; Maximum length 6' (1.83 m)

Metering and monitoring specifications

EVENT RECORDER

Capacity: ..... 256 events
Data storage: ..... non-volatile memory

FREQUENCY METERING

Range: ..... 40.00 to 70.00 Hz in steps of 0.01
Accuracy: ..... ±0.05 Hz

POWER METERING

Real power range: ..... –2000.0 to 2000.0 kW in steps of 0.1
Apparent power range: ..... 0.0 to 2500.0 kVA in steps of 0.1
Accuracy: ..... ±1% of full scale

POWER FACTOR METERING

Range: ..... –0.99 to +0.99 in steps of 0.01
Accuracy: ..... ±0.05

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Control specifications

UNDERVOLTAGE RESTART

Dropout/Pickup Level: ..... 60 to 100% NCV in steps of 1%
Short Dip Time: ..... 100 to 500 ms or OFF in steps of 10 ms
Medium Dip Time: ..... 0.1 to 10.0 s in steps of 0.1 s
Medium Dip Delay: ..... 0.2 to 90 s in steps of 0.2 s
Long Dip Time: ..... 0.5 to 60.0 min or OFF in steps of 0.5 min
Long Dip Delay: ..... 1.0 to 1200.0 s in steps of 1.0 s
Short Dip Time Accuracy: ..... ±5% of total time
Medium and Long Dip Time Accuracy: ..... ±1 s or ±5% of total time, whichever is greater

Inputs specifications

AUXILIARY VOLTAGE INPUT (UNDERVOLTAGE RESTART SOURCE)

External VT primary: ..... 110 to 690 V AC in steps of 1 (if used)
Input range: ..... 60 to 300 V AC
Nominal frequency: ..... 50 or 60 Hz
Accuracy: ..... ±5% of reading

DIGITAL INPUTS (IO_C MODULE)

Fixed pickup: ..... 65 V AC
Recognition time: ..... 2 cycles
Current draw at rated voltage: ..... 75 mA @ 120 V AC for 200 µs every cycle
60 mA @ 240 V AC for 800 µs every cycle
Input impedence: ..... 1.7 kΩ
Type: ..... opto-isolated inputs
External switch: ..... wet contact
Maximum input voltage: ..... 300 V AC

DIGITAL INPUTS (IO_E MODULE)

Fixed pickup: ..... 20 V DC
Recognition time: ..... 2 cycles
Current draw at rated voltage: ..... 7 mA @ 24 V DC
14 mA @ 48 V DC
Input impedence: ..... 1.23 kΩ
Type: ..... opto-isolated inputs
External switch: ..... wet contact
Maximum input voltage: ..... 60 V DC

GROUND CURRENT INPUT (50:0.025)

CT primary: ..... 0.5 to 15.0 A
Nominal frequency: ..... 50 or 60 Hz
Accuracy (CBCT): ..... ±0.1 A (0.5 to 3.99 A)
±0.2 A (4.0 A to 15 A)
Burden: ..... <8.6 mVA at 25 A

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PHASE CURRENT INPUTS (INCLUDING RESIDUAL GROUND CURRENT)

Range: 0.2 to 40 A (8 × CT), direct connection up to 5 A FLA
Input type: Combined 1 A / 5 A
Frequency: 50 or 60 Hz
Accuracy: ExtCT: ±2% of reading or ±1% of 8× CTPrimary, whichever is greater
Direct: ±2% of reading or ±0.1 A, whichever is greater
Withstand (at 5A nominal): 0.2 s at 100×
1.0 s at 50×
2.0 s at 40×
continuous at 3× rated current
Burden: <4 mVA at 1A
<0.1 VA at 5 A

PHASE VOLTAGE INPUTS (THREE-PHASE VOLTAGE)

Input range: 208 to 690 V
Nominal frequency: 50 or 60 Hz
Accuracy: ±2% of reading, or ±1 V, whichever is greater

RTD INPUTS

Sensor type: Three-wire RTD (100 ohm Platinum)
Sensing current: 5 mA
Accuracy: ±3°C

THERMISTOR INPUTS

Sensor type: Positive temperature coefficient PTC (R_{HOT} =100 to 30000 ohms), negative temperature coefficient NTC(R_{HOT} = 100 to 30000 ohms)
Accuracy: ±6% of reading or ±100 ohms, whichever is greater

Outputs specifications

OUTPUT RELAYS

Configuration: electromechanical form-A (IO_C) and form-C (IO_D)
Contact material: silver-alloy
Operate time: 10 ms
Minimum contact load: 10 mA at 5 V DC
Maximum switching rate: 300 operations per minute (no load), 30 operations per minute (load)
Mechanical life: 10 000 000 operations
Continuous current: 10 A
Make and carry for 0.2s: 30 A per ANSI C37.90

OUTPUT RELAY BREAK CAPACITY (FORM-A RELAY)

AC resistive, 120 V AC: 10 A
AC resistive, 240 V AC: 10 A
AC inductive, PF = 0.4 pilot duty: 2 A
DC resistive, 30 V DC: 10 A

OUTPUT RELAY BREAK CAPACITY (FORM-C RELAY)

AC resistive, 120 V AC: 10 A normally-open, 5 A normally-closed
AC resistive, 240 V AC: 10 A normally-open, 8 A normally-closed
AC inductive, PF = 0.4 pilot duty: 2.5 A
DC resistive, 30 V DC: 10 A

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Power supply specifications

POWER SUPPLY (HIGH PSU)

Nominal: 120 to 240 V AC 125 to 250 V DC
Range: 60 to 300 V AC (50 and 60 Hz) 84 to 250 V DC
Ride-Through: 35 ms

POWER SUPPLY (LOW PSU)

Nominal: 24 to 48 V DC
Range: 20 to 60 V DC
Ride-Through: 35 ms

ALL RANGES

Voltage withstand: 2 × highest nominal voltage for 10 ms
Power consumption: 16 W typical, 25 W maximum

Communications specifications

DEVICENET (COPPER)

Modes: slave (125, 250, and 500 kbps)
Connector: 5-pin terminal
Current Draw: 80 mA @ 24 VDC

ETHERNET (COPPER)

Modes: 10/100 MB (auto-detect)
Connector: RJ-45
SNTP clock synchronization error: <200 ms (typical)
Protocol: Modbus TCP

PROFIBUS (COPPER)

Modes: DPV0 slave, up to 1.5 Mbps DPV1 slave, up to 1.5 Mbps
Connector: 5-pin terminal

RS485 PORT

Port: opto-isolated
Baud rates: up to 115 kbps
Protocol: Modbus RTU, half-duplex
Maximum distance: 1200 m
Isolation: 2 kV

USB PORT (GRAPHIC CONTROL PANEL ONLY)

Standard specification: Compliant with both USB 2.0 and USB 1.1
Data transfer rate: USB device emulating serial communications port at 115 kbps

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Testing and certification

TESTING AND CERTIFICATION		
Test	**Reference Standard**	**Test Level**
Dielectric Voltage Withstand:	EN60255-5	2.3KV (1 minute)
Impulse Voltage Withstand:	EN60255-5	5KV
Damped Oscillatory:	IEC61000-4-18IEC60255-22-1	2.5KV CM, 1KV DM
Electrostatic Discharge:	EN61000-4-2/IEC60255-22-2	Level 4
RF Immunity:	EN61000-4-3/IEC60255-22-3	Level 3
Fast Transient Disturbance:	EN61000-4-4/IEC60255-22-4	Class A
Surge Immunity:	EN61000-4-5/IEC60255-22-5	Level 3
Conducted RF Immunity:	EN61000-4-6/IEC60255-22-6	Level 3
Voltage Interruption and Ripple DC:	IEC60255-11	15% ripple , 200ms interupts
Radiated & Conducted Emissions:	CISPR11 /CISPR22/ IEC60255-25	Class A
Sinusoidal Vibration:	IEC60255-21-1	Class 1
Shock & Bump:	IEC60255-21-2	Class 1
Power magnetic Immunity:	IEC61000-4-8	Level 5
Pulse Magnetic Immunity:	IEC61000-4-9	Level 4
Voltage Dip & Interruption:	IEC61000-4-11	0,40,70% dips,250/300cycle interrupts
Damped Oscillatory:	IEC61000-4-12	2.5KV CM, 1KV DM
Harmonics & Interharmonics:	IEC61000-4-13	Class 3
Voltage Ripple:	IEC61000-4-17	15% ripple
Ingress Protection:	IEC60529	IP20 (base unit) , IP54 (Control Panel)
Environmental (Cold):	IEC60068-2-1	-25°C 16 hrs
Environmental (Dry heat):	IEC60068-2-2	70°C 16hrs
Relative Humidity Cyclic:	IEC60068-2-30	6-day variant 2

APPROVALS		
	Applicable Council Directive	**According to**
CE compliance:	Low voltage directive	EN60255-5, EN61010-1
	EMC Directive	EN50263 / EN61000-6-2/ EN61000-6-4
North America:	cULus	UL1053 [e83849 NKCR]
		UL508 [e83849 NKCR]
		C22.2-14 [e83849 NKCR7]
EAC	Machines and Equipment	TR CU 010/2011
ISO:	Manufactured under a registered quality program	ISO9001

EAC

The EAC Technical Regulations (TR) for Machines and Equipment apply to the Customs Union (CU) of the Russian Federation, Belarus, and Kazakhstan

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Item	Description
Country of origin	Spain or Canada; see label on the unit
Date of manufacture	See label on the MM300 unit
Declaration of Conformity and/or Certificate of Conformity	Available on request

Physical specifications

DIMENSIONS

Size: ..... Base: 120 mm (W) × 90 mm (H) × 113 mm (D) [+ terminals 10mm]
Expansion: 62 mm (W) × 90 mm (H) × 113 mm (D)
GCP: 153 mm (W) × 102 mm (H) × 35 mm (D)
BCP: 75 mm (W) × 75 mm (H) × 31 mm (D)

Weight (Base): ..... 0.75 kg

Environmental specifications

ENVIRONMENTAL SPECIFICATIONS	
Ambient temperatures:	
Storage/shipping:	- 40°C to 90°C *
Operating:	-20°C to 60°C *
* 1" around Base Unit	
Humidity:	Operating up to 95% (non condensing) @ 55°C (As per IEC60068-2-30 Variant 2, 6days)
Altitude:	2000m (max)
Overvoltage Category:	II
Ingress Protection:	IP20 (Base Unit) IP54 (Control Panel)
Environmental rating:	60°C surrounding air
Pollution Degree:	II
	Type 1 (panel mount versions only)
Noise:	0 dB

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GE
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MM300 Motor Management System

Chapter 8: MM300 order codes

The information to specify an MM300 relay is provided in the following order code figure.

Figure 8-1: MM300 order codes

	Base							Expanded				
	MM300 –	*	E	*	*	*	*	A	*	*	*	*	
Interface	**MM300**	|		|	|	|	|		|	|	|	|	MM300 Motor Management System
Control panel		**X**		|	|	|	|		|	|	|	|	No control panel
		B		|	|	|	|		|	|	|	|	Basic control panel, no USB
		G		|	|	|	|		|	|	|	|	Graphical control panel with USB
Power supply				**H**	|	|	|		|	|	|	|	High: 80 to 250 V DC (Standard); 60 to 300 V AC
				L	|	|	|		|	|	|	|	Low*: 24 V DC (24 to 48 V DC Nominal)
Communications					**S**	|	|		|	|	|	|	Standard communications: RS485 Modbus RTU
					D	|	|		|	|	|	|	Standard plus DeviceNet Slave and 10/100 Modbus TCP
					P	|	|		|	|	|	|	Standard plus Profibus DP Slave and 10/100 Modbus TCP
Options						**S**	|		|	|	|	|	Standard: Starter control and event recorder
						1	|		|	|	|	|	Option 1: Standard plus undervoltage autorestart
						2	|		|	|	|	|	Option 2: Option 1 plus waveform capture and data logger
						3	|		|	|	|	|	Option 3: Option 2 plus FlexLogic™
Protection							|		**X**	**X**	**X**	**X**	No Additional Protection
							|		**B**	|	|	|	Three-phase voltage metering and three-phase underpower, undervoltage, overvoltage, phase reversal
							|		**G**	**G**	**G**	**G**	Bank of three (3) RTDs: 100PT (maximum of 2 banks)
Input/output modules							**C**		**C**	**C**	**C**	**C**	Two (2) 10 A form-A relays and six (6) 60 to 300 V AC digital Inputs
							E		**E**	**E**	**E**	**E**	Two (2) 10 A form-A relays and six (6) 20 to 60 V DC digital Inputs
									D	**D**	**D**	**D**	Four (4) 10 A form-C relays

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NOTES: * The UV Restart feature is not supported with the Low-Voltage power supply option.
Harsh Environment Coating is a standard feature on all MM300 units.

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Example of an MM300 order code

MM300-GEHS1CAXXXX: MM300 with graphical control panel and USB port, English language display, high voltage 84 to 250 V DC and 60 to 300 V AC power supply, RS485 Modbus RTU communications, starter control, event recorder, undervoltage autorestart, three-phase current, thermal overload, undercurrent, single phase underpower, two 10 A form-A contact output relays, and six digital inputs.

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